IJA # 1452

Archival Materials from a Ring Binder of Mathematics Exams

ELBA

.................19

.................19

RADO

Made in Germany

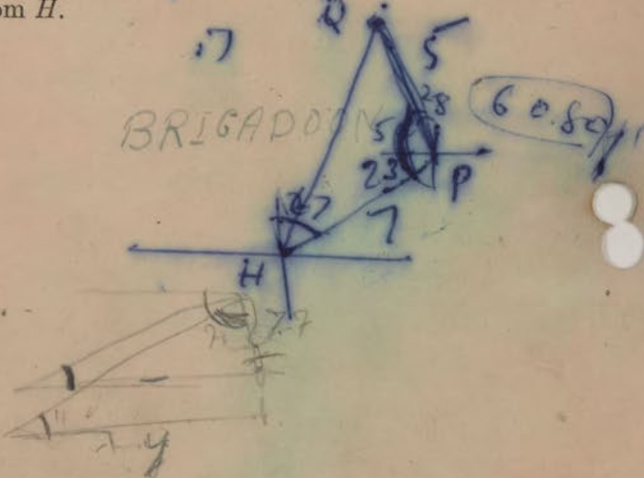
كهرمانة سليم البحيري ٧٢/٥/٤

Arith & Trig.

Summer 66
January 66
Jan. 67

Sum. 69
Sum. 70
Sum. 71

11. A ship leaves a harbour, H, and steams 7 nautical miles in a direction N. 67° E. (067°) to a point P. At P it alters course and steams 5 nautical miles in a direction N. 28° W. (332°) to a point Q. Find the distance and bearing of Q from H.



$(QH)^2 = 25 + 49 - 2\times5\times7\cos 75$

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1955

PURE MATHEMATICS

(a) ARITHMETIC AND TRIGONOMETRY

MONDAY, *June* 20.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *the questions in this section. Mathematical tables must* NOT *be used in Questions* 1 *and* 2.]

1. (i) Simplify $\dfrac{1\frac{1}{6}\times 8\frac{1}{3}}{5\frac{1}{2}+3\frac{1}{4}}$.

(ii) Find the exact value of $\dfrac{5{\cdot}6\times 2{\cdot}4}{0{\cdot}2\times 0{\cdot}07}$.

(iii) Find the cost of 2 tons 5 cwt. at £7 6*s*. 8*d*. per ton.

2. (i) Convert a speed of 310 kilometres in 37 minutes to kilometres per hour, correct to the nearest kilometre per hour.

(ii) In 1914 new-laid eggs cost 10*d*. a dozen. In November, 1954, they cost $6\frac{1}{4}d$. each. Express the 1954 price as a percentage of the 1914 price.

(iii) Bone meal costing 3*d*. a lb. is applied at the rate of 4 oz. per square yard to an allotment measuring 25 yd. by 16 yd. Find the total cost.

3. (i) Show that 1 sq. mile $=640$ acres. A map is drawn to a scale of 2 in. to 1 mile. What is the area, in acres, of a field which is represented on the map by an area of $\frac{1}{8}$ sq. in.?

(ii) A motorist drives a distance of 20 miles at an average speed of 40 m.p.h. and returns at an average speed of 30 m.p.h. Find his average speed, in m.p.h., for the whole journey.

4. Find the number of two-gallon tins which can be filled from a full cylindrical storage tank of diameter 6 ft. and length 8 ft., allowing for a two per cent loss in filling.

$\left[\text{Take 1 cu. ft.}=6\tfrac{1}{4}\text{ gall. and }\pi=\frac{22}{7}.\right]$

5. The ordinary price of pyjamas is 22*s.* 6*d.* During a sale there is a discount of 2*s.* in the £. What is the sale price? Towards the end of the sale 2*s.* 6*d.* is taken off the sale price. Express the *total* reduction as a percentage of the ordinary price.

6. A motor-car depreciates in value each year by 15 per cent of its value at the beginning of the year. What is the value, to the nearest £, of a car, costing £750, two years after purchase?

Section B

[*Answer any* THREE *questions from this section.*]

7. In the financial year 1954–55 a man had an earned income of £1,350 and a further *unearned* income of £200 from investments. In that year income-tax was levied according to the following rules. The first £210 of the man's income was free of tax and there was a further tax-free allowance of two-ninths of the *earned* income. The remainder of his *total* income, called the "taxable income", was taxed as follows. The first £100 of the taxable income was taxed at 2*s.* 6*d.* in the £; the next £150 at 5*s.*; the next £150 at 7*s.*; and the remainder at 9*s.* in the £. How much tax did the man pay?

8. Fruit cordial is packed in bottles of external diameter $3\frac{1}{2}$ in. The bottles are packed in crates, to hold two dozen bottles, in four rows of six. The sides of the crates are 1 in. thick and there are separators of thickness $\frac{1}{2}$ in. between the bottles, as in the diagram.

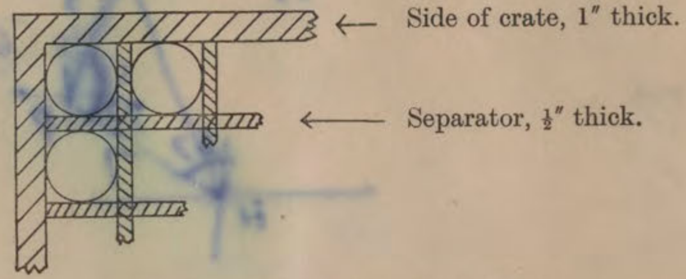


Diagram showing a corner of a crate.

Find the external dimensions of the bottom of a crate and determine the greatest number of crates which can be arranged on the floor of a lorry of internal measurements 6 ft. by 13 ft.

Find, in gallons, the amount of cordial which can be carried by the lorry if each bottle holds $1\frac{1}{4}$ pints and the lorry, when fully loaded, can carry four layers of crates.

9. In 1939 two men, Adams and Black, each possessed £1,250 and each bought a house with his money.

Adams let his house, and in 1954 was receiving a rent of £90 per annum. Out of this he had to pay £20 for repairs, and then had to pay income-tax of 9*s.* in the £ on the remainder of the rent.

Black sold his house in 1948 for £3,500 and invested £2,000 in a Building Society paying $2\frac{1}{2}$% per annum free of tax, and the rest in another society paying $2\frac{1}{4}$% per annum free of tax.

Calculate the net income each man received in 1954 and express Black's net income as a percentage of the capital he owned in 1939.

10. From the top of a cliff known to be 77 metres above sea-level at low tide, the angle of depression of a buoy is 11° 14′ at low tide and 10° 34′ at high tide. Find, to the nearest ten centimetres, the rise of the tide.

[P. T. O.

Maths A
Arith
360
Overseas

UNIVERSITY OF LONDON

General Certificate of Education Examination

SUMMER 1971 **ORDINARY LEVEL**

Mathematics 1

Syllabus A

ARITHMETIC AND TRIGONOMETRY

for Candidates Overseas

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Evaluate $\dfrac{1 \cdot 5 \times 0 \cdot 021}{0 \cdot 003 \times 1 \cdot 75}$.

(ii) Express as a single fraction in its lowest terms

$$(2\tfrac{1}{2} + 1\tfrac{1}{4}) \div 2\tfrac{1}{2}.$$

(iii) Express $\frac{3}{4}$ of 1 cwt as a fraction of 1 ton.

TSE 70/1481 7/3/3/100/17160

Turn over

2. (i) Find the average of five numbers, if one of them is 11 and the average of the other four numbers is 6.

(ii) A map is drawn to the scale of 1 inch to 1 mile. Find the length on the map which represents an actual distance of 1 540 yards.

---

3. (i) The area of a trapezium is 80 cm², and the distance between the parallel sides is 10 cm. If the length of one of the parallel sides is 5 cm, calculate the length of the other parallel side.

(ii) A room is 9 ft long, 6 ft wide and 7 ft 6 inches high. If the combined area of the window and door is 36 ft², find the cost of tiling the walls with tiles 6 inches square which cost £15 per 100, if the door and window are positioned such that the tiles fit exactly.

---

4. (i) A car has wheels of diameter 21 inches. Calculate how many times in a second each revolves when the car has a speed of 60 mile/h.

[Take π as $3\frac{1}{7}$.]

(ii) Find the number of years for which £120 must be invested at $7\frac{1}{2}\%$ per annum simple interest to amount to £174.

(iii) Calculate the compound interest on £1 500 at 5% per annum for 2 years.

---

5. A wholesaler buys 1 000 articles from a manufacturer for a total cost of £120. He sells them to retailers at 20p each for the first 100, 18p each for the next 200 and at 15p each for the remainder of the order. If one retailer orders 750 articles and another orders 250, calculate the wholesaler's profit. Express this as a percentage of his outlay.

---

6. (i) Calculate the angle between a longer side and a diagonal of a rectangle with sides of 4 cm and 5 cm.

(ii) 1 ft³ of metal weighs 672 lb. Calculate the weight in grammes, to the nearest $\frac{1}{10}$ gramme, of 1 cm³ of the same metal.

[Take 1 inch = 2·54 cm; 1 oz = 31·1 grammes.]

Section B

Answer any THREE questions in this section.

7. A manufacturer estimates that at inspection 12% of the articles he produces will have to be rejected. He accepts an order to supply 22 000 articles at £7·50 each. Calculate how many articles he must produce to ensure the order is completed.

He estimates the profit on his total outlay, which includes the manufacture of rejected articles, to be 65%. Find the cost of manufacture of each article.

In fact only 8% were rejected and he sold the extra articles at the reduced price of £6·00 each. Find his actual profit and express this as a percentage of his total outlay.

---

8. A town has two circular reservoirs. One has a diameter of 800 yards. If the water level of this reservoir is raised by 1 inch, calculate how many gallons of water will be added. Give your answer to the nearest 10 000 gallons.

A rise of 1 inch in the water levels of both reservoirs provides jointly 4 million gallons of water. Calculate the diameter of the second reservoir.

[Take π as $3\frac{1}{7}$; 1 gallon of water weighs 10 lb;
1 cubic foot of water weighs 62·4 lb.]

---

9. A man travels by car from A to D via B and C. The times for the three sections AB, BC, CD are in the ratio of 1:5:4 and the distance AB, BC, CD are in the ratio 1:12:8. The distance BC is 180 miles and the total driving time for the journey AD is 6 hours 40 minutes. Calculate

(*a*) the time for each section,

(*b*) the distances AB and CD,

(*c*) his average speed for the whole journey from A to D.

On another occasion his average speed from A to B is reduced to 18 mile/h and from C to D is reduced to 40 mile/h, the speed from B to C remaining the same. Calculate the ratio of the three times in this case.

Turn over

10. A and B are points on a coast, B being 2 000 yd due East of A. A man sails from A on a bearing of 060° (N60°E) for 800 yd to a buoy P, where he changes course to 070° (N70°E) and sails for 1 000 yd to another buoy Q. Calculate

(*a*) the distances of P and Q from the line AB,

(*b*) the distance QB,

(*c*) the course he must set to sail directly from Q to B.

---

11. C, B, D are three points on level ground not in a straight line. B is the foot of a vertical mast, BT. The angle of elevation of the top of the mast, T, from C is 15° 18′. Given that $BC = 400$ ft, $BD = 300$ ft, and the angle $CBD = 40°$, calculate

(*a*) the height of the mast BT,

(*b*) the angle of elevation of T from D,

(*c*) the shortest distance of C from BD,

(*d*) the angle CDB.

Maths A
Arith
360
Overseas

UNIVERSITY OF LONDON

General Certificate of Education Examination

SUMMER 1971 **ORDINARY LEVEL**

Mathematics 1

Syllabus A

ARITHMETIC AND TRIGONOMETRY

for Candidates Overseas

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Evaluate $\dfrac{1{\cdot}5 \times 0{\cdot}021}{0{\cdot}003 \times 1{\cdot}75}$.

(ii) Express as a single fraction in its lowest terms

$$(2\tfrac{1}{2} + 1\tfrac{1}{4}) \div 2\tfrac{1}{2}.$$

(iii) Express $\frac{3}{4}$ of 1 cwt as a fraction of 1 ton.

TSE 70/1481 7/3/3/100/17160

Turn over

2. (i) Find the average of five numbers, if one of them is 11 and the average of the other four numbers is 6.

(ii) A map is drawn to the scale of 1 inch to 1 mile. Find the length on the map which represents an actual distance of 1 540 yards.

---

3. (i) The area of a trapezium is 80 cm^2, and the distance between the parallel sides is 10 cm. If the length of one of the parallel sides is 5 cm, calculate the length of the other parallel side.

(ii) A room is 9 ft long, 6 ft wide and 7 ft 6 inches high. If the combined area of the window and door is 36 ft^2, find the cost of tiling the walls with tiles 6 inches square which cost £15 per 100, if the door and window are positioned such that the tiles fit exactly.

---

4. (i) A car has wheels of diameter 21 inches. Calculate how many times in a second each revolves when the car has a speed of 60 mile/h.

[Take π as $3\frac{1}{7}$.]

(ii) Find the number of years for which £120 must be invested at $7\frac{1}{2}\%$ per annum simple interest to amount to £174.

(iii) Calculate the compound interest on £1 500 at 5% per annum for 2 years.

---

5. A wholesaler buys 1 000 articles from a manufacturer for a total cost of £120. He sells them to retailers at 20p each for the first 100, 18p each for the next 200 and at 15p each for the remainder of the order. If one retailer orders 750 articles and another orders 250, calculate the wholesaler's profit. Express this as a percentage of his outlay.

---

6. (i) Calculate the angle between a longer side and a diagonal of a rectangle with sides of 4 cm and 5 cm.

(ii) 1 ft^3 of metal weighs 672 lb. Calculate the weight in grammes, to the nearest $\frac{1}{10}$ gramme, of 1 cm^3 of the same metal.

[Take 1 inch = 2·54 cm; 1 oz = 31·1 grammes.]

Section B

Answer any THREE questions in this section.

7. A manufacturer estimates that at inspection 12% of the articles he produces will have to be rejected. He accepts an order to supply 22 000 articles at £7·50 each. Calculate how many articles he must produce to ensure the order is completed.

He estimates the profit on his total outlay, which includes the manufacture of rejected articles, to be 65%. Find the cost of manufacture of each article.

In fact only 8% were rejected and he sold the extra articles at the reduced price of £6·00 each. Find his actual profit and express this as a percentage of his total outlay.

---

8. A town has two circular reservoirs. One has a diameter of 800 yards. If the water level of this reservoir is raised by 1 inch, calculate how many gallons of water will be added. Give your answer to the nearest 10 000 gallons.

A rise of 1 inch in the water levels of both reservoirs provides jointly 4 million gallons of water. Calculate the diameter of the second reservoir.

[Take π as $3\frac{1}{7}$; 1 gallon of water weighs 10 lb;
1 cubic foot of water weighs 62·4 lb.]

---

9. A man travels by car from A to D via B and C. The times for the three sections AB, BC, CD are in the ratio of 1:5:4 and the distance AB, BC, CD are in the ratio 1:12:8. The distance BC is 180 miles and the total driving time for the journey AD is 6 hours 40 minutes. Calculate

(*a*) the time for each section,

(*b*) the distances AB and CD,

(*c*) his average speed for the whole journey from A to D.

On another occasion his average speed from A to B is reduced to 18 mile/h and from C to D is reduced to 40 mile/h, the speed from B to C remaining the same. Calculate the ratio of the three times in this case.

Turn over

10. A and B are points on a coast, B being 2 000 yd due East of A. A man sails from A on a bearing of 060° (N60°E) for 800 yd to a buoy P, where he changes course to 070° (N70°E) and sails for 1 000 yd to another buoy Q. Calculate

(*a*) the distances of P and Q from the line AB,

(*b*) the distance QB,

(*c*) the course he must set to sail directly from Q to B.

---

11. C, B, D are three points on level ground not in a straight line. B is the foot of a vertical mast, BT. The angle of elevation of the top of the mast, T, from C is 15° 18′. Given that $BC = 400$ ft, $BD = 300$ ft, and the angle $CBD = 40°$, calculate

(*a*) the height of the mast BT,

(*b*) the angle of elevation of T from D,

(*c*) the shortest distance of C from BD,

(*d*) the angle CDB.

Maths A
Arith
360
Overseas

UNIVERSITY OF LONDON

General Certificate of Education Examination

SUMMER 1971 **ORDINARY LEVEL**

Mathematics 1

Syllabus A

ARITHMETIC AND TRIGONOMETRY

for Candidates Overseas

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Evaluate $\dfrac{1{\cdot}5 \times 0{\cdot}021}{0{\cdot}003 \times 1{\cdot}75}$.

(ii) Express as a single fraction in its lowest terms

$$(2\tfrac{1}{2} + 1\tfrac{1}{4}) \div 2\tfrac{1}{2}.$$

(iii) Express $\frac{3}{4}$ of 1 cwt as a fraction of 1 ton.

TSE 70/1481 7/3/3/100/17160

Turn over

2. (i) Find the average of five numbers, if one of them is 11 and the average of the other four numbers is 6.

(ii) A map is drawn to the scale of 1 inch to 1 mile. Find the length on the map which represents an actual distance of 1 540 yards.

---

3. (i) The area of a trapezium is 80 cm^2, and the distance between the parallel sides is 10 cm. If the length of one of the parallel sides is 5 cm, calculate the length of the other parallel side.

(ii) A room is 9 ft long, 6 ft wide and 7 ft 6 inches high. If the combined area of the window and door is 36 ft^2, find the cost of tiling the walls with tiles 6 inches square which cost £15 per 100, if the door and window are positioned such that the tiles fit exactly.

---

4. (i) A car has wheels of diameter 21 inches. Calculate how many times in a second each revolves when the car has a speed of 60 mile/h.

[Take π as $3\frac{1}{7}$.]

(ii) Find the number of years for which £120 must be invested at $7\frac{1}{2}\%$ per annum simple interest to amount to £174.

(iii) Calculate the compound interest on £1 500 at 5% per annum for 2 years.

---

5. A wholesaler buys 1 000 articles from a manufacturer for a total cost of £120. He sells them to retailers at 20p each for the first 100, 18p each for the next 200 and at 15p each for the remainder of the order. If one retailer orders 750 articles and another orders 250, calculate the wholesaler's profit. Express this as a percentage of his outlay.

---

6. (i) Calculate the angle between a longer side and a diagonal of a rectangle with sides of 4 cm and 5 cm.

(ii) 1 ft^3 of metal weighs 672 lb. Calculate the weight in grammes, to the nearest $\frac{1}{10}$ gramme, of 1 cm^3 of the same metal.

[Take 1 inch = 2·54 cm; 1 oz = 31·1 grammes.]

Section B

Answer any THREE questions in this section.

7. A manufacturer estimates that at inspection 12% of the articles he produces will have to be rejected. He accepts an order to supply 22 000 articles at £7·50 each. Calculate how many articles he must produce to ensure the order is completed.

He estimates the profit on his total outlay, which includes the manufacture of rejected articles, to be 65%. Find the cost of manufacture of each article.

In fact only 8% were rejected and he sold the extra articles at the reduced price of £6·00 each. Find his actual profit and express this as a percentage of his total outlay.

---

8. A town has two circular reservoirs. One has a diameter of 800 yards. If the water level of this reservoir is raised by 1 inch, calculate how many gallons of water will be added. Give your answer to the nearest 10 000 gallons.

A rise of 1 inch in the water levels of both reservoirs provides jointly 4 million gallons of water. Calculate the diameter of the second reservoir.

[Take π as $3\frac{1}{7}$; 1 gallon of water weighs 10 lb;
1 cubic foot of water weighs 62·4 lb.]

---

9. A man travels by car from A to D via B and C. The times for the three sections AB, BC, CD are in the ratio of 1:5:4 and the distance AB, BC, CD are in the ratio 1:12:8. The distance BC is 180 miles and the total driving time for the journey AD is 6 hours 40 minutes. Calculate

(*a*) the time for each section,

(*b*) the distances AB and CD,

(*c*) his average speed for the whole journey from A to D.

On another occasion his average speed from A to B is reduced to 18 mile/h and from C to D is reduced to 40 mile/h, the speed from B to C remaining the same. Calculate the ratio of the three times in this case.

Turn over

10. *A* and *B* are points on a coast, *B* being 2 000 yd due East of *A*. A man sails from *A* on a bearing of 060° (N60°E) for 800 yd to a buoy *P*, where he changes course to 070° (N70°E) and sails for 1 000 yd to another buoy *Q*. Calculate

(*a*) the distances of *P* and *Q* from the line *AB*,

(*b*) the distance *QB*,

(*c*) the course he must set to sail directly from *Q* to *B*.

---

11. *C*, *B*, *D* are three points on level ground not in a straight line. *B* is the foot of a vertical mast, *BT*. The angle of elevation of the top of the mast, *T*, from *C* is 15° 18′. Given that $BC = 400$ ft, $BD = 300$ ft, and the angle $CBD = 40°$, calculate

(*a*) the height of the mast *BT*,

(*b*) the angle of elevation of *T* from *D*,

(*c*) the shortest distance of *C* from *BD*,

(*d*) the angle *CDB*.

Maths A
Arith
360

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1970

Ordinary Level

MATHEMATICS 1

Syllabus A

ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Questions 3 *and* 8 *are currency questions. Candidates may answer these questions either in present currency or in decimal currency.*

Section A

1. Calculate the exact value of

(*a*) $\sqrt{3^2 + 4^2}$, (*c*) $3\frac{5}{8} - 2{\cdot}83$,

(*b*) $\dfrac{0{\cdot}259 \times 10{\cdot}01}{48{\cdot}1}$, (*d*) $(0{\cdot}05)^3$.

TSE 68/1739 16/2/2/2/100/28150

Turn over

2. A cooker is in the form of a rectangular box of height 88 cm and its base is a square of side 55 cm. Calculate

(*a*) the volume of the cooker in cubic centimetres,

(*b*) the volume of the cooker in cubic metres,

(*c*) the area of the base of the cooker in square feet giving your answer correct to three significant figures.

[Take 1 m = 39·4 in.]

3. Answer either Part A (present currency) or Part B (decimal currency).

Part A (present currency). A builder employs
4 bricklayers for a 44-hour week at 8*s* 6*d* per hour,
1 plumber for a 42-hour week at 9*s* per hour,
2 carpenters for a 40-hour week at 9*s* 6*d* per hour,
and in addition he has to pay 71*s* per man per week National Insurance. Calculate the weekly cost to the builder of employing these men.

Part B (decimal currency). A builder employs
4 bricklayers for a 44-hour week at $42\frac{1}{2}$p per hour,
1 plumber for a 42-hour week at 45p per hour,
2 carpenters for a 40-hour week at $47\frac{1}{2}$p per hour,
and in addition he has to pay £3·55 per man per week National Insurance. Calculate the weekly cost to the builder of employing these men.

4. A solid gold medal is in the shape of a cylindrical disc of diameter 7 cm and thickness 6 mm. If the density of gold is 19 gramme/cm³ calculate

(*a*) the perimeter of the disc,

(*b*) the weight of the medal.

[Take $\pi = 3\frac{1}{7}$.]

5. In a University student meeting the ratio of men to women is 7 : 2. If 120 women attend the meeting, calculate the number of men attending the meeting.

If the number of students attending the meeting represents 3% of the student population of the University, calculate the total student population of the University.

6. If the length of a diagonal of a rectangle is 12 cm and the acute angle between the diagonals is 54°, calculate the lengths of the sides of the rectangle.

Section B

Answer any THREE questions in this section.

7. An examination consists of a theory paper and a practical paper. Candidates may obtain full marks by answering correctly 5 questions on the theory paper and 3 questions on the practical paper. If each question on the practical paper carries two and a half times the number of marks awarded for each question on the theory paper, calculate the percentage of the full marks obtained by

(*a*) a candidate who attempts only 4 questions on the theory paper and 2 questions on the practical paper but answers each correctly,

(*b*) a candidate who scores three-fifths of the possible marks on the theory paper and two-fifths of the possible marks on the practical paper.

8. Answer this question either in present currency or in decimal currency.

Find the cost of buying a new house if, in addition to the builder's price of £8200, the purchaser must pay a fee equal to $12\frac{1}{2}$% of the builder's price to the Architect, a fee equal to $2\frac{1}{2}$% of the builder's price to the Surveyor and £482 in legal expenses.

After making a cash payment, the purchaser borrows £7800 from an Insurance Company and agrees to pay, at the end of each year, interest at the rate of $7\frac{1}{2}$% per annum on the amount on loan during that year.

If the purchaser makes a payment of £900 to the Insurance Company at the end of each of the first two years, calculate

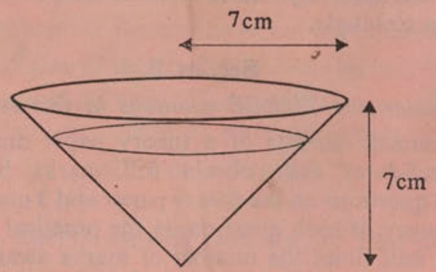
(*a*) how much capital is repaid at the end of the first year,

(*b*) how much interest is paid at the end of the second year,

(*c*) the amount still on loan at the beginning of the third year.

Turn over

9.



The figure represents a hollow cone with its vertex downwards containing water whose volume is half that of the cone. Given that the height of the cone is 7 cm and the radius of the top is 7 cm, calculate

(*a*) the depth of water,

(*b*) the diameter of the water surface.

[The volume of a cone of height h and radius r is $\frac{1}{3}\pi r^2 h$.]

10. An aeroplane flies 50 miles in the direction 027° (N 27° E) from A to B and alters course to 149° (S 31° E) to fly to a point C which is 80 miles from B.

Calculate the distance and bearing of C from A.

11. A vertical wall which is 6 ft high and 20 ft long is built on a North/South line on a horizontal plane. If the elevation of the sun is 53° and its bearing is 168° (S 12° E), calculate the area of the shadow of the wall on the horizontal plane.

3.6677 / 2 = 1.8338

3.835
3.8352
1.0017

6784

68.21

7

−0.0017

Maths A
Arith
360

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1970

Ordinary Level

MATHEMATICS 1

Syllabus A

ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Questions 3 and 8 are currency questions. Candidates may answer these questions either in present currency or in decimal currency.

Section A

1. Calculate the exact value of

(*a*) $\sqrt{3^2 + 4^2}$, 5 (*c*) $3\frac{5}{8} - 2{\cdot}83$, 0.795

(*b*) $\dfrac{0{\cdot}259 \times 10{\cdot}01}{48{\cdot}1}$, (*d*) $(0{\cdot}05)^3$. 0.000125

0.0539

TSE 68/1739 16/2/2/2/100/28150

Turn over

2. A cooker is in the form of a rectangular box of height 88 cm and its base is a square of side 55 cm. Calculate

(*a*) the volume of the cooker in cubic centimetres,

(*b*) the volume of the cooker in cubic metres,

(*c*) the area of the base of the cooker in square feet giving your answer correct to three significant figures.

[Take 1 m = 39·4 in.]

3. Answer either Part A (present currency) or Part B (decimal currency).

Part A (present currency). A builder employs
4 bricklayers for a 44-hour week at 8*s* 6*d* per hour,
1 plumber for a 42-hour week at 9*s* per hour,
2 carpenters for a 40-hour week at 9*s* 6*d* per hour,
and in addition he has to pay 71*s* per man per week National Insurance. Calculate the weekly cost to the builder of employing these men.

Part B (decimal currency). A builder employs
4 bricklayers for a 44-hour week at $42\frac{1}{2}$p per hour,
1 plumber for a 42-hour week at 45p per hour,
2 carpenters for a 40-hour week at $47\frac{1}{2}$p per hour,
and in addition he has to pay £3·55 per man per week National Insurance. Calculate the weekly cost to the builder of employing these men.

4. A solid gold medal is in the shape of a cylindrical disc of diameter 7 cm and thickness 6 mm. If the density of gold is 19 gramme/cm³ calculate

(*a*) the perimeter of the disc,

(*b*) the weight of the medal.

[Take $\pi = 3\frac{1}{7}$.]

5. In a University student meeting the ratio of men to women is 7 : 2. If 120 women attend the meeting, calculate the number of men attending the meeting.

If the number of students attending the meeting represents 3% of the student population of the University, calculate the total student population of the University.

6. If the length of a diagonal of a rectangle is 12 cm and the acute angle between the diagonals is 54°, calculate the lengths of the sides of the rectangle.

Section B

Answer any THREE questions in this section.

7. An examination consists of a theory paper and a practical paper. Candidates may obtain full marks by answering correctly 5 questions on the theory paper and 3 questions on the practical paper. If each question on the practical paper carries two and a half times the number of marks awarded for each question on the theory paper, calculate the percentage of the full marks obtained by

(*a*) a candidate who attempts only 4 questions on the theory paper and 2 questions on the practical paper but answers each correctly,

(*b*) a candidate who scores three-fifths of the possible marks on the theory paper and two-fifths of the possible marks on the practical paper.

8. Answer this question either in present currency or in decimal currency.

Find the cost of buying a new house if, in addition to the builder's price of £8200, the purchaser must pay a fee equal to $12\frac{1}{2}$% of the builder's price to the Architect, a fee equal to $2\frac{1}{2}$% of the builder's price to the Surveyor and £482 in legal expenses.

After making a cash payment, the purchaser borrows £7800 from an Insurance Company and agrees to pay, at the end of each year, interest at the rate of $7\frac{1}{2}$% per annum on the amount on loan during that year.

If the purchaser makes a payment of £900 to the Insurance Company at the end of each of the first two years, calculate

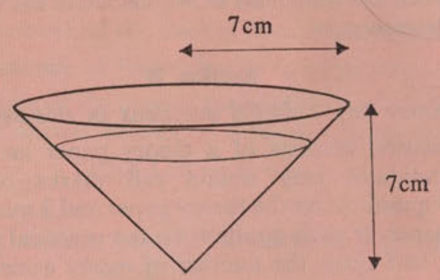
(*a*) how much capital is repaid at the end of the first year,

(*b*) how much interest is paid at the end of the second year,

(*c*) the amount still on loan at the beginning of the third year.

Turn over

9.



The figure represents a hollow cone with its vertex downwards containing water whose volume is half that of the cone. Given that the height of the cone is 7 cm and the radius of the top is 7 cm, calculate

(*a*) the depth of water,

(*b*) the diameter of the water surface.

[The volume of a cone of height h and radius r is $\frac{1}{3}\pi r^2 h$.]

10. An aeroplane flies 50 miles in the direction 027° (N 27° E) from *A* to *B* and alters course to 149° (S 31° E) to fly to a point *C* which is 80 miles from *B*.

Calculate the distance and bearing of *C* from *A*.

11. A vertical wall which is 6 ft high and 20 ft long is built on a North/South line on a horizontal plane. If the elevation of the sun is 53° and its bearing is 168° (S 12° E), calculate the area of the shadow of the wall on the horizontal plane.

Maths A
Arith
360

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1970

Ordinary Level

MATHEMATICS 1

Syllabus A

ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Questions 3 *and* 8 *are currency questions. Candidates may answer these questions either in present currency or in decimal currency.*

Section A

1. Calculate the exact value of

(*a*) $\sqrt{3^2 + 4^2}$, (*c*) $3\frac{5}{8} - 2{\cdot}83$,

(*b*) $\dfrac{0{\cdot}259 \times 10{\cdot}01}{48{\cdot}1}$, (*d*) $(0{\cdot}05)^3$.

TSE 68/1739 16/2/2/2/100/28150

Turn over

2. A cooker is in the form of a rectangular box of height 88 cm and its base is a square of side 55 cm. Calculate

(*a*) the volume of the cooker in cubic centimetres,

(*b*) the volume of the cooker in cubic metres,

(*c*) the area of the base of the cooker in square feet giving your answer correct to three significant figures.

[Take 1 m = 39·4 in.]

3. Answer either Part A (present currency) or Part B (decimal currency).

Part A (present currency). A builder employs
4 bricklayers for a 44-hour week at 8*s* 6*d* per hour,
1 plumber for a 42-hour week at 9*s* per hour,
2 carpenters for a 40-hour week at 9*s* 6*d* per hour,
and in addition he has to pay 71*s* per man per week National Insurance. Calculate the weekly cost to the builder of employing these men.

Part B (decimal currency). A builder employs
4 bricklayers for a 44-hour week at $42\frac{1}{2}$p per hour,
1 plumber for a 42-hour week at 45p per hour,
2 carpenters for a 40-hour week at $47\frac{1}{2}$p per hour,
and in addition he has to pay £3·55 per man per week National Insurance. Calculate the weekly cost to the builder of employing these men.

4. A solid gold medal is in the shape of a cylindrical disc of diameter 7 cm and thickness 6 mm. If the density of gold is 19 gramme/cm³ calculate

(*a*) the perimeter of the disc,

(*b*) the weight of the medal.

[Take $\pi = 3\frac{1}{7}$.]

5. In a University student meeting the ratio of men to women is 7 : 2. If 120 women attend the meeting, calculate the number of men attending the meeting.

If the number of students attending the meeting represents 3% of the student population of the University, calculate the total student population of the University.

6. If the length of a diagonal of a rectangle is 12 cm and the acute angle between the diagonals is 54°, calculate the lengths of the sides of the rectangle.

Section B

Answer any THREE questions in this section.

7. An examination consists of a theory paper and a practical paper. Candidates may obtain full marks by answering correctly 5 questions on the theory paper and 3 questions on the practical paper. If each question on the practical paper carries two and a half times the number of marks awarded for each question on the theory paper, calculate the percentage of the full marks obtained by

(*a*) a candidate who attempts only 4 questions on the theory paper and 2 questions on the practical paper but answers each correctly,

(*b*) a candidate who scores three-fifths of the possible marks on the theory paper and two-fifths of the possible marks on the practical paper.

8. Answer this question either in present currency or in decimal currency.

Find the cost of buying a new house if, in addition to the builder's price of £8200, the purchaser must pay a fee equal to $12\frac{1}{2}\%$ of the builder's price to the Architect, a fee equal to $2\frac{1}{2}\%$ of the builder's price to the Surveyor and £482 in legal expenses.

After making a cash payment, the purchaser borrows £7800 from an Insurance Company and agrees to pay, at the end of each year, interest at the rate of $7\frac{1}{2}\%$ per annum on the amount on loan during that year.

If the purchaser makes a payment of £900 to the Insurance Company at the end of each of the first two years, calculate

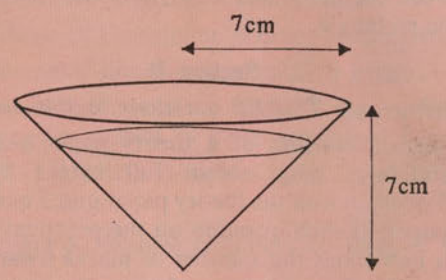
(*a*) how much capital is repaid at the end of the first year,

(*b*) how much interest is paid at the end of the second year,

(*c*) the amount still on loan at the beginning of the third year.

Turn over

9.



The figure represents a hollow cone with its vertex downwards containing water whose volume is half that of the cone. Given that the height of the cone is 7 cm and the radius of the top is 7 cm, calculate

(*a*) the depth of water,

(*b*) the diameter of the water surface.

[The volume of a cone of height h and radius r is $\frac{1}{3}\pi r^2 h$.]

10. An aeroplane flies 50 miles in the direction 027° (N 27° E) from A to B and alters course to 149° (S 31° E) to fly to a point C which is 80 miles from B.

Calculate the distance and bearing of C from A.

11. A vertical wall which is 6 ft high and 20 ft long is built on a North/South line on a horizontal plane. If the elevation of the sun is 53° and its bearing is 168° (S 12° E), calculate the area of the shadow of the wall on the horizontal plane.

Pure Maths A
Arith
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS I

Syllabus A

ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Express as a single fraction in its lowest terms

$$(7\tfrac{1}{12} - 1\tfrac{5}{8}) \div 1\tfrac{7}{8}.$$

(ii) Express 12*s* 3*d* as an exact decimal of £1.

2. (i) Express in miles per hour a speed of 55 feet per second.

(ii) Given that 1 inch = 2·54 centimetres, express one kilometre as a decimal of a mile, correct to three significant figures.

3. (i) Calculate the simple interest on £1 350 for 3 years at 4% per annum.

(ii) The density of hard coke is 28 lb per ft^3. Calculate the weight in cwt of 8 yd^3 of hard coke.

TSE 67/1573 11/2/33650

Turn Over

4. The freezing point of water is 0° on the Celsius scale and 32° on the Fahrenheit scale, while the boiling point of water is 100° on the Celsius scale and 212° on the Fahrenheit scale. Calculate

(*a*) the temperature difference, in degrees Fahrenheit, between the freezing and boiling points of water,

(*b*) the rise in temperature on the Fahrenheit scale which corresponds to a rise of 1° on the Celsius scale,

(*c*) the Fahrenheit temperature which corresponds to 35° Celsius,

(*d*) the Celsius temperature which corresponds to $99{\cdot}5^\circ$ Fahrenheit.

5. (i) Fig 1 represents a window frame, which consists of a square $ABCD$ and a semi-circle BXC. If $BC = 28$ in., calculate in square inches the total area of $ABXCD$.

[Take π as $3\frac{1}{7}$.]

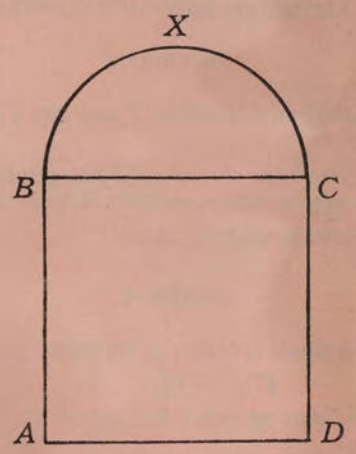


Fig 1

(ii) The longest side of a set-square, whose angles are 30°, 60° and 90°, is 12 cm. Calculate the length of the side opposite the 60° angle, giving your answer to the nearest millimetre.

6. A dealer bought a radio receiver from a manufacturer for £36 and sold it at a profit of $12\frac{1}{2}\%$ on the cost price. Calculate the retail price.

The manufacturer increased the price charged to the dealer, who decided to leave the retail price unchanged. If the new profit made by the dealer was 8% of the price paid to the manufacturer, calculate the increase in the price the manufacturer charged for the radio receiver, and express this increase as a percentage of the manufacturer's original price.

Section B

Answer any THREE questions in this section.

7. The General Rate for 1968 in a County Borough was fixed at 10*s* 9*d* in the pound and the Water Rate at 9*d* in the pound. Calculate the total rates (including General Rate and Water Rate) paid in the year on a house of rateable value £134.

If the total amount received by the County Borough Council from the General Rate was £4 300 000, calculate the total rateable value of all the property in the County Borough.

The expenditure by the County Borough Council on the public libraries was equivalent to a rate of $3{\cdot}21$ pence in the pound. Find the amount of money spent on the public libraries during the year.

8. A rectangular swimming pool of length 75 ft and width 25 ft contained water to a uniform depth of 12 ft. Calculate, in ft^3, the volume of water in the pool.

The pool was completely emptied in exactly 4 hours by a pump which pumped water at a steady rate from the pool through a pipe of circular cross-section of radius 2 in. Calculate, in feet per second, the speed of water flowing through the pipe, giving your answer correct to one decimal place.

It is known that the pool could have been emptied in exactly 6 hours by a second pump working alone. Calculate how much time would have been saved in emptying the pool if both pumps had operated together.

[Take π as $3\frac{1}{7}$.]

9. A printer intends to sell a book at £2 a copy. Calculate the money he would receive if he were to sell

(*a*) 8 000 copies,

(*b*) 12 000 copies.

The printer estimated that a part of the cost of production (for the cost of paper, printing and binding) will be in direct proportion to the number of copies produced, while part (for setting up the type and other basic expenses) will be independent of the number of copies printed. He also estimated that if 8 000 copies were printed and sold he would just cover all the costs of production, but that if he were to print and sell 12 000 copies there would be a total profit of £3 000. Calculate

(*c*) the estimated cost, per thousand copies printed, of paper, printing and binding,

(*d*) the estimated cost of setting up the type and other basic expenses,

(*e*) the total estimated cost of producing 20 000 copies.

10. *PQRS* is a quadrilateral in which *PQR* is a right angle, the angle $PRQ = 48° 27'$, $QR = 13{\cdot}1$ cm, $PS = 21{\cdot}3$ cm, and the angle $SPR = 55° 16'$. Calculate the lengths of *PQ* and *PR* and the area of the quadrilateral *PQRS*.

11. *ABC* is a sheet of metal in the form of an equilateral triangle of side 8 cm and *P* is the point of intersection of the altitudes. Three equal strings of length 9 cm are attached to the vertices of the triangle and their other ends are tied to a hook *O* in the ceiling, so that the triangle is suspended with *P* vertically below *O* and the plane of the triangle horizontal. Calculate

(*a*) the angle *OBC*,

(*b*) the length of *BP*,

(*c*) the inclination of *OB* to the horizontal.

Pure Maths A
Arith
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS I

Syllabus A

ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Express as a single fraction in its lowest terms

$$(7\tfrac{1}{12} - 1\tfrac{5}{8}) \div 1\tfrac{7}{8}.$$

(ii) Express 12*s* 3*d* as an exact decimal of £1.

2. (i) Express in miles per hour a speed of 55 feet per second.

(ii) Given that 1 inch = 2·54 centimetres, express one kilometre as a decimal of a mile, correct to three significant figures.

3. (i) Calculate the simple interest on £1 350 for 3 years at 4% per annum.

(ii) The density of hard coke is 28 lb per ft^3. Calculate the weight in cwt of 8 yd^3 of hard coke.

TSE 67/1573 11/2/33650

Turn Over

4. The freezing point of water is 0° on the Celsius scale and 32° on the Fahrenheit scale, while the boiling point of water is 100° on the Celsius scale and 212° on the Fahrenheit scale. Calculate

   (*a*) the temperature difference, in degrees Fahrenheit, between the freezing and boiling points of water,

   (*b*) the rise in temperature on the Fahrenheit scale which corresponds to a rise of 1° on the Celsius scale,

   (*c*) the Fahrenheit temperature which corresponds to 35° Celsius,

   (*d*) the Celsius temperature which corresponds to 99·5° Fahrenheit.

5. (i) Fig 1 represents a window frame, which consists of a square *ABCD* and a semi-circle *BXC*. If $BC = 28$ in., calculate in square inches the total area of *ABXCD*.

[Take π as $3\frac{1}{7}$.]

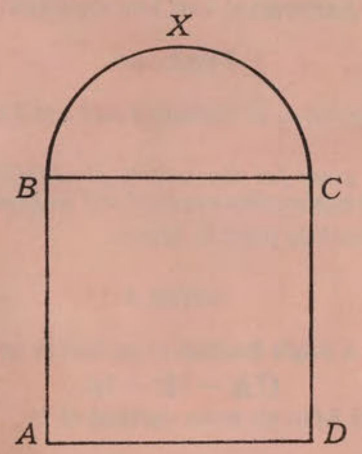


Fig 1

(ii) The longest side of a set-square, whose angles are 30°, 60° and 90°, is 12 cm. Calculate the length of the side opposite the 60° angle, giving your answer to the nearest millimetre.

6. A dealer bought a radio receiver from a manufacturer for £36 and sold it at a profit of $12\frac{1}{2}$% on the cost price. Calculate the retail price.

   The manufacturer increased the price charged to the dealer, who decided to leave the retail price unchanged. If the new profit made by the dealer was 8% of the price paid to the manufacturer, calculate the increase in the price the manufacturer charged for the radio receiver, and express this increase as a percentage of the manufacturer's original price.

Section B

Answer any THREE questions in this section.

7. The General Rate for 1968 in a County Borough was fixed at 10*s* 9*d* in the pound and the Water Rate at 9*d* in the pound. Calculate the total rates (including General Rate and Water Rate) paid in the year on a house of rateable value £134.

   If the total amount received by the County Borough Council from the General Rate was £4 300 000, calculate the total rateable value of all the property in the County Borough.

   The expenditure by the County Borough Council on the public libraries was equivalent to a rate of 3·21 pence in the pound. Find the amount of money spent on the public libraries during the year.

8. A rectangular swimming pool of length 75 ft and width 25 ft contained water to a uniform depth of 12 ft. Calculate, in ft^3, the volume of water in the pool.

   The pool was completely emptied in exactly 4 hours by a pump which pumped water at a steady rate from the pool through a pipe of circular cross-section of radius 2 in. Calculate, in feet per second, the speed of water flowing through the pipe, giving your answer correct to one decimal place.

   It is known that the pool could have been emptied in exactly 6 hours by a second pump working alone. Calculate how much time would have been saved in emptying the pool if both pumps had operated together.

[Take π as $3\frac{1}{7}$.]

9. A printer intends to sell a book at £2 a copy. Calculate the money he would receive if he were to sell

(*a*) 8 000 copies,

(*b*) 12 000 copies.

The printer estimated that a part of the cost of production (for the cost of paper, printing and binding) will be in direct proportion to the number of copies produced, while part (for setting up the type and other basic expenses) will be independent of the number of copies printed. He also estimated that if 8 000 copies were printed and sold he would just cover all the costs of production, but that if he were to print and sell 12 000 copies there would be a total profit of £3 000. Calculate

(*c*) the estimated cost, per thousand copies printed, of paper, printing and binding,

(*d*) the estimated cost of setting up the type and other basic expenses,

(*e*) the total estimated cost of producing 20 000 copies.

10. $PQRS$ is a quadrilateral in which PQR is a right angle, the angle $PRQ = 48° 27'$, $QR = 13{\cdot}1$ cm, $PS = 21{\cdot}3$ cm, and the angle $SPR = 55° 16'$. Calculate the lengths of PQ and PR and the area of the quadrilateral $PQRS$.

11. ABC is a sheet of metal in the form of an equilateral triangle of side 8 cm and P is the point of intersection of the altitudes. Three equal strings of length 9 cm are attached to the vertices of the triangle and their other ends are tied to a hook O in the ceiling, so that the triangle is suspended with P vertically below O and the plane of the triangle horizontal. Calculate

(*a*) the angle OBC,

(*b*) the length of BP,

(*c*) the inclination of OB to the horizontal.

Pure Maths A
Arith
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS I

Syllabus A

ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Express as a single fraction in its lowest terms

$$(7\tfrac{1}{12} - 1\tfrac{5}{6}) \div 1\tfrac{7}{8}.$$

(ii) Express 12*s* 3*d* as an exact decimal of £1.

2. (i) Express in miles per hour a speed of 55 feet per second.

(ii) Given that 1 inch = 2·54 centimetres, express one kilometre as a decimal of a mile, correct to three significant figures.

3. (i) Calculate the simple interest on £1 350 for 3 years at 4% per annum.

(ii) The density of hard coke is 28 lb per ft^3. Calculate the weight in cwt of 8 yd^3 of hard coke.

TSE 67/1573 11/2/33650

Turn Over

4. The freezing point of water is 0° on the Celsius scale and 32° on the Fahrenheit scale, while the boiling point of water is 100° on the Celsius scale and 212° on the Fahrenheit scale. Calculate

(*a*) the temperature difference, in degrees Fahrenheit, between the freezing and boiling points of water,

(*b*) the rise in temperature on the Fahrenheit scale which corresponds to a rise of 1° on the Celsius scale,

(*c*) the Fahrenheit temperature which corresponds to 35° Celsius,

(*d*) the Celsius temperature which corresponds to 99·5° Fahrenheit.

5. (i) Fig 1 represents a window frame, which consists of a square *ABCD* and a semi-circle *BXC*. If $BC = 28$ in., calculate in square inches the total area of *ABXCD*.

[Take π as $3\frac{1}{7}$.]

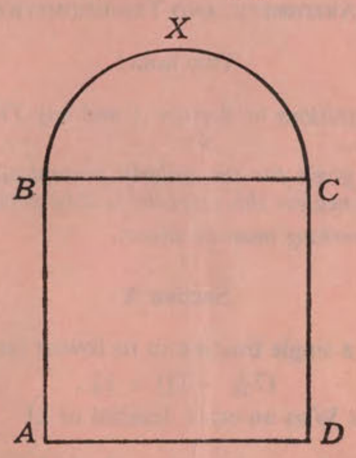


Fig 1

(ii) The longest side of a set-square, whose angles are 30°, 60° and 90°, is 12 cm. Calculate the length of the side opposite the 60° angle, giving your answer to the nearest millimetre.

6. A dealer bought a radio receiver from a manufacturer for £36 and sold it at a profit of $12\frac{1}{2}$% on the cost price. Calculate the retail price.

The manufacturer increased the price charged to the dealer, who decided to leave the retail price unchanged. If the new profit made by the dealer was 8% of the price paid to the manufacturer, calculate the increase in the price the manufacturer charged for the radio receiver, and express this increase as a percentage of the manufacturer's original price.

Section B

Answer any THREE questions in this section.

7. The General Rate for 1968 in a County Borough was fixed at 10*s* 9*d* in the pound and the Water Rate at 9*d* in the pound. Calculate the total rates (including General Rate and Water Rate) paid in the year on a house of rateable value £134.

If the total amount received by the County Borough Council from the General Rate was £4 300 000, calculate the total rateable value of all the property in the County Borough.

The expenditure by the County Borough Council on the public libraries was equivalent to a rate of 3·21 pence in the pound. Find the amount of money spent on the public libraries during the year.

8. A rectangular swimming pool of length 75 ft and width 25 ft contained water to a uniform depth of 12 ft. Calculate, in ft³, the volume of water in the pool.

The pool was completely emptied in exactly 4 hours by a pump which pumped water at a steady rate from the pool through a pipe of circular cross-section of radius 2 in. Calculate, in feet per second, the speed of water flowing through the pipe, giving your answer correct to one decimal place.

It is known that the pool could have been emptied in exactly 6 hours by a second pump working alone. Calculate how much time would have been saved in emptying the pool if both pumps had operated together.

[Take π as $3\frac{1}{7}$.]

9. A printer intends to sell a book at £2 a copy. Calculate the money he would receive if he were to sell

(a) 8 000 copies,

(b) 12 000 copies.

The printer estimated that a part of the cost of production (for the cost of paper, printing and binding) will be in direct proportion to the number of copies produced, while part (for setting up the type and other basic expenses) will be independent of the number of copies printed. He also estimated that if 8 000 copies were printed and sold he would just cover all the costs of production, but that if he were to print and sell 12 000 copies there would be a total profit of £3 000. Calculate

(c) the estimated cost, per thousand copies printed, of paper, printing and binding,

(d) the estimated cost of setting up the type and other basic expenses,

(e) the total estimated cost of producing 20 000 copies.

10. $PQRS$ is a quadrilateral in which PQR is a right angle, the angle $PRQ = 48° 27'$, $QR = 13{\cdot}1$ cm, $PS = 21{\cdot}3$ cm, and the angle $SPR = 55° 16'$. Calculate the lengths of PQ and PR and the area of the quadrilateral $PQRS$.

11. ABC is a sheet of metal in the form of an equilateral triangle of side 8 cm and P is the point of intersection of the altitudes. Three equal strings of length 9 cm are attached to the vertices of the triangle and their other ends are tied to a hook O in the ceiling, so that the triangle is suspended with P vertically below O and the plane of the triangle horizontal. Calculate

(a) the angle OBC,

(b) the length of BP,

(c) the inclination of OB to the horizontal.

Pure Maths A
Arith
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS I

Syllabus A

ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Express as a single fraction in its lowest terms

$$(7\tfrac{1}{12} - 1\tfrac{5}{6}) \div 1\tfrac{7}{8}.$$

(ii) Express 12*s* 3*d* as an exact decimal of £1.

2. (i) Express in miles per hour a speed of 55 feet per second.

(ii) Given that 1 inch = 2·54 centimetres, express one kilometre as a decimal of a mile, correct to three significant figures.

3. (i) Calculate the simple interest on £1 350 for 3 years at 4% per annum.

(ii) The density of hard coke is 28 lb per ft³. Calculate the weight in cwt of 8 yd³ of hard coke.

TSE 67/1573 11/2/33650

Turn Over

4. The freezing point of water is 0° on the Celsius scale and 32° on the Fahrenheit scale, while the boiling point of water is 100° on the Celsius scale and 212° on the Fahrenheit scale. Calculate

(*a*) the temperature difference, in degrees Fahrenheit, between the freezing and boiling points of water,

(*b*) the rise in temperature on the Fahrenheit scale which corresponds to a rise of 1° on the Celsius scale,

(*c*) the Fahrenheit temperature which corresponds to 35° Celsius,

(*d*) the Celsius temperature which corresponds to 99·5° Fahrenheit.

5. (i) Fig 1 represents a window frame, which consists of a square $ABCD$ and a semi-circle BXC. If $BC = 28$ in., calculate in square inches the total area of $ABXCD$.

[Take π as $3\frac{1}{7}$.]

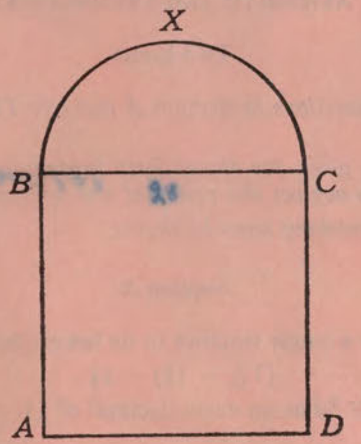


Fig 1

(ii) The longest side of a set-square, whose angles are 30°, 60° and 90°, is 12 cm. Calculate the length of the side opposite the 60° angle, giving your answer to the nearest millimetre.

6. A dealer bought a radio receiver from a manufacturer for £36 and sold it at a profit of $12\frac{1}{2}$% on the cost price. Calculate the retail price.

The manufacturer increased the price charged to the dealer, who decided to leave the retail price unchanged. If the new profit made by the dealer was 8% of the price paid to the manufacturer, calculate the increase in the price the manufacturer charged for the radio receiver, and express this increase as a percentage of the manufacturer's original price.

Section B

Answer any THREE questions in this section.

7. The General Rate for 1968 in a County Borough was fixed at 10*s* 9*d* in the pound and the Water Rate at 9*d* in the pound. Calculate the total rates (including General Rate and Water Rate) paid in the year on a house of rateable value £134.

If the total amount received by the County Borough Council from the General Rate was £4 300 000, calculate the total rateable value of all the property in the County Borough.

The expenditure by the County Borough Council on the public libraries was equivalent to a rate of 3·21 pence in the pound. Find the amount of money spent on the public libraries during the year.

8. A rectangular swimming pool of length 75 ft and width 25 ft contained water to a uniform depth of 12 ft. Calculate, in ft^3, the volume of water in the pool.

The pool was completely emptied in exactly 4 hours by a pump which pumped water at a steady rate from the pool through a pipe of circular cross-section of radius 2 in. Calculate, in feet per second, the speed of water flowing through the pipe, giving your answer correct to one decimal place.

It is known that the pool could have been emptied in exactly 6 hours by a second pump working alone. Calculate how much time would have been saved in emptying the pool if both pumps had operated together.

[Take π as $3\frac{1}{7}$.]

Turn Over

9. A printer intends to sell a book at £2 a copy. Calculate the money he would receive if he were to sell

(*a*) 8 000 copies,

(*b*) 12 000 copies.

The printer estimated that a part of the cost of production (for the cost of paper, printing and binding) will be in direct proportion to the number of copies produced, while part (for setting up the type and other basic expenses) will be independent of the number of copies printed. He also estimated that if 8 000 copies were printed and sold he would just cover all the costs of production, but that if he were to print and sell 12 000 copies there would be a total profit of £3 000. Calculate

(*c*) the estimated cost, per thousand copies printed, of paper, printing and binding,

(*d*) the estimated cost of setting up the type and other basic expenses,

(*e*) the total estimated cost of producing 20 000 copies.

10. $PQRS$ is a quadrilateral in which PQR is a right angle, the angle $PRQ = 48° 27'$, $QR = 13{\cdot}1$ cm, $PS = 21{\cdot}3$ cm, and the angle $SPR = 55° 16'$. Calculate the lengths of PQ and PR and the area of the quadrilateral $PQRS$.

11. ABC is a sheet of metal in the form of an equilateral triangle of side 8 cm and P is the point of intersection of the altitudes. Three equal strings of length 9 cm are attached to the vertices of the triangle and their other ends are tied to a hook O in the ceiling, so that the triangle is suspended with P vertically below O and the plane of the triangle horizontal. Calculate

(*a*) the angle OBC,

(*b*) the length of BP,

(*c*) the inclination of OB to the horizontal.

Pure Maths A
Arith

40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS I

Syllabus A

ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Express as a single fraction in its lowest terms

$$(7\tfrac{1}{12} - 1\tfrac{5}{6}) \div 1\tfrac{7}{8}.$$

(ii) Express 12*s* 3*d* as an exact decimal of £1.

2. (i) Express in miles per hour a speed of 55 feet per second.

(ii) Given that 1 inch = 2·54 centimetres, express one kilometre as a decimal of a mile, correct to three significant figures.

3. (i) Calculate the simple interest on £1 350 for 3 years at 4% per annum.

(ii) The density of hard coke is 28 lb per ft³. Calculate the weight in cwt of 8 yd³ of hard coke.

TSE 67/1573 11/2/33650

Turn Over

4. The freezing point of water is 0° on the Celsius scale and 32° on the Fahrenheit scale, while the boiling point of water is 100° on the Celsius scale and 212° on the Fahrenheit scale. Calculate

(*a*) the temperature difference, in degrees Fahrenheit, between the freezing and boiling points of water,

(*b*) the rise in temperature on the Fahrenheit scale which corresponds to a rise of 1° on the Celsius scale,

(*c*) the Fahrenheit temperature which corresponds to 35° Celsius,

(*d*) the Celsius temperature which corresponds to 99·5° Fahrenheit.

5. (i) Fig 1 represents a window frame, which consists of a square *ABCD* and a semi-circle *BXC*. If *BC* = 28 in., calculate in square inches the total area of *ABXCD*.

[Take π as $3\frac{1}{7}$.]

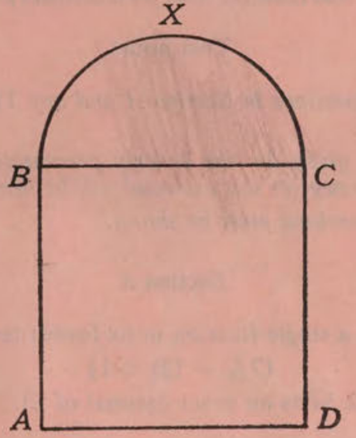


Fig 1

(ii) The longest side of a set-square, whose angles are 30°, 60° and 90°, is 12 cm. Calculate the length of the side opposite the 60° angle, giving your answer to the nearest millimetre.

6. A dealer bought a radio receiver from a manufacturer for £36 and sold it at a profit of $12\frac{1}{2}$% on the cost price. Calculate the retail price.

The manufacturer increased the price charged to the dealer, who decided to leave the retail price unchanged. If the new profit made by the dealer was 8% of the price paid to the manufacturer, calculate the increase in the price the manufacturer charged for the radio receiver, and express this increase as a percentage of the manufacturer's original price.

Section B

Answer any THREE questions in this section.

7. The General Rate for 1968 in a County Borough was fixed at 10*s* 9*d* in the pound and the Water Rate at 9*d* in the pound. Calculate the total rates (including General Rate and Water Rate) paid in the year on a house of rateable value £134.

If the total amount received by the County Borough Council from the General Rate was £4 300 000, calculate the total rateable value of all the property in the County Borough.

The expenditure by the County Borough Council on the public libraries was equivalent to a rate of 3·21 pence in the pound. Find the amount of money spent on the public libraries during the year.

8. A rectangular swimming pool of length 75 ft and width 25 ft contained water to a uniform depth of 12 ft. Calculate, in ft³, the volume of water in the pool.

The pool was completely emptied in exactly 4 hours by a pump which pumped water at a steady rate from the pool through a pipe of circular cross-section of radius 2 in. Calculate, in feet per second, the speed of water flowing through the pipe, giving your answer correct to one decimal place.

It is known that the pool could have been emptied in exactly 6 hours by a second pump working alone. Calculate how much time would have been saved in emptying the pool if both pumps had operated together.

[Take π as $3\frac{1}{7}$.]

Turn Over

9. A printer intends to sell a book at £2 a copy. Calculate the money he would receive if he were to sell

(*a*) 8 000 copies,

(*b*) 12 000 copies.

The printer estimated that a part of the cost of production (for the cost of paper, printing and binding) will be in direct proportion to the number of copies produced, while part (for setting up the type and other basic expenses) will be independent of the number of copies printed. He also estimated that if 8 000 copies were printed and sold he would just cover all the costs of production, but that if he were to print and sell 12 000 copies there would be a total profit of £3 000. Calculate

(*c*) the estimated cost, per thousand copies printed, of paper, printing and binding,

(*d*) the estimated cost of setting up the type and other basic expenses,

(*e*) the total estimated cost of producing 20 000 copies.

10. $PQRS$ is a quadrilateral in which PQR is a right angle, the angle $PRQ = 48° 27'$, $QR = 13{\cdot}1$ cm, $PS = 21{\cdot}3$ cm, and the angle $SPR = 55° 16'$. Calculate the lengths of PQ and PR and the area of the quadrilateral $PQRS$.

11. ABC is a sheet of metal in the form of an equilateral triangle of side 8 cm and P is the point of intersection of the altitudes. Three equal strings of length 9 cm are attached to the vertices of the triangle and their other ends are tied to a hook O in the ceiling, so that the triangle is suspended with P vertically below O and the plane of the triangle horizontal. Calculate

(*a*) the angle OBC,

(*b*) the length of BP,

(*c*) the inclination of OB to the horizontal.

Pure Maths A
Arith
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS I

Syllabus A

ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Express as a single fraction in its lowest terms

$$(7\tfrac{1}{12} - 1\tfrac{5}{8}) \div 1\tfrac{7}{8}\,.$$

(ii) Express 12*s* 3*d* as an exact decimal of £1.

2. (i) Express in miles per hour a speed of 55 feet per second.

(ii) Given that 1 inch = 2·54 centimetres, express one kilometre as a decimal of a mile, correct to three significant figures.

3. (i) Calculate the simple interest on £1 350 for 3 years at 4% per annum.

(ii) The density of hard coke is 28 lb per ft^3. Calculate the weight in cwt of 8 yd^3 of hard coke.

TSE 67/1573 11/2/33650

Turn Over

4. The freezing point of water is 0° on the Celsius scale and 32° on the Fahrenheit scale, while the boiling point of water is 100° on the Celsius scale and 212° on the Fahrenheit scale. Calculate

(*a*) the temperature difference, in degrees Fahrenheit, between the freezing and boiling points of water,

(*b*) the rise in temperature on the Fahrenheit scale which corresponds to a rise of 1° on the Celsius scale,

(*c*) the Fahrenheit temperature which corresponds to 35° Celsius,

(*d*) the Celsius temperature which corresponds to 99·5° Fahrenheit.

5. (i) Fig 1 represents a window frame, which consists of a square *ABCD* and a semi-circle *BXC*. If $BC = 28$ in., calculate in square inches the total area of *ABXCD*.

[Take π as $3\frac{1}{7}$.]

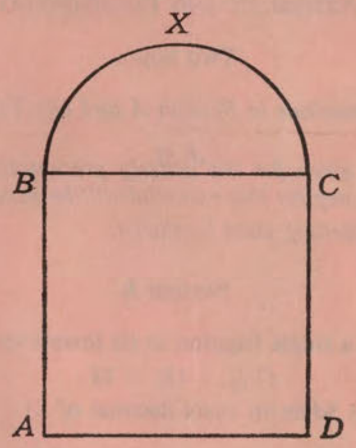


Fig 1

(ii) The longest side of a set-square, whose angles are 30°, 60° and 90°, is 12 cm. Calculate the length of the side opposite the 60° angle, giving your answer to the nearest millimetre.

6. A dealer bought a radio receiver from a manufacturer for £36 and sold it at a profit of $12\frac{1}{2}$% on the cost price. Calculate the retail price.

The manufacturer increased the price charged to the dealer, who decided to leave the retail price unchanged. If the new profit made by the dealer was 8% of the price paid to the manufacturer, calculate the increase in the price the manufacturer charged for the radio receiver, and express this increase as a percentage of the manufacturer's original price.

Section B

Answer any THREE questions in this section.

7. The General Rate for 1968 in a County Borough was fixed at 10*s* 9*d* in the pound and the Water Rate at 9*d* in the pound. Calculate the total rates (including General Rate and Water Rate) paid in the year on a house of rateable value £134.

If the total amount received by the County Borough Council from the General Rate was £4 300 000, calculate the total rateable value of all the property in the County Borough.

The expenditure by the County Borough Council on the public libraries was equivalent to a rate of 3·21 pence in the pound. Find the amount of money spent on the public libraries during the year.

8. A rectangular swimming pool of length 75 ft and width 25 ft contained water to a uniform depth of 12 ft. Calculate, in ft^3, the volume of water in the pool.

The pool was completely emptied in exactly 4 hours by a pump which pumped water at a steady rate from the pool through a pipe of circular cross-section of radius 2 in. Calculate, in feet per second, the speed of water flowing through the pipe, giving your answer correct to one decimal place.

It is known that the pool could have been emptied in exactly 6 hours by a second pump working alone. Calculate how much time would have been saved in emptying the pool if both pumps had operated together.

[Take π as $3\frac{1}{7}$.]

9. A printer intends to sell a book at £2 a copy. Calculate the money he would receive if he were to sell

(*a*) 8 000 copies,

(*b*) 12 000 copies.

The printer estimated that a part of the cost of production (for the cost of paper, printing and binding) will be in direct proportion to the number of copies produced, while part (for setting up the type and other basic expenses) will be independent of the number of copies printed. He also estimated that if 8 000 copies were printed and sold he would just cover all the costs of production, but that if he were to print and sell 12 000 copies there would be a total profit of £3 000. Calculate

(*c*) the estimated cost, per thousand copies printed, of paper, printing and binding,

(*d*) the estimated cost of setting up the type and other basic expenses,

(*e*) the total estimated cost of producing 20 000 copies.

10. $PQRS$ is a quadrilateral in which PQR is a right angle, the angle $PRQ = 48° 27'$, $QR = 13{\cdot}1$ cm, $PS = 21{\cdot}3$ cm, and the angle $SPR = 55° 16'$. Calculate the lengths of PQ and PR and the area of the quadrilateral $PQRS$.

11. ABC is a sheet of metal in the form of an equilateral triangle of side 8 cm and P is the point of intersection of the altitudes. Three equal strings of length 9 cm are attached to the vertices of the triangle and their other ends are tied to a hook O in the ceiling, so that the triangle is suspended with P vertically below O and the plane of the triangle horizontal. Calculate

(*a*) the angle OBC,

(*b*) the length of BP,

(*c*) the inclination of OB to the horizontal.

Pure Maths A
Arith
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS I

Syllabus A

ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Express as a single fraction in its lowest terms

$$(7\tfrac{1}{12} - 1\tfrac{5}{8}) \div 1\tfrac{7}{8}\,.$$

(ii) Express 12*s* 3*d* as an exact decimal of £1.

2. (i) Express in miles per hour a speed of 55 feet per second.

(ii) Given that 1 inch = 2·54 centimetres, express one kilometre as a decimal of a mile, correct to three significant figures.

3. (i) Calculate the simple interest on £1 350 for 3 years at 4% per annum.

(ii) The density of hard coke is 28 lb per ft^3. Calculate the weight in cwt of 8 yd^3 of hard coke.

TSE 67/1573 11/2/33650

Turn Over

4. The freezing point of water is 0° on the Celsius scale and 32° on the Fahrenheit scale, while the boiling point of water is 100° on the Celsius scale and 212° on the Fahrenheit scale. Calculate

(*a*) the temperature difference, in degrees Fahrenheit, between the freezing and boiling points of water,

(*b*) the rise in temperature on the Fahrenheit scale which corresponds to a rise of 1° on the Celsius scale,

(*c*) the Fahrenheit temperature which corresponds to 35° Celsius,

(*d*) the Celsius temperature which corresponds to 99·5° Fahrenheit.

5. (i) Fig 1 represents a window frame, which consists of a square *ABCD* and a semi-circle *BXC*. If $BC = 28$ in., calculate in square inches the total area of *ABXCD*.

[Take π as $3\frac{1}{7}$.]

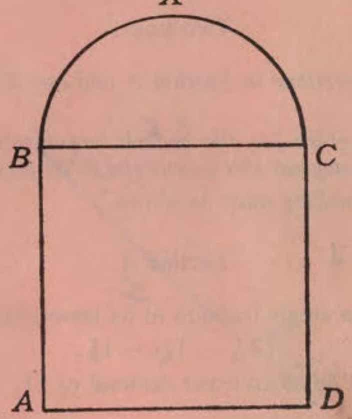


Fig 1

(ii) The longest side of a set-square, whose angles are 30°, 60° and 90°, is 12 cm. Calculate the length of the side opposite the 60° angle, giving your answer to the nearest millimetre.

6. A dealer bought a radio receiver from a manufacturer for £36 and sold it at a profit of $12\frac{1}{2}$% on the cost price. Calculate the retail price.

The manufacturer increased the price charged to the dealer, who decided to leave the retail price unchanged. If the new profit made by the dealer was 8% of the price paid to the manufacturer, calculate the increase in the price the manufacturer charged for the radio receiver, and express this increase as a percentage of the manufacturer's original price.

Section B

Answer any THREE questions in this section.

7. The General Rate for 1968 in a County Borough was fixed at 10*s* 9*d* in the pound and the Water Rate at 9*d* in the pound. Calculate the total rates (including General Rate and Water Rate) paid in the year on a house of rateable value £134.

If the total amount received by the County Borough Council from the General Rate was £4 300 000, calculate the total rateable value of all the property in the County Borough.

The expenditure by the County Borough Council on the public libraries was equivalent to a rate of 3·21 pence in the pound. Find the amount of money spent on the public libraries during the year.

8. A rectangular swimming pool of length 75 ft and width 25 ft contained water to a uniform depth of 12 ft. Calculate, in ft^3, the volume of water in the pool.

The pool was completely emptied in exactly 4 hours by a pump which pumped water at a steady rate from the pool through a pipe of circular cross-section of radius 2 in. Calculate, in feet per second, the speed of water flowing through the pipe, giving your answer correct to one decimal place.

It is known that the pool could have been emptied in exactly 6 hours by a second pump working alone. Calculate how much time would have been saved in emptying the pool if both pumps had operated together.

[Take π as $3\frac{1}{7}$.]

9. A printer intends to sell a book at £2 a copy. Calculate the money he would receive if he were to sell

(*a*) 8 000 copies,

(*b*) 12 000 copies.

The printer estimated that a part of the cost of production (for the cost of paper, printing and binding) will be in direct proportion to the number of copies produced, while part (for setting up the type and other basic expenses) will be independent of the number of copies printed. He also estimated that if 8 000 copies were printed and sold he would just cover all the costs of production, but that if he were to print and sell 12 000 copies there would be a total profit of £3 000. Calculate

(*c*) the estimated cost, per thousand copies printed, of paper, printing and binding,

(*d*) the estimated cost of setting up the type and other basic expenses,

(*e*) the total estimated cost of producing 20 000 copies.

10. $PQRS$ is a quadrilateral in which PQR is a right angle, the angle $PRQ = 48° 27'$, $QR = 13{\cdot}1$ cm, $PS = 21{\cdot}3$ cm, and the angle $SPR = 55° 16'$. Calculate the lengths of PQ and PR and the area of the quadrilateral $PQRS$.

11. ABC is a sheet of metal in the form of an equilateral triangle of side 8 cm and P is the point of intersection of the altitudes. Three equal strings of length 9 cm are attached to the vertices of the triangle and their other ends are tied to a hook O in the ceiling, so that the triangle is suspended with P vertically below O and the plane of the triangle horizontal. Calculate

(*a*) the angle OBC,

(*b*) the length of BP,

(*c*) the inclination of OB to the horizontal.

Pure Maths A
Arith
40
O/S

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1967

Ordinary Level

PURE MATHEMATICS I

Syllabus A

ARITHMETIC AND TRIGONOMETRY

for Candidates Overseas

Two hours

Answer ALL questions in Section A and any THREE questions in Section B. All necessary working must be shown.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

Section A

1. (i) Express as a single fraction in its lowest terms

$$\frac{6\frac{2}{3} - 3\frac{3}{4}}{(2\frac{1}{2})^2} \div \frac{2}{15}.$$

(ii) Without using tables, find the exact value of

$$\frac{22}{7}\,[(5\cdot35)^2 - (1\cdot65)^2].$$

(iii) Express 13 cwt 42 lb as an exact decimal of 1 ton.

TE&S 64/1358 11/2/2/100/13700

Turn Over

2. (i) Calculate to the nearest shilling the value in English money of 657 francs when the exchange rate is 13·55 francs to the £.

(ii) A car travels a distance of 6,600 yards in $6\frac{1}{4}$ minutes. Find its average speed in miles per hour.

(iii) *A* has 11*s* 7*d* and *B* has 14*s* 2*d*. A sum of £2 16*s* 3*d* is to be divided between *A* and *B* so that each shall finally have the same total amount. Find how much must be given to *A*.

3. (i) By selling a radiogram for £78, a dealer would make a profit of 30 per cent on the cost price. Find his gain or loss per cent if he reduces the selling price to £63.

(ii) A piece of wire cut from a roll is 4·5 cm long and weighs 3·69 gm. If the whole roll of wire weighed 1·64 Kg, find the original length, in metres, of the wire in the roll.

4. To construct a new length of motorway, three contractors *A*, *B* and *C* estimated that they could complete the work in 56 months, 48 months and 42 months respectively. Find the time actually taken if all three contractors were engaged together on the construction.

If the total amount paid for the work was £840,000, find how much the contractor *A* received.

5.

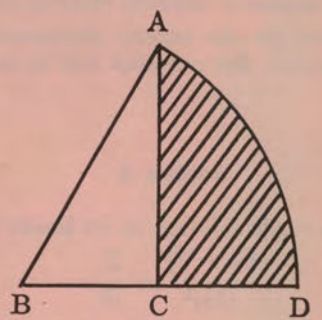


Fig 1

In Fig 1, the angle $ACB = 90°$, $AB = 7$ cm and $BC = 3·5$ cm. The circular arc *AD* is drawn with centre *B* and radius 7 cm to cut *BC* produced at *D*. Calculate

(*a*) the angle *ABC*,

(*b*) the length of *AC*,

(*c*) the area of the shaded portion of the figure.

[Take $\pi = \frac{22}{7}$.]

6. A sum of money was borrowed from a bank for a period of two years, the interest charged being added to the loan annually. The amount owing at the end of the first year was £2,650 and at the end of the second year it was £2,809. Calculate

(*a*) the rate per cent per annum at which interest was charged,

(*b*) the sum originally borrowed.

Section B

Answer any THREE questions in this section.

7. The actual cost of manufacture of a certain article in a factory is 10*d*. In addition, the fixed charges of the factory have to be met and the total amount of these is the same, however many articles are made. When the factory executed an order for 10,000 of these articles, the average cost of manufacture was 1*s* 3*d* per article and these were sold at a profit of 10 per cent. Calculate

(*a*) the fixed factory charges,

(*b*) the total profit made.

The factory received a second order on which it made a total cash profit equal to twice the profit made on the first order. If each article was sold for 1*s* $0\frac{1}{2}$*d*, calculate

(*c*) the number of articles ordered,

(*d*) the profit per cent on the second order, giving the answer correct to the nearest $\frac{1}{10}$ per cent.

8. The inner edge of a cycling track is formed by two straight lines, which are opposite sides of a rectangle, joined at their ends by two semi-circles. Each straight stretch is 110 yards long and the diameters of the semi-circles are each 70 yards. Calculate the distance round the inner edge of the track.

Two cyclists *A* and *B* are riding round the track. *A*'s cycle wheels have a diameter of 28 in. while *B*'s cycle wheels have a diameter of 26 in. The wheels of both cycles are making three revolutions per second. If *A* passes *B* at 10 a.m., find

(*a*) the speed of *A* in miles per hour,

(*b*) the difference, in yards per minute, between the speeds of *A* and *B*,

(*c*) the time at which *A* next passes *B*.

[Take $\pi = \frac{22}{7}$.]

Turn Over

9. A four-engined jet aircraft leaves an airport on a scheduled flight of 2,400 miles. It carries sufficient fuel in its main tanks for a flight of 2,700 miles and, in addition, it has a reserve supply. After completing three-quarters of the scheduled flight, one engine fails, and, at the same time, two-thirds of the fuel supply left in the main tanks is lost. Calculate what fraction of the main supply is left.

Assuming that the aircraft continues to fly on the three remaining engines with each engine consuming only the same amount of fuel per mile as before, find how much further the aircraft would be able to fly without drawing on its reserve supply.

If the aircraft is just able to complete the scheduled flight by using all its reserve supply, express this reserve supply as a fraction of the original fuel supply carried in the main tanks.

10. $ABCD$ is a quadrilateral in which $AB = 8$ in., the angle $ABC = 90°$, the angle $BCA = 33° 42'$ and $CD = DA = 10$ in. Calculate

(*a*) the length of AC,

(*b*) the angle ACD,

(*c*) the area of the quadrilateral $ABCD$.

11. A hemispherical bowl lampshade of radius 9 in. is suspended by three chains each 16 in. long from the point on the ceiling vertically above the centre of the bowl. The chains are attached to the bowl at points symmetrically placed round its rim. Calculate

(*a*) the angle which each chain makes with the horizontal,

(*b*) the distance between the points of attachment to the bowl of any two chains,

(*c*) the angle between any two chains.

Pure Maths A
Arith
40
O/S

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1967

Ordinary Level

PURE MATHEMATICS I

Syllabus A

ARITHMETIC AND TRIGONOMETRY

for Candidates Overseas

Two hours

Answer ALL questions in Section A and any THREE questions in Section B. All necessary working must be shown.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

Section A

1. (i) Express as a single fraction in its lowest terms

$$\frac{6\frac{2}{3} - 3\frac{3}{4}}{(2\frac{1}{2})^2} \div \frac{2}{15}.$$

(ii) Without using tables, find the exact value of

$$\frac{22}{7}\left[(5\cdot35)^2 - (1\cdot65)^2\right].$$

(iii) Express 13 cwt 42 lb as an exact decimal of 1 ton.

TE&S 64/1358 11/2/2/100/13700

Turn Over

2. (i) Calculate to the nearest shilling the value in English money of 657 francs when the exchange rate is 13·55 francs to the £.

(ii) A car travels a distance of 6,600 yards in $6\frac{1}{4}$ minutes. Find its average speed in miles per hour.

(iii) A has 11*s* 7*d* and B has 14*s* 2*d*. A sum of £2 16*s* 3*d* is to be divided between A and B so that each shall finally have the same total amount. Find how much must be given to A.

3. (i) By selling a radiogram for £78, a dealer would make a profit of 30 per cent on the cost price. Find his gain or loss per cent if he reduces the selling price to £63.

(ii) A piece of wire cut from a roll is 4·5 cm long and weighs 3·69 gm. If the whole roll of wire weighed 1·64 Kg, find the original length, in metres, of the wire in the roll.

4. To construct a new length of motorway, three contractors A, B and C estimated that they could complete the work in 56 months, 48 months and 42 months respectively. Find the time actually taken if all three contractors were engaged together on the construction.

If the total amount paid for the work was £840,000, find how much the contractor A received.

5.

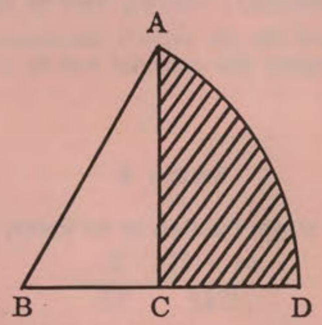


Fig 1

In Fig 1, the angle $ACB = 90°$, $AB = 7$ cm and $BC = 3{\cdot}5$ cm. The circular arc AD is drawn with centre B and radius 7 cm to cut BC produced at D. Calculate

(*a*) the angle ABC,

(*b*) the length of AC,

(*c*) the area of the shaded portion of the figure.

[Take $\pi = \frac{22}{7}$.]

6. A sum of money was borrowed from a bank for a period of two years, the interest charged being added to the loan annually. The amount owing at the end of the first year was £2,650 and at the end of the second year it was £2,809. Calculate

(*a*) the rate per cent per annum at which interest was charged,

(*b*) the sum originally borrowed.

Section B

Answer any THREE questions in this section.

7. The actual cost of manufacture of a certain article in a factory is 10*d*. In addition, the fixed charges of the factory have to be met and the total amount of these is the same, however many articles are made. When the factory executed an order for 10,000 of these articles, the average cost of manufacture was 1*s* 3*d* per article and these were sold at a profit of 10 per cent. Calculate

(*a*) the fixed factory charges,

(*b*) the total profit made.

The factory received a second order on which it made a total cash profit equal to twice the profit made on the first order. If each article was sold for 1*s* $0\frac{1}{2}$*d*, calculate

(*c*) the number of articles ordered,

(*d*) the profit per cent on the second order, giving the answer correct to the nearest $\frac{1}{10}$ per cent.

8. The inner edge of a cycling track is formed by two straight lines, which are opposite sides of a rectangle, joined at their ends by two semi-circles. Each straight stretch is 110 yards long and the diameters of the semi-circles are each 70 yards. Calculate the distance round the inner edge of the track.

Two cyclists A and B are riding round the track. A's cycle wheels have a diameter of 28 in. while B's cycle wheels have a diameter of 26 in. The wheels of both cycles are making three revolutions per second. If A passes B at 10 a.m., find

(*a*) the speed of A in miles per hour,

(*b*) the difference, in yards per minute, between the speeds of A and B,

(*c*) the time at which A next passes B.

[Take $\pi = \frac{22}{7}$.]

Turn Over

9. A four-engined jet aircraft leaves an airport on a scheduled flight of 2,400 miles. It carries sufficient fuel in its main tanks for a flight of 2,700 miles and, in addition, it has a reserve supply. After completing three-quarters of the scheduled flight, one engine fails, and, at the same time, two-thirds of the fuel supply left in the main tanks is lost. Calculate what fraction of the main supply is left.

Assuming that the aircraft continues to fly on the three remaining engines with each engine consuming only the same amount of fuel per mile as before, find how much further the aircraft would be able to fly without drawing on its reserve supply.

If the aircraft is just able to complete the scheduled flight by using all its reserve supply, express this reserve supply as a fraction of the original fuel supply carried in the main tanks.

10. $ABCD$ is a quadrilateral in which $AB = 8$ in., the angle $ABC = 90°$, the angle $BCA = 33° 42'$ and $CD = DA = 10$ in. Calculate

(*a*) the length of AC,

(*b*) the angle ACD,

(*c*) the area of the quadrilateral $ABCD$.

11. A hemispherical bowl lampshade of radius 9 in. is suspended by three chains each 16 in. long from the point on the ceiling vertically above the centre of the bowl. The chains are attached to the bowl at points symmetrically placed round its rim. Calculate

(*a*) the angle which each chain makes with the horizontal,

(*b*) the distance between the points of attachment to the bowl of any two chains,

(*c*) the angle between any two chains.

Pure Maths A
Arith
40
O/S

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1967

Ordinary Level

PURE MATHEMATICS I

Syllabus A

ARITHMETIC AND TRIGONOMETRY

for Candidates Overseas

Two hours

Answer ALL questions in Section A and any THREE questions in Section B. All necessary working must be shown.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

Section A

1. (i) Express as a single fraction in its lowest terms

$$\frac{6\frac{2}{3} - 3\frac{3}{4}}{(2\frac{1}{2})^2} \div \frac{2}{15}.$$

(ii) Without using tables, find the exact value of

$$\frac{22}{7}\,[(5{\cdot}35)^2 - (1{\cdot}65)^2].$$

(iii) Express 13 cwt 42 lb as an exact decimal of 1 ton.

TE&S 64/1358 11/2/2/100/13700

Turn Over

2. (i) Calculate to the nearest shilling the value in English money of 657 francs when the exchange rate is 13·55 francs to the £.

(ii) A car travels a distance of 6,600 yards in $6\frac{1}{4}$ minutes. Find its average speed in miles per hour.

(iii) A has 11*s* 7*d* and B has 14*s* 2*d*. A sum of £2 16*s* 3*d* is to be divided between A and B so that each shall finally have the same total amount. Find how much must be given to A.

3. (i) By selling a radiogram for £78, a dealer would make a profit of 30 per cent on the cost price. Find his gain or loss per cent if he reduces the selling price to £63.

(ii) A piece of wire cut from a roll is 4·5 cm long and weighs 3·69 gm. If the whole roll of wire weighed 1·64 Kg, find the original length, in metres, of the wire in the roll.

4. To construct a new length of motorway, three contractors A, B and C estimated that they could complete the work in 56 months, 48 months and 42 months respectively. Find the time actually taken if all three contractors were engaged together on the construction.

If the total amount paid for the work was £840,000, find how much the contractor A received.

5.

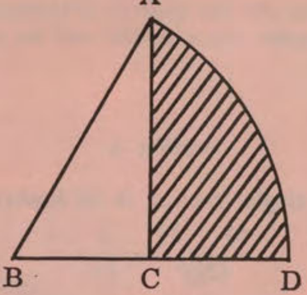


Fig 1

In Fig 1, the angle $ACB = 90°$, $AB = 7$ cm and $BC = 3{\cdot}5$ cm. The circular arc AD is drawn with centre B and radius 7 cm to cut BC produced at D. Calculate

(*a*) the angle ABC,

(*b*) the length of AC,

(*c*) the area of the shaded portion of the figure.

[Take $\pi = \frac{22}{7}$.]

6. A sum of money was borrowed from a bank for a period of two years, the interest charged being added to the loan annually. The amount owing at the end of the first year was £2,650 and at the end of the second year it was £2,809. Calculate

(*a*) the rate per cent per annum at which interest was charged,

(*b*) the sum originally borrowed.

Section B

Answer any THREE questions in this section.

7. The actual cost of manufacture of a certain article in a factory is 10*d*. In addition, the fixed charges of the factory have to be met and the total amount of these is the same, however many articles are made. When the factory executed an order for 10,000 of these articles, the average cost of manufacture was 1*s* 3*d* per article and these were sold at a profit of 10 per cent. Calculate

(*a*) the fixed factory charges,

(*b*) the total profit made.

The factory received a second order on which it made a total cash profit equal to twice the profit made on the first order. If each article was sold for 1*s* $0\frac{1}{2}$*d*, calculate

(*c*) the number of articles ordered,

(*d*) the profit per cent on the second order, giving the answer correct to the nearest $\frac{1}{10}$ per cent.

8. The inner edge of a cycling track is formed by two straight lines, which are opposite sides of a rectangle, joined at their ends by two semi-circles. Each straight stretch is 110 yards long and the diameters of the semi-circles are each 70 yards. Calculate the distance round the inner edge of the track.

Two cyclists A and B are riding round the track. A's cycle wheels have a diameter of 28 in. while B's cycle wheels have a diameter of 26 in. The wheels of both cycles are making three revolutions per second. If A passes B at 10 a.m., find

(*a*) the speed of A in miles per hour,

(*b*) the difference, in yards per minute, between the speeds of A and B,

(*c*) the time at which A next passes B.

[Take $\pi = \frac{22}{7}$.]

9. A four-engined jet aircraft leaves an airport on a scheduled flight of 2,400 miles. It carries sufficient fuel in its main tanks for a flight of 2,700 miles and, in addition, it has a reserve supply. After completing three-quarters of the scheduled flight, one engine fails, and, at the same time, two-thirds of the fuel supply left in the main tanks is lost. Calculate what fraction of the main supply is left.

Assuming that the aircraft continues to fly on the three remaining engines with each engine consuming only the same amount of fuel per mile as before, find how much further the aircraft would be able to fly without drawing on its reserve supply.

If the aircraft is just able to complete the scheduled flight by using all its reserve supply, express this reserve supply as a fraction of the original fuel supply carried in the main tanks.

10. $ABCD$ is a quadrilateral in which $AB = 8$ in., the angle $ABC = 90°$, the angle $BCA = 33° 42'$ and $CD = DA = 10$ in.

Calculate

(*a*) the length of AC,

(*b*) the angle ACD,

(*c*) the area of the quadrilateral $ABCD$.

11. A hemispherical bowl lampshade of radius 9 in. is suspended by three chains each 16 in. long from the point on the ceiling vertically above the centre of the bowl. The chains are attached to the bowl at points symmetrically placed round its rim.

Calculate

(*a*) the angle which each chain makes with the horizontal,

(*b*) the distance between the points of attachment to the bowl of any two chains,

(*c*) the angle between any two chains.

Pure Maths A
Arith
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1966

Ordinary Level

PURE MATHEMATICS I

Syllabus A

ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.
All necessary working must be shown.

Section A

1. (i) Express as a single fraction in its lowest terms

$$(4\tfrac{1}{18} - 2\tfrac{1}{4}) \div 2\tfrac{8}{9}\,.$$

(ii) Find, without the use of tables, the value of

$$\frac{51{\cdot}35 + 41{\cdot}05}{1{\cdot}76 \times 10{\cdot}5}\,.$$

(iii) If 21 ft 3 in. is 17% of a certain distance, find that distance in yards and feet.

TE&S 64/1399 11/2/100/41000

Turn Over

2. (i) Calculate the total interest on £840 invested at 5% per annum at compound interest for 2 years.

(ii) A quantity of water partly filled a cylindrical can of diameter 7 in. to a depth of 9 in. The water was poured into another cylindrical can of diameter 5 in., but in the process one-sixth was spilt. Find the depth of water in the second can.

3. (i) In an examination there were 12 candidates. When the results were published 5 boys had each scored 56 marks, 4 had each scored 62 and 2 had each scored 48. If the average mark was 55, find how many marks the twelfth candidate scored.

(ii) In a journey of 81 miles a car averaged 34 m.p.h. for the first 51 miles and 25 m.p.h. for the remainder. Find the car's average speed over the whole journey.

4. (i) If 1 in. = 2·54 cm and 1 gm of water occupies 1 cu cm calculate the weight in kg of 1 cu ft of water, giving your answer correct to three significant figures.

(ii) A retailer bought articles at £2 16*s* 3*d* each and sold them at a profit of 12% on the cost price. Calculate the retail price of each article.

Owing to a sharp rise in manufacturing costs the price charged to the retailer was raised, but the retailer decided to make no change in the price at which he would sell his stock. He calculated that each article sold would now result in a loss of $5\frac{1}{2}\%$ on the new cost price. Find the amount by which the manufacturer increased the price he charged to the retailer for each article.

5. A car's petrol gauge registered two-thirds full at the beginning of a journey. After covering part of the distance the driver bought 5 gallons of petrol and on completion of the journey the petrol gauge again registered two-thirds full. If the total distance travelled was $172\frac{1}{2}$ miles, calculate the petrol consumption of the car in miles per gallon.

After travelling a further $51\frac{3}{4}$ miles the gauge showed that the petrol tank was half full. Calculate the capacity of the tank.

6.

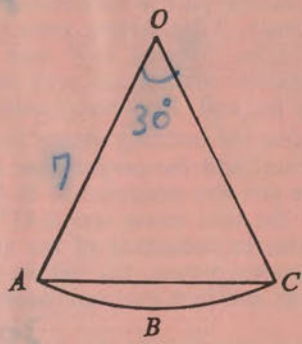


Fig 1

In Fig 1 O is the centre of the circular arc ABC and the angle $AOC = 30°$. If $OA = 7$ cm, calculate

(*a*) area of the sector $OABC$,

(*b*) area of the triangle AOC.

[Take $\pi = 3\frac{1}{7}$.]

Section B

Answer any THREE questions in this section.

7. A large-scale map is on a $\frac{1}{2{,}500}$ scale. Express the scale in the form of x in. to the mile, giving an exact value of x in decimal form.

A man measured the distance between two points A and B on the map and found it to be 20·46 in. If he incorrectly assumed that the scale was 25 in. to the mile find, as accurately as your tables permit, the error in yards in his calculation of the true distance between the two points A and B on the ground.

Turn Over

8. A man received a legacy of £1,200 and decided to invest part of it in a building society, part in corporation mortgage loans and part in unit trusts. After paying certain small expenses amounting to £2 5*s* he invested £400 each in the building society and the corporation loans and with the rest he bought unit trusts at 4*s* 7½*d* per unit. How many units did he buy?

During the first year the building society paid interest at the rate of $3\frac{1}{2}\%$ (tax free) and the corporation loans paid $5\frac{3}{4}\%$ from which income tax was deducted at 7*s* 9*d* in the £. The annual interest on the unit trusts was 2·437 pence per unit which was also liable to deduction of tax at the same rate. Calculate, to the nearest penny, the net income he received from each investment and find his total income.

9. A large reservoir was replenished with 836,000 cu ft of water flowing through three inlet pipes whose diameters were 2 ft, $3\frac{1}{2}$ ft and 4 ft, and the speeds at which water flowed through them were 7 ft per sec, 4 ft per sec and $3\frac{1}{2}$ ft per sec respectively. Calculate the volume of water discharged into the reservoir from each inlet pipe.

It is intended to enlarge the smallest pipe by increasing its diameter and to close the largest pipe altogether. In the two pipes remaining the speeds of flow of water are to be adjusted to be in the ratio of 4 : 7. If the volumes of water to be discharged through the two pipes are now to be in the ratio 7 : 16, calculate the increase in the diameter of the smallest pipe as a percentage of its original diameter.

10.

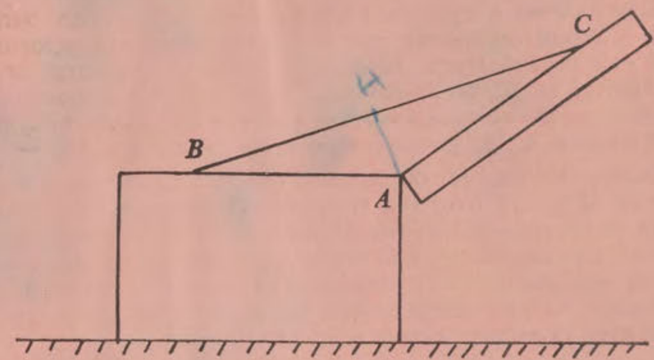


Fig 2

Fig 2 represents the side view of a box, standing on a horizontal table, with a lid hinged at *A*. The lid is kept open at an inclination of 43° 12′ to the horizontal by means of a light chain *BC*. If $AB = 8$ in., $AC = 6$ in., calculate

(*a*) the inclination of the chain to the horizontal,

(*b*) the length of the chain.

11. *O* is the vertex of a pyramid whose base is a horizontal rectangle *ABCD*. *O* is vertically above the point of intersection of the diagonals of *ABCD*. If $OA = OB = OC = OD = 8$ in., $AB = DC = 3$ in. and $AD = BC = 5$ in., calculate

(*a*) the length of *AC*,

(*b*) the vertical height of the pyramid,

(*c*) the inclination of *OA* to the horizontal.

If *P* is the mid-point of *OC*, calculate the tangent of the angle *PAC*.

٥٢٦٥

889
12

٥٧,٨٨٩
٢....

17889 × 2 =
2000
1000

17889

22
889 3
1000 12
250

7

٢٥٠
٢٦٦٧
٢٥٠
١٦٧
١٥٠
١٧

Pure Maths A
Arith O/S
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1966

Ordinary Level

PURE MATHEMATICS I

Syllabus A

ARITHMETIC AND TRIGONOMETRY

for Candidates Overseas

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Simplify $3\frac{5}{12} + \frac{3}{5} \times \frac{25}{36} - 1\frac{4}{15}$.

(ii) Divide £25 14*s* 3*d* by 33.

(iii) Find the exact value of $\frac{0{\cdot}017 \times 8{\cdot}4}{68}$.

TE&S 64/1356 11/2/12500

Turn Over

2. (i) The driving wheel of a locomotive has a radius of 42 ins. Find the number of revolutions it will make in a journey of one mile. [Take $\pi = \frac{22}{7}$.]

(ii) A ship has four funnels each of 16 feet in external diameter and 63 feet in height. Find the number of tins of paint, each containing 32 lb of paint, which are required to cover the funnels externally if each lb of paint will cover 66 sq ft. [Take $\pi = \frac{22}{7}$.]

3. (i) The marked price of an article is £4. The salesman allows a discount of $12\frac{1}{2}$ per cent on the marked price and still makes a profit of 20 per cent of the cost price. Find the cost price.

(ii) Express 11,988 in prime factors and find the smallest number by which it is to be multiplied in order to make it a perfect square.

4. (i) If £1 is equivalent to 2·79 dollars and also to 13·61 francs express, to the nearest franc, the value of 20 dollars in francs.

(ii) After being invested for two years at Compound Interest a sum of money amounted to £1,984 10*s*. At the end of the first year it had amounted to £1,890. Determine the rate of interest charged and the sum of money invested.

5. (i) A square field of area 40 acres is represented on a map of scale 5 inches to the mile. Find the length of the side of the field as it is on the map. [1 acre = 4,840 sq yd.]

(ii) Rain falls on a flat roof of dimensions 44 ft long and 56 ft wide. It is collected into a cylindrical tank of internal radius 1 ft 9 ins. The rain falls to a depth of 0·4 ins. Calculate the increase in the depth of water in the tank. Give your answer to the nearest inch. [Take $\pi = \frac{22}{7}$.]

6. (i) Find from the tables the values of

(*a*) cos 14° 47′,

(*b*) log sin 29° 46′,

(*c*) $\sqrt{(141{\cdot}7)}$.

(ii) Calculate the angle between the tangents which are drawn to a circle of radius 7 cm from a point 25 cm from the centre.

Section B

Answer any THREE questions from this section.

7. The rateable value of a town is £2,660,400. Calculate the amount raised by a penny rate.

The cost of the Baths service is £13,490. Find the rate in the £ it is necessary to levy to pay for this service. Give your answer in pence to two decimal places.

A man owns a house of rateable value £63. If the Education rate is 10*s* $7\frac{1}{2}$*d* in the £ calculate the amount the man will have to pay towards this service.

8. (i) Find the price of a $6\frac{1}{4}$ per cent stock if it gives the same yield as an investment in a $5\frac{1}{2}$ per cent stock at 99.

(ii) An investor holds £5,600 of a 6 per cent stock. He then buys an amount of $5\frac{1}{2}$ per cent stock at 98 which is sufficient to bring his total income to £666. Calculate the cost of the $5\frac{1}{2}$ per cent stock he buys.

9. Calculate the weight of a cylindrical iron pipe of length 20 ft, whose outer diameter is 2 ft and whose thickness is 2 ins. The weight of one cubic foot of iron is 494 lb. Give your answer in tons correct to three significant figures. [Take $\pi = 3{\cdot}142$.]

If water flows through this pipe at a rate of 1,600 gallons per minute, find the rate of flow in feet per second correct to three significant figures. [1 cu ft of water = 6·23 gallons.]

Turn Over

10.

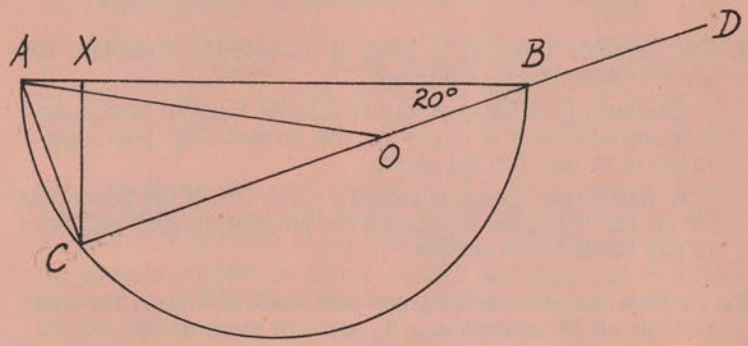


Fig 1

A rod CD rests in a hemispherical bowl as in Fig 1. The radius of the bowl is 14 in. and the angle ABC is 20°. If O is the mid-point of CD and OB is 8 in., calculate

(*a*) the length of CD,

(*b*) CX, the depth of C below AB,

(*c*) the length AO.

11. From the top of a vertical tower 30 ft high a vertical radio mast is observed. It is noted that the angle of elevation of the top of the mast is 55° and the angle of depression of the foot of the mast is 21°. The feet of the tower and the mast are in the same horizontal line. Calculate

(*a*) the horizontal distance between the tower and the mast,

(*b*) the height of the mast,

(*c*) the angle of elevation of the top of the mast from the foot of the tower.

Pure Maths A
Arith
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1965

Ordinary Level

PURE MATHEMATICS I

Syllabus A

ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B. All necessary working must be shown.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

Section A

1. (i) Simplify $\frac{3}{4}$ of $1\frac{1}{6} \div (1\frac{1}{7} - \frac{11}{14})$.

(ii) Find the exact value of $\dfrac{2{\cdot}4 \times 0{\cdot}036}{0{\cdot}00576}$.

(iii) Express 17*s* 9*d* as a decimal of £2.

2. (i) £116 2*s* 10*d* is divided as wages between 4 men and 3 boys. If each man receives twice as much as each boy, find the total amount required to pay 3 men and 7 boys at the same rates and for the same time.

(ii) The distance from London to Inverness is 568 miles. Find the average speed of a train which leaves London at 7.10 p.m. and arrives in Inverness at 8.35 a.m. the following morning. Give your answer in m.p.h. correct to 3 significant figures.

TE&S 63/1666 11/2/25/43000

Turn Over

3. (i) Find the Compound Interest on £328 for 3 years at 4 per cent per annum correct to the nearest 6*d*.

(ii) A cylindrical vessel has a radius of 5 in. and just holds 4·8 gallons of liquid. Calculate the height of the vessel correct to $\frac{1}{10}$ in.

[Take $\pi = 3{\cdot}142$, 1 gallon = 277 cu. in.]

4. The side of a square piece of thin metal sheet is 1·05 cm. Its weight is 9·65 grams. Find the weight in kilograms, correct to 3 significant figures, of 1 square metre of the metal sheet.

5. (i) A packet of typing paper contains 480 sheets, each measuring $8\frac{1}{4}$ in. × $5\frac{1}{2}$ in. Find the area in acres of the paper in 36,000 packets.

[1 acre = 4,840 sq. yd.]

(ii) Find the price in shillings and pence per pound, correct to the nearest 1*d* *above*, which is equivalent to a price of 25 francs per kilogram.

[Take 1 kilogram = 2·2 lb and £1 = 13·8 francs.]

6. (i) Find from the tables

(*a*) sin 53° 17′,

(*b*) log cot 30° 29′.

(ii) One angle of a right-angled triangle is 27° and the hypotenuse is of length 8 in. Find the area of the triangle.

Section B

Answer THREE questions in this section.

7. A married man had an income of £1,845. He was allowed two-ninths of his income free of tax. In addition, he was allowed £240 free of tax as a married man, £100 for each child under 11, £125 for each child between 11 and 16, and £150 for each child over 16 in full-time education.

On the remainder of his income he paid tax at the rate of 1*s* 9*d* in the £ on the first £60, 4*s* 3*d* in the £ on the next £150, 6*s* 3*d* in the £ on the next £150 and 7*s* 9*d* in the £ on the remainder.

How much tax did he pay if he had 3 children aged 10, 13 and 17 years respectively who were all at school?

Express the amount paid in income tax as a percentage of his income.

8. A man has £2,490 to invest. He invests £900 in $3\frac{1}{2}$ per cent stock at 75, £850 in 3 per cent stock at 68 and the remainder in 6 per cent stock. If the total yield from his investments is 5 per cent at what price does he buy the 6 per cent stock?

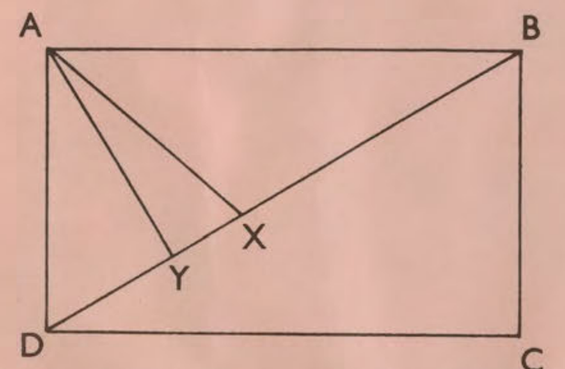
Find his dividend income if he had invested the whole amount in 5*s* shares at 13*s* 10*d* per share and the dividend was $7\frac{1}{2}d$ per share.

9. Water is being delivered through a pipe whose internal diameter is 3 in. at the rate of 90 gallons per minute. Find the speed of the water in the pipe correct to the nearest $\frac{1}{10}$ ft per sec.

If the external diameter of the pipe is 4 in. and the pipe is made of metal weighing 570 lb per cu ft, find the weight of 1 yard of the pipe, correct to the nearest lb.

[Take $\pi = 3{\cdot}142$ and $6\frac{1}{4}$ gallons = 1 cu ft.]

10.



ABCD is a rectangle with $AB = 8$ cm and $AD = 5$ cm. *AY* is drawn perpendicular to *BD* and $3DX = DB$. Calculate

(*a*) *AY*, *XY* and *AX*,

(*b*) the angle *XAY*.

11. From a point due South of a hill the angle of elevation of the summit of the hill is 23° and from a point due West of the hill the angle of elevation of the summit is 17°. The distance between the points of observation is 3,000 yards. Calculate

(*a*) the height of the hill in feet;

(*b*) the bearing of the first-mentioned point of observation from the second.

Pure Maths A
Arith
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1965

Ordinary Level

PURE MATHEMATICS I

Syllabus A

ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B. All necessary working must be shown.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

Section A

1. (i) Simplify $\frac{3}{4}$ of $1\frac{1}{6} \div (1\frac{1}{7} - \frac{11}{14})$.

(ii) Find the exact value of $\dfrac{2{\cdot}4 \times 0{\cdot}036}{0{\cdot}00576}$.

(iii) Express 17*s* 9*d* as a decimal of £2.

2. (i) £116 2*s* 10*d* is divided as wages between 4 men and 3 boys. If each man receives twice as much as each boy, find the total amount required to pay 3 men and 7 boys at the same rates and for the same time.

(ii) The distance from London to Inverness is 568 miles. Find the average speed of a train which leaves London at 7.10 p.m. and arrives in Inverness at 8.35 a.m. the following morning. Give your answer in m.p.h. correct to 3 significant figures.

Turn Over

3. (i) Find the Compound Interest on £328 for 3 years at 4 per cent per annum correct to the nearest 6*d*.

(ii) A cylindrical vessel has a radius of 5 in. and just holds 4·8 gallons of liquid. Calculate the height of the vessel correct to $\frac{1}{10}$ in.

[Take $\pi = 3{\cdot}142$, 1 gallon = 277 cu. in.]

4. The side of a square piece of thin metal sheet is 1·05 cm. Its weight is 9·65 grams. Find the weight in kilograms, correct to 3 significant figures, of 1 square metre of the metal sheet.

5. (i) A packet of typing paper contains 480 sheets, each measuring $8\frac{1}{4}$ in. × $5\frac{1}{2}$ in. Find the area in acres of the paper in 36,000 packets.

[1 acre = 4,840 sq. yd.]

(ii) Find the price in shillings and pence per pound, correct to the nearest 1*d above*, which is equivalent to a price of 25 francs per kilogram.

[Take 1 kilogram = 2·2 lb and £1 = 13·8 francs.]

6. (i) Find from the tables

(*a*) sin 53° 17′,

(*b*) log cot 30° 29′.

(ii) One angle of a right-angled triangle is 27° and the hypotenuse is of length 8 in. Find the area of the triangle.

Section B

Answer THREE questions in this section.

7. A married man had an income of £1,845. He was allowed two-ninths of his income free of tax. In addition, he was allowed £240 free of tax as a married man, £100 for each child under 11, £125 for each child between 11 and 16, and £150 for each child over 16 in full-time education.

On the remainder of his income he paid tax at the rate of 1*s* 9*d* in the £ on the first £60, 4*s* 3*d* in the £ on the next £150, 6*s* 3*d* in the £ on the next £150 and 7*s* 9*d* in the £ on the remainder.

How much tax did he pay if he had 3 children aged 10, 13 and 17 years respectively who were all at school?

Express the amount paid in income tax as a percentage of his income.

8. A man has £2,490 to invest. He invests £900 in $3\frac{1}{2}$ per cent stock at 75, £850 in 3 per cent stock at 68 and the remainder in 6 per cent stock. If the total yield from his investments is 5 per cent at what price does he buy the 6 per cent stock?

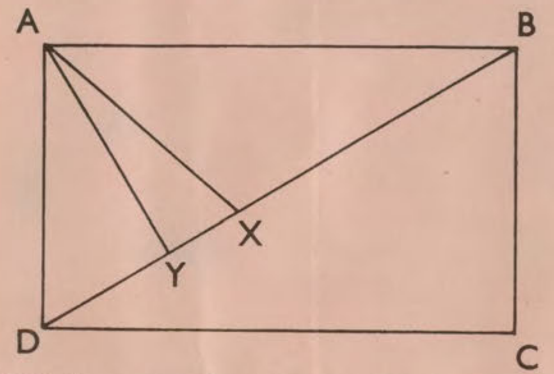
Find his dividend income if he had invested the whole amount in 5*s* shares at 13*s* 10*d* per share and the dividend was $7\frac{1}{2}d$ per share.

9. Water is being delivered through a pipe whose internal diameter is 3 in. at the rate of 90 gallons per minute. Find the speed of the water in the pipe correct to the nearest $\frac{1}{10}$ ft per sec.

If the external diameter of the pipe is 4 in. and the pipe is made of metal weighing 570 lb per cu ft, find the weight of 1 yard of the pipe, correct to the nearest lb.

[Take $\pi = 3{\cdot}142$ and $6\frac{1}{4}$ gallons = 1 cu ft.]

10.



$ABCD$ is a rectangle with $AB = 8$ cm and $AD = 5$ cm. AY is drawn perpendicular to BD and $3DX = DB$. Calculate

(*a*) AY, XY and AX,

(*b*) the angle XAY.

11. From a point due South of a hill the angle of elevation of the summit of the hill is 23° and from a point due West of the hill the angle of elevation of the summit is 17°. The distance between the points of observation is 3,000 yards. Calculate

(*a*) the height of the hill in feet;

(*b*) the bearing of the first-mentioned point of observation from the second.

Pure Maths A
Arith
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1965

Ordinary Level

PURE MATHEMATICS I

Syllabus A

ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B. All necessary working must be shown.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

Section A

1. (i) Simplify $\frac{3}{4}$ of $1\frac{1}{6} \div (1\frac{1}{7} - \frac{11}{14})$.

(ii) Find the exact value of $\dfrac{2{\cdot}4 \times 0{\cdot}036}{0{\cdot}00576}$.

(iii) Express 17*s* 9*d* as a decimal of £2.

2. (i) £116 2*s* 10*d* is divided as wages between 4 men and 3 boys. If each man receives twice as much as each boy, find the total amount required to pay 3 men and 7 boys at the same rates and for the same time.

(ii) The distance from London to Inverness is 568 miles. Find the average speed of a train which leaves London at 7.10 p.m. and arrives in Inverness at 8.35 a.m. the following morning. Give your answer in m.p.h. correct to 3 significant figures.

TE&S 63/1666 11/2/25/43000

Turn Over

3. (i) Find the Compound Interest on £328 for 3 years at 4 per cent per annum correct to the nearest 6*d*.

(ii) A cylindrical vessel has a radius of 5 in. and just holds 4·8 gallons of liquid. Calculate the height of the vessel correct to $\frac{1}{10}$ in.

[Take $\pi = 3{\cdot}142$, 1 gallon = 277 cu. in.]

4. The side of a square piece of thin metal sheet is 1·05 cm. Its weight is 9·65 grams. Find the weight in kilograms, correct to 3 significant figures, of 1 square metre of the metal sheet.

5. (i) A packet of typing paper contains 480 sheets, each measuring $8\frac{1}{4}$ in. × $5\frac{1}{2}$ in. Find the area in acres of the paper in 36,000 packets.

[1 acre = 4,840 sq. yd.]

(ii) Find the price in shillings and pence per pound, correct to the nearest 1*d above*, which is equivalent to a price of 25 francs per kilogram.

[Take 1 kilogram = 2·2 lb and £1 = 13·8 francs.]

6. (i) Find from the tables

(*a*) sin 53° 17′,

(*b*) log cot 30° 29′.

(ii) One angle of a right-angled triangle is 27° and the hypotenuse is of length 8 in. Find the area of the triangle.

Section B

Answer THREE questions in this section.

7. A married man had an income of £1,845. He was allowed two-ninths of his income free of tax. In addition, he was allowed £240 free of tax as a married man, £100 for each child under 11, £125 for each child between 11 and 16, and £150 for each child over 16 in full-time education.

On the remainder of his income he paid tax at the rate of 1*s* 9*d* in the £ on the first £60, 4*s* 3*d* in the £ on the next £150, 6*s* 3*d* in the £ on the next £150 and 7*s* 9*d* in the £ on the remainder.

How much tax did he pay if he had 3 children aged 10, 13 and 17 years respectively who were all at school?

Express the amount paid in income tax as a percentage of his income.

8. A man has £2,490 to invest. He invests £900 in $3\frac{1}{2}$ per cent stock at 75, £850 in 3 per cent stock at 68 and the remainder in 6 per cent stock. If the total yield from his investments is 5 per cent at what price does he buy the 6 per cent stock?

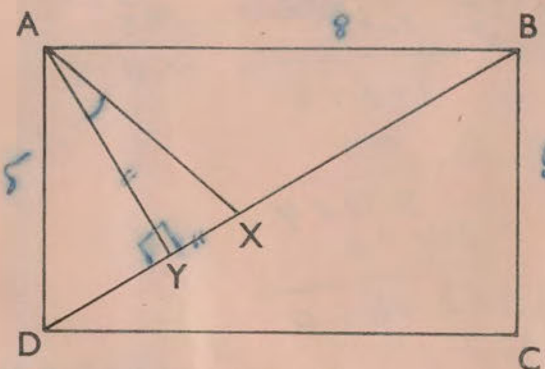
Find his dividend income if he had invested the whole amount in 5*s* shares at 13*s* 10*d* per share and the dividend was $7\frac{1}{2}d$ per share.

9. Water is being delivered through a pipe whose internal diameter is 3 in. at the rate of 90 gallons per minute. Find the speed of the water in the pipe correct to the nearest $\frac{1}{10}$ ft per sec.

If the external diameter of the pipe is 4 in. and the pipe is made of metal weighing 570 lb per cu ft, find the weight of 1 yard of the pipe, correct to the nearest lb.

[Take $\pi = 3{\cdot}142$ and $6\frac{1}{4}$ gallons = 1 cu ft.]

10.



ABCD is a rectangle with $AB = 8$ cm and $AD = 5$ cm. AY is drawn perpendicular to BD and $3DX = DB$. Calculate

(*a*) *AY*, *XY* and *AX*,

(*b*) the angle *XAY*.

11. From a point due South of a hill the angle of elevation of the summit of the hill is 23° and from a point due West of the hill the angle of elevation of the summit is 17°. The distance between the points of observation is 3,000 yards. Calculate

(*a*) the height of the hill in feet,

(*b*) the bearing of the first-mentioned point of observation from the second.

276
276
30.36

2.4 × 0.036
0.00576
24

36.8
185) 6816
555
1266
1110
1560
1480
800

87.61
2205) 193000
17610
16900
15435
14650
13230
1420

104
104
416
104
10816
104
43264
10816
1124864

105
105
525
105
11025

16.48
3036) 50000
3036
19640
18216
14240
12144
2096

25 ×20
2.2 ×13.8

1124864
328
8998912
2249728
3374592
368955392
19.107844
129408

Pure Maths A
Arith Overseas

40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1965

Ordinary Level

PURE MATHEMATICS (SYLLABUS A)

(1) ARITHMETIC AND TRIGONOMETRY

for Overseas Candidates

Two Hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Find the least number that must be added to 1557 to make it exactly divisible by 53.

(ii) Simplify $(1\frac{3}{4} + \frac{4}{5}) \div 1\frac{7}{10}$.

(iii) Without using logarithms, find the exact value of

$$\frac{0{\cdot}085 \times 4{\cdot}5}{0{\cdot}0025 \times 0{\cdot}17}.$$

2. (i) Express 7*s*. 6*d*. as an exact decimal of £4.

(ii) Calculate the cost of 520 cm of cloth at 18 francs 20 cents per metre.

(iii) A man's annual income is £977 12*s*. 0*d*. Calculate his weekly income. [Take 1 year as 52 weeks.]

TE&S 62/1523 11/2/25/8750

Turn Over

3. (i) If 16 machines working for 5 hours a day complete a piece of work in 9 days, how long would it take 20 machines working at the same rate for 3 hours a day to complete the same piece of work?

(ii) The profits of a company in four successive years were £5,290, £6,410, £7,230, £8,150. What must be the profit in the next year if the average yearly profit for the five years is to be £7,150?

4. (i) The simple interest on £240 for 3 years is £19 16*s*. 0*d*. What is the rate per cent per annum?

(ii) A tradesman sells an article for £4 4*s*. 0*d*., thus making a profit of 12 per cent on the cost price. At what price must he sell a similar article in order to make a profit of 16 per cent on the cost price?

5. (i) A rectangular plot is 99 ft long and 55 ft wide. Express the area of the plot as a fraction of an acre. (1 acre = 4,840 sq. yd.)

(ii) A rectangular room is 23 ft long, 13 ft 6 in. wide and 10 ft high. The room has a door which is 6 ft high and $2\frac{1}{2}$ ft wide and a rectangular window which is 8 ft by 5 ft. Find the cost of distempering the walls of the room at 1*s*. 4*d*. per square yard.

6. A regular pentagon is inscribed in a circle of radius 7 in. Calculate

(i) the length of a side of the pentagon,

(ii) the area of a minor segment of the circle cut off by a side of the pentagon.

[Take π as $3\frac{1}{7}$.]

Section B

Answer any THREE questions in this section.

7. A hollow cylindrical pipe of length 9 ft has an external diameter of $3\frac{1}{4}$ in. and an internal diameter of $2\frac{1}{2}$ in., and is made of lead weighing 712 pounds per cubic foot. Find to the nearest pound the weight of the pipe.

If water is flowing through the pipe at 8 ft per sec, keeping the pipe full, find to the nearest gallon the number of gallons discharged in one minute.

[Take $\pi = 3{\cdot}142$ and 1 cu ft = $6\frac{1}{4}$ gallons.]

8. (i) A wholesaler sells 20 radios every week at £8 each. A reduction of 25 per cent in the wholesale price results in an increase of 50 per cent in the number of radios sold in a week. Find the increase in the total weekly receipts for the sale of radios.

(ii) In a certain year the gross income of a charity was £24,000; after payment of expenses the balance was £19,800. In the next year the gross income increased by $4\frac{1}{2}$ per cent and expenses increased by 10 per cent. Find the percentage increase or decrease in the balance.

9. An alloy is made up of three metals, *A*, *B* and *C*, in the proportion by weight of one part of *A* to three parts of *B* and four parts of *C*. If one cubic centimetre of *A*, *B* and *C* weigh 7·8 gm, 2·7 gm and 8·9 gm respectively, calculate

(*a*) the weight of *B* in one kilogram of the alloy,

(*b*) the volume of *B* in one kilogram of the alloy,

(*c*) the volume of one kilogram of the alloy.

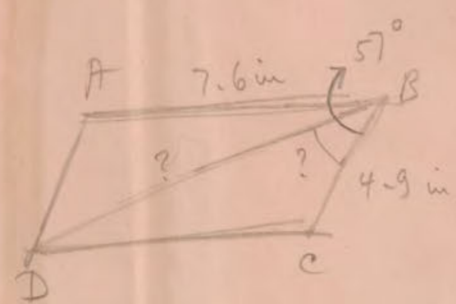
[Give all answers correct to three significant figures.]

10. In the parallelogram *ABCD*, *AB* = 7·6 in., *BC* = 4·9 in. and the angle *ABC* = 57°. Calculate

(*a*) the area of *ABCD*,

(*b*) the length of the diagonal *BD*,

(*c*) the angle *CBD*.



11. Fig. 1 shows a rectangular metal plate $ABCD$ in which $AB = 4$ in and $BC = 3$ in. suspended 6 in. below a point O by four equal strings OA, OB, OC and OD. Calculate

(*a*) the length of OA,

(*b*) the angle AOB,

(*c*) the angle AOC.

If X and Y are the mid-points of AB and CD respectively, calculate the angle XOY.

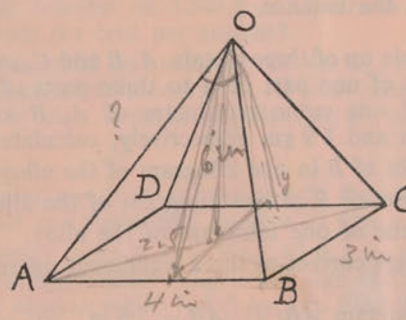


Fig. 1

Pure Maths A
Arith
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1964

Ordinary Level

PURE MATHEMATICS (SYLLABUS A)

(1) ARITHMETIC AND TRIGONOMETRY

Two Hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Simplify $\dfrac{3\frac{1}{3} - 2\frac{1}{2}}{3\frac{1}{3} + 2\frac{1}{2}} \times 3\frac{1}{2}$.

(ii) Find the exact value of

$$\frac{6{\cdot}12 \times 0{\cdot}589}{0{\cdot}36 \times 1{\cdot}9} .$$

(iii) Use logarithm tables to calculate the cube root of 8·57 correct to three significant figures.

TE&S 62/1493 13/2/25/42350

Turn Over

2. (i) Find the cost of 4 tons 15 cwt of grain at £2 13s. 0d. per cwt.

(ii) If £1 = 2·80 dollars, express £5 12s. 6d. in dollars.

(iii) If the average price of 12 toys is 16s. 3d. each and the average price of 11 of them is 14s. 9d. each, calculate the price of the twelfth toy.

3. (i) A machine depreciates each year by 20 per cent of its value at the beginning of the year. Find the value after 3 years of a machine originally costing £750.

(ii) A man spent £1,232 10s. in buying some $3\frac{1}{2}$ per cent Government Stock at $72\frac{1}{2}$. Calculate (*a*) the amount of the stock he bought, (*b*) the annual income received from this investment.

4. (i) If the speed of sound is 1,100 ft per sec, find the time in seconds for sound to travel 10 miles.

(ii) On a plan drawn on a scale of 1 to 180 a circular lake is represented by an area of 154 square inches. Calculate (*a*) the actual area, in square yards, of the lake, (*b*) the actual radius, in feet, of the lake.
[Take π as $3\frac{1}{7}$.]

5. A television set, cash price £89 5s., is advertised for hire-purchase for a deposit of £8 18s. 6d. and 24 monthly payments of £4 9s. 0d. Calculate the amount by which the total hire-purchase price exceeds the cash price. Express this excess amount, correct to one place of decimals, as a percentage of the cash price.

6. (i) Use tables to find (*a*) $\cos 26° 32'$, (*b*) $\dfrac{10}{\tan 61° 9'}$.

(ii) ABC is a triangle in which $AB = AC = 6$ cm, $BC = 8$ cm and M is the mid-point of BC. Calculate (*a*) AM, (*b*) the area of the triangle ABC, (*c*) the angle ABC, (*d*) the angle BAC.

Section B

Answer any THREE questions in this section.

7. The proportions by weight of three metals A, B and C in an alloy are 5:2:1. Calculate the weight of metal A in 1 ton of the alloy.

One hundredweight of the alloy is melted down and 14 lb of the metal B is added.

(*a*) Express the proportions by weight of the three metals in the new alloy in terms of whole numbers.

(*b*) Calculate how much more of metal B must be added to this second mixture so as to produce an alloy in 1 cwt of which there would be 60 lb of metal A.

8. A man's income tax for a year was calculated as follows:

(i) two-ninths of his total income was untaxed,

(ii) of the remaining seven-ninths, allowances of £240 as a married man's personal allowance and £125 for *each* of his three children were untaxed,

(iii) the remainder of his income after these deductions had been made was called his taxable income and was taxed at 1s. 9d. in the £ for the first £60 and 4s. 3d. in the £ for the other part.

In one year the man paid a total of £29 18*s*. 0*d*. in tax.

Calculate:

(*a*) the man's taxable income,

(*b*) the man's total income,

(*c*) the percentage of his total income which the man paid in tax.

(Give this answer correct to the nearest one-tenth of one per cent.)

9. A cylindrical tank, open at the top, is made of metal 3 in. thick. The internal radius of the tank is 3 ft 6 in. and the internal depth of the tank is 5 ft 6 in. The tank stands with its plane base horizontal. Calculate:

(*a*) the number of gallons of liquid in the tank when it is $\frac{3}{5}$ full,

(*b*) the area of the external curved surface of the tank,

(*c*) the area of the plane surface of metal at the top of the tank.

(Take one cu. ft as $6\frac{1}{4}$ gallons, and π as 3·142 and give your answers correct to the nearest ten gallons or correct to the nearest $\frac{1}{10}$ sq ft.)

Turn Over

10. An observation post A is 5 miles due W from a second post B. At noon precisely a car was observed to be due N of A and bearing 300° (N 60° W) from B. At 12.06 p.m. precisely the car, which was travelling in a straight line at uniform speed, was observed to be due N of B and bearing 040° (N 40° E) from A. Calculate:

(*a*) the distance of the car from A at noon,

(*b*) the distance of the car from B at 12.06 p.m.,

(*c*) the direction in which the car was travelling (correct to the nearest degree),

(*d*) the speed of the car (in miles per hour correct to the nearest unit).

11. Fig. 1 shows a triangular prism. The triangular faces of the prism are parallel and the other three faces are rectangles. The

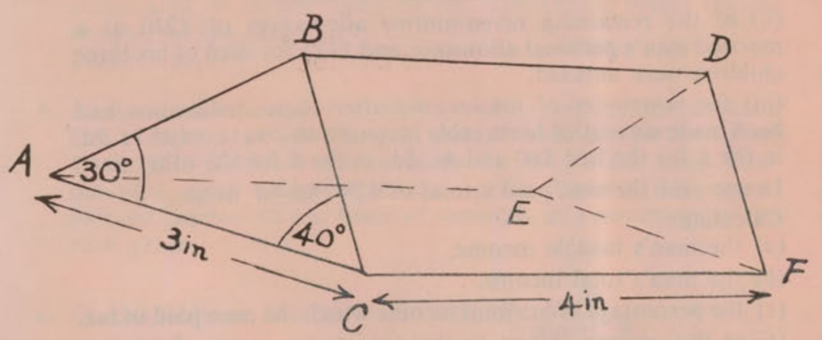


FIG. 1

edges AC, CF are respectively 3 in. and 4 in. long and the angles BAC and BCA are respectively 30° and 40°. Calculate:

(*a*) the length of the edge AB,

(*b*) the angle AFB.

Pure Maths A
Arith
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1964

Ordinary Level

PURE MATHEMATICS (SYLLABUS A)

(1) ARITHMETIC AND TRIGONOMETRY

Two Hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Simplify $$\frac{3\frac{1}{3} - 2\frac{1}{2}}{3\frac{1}{3} + 2\frac{1}{2}} \times 3\frac{1}{2}.$$

(ii) Find the exact value of
$$\frac{6{\cdot}12 \times 0{\cdot}589}{0{\cdot}36 \times 1{\cdot}9}.$$

(iii) Use logarithm tables to calculate the cube root of 8·57 correct to three significant figures.

TE&S 62/1493 13/2/25/42350

Turn Over

2. (i) Find the cost of 4 tons 15 cwt of grain at £2 13s. 0d. per cwt.

(ii) If £1 = 2·80 dollars, express £5 12s. 6d. in dollars.

(iii) If the average price of 12 toys is 16s. 3d. each and the average price of 11 of them is 14s. 9d. each, calculate the price of the twelfth toy.

3. (i) A machine depreciates each year by 20 per cent of its value at the beginning of the year. Find the value after 3 years of a machine originally costing £750.

(ii) A man spent £1,232 10s. in buying some $3\frac{1}{2}$ per cent Government Stock at $72\frac{1}{2}$. Calculate (*a*) the amount of the stock he bought, (*b*) the annual income received from this investment.

4. (i) If the speed of sound is 1,100 ft per sec, find the time in seconds for sound to travel 10 miles.

(ii) On a plan drawn on a scale of 1 to 180 a circular lake is represented by an area of 154 square inches. Calculate (*a*) the actual area, in square yards, of the lake, (*b*) the actual radius, in feet, of the lake.
[Take π as $3\frac{1}{7}$.]

5. A television set, cash price £89 5s., is advertised for hire-purchase for a deposit of £8 18s. 6d. and 24 monthly payments of £4 9s. 0d. Calculate the amount by which the total hire-purchase price exceeds the cash price. Express this excess amount, correct to one place of decimals, as a percentage of the cash price.

6. (i) Use tables to find (*a*) $\cos 26° 32'$, (*b*) $\dfrac{10}{\tan 61° 9'}$.

(ii) ABC is a triangle in which $AB = AC = 6$ cm, $BC = 8$ cm and M is the mid-point of BC. Calculate (*a*) AM, (*b*) the area of the triangle ABC, (*c*) the angle ABC, (*d*) the angle BAC.

Section B

Answer any THREE questions in this section.

7. The proportions by weight of three metals A, B and C in an alloy are 5:2:1. Calculate the weight of metal A in 1 ton of the alloy.

One hundredweight of the alloy is melted down and 14 lb of the metal B is added.

(*a*) Express the proportions by weight of the three metals in the new alloy in terms of whole numbers.

(*b*) Calculate how much more of metal B must be added to this second mixture so as to produce an alloy in 1 cwt of which there would be 60 lb of metal A.

8. A man's income tax for a year was calculated as follows:

(i) two-ninths of his total income was untaxed,

(ii) of the remaining seven-ninths, allowances of £240 as a married man's personal allowance and £125 for *each* of his three children were untaxed,

(iii) the remainder of his income after these deductions had been made was called his taxable income and was taxed at 1s. 9d. in the £ for the first £60 and 4s. 3d. in the £ for the other part.

In one year the man paid a total of £29 18*s*. 0*d*. in tax.

Calculate:

(*a*) the man's taxable income,

(*b*) the man's total income,

(*c*) the percentage of his total income which the man paid in tax.

(Give this answer correct to the nearest one-tenth of one per cent.)

9. A cylindrical tank, open at the top, is made of metal 3 in. thick. The internal radius of the tank is 3 ft 6 in. and the internal depth of the tank is 5 ft 6 in. The tank stands with its plane base horizontal. Calculate:

(*a*) the number of gallons of liquid in the tank when it is $\frac{4}{5}$ full,

(*b*) the area of the external curved surface of the tank,

(*c*) the area of the plane surface of metal at the top of the tank.

(Take one cu. ft as $6\frac{1}{4}$ gallons, and π as 3·142 and give your answers correct to the nearest ten gallons or correct to the nearest $\frac{1}{10}$ sq ft.)

Turn Over

10. An observation post A is 5 miles due W from a second post B. At noon precisely a car was observed to be due N of A and bearing 300° (N 60° W) from B. At 12.06 p.m. precisely the car, which was travelling in a straight line at uniform speed, was observed to be due N of B and bearing 040° (N 40° E) from A. Calculate:

(*a*) the distance of the car from A at noon,

(*b*) the distance of the car from B at 12.06 p.m.,

(*c*) the direction in which the car was travelling (correct to the nearest degree),

(*d*) the speed of the car (in miles per hour correct to the nearest unit).

11. Fig. 1 shows a triangular prism. The triangular faces of the prism are parallel and the other three faces are rectangles. The

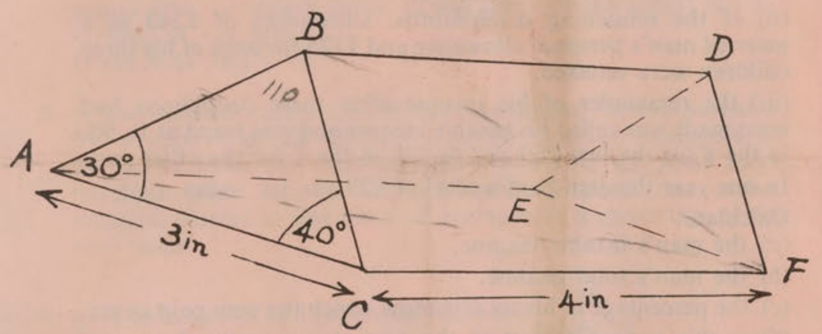


FIG. 1

edges AC, CF are respectively 3 in. and 4 in. long and the angles BAC and BCA are respectively 30° and 40°. Calculate:

(*a*) the length of the edge AB,

(*b*) the angle AFB.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1964

Ordinary Level

PURE MATHEMATICS (SYLLABUS A)

I ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B. All necessary working must be shown.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

SECTION A

1. (i) Express as a single fraction in its lowest terms

$$5\tfrac{3}{10} - \frac{9\tfrac{1}{5}}{3\tfrac{1}{4} - 1\tfrac{1}{3}}.$$

(ii) Find the exact value of

$$\frac{2{\cdot}72 \times 0{\cdot}55}{6{\cdot}6 \ - 4{\cdot}73}.$$

(iii) Use tables to find the value of $17{\cdot}2 \cos 35^\circ 21'$.

2. (i) Express 77 lb as an exact decimal of 1 ton.

(ii) Three circular lead discs have the same thickness and their radii are 3 cm, 4 cm and 5 cm respectively. They are melted down and cast into a single circular disc of the same thickness as before. Find the radius of this disc in centimetres correct to two places of decimals.

(iii) An oil-tank is one-third full. After 56 gallons of oil are pumped in the tank is five-sevenths full. Find the additional quantity of oil needed to fill the tank completely.

TE&S 61/846 11/2/25/18500/1600

Turn Over

3. (i) At an election in which there were two candidates, 35,163 electors recorded their votes. There were 97 spoilt ballot papers and the winning candidate gained 5,160 more votes than his opponent. Find the number of votes gained by the winning candidate.

(ii) A sum of £2,232 is invested in $7\frac{1}{2}$ per cent stock at 124. Find

(*a*) the amount of stock bought,

(*b*) the annual dividend.

4. (i) A house agent sold a house and received commission on the sale at the rate of 5 per cent of the first £500 of the selling price and $2\frac{1}{2}$ per cent of the remainder. If the agent's commission amounted to £169, find the selling price of the house.

(ii) Tea costing 6*s*. per lb is mixed with tea costing 6*s*. 8*d*. per lb to obtain a blend which is sold at 7*s*. per lb. If this selling price yields a profit of 12 per cent of the cost price, calculate

(*a*) the cost price per lb of the mixture,

(*b*) the proportion in which the two teas are mixed.

5. In a boat race between two crews *A* and *B* who started together, crew *A* was 1,081 yards from the winning post after 15 minutes. The race was won in a total time of 18 minutes by crew *B* who finished the course 30 yards ahead of crew *A*. Assuming that both crews rowed at a constant speed, find

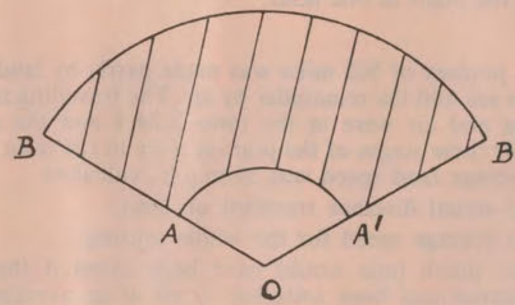
(*a*) the length of the course in yards,

(*b*) the speed of crew *B* in miles per hour.

6. In the figure, OAB and $OA'B'$ are the extreme positions of a lorry's windscreen-wiper which rotates forwards and backwards about O and the shaded area $ABB'A'$ represents the area of glass which is swept clean when the rubber blade AB, whose length is 14 in., moves to the position $A'B'$. The radius OA of the unswept sector AOA' is 7 in. and the angle AOA' is 120°. Taking π to be $3\frac{1}{7}$, find

(*a*) the lengths of the circular arcs AA' and BB',

(*b*) the area of glass which is swept clean.



Section B

Answer any THREE questions in this Section

7. If £100 is invested at 5 per cent per annum compound interest, find the sums to which it will amount (*a*) at the end of one year, (*b*) at the end of two years.

Hence find the sums which must be invested at 5 per cent per annum compound interest to yield an amount of £441, (*c*) at the end of one year, (*d*) at the end of two years.

A legacy of £3,075 is to be divided between *A* and *B*, who are respectively 20 years and 19 years of age exactly, in such a way that if their portions were invested at 5 per cent per annum compound interest, they would receive equal amounts on reaching the age of 21 years. Calculate the ratio in which the legacy must be divided between *A* and *B* and the amount each would receive at the age of 21.

Turn Over

8. A rectangular swimming bath with vertical sides is 80 feet long and 30 feet wide and its rectangular base slopes uniformly from a depth of 4 feet at the shallow end to 8 feet at the deep end. If the bath contains 82,500 gallons of water, find the distance of the water level below the top of the bath, taking 1 cubic foot as $6\frac{1}{4}$ gallons.

The water is circulated through a purifying plant by a pump which draws water from the bath through a pipe of diameter 4 inches at the rate of $3\frac{1}{2}$ feet per second. Taking π to be $3\frac{1}{7}$, find what fraction of the water in the bath passes through the plant in one hour.

9. A journey of 805 miles was made partly by land travel, partly by sea and the remainder by air. The travelling times by land, sea and air were in the ratio 3:24:4 and the average speeds for these stages of the journey were in the ratio 8:3:45. If the average land speed was 56 m.p.h., calculate

(*a*) the actual distance travelled on land,

(*b*) the average speed for the whole journey,

(*c*) how much time would have been saved if the whole distance had been travelled by air at an average speed of 420 m.p.h.

10. A and B are two points 10 feet apart on a horizontal ceiling. A rod PQ is hung from A and B by two strings AP and BQ, the strings and the rod being in the same vertical plane. If $AP = 5$ ft, $BQ = 8$ ft, the angle $BAP = 60°$ and the angle $ABQ = 75° 49'$, calculate

(*a*) the inclination of PQ to the horizontal,

(*b*) the length of PQ.

If the string BQ is shortened to 5 feet so that the rod PQ rests horizontally, calculate the new inclinations of the strings to the horizontal.

11. The pilot of an aircraft, which was flying due east and climbing, reported his height to be 3,000 feet to a ground control station due south of him from which his aircraft was observed to be at an angle of elevation of 15°. Thirty seconds later, his aircraft was observed to be on a bearing of 050° (N 50° E) from the ground control station and at an angle of elevation of 27°. Calculate

(*a*) the rate, in feet per second, at which the height of the aircraft was increasing,

(*b*) the angle which the line of flight made with the horizontal.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1963

Ordinary Level

PURE MATHEMATICS (SYLLABUS A)

(I) ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B. All necessary working must be shown.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

SECTION A

1. (i) Express as a fraction in its lowest terms

$$\frac{3\frac{3}{4} - \frac{1}{8}}{2\frac{5}{12}(2\frac{1}{2} + \frac{1}{6})}.$$

(ii) Express as an exact decimal

$$\frac{0{\cdot}204 \times 0{\cdot}415}{0{\cdot}0498}.$$

(iii) Find the value of £5·8187 in £ s. d., giving the answer to the nearest penny.

2. (i) A building society increased its rate of interest on investments from $3\frac{1}{2}$ per cent to $3\frac{3}{4}$ per cent per annum. Find how much a man has invested if his annual dividend increased by £1 5*s*.

(ii) If 1 metre = 39·37 inches, find the difference, in feet and inches, between 1 kilometre and $\frac{5}{8}$ mile.

(iii) The diameter of a bicycle wheel is 28 inches. If the bicycle is travelling at 10 miles per hour, find the number of revolutions which the wheel makes each minute.

(Take π as $3\frac{1}{7}$.)

Turn Over

Th.P. 61/844 11/2/25/40000

3. (i) The scale of a map is 1:25,000. Find the area, in sq. kilometres, of a woodland which is represented on the map as a rectangle 16·2 cm long and 15·6 cm wide.

(ii) A boy cycles for 2 hours at an average speed of 10 m.p.h. and then does the return journey at an average speed of 12 m.p.h. Find his average speed for the whole journey.

(iii) A swimming bath, full of water, can be emptied by three pipes in 3 hours. One pipe would take 6 hours by itself and another 10 hours by itself. If these two pipes are closed and only the third pipe is working, calculate the time taken to empty the bath.

4. The engine of a goods train, travelling at 33 m.p.h., passes a signal at 10 a.m. The engine of a passenger train, travelling at 44 m.p.h. in the same direction on a parallel track, passes the same signal at 10.15 a.m. If the trains continue at these same uniform speeds, calculate the time at which the two engines will be level.

5. An alloy of copper and zinc contains 40 per cent by weight of copper and the rest zinc. Find the weight of copper which should be added to 360 lb of this alloy to make a new alloy containing 46 per cent of copper.

6. A man bought a portable garage and paid the cash price, which was £85. Had he chosen to pay by the instalment method, he would have made an initial payment of £12 12*s.* followed by twelve monthly instalments of £6 17*s.* 8*d.* each. Find the difference between the cash price and the total price he would have paid by the instalment method, and express this difference as a percentage of the cash price.

Section B

Answer any THREE questions in this section

7. An electrical company made 35,000 components for an aircraft manufacturer. The company allowed for a wastage of one per cent of the components, but anticipated a profit of $33\frac{1}{3}$ per cent on its outlay if the remaining components were sold at £2 8*s.* each. The number of components rejected was greater than expected and the company's profit was reduced to 28 per cent. Find

(*a*) the company's outlay,

(*b*) the actual sum of money received by the company,

(*c*) the number of components rejected.

8. A swimming bath, 84 ft long and 56 ft wide, is full of water, the depth at the shallow end being $3\frac{1}{2}$ ft and at the other end $7\frac{1}{2}$ ft. Any vertical section parallel to the longer side is a trapezium with one side 84 ft long and the parallel sides $3\frac{1}{2}$ ft and $7\frac{1}{2}$ ft respectively. To empty the bath the water is pumped through a pipe of diameter 4 in. at the rate of 275 gallons a minute. Taking 1 cu. ft as $6\frac{1}{4}$ gallons and π as $3\frac{1}{7}$, calculate

(*a*) the speed, in feet per second, at which the water is passing through the pipe,

(*b*) the depth of the water at the shallow end when the bath is half empty,

(*c*) the time, in hours, taken to empty the bath.

9. Find the annual income of a man who invested his savings of £5,850 in £1 shares, costing 18*s.* each, if interest on the shares is paid at the rate of $3\frac{1}{2}$ per cent per annum.

One year later, when the price of the shares had risen, the man sold 2,500 of the shares and invested the proceeds in an annuity which secured him an annual income of £10 8*s.* for every £100 invested. If this increased his annual income by £276 10*s.*, find

(*a*) his annual income from the annuity,

(*b*) the selling price of a £1 share.

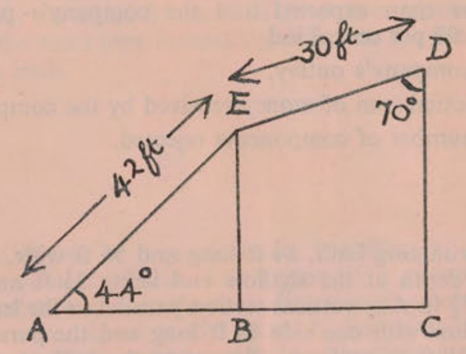
Turn Over

10. The diagram, which is not drawn to scale, is part of the design for a building. AC is horizontal and EB and DC are vertical. If $AE = 42$ ft, $ED = 30$ ft, the angle $EAB = 44°$ and the angle $EDC = 70°$, calculate

(*a*) the lengths of EB and DC,

(*b*) the angle DAC,

(*c*) the area of the figure $EDCB$.



11. $ABCD$ is a horizontal rectangular parade ground whose length AB is 240 ft. A vertical flagpole TX of height 80 ft stands with its foot X on CD. If the angle $ABX = 50°$ and the angle $BAX = 40°$, calculate

(*a*) the lengths of BX and BC,

(*b*) the angle of elevation from B of T, the top of the flagpole.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1963

Ordinary Level

PURE MATHEMATICS (SYLLABUS A)

(I) ARITHMETIC AND TRIGONOMETRY

Two hours

Answer ALL questions in Section A and any THREE questions in Section B. All necessary working must be shown.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

SECTION A

1. (i) Express as a fraction in its lowest terms

$$\frac{3\frac{3}{4} - \frac{1}{8}}{2\frac{5}{12}(2\frac{1}{2} + \frac{1}{6})}.$$

(ii) Express as an exact decimal

$$\frac{0{\cdot}204 \times 0{\cdot}415}{0{\cdot}0498}.$$

(iii) Find the value of £5·8187 in £ s. d., giving the answer to the nearest penny.

2. (i) A building society increased its rate of interest on investments from $3\frac{1}{2}$ per cent to $3\frac{3}{4}$ per cent per annum. Find how much a man has invested if his annual dividend increased by £1 5*s*.

(ii) If 1 metre = 39·37 inches, find the difference, in feet and inches, between 1 kilometre and $\frac{5}{8}$ mile.

(iii) The diameter of a bicycle wheel is 28 inches. If the bicycle is travelling at 10 miles per hour, find the number of revolutions which the wheel makes each minute.

(Take π as $3\frac{1}{7}$.)

Turn Over

Th.P. 61/844 11/2/25/40000

3. (i) The scale of a map is 1:25,000. Find the area, in sq. kilometres, of a woodland which is represented on the map as a rectangle 16·2 cm long and 15·6 cm wide.

(ii) A boy cycles for 2 hours at an average speed of 10 m.p.h. and then does the return journey at an average speed of 12 m.p.h. Find his average speed for the whole journey.

(iii) A swimming bath, full of water, can be emptied by three pipes in 3 hours. One pipe would take 6 hours by itself and another 10 hours by itself. If these two pipes are closed and only the third pipe is working, calculate the time taken to empty the bath.

4. The engine of a goods train, travelling at 33 m.p.h., passes a signal at 10 a.m. The engine of a passenger train, travelling at 44 m.p.h. in the same direction on a parallel track, passes the same signal at 10.15 a.m. If the trains continue at these same uniform speeds, calculate the time at which the two engines will be level.

5. An alloy of copper and zinc contains 40 per cent by weight of copper and the rest zinc. Find the weight of copper which should be added to 360 lb of this alloy to make a new alloy containing 46 per cent of copper.

6. A man bought a portable garage and paid the cash price, which was £85. Had he chosen to pay by the instalment method, he would have made an initial payment of £12 12*s.* followed by twelve monthly instalments of £6 17*s.* 8*d.* each. Find the difference between the cash price and the total price he would have paid by the instalment method, and express this difference as a percentage of the cash price.

Section B

Answer any THREE questions in this section

7. An electrical company made 35,000 components for an aircraft manufacturer. The company allowed for a wastage of one per cent of the components, but anticipated a profit of $33\frac{1}{3}$ per cent on its outlay if the remaining components were sold at £2 8*s.* each. The number of components rejected was greater than expected and the company's profit was reduced to 28 per cent. Find

(*a*) the company's outlay,

(*b*) the actual sum of money received by the company,

(*c*) the number of components rejected.

8. A swimming bath, 84 ft long and 56 ft wide, is full of water, the depth at the shallow end being $3\frac{1}{2}$ ft and at the other end $7\frac{1}{2}$ ft. Any vertical section parallel to the longer side is a trapezium with one side 84 ft long and the parallel sides $3\frac{1}{2}$ ft and $7\frac{1}{2}$ ft respectively. To empty the bath the water is pumped through a pipe of diameter 4 in. at the rate of 275 gallons a minute. Taking 1 cu. ft as $6\frac{1}{4}$ gallons and π as $3\frac{1}{7}$, calculate

(*a*) the speed, in feet per second, at which the water is passing through the pipe,

(*b*) the depth of the water at the shallow end when the bath is half empty,

(*c*) the time, in hours, taken to empty the bath.

9. Find the annual income of a man who invested his savings of £5,850 in £1 shares, costing 18*s.* each, if interest on the shares is paid at the rate of $3\frac{1}{2}$ per cent per annum.

One year later, when the price of the shares had risen, the man sold 2,500 of the shares and invested the proceeds in an annuity which secured him an annual income of £10 8*s.* for every £100 invested. If this increased his annual income by £276 10*s.*, find

(*a*) his annual income from the annuity,

(*b*) the selling price of a £1 share.

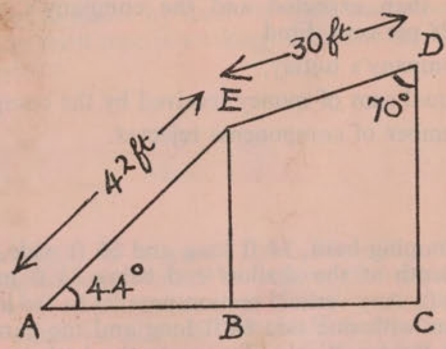
Turn Over

10. The diagram, which is not drawn to scale, is part of the design for a building. AC is horizontal and EB and DC are vertical. If $AE = 42$ ft, $ED = 30$ ft, the angle $EAB = 44°$ and the angle $EDC = 70°$, calculate

(*a*) the lengths of EB and DC,

(*b*) the angle DAC,

(*c*) the area of the figure $EDCB$.



11. $ABCD$ is a horizontal rectangular parade ground whose length AB is 240 ft. A vertical flagpole TX of height 80 ft stands with its foot X on CD. If the angle $ABX = 50°$ and the angle $BAX = 40°$, calculate

(*a*) the lengths of BX and BC,

(*b*) the angle of elevation from B of T, the top of the flagpole.

UNIVERSITY OF LONDON

General Certificate of Education Examination

January 1962

Ordinary Level

PURE MATHEMATICS (SYLLABUS A)

I ARITHMETIC AND TRIGONOMETRY

Alternative Paper for Candidates Overseas

Wednesday, 3 January: 9.30 to 11.30

All necessary working must be shown. Answer ALL questions in Section A and any THREE questions in Section B.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

Section A

1. (i) Simplify $\dfrac{5\frac{2}{3} - 4\frac{1}{4}}{5\frac{2}{3} + 4\frac{1}{4}}$.

(ii) Find the exact value of $\dfrac{0{\cdot}88 \times 13{\cdot}8}{2{\cdot}53}$.

(iii) Use logarithm tables to calculate the square root of 6·97 correct to three significant figures.

2. (i) If 37 equally priced articles cost £6 18*s*. 9*d*., find the cost of one article.

(ii) A cyclist travels at 12 m.p.h. Calculate the distance, in yards, that he covers in 3 minutes.

(iii) Express 13*s*. 9*d*. as an exact decimal of £1.

3. (i) If a cubic foot of water is $6\frac{1}{4}$ gallons, find the number of gallons discharged in 3 hours from a pipe, of radius 2 in., through which water is flowing at the rate of $3\frac{1}{2}$ ft per sec. [Take π as $3\frac{1}{7}$.]

(ii) If the diameter of a bicycle wheel is 28 in., find the number of revolutions of the wheel when the bicycle travels a distance of 1 mile. [Take π as $3\frac{1}{7}$.]

[Turn Over

Th.P. 60/1082 13/4/6000

4. (i) Assuming that a wall costs £5 10*s*. per yard of length to construct, calculate in sq. ft the area of the square which can be walled for £198.

(ii) The gross profits of a business in a year amounted to £6,450. If expenses of £1,700 are deducted from this and the remaining profit is divided between A and B in the ratio 3 : 7, find the amount received by A.

5. (i) Find the cost of 2,450 £1 shares at 24*s*. 6*d*. each. If these shares pay a dividend of 20 per cent, find the income derived from them.

(ii) An American merchant purchases metal from England at a cost of £125 per ton. If the exchange rate is 2 dollars 80 cents to £1, find the price in dollars per ton at which the metal must be sold in order that the merchant shall make a profit of 15 per cent on his outlay.

6. A ladder PQ rests against a vertical wall with the lower end P on horizontal ground and the top Q against the top of the wall. If the ladder makes an angle of 75° with the ground and P is 4 ft from the foot of the wall, calculate in feet and inches correct to the nearest inch

(*a*) the height of the wall,

(*b*) the length of the ladder.

Section B

Answer any THREE questions from this section

7. The basic wage of a workman is £12 12*s*. 0*d*. per week of 42 hours. A man is paid 8*s*. 3*d*. for each hour worked in excess of 42. Calculate

(*a*) the weekly wage of a workman who works 47 hours each week,

(*b*) the number of hours worked by a man who earns £16 6*s*. 3*d*. per week,

(*c*) the number of hours worked each week by a workman whose average pay per hour is 6*s*. 6*d*.,

(*d*) the annual income of a workman who works 45 hours per week for 50 weeks and receives £27 10*s*. 0*d*. as holiday pay.

8. (i) A caterer used gas for cooking and agreed to pay a standing charge of £15 15*s*. 0*d*. per quarter plus 1*s*. 5*d*. for each therm of gas used. If he used 660 therms in one quarter, calculate how much less he paid than if he had paid a flat rate of 2*s*. 2*d*. per therm without a standing charge.

(ii) A train, of length 132 yards and travelling at 45 m.p.h., passes through a station. If the length of the platform is 165 yards, calculate the time, in seconds, taken for the train to pass completely through the station. Calculate also the time, in seconds, during which the whole of the train was within the station.

9. A rectangular tank is to hold 1,900 gallons. Taking 1 cu. ft as $6\frac{1}{4}$ gallons, calculate the volume of the tank.

If the tank is to have a square base of side 6 ft, calculate the depth of the tank.

Water can flow into the tank through an inlet tap at the rate of $102\frac{1}{2}$ gallons per minute and out of the tank from an outlet tap at the rate of 140 gallons per minute. If the tank taps are opened simultaneously when the tank is half full, calculate the interval of time before the depth of water in the tank has fallen to $1\frac{1}{2}$ ft.

10. Two points, A and B, on a horizontal plane are such that B is 7 miles from A on a bearing 070° (N 70° E). A man at the point T on the horizontal plane through AB observes the bearing of A to be 300° (N 60° W). If $TA = 4$ miles, calculate

(*a*) the distance of T from AB,

(*b*) the distance TB,

(*c*) the bearing of B from T.

11. A vertical mast AB of height 100 ft is erected at a distance of 60 ft from a vertical wall of height 70 ft. The foot of the mast and the foot of the wall are on the same horizontal level. When the elevation of the sun is 43°, the shadow of the mast is cast towards and perpendicular to the wall. Calculate the height above the plane of the top of the shadow of the mast.

If the mast is rotated about its lower end A towards and perpendicular to the wall so that it rests on the top of the wall at C, calculate BC.

UNIVERSITY OF LONDON

General Certificate of Education Examination

January 1962

Ordinary Level

PURE MATHEMATICS (SYLLABUS A)

I ARITHMETIC AND TRIGONOMETRY

Alternative Paper for Candidates Overseas

Wednesday, 3 January: 9.30 to 11.30

All necessary working must be shown. Answer ALL questions in Section A and any THREE questions in Section B.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

SECTION A

1. (i) Simplify $\dfrac{5\frac{2}{3} - 4\frac{1}{4}}{5\frac{2}{3} + 4\frac{1}{4}}$.

(ii) Find the exact value of $\dfrac{0{\cdot}88 \times 13{\cdot}8}{2{\cdot}53}$.

(iii) Use logarithm tables to calculate the square root of 6·97 correct to three significant figures.

2. (i) If 37 equally priced articles cost £6 18*s*. 9*d*., find the cost of one article.

(ii) A cyclist travels at 12 m.p.h. Calculate the distance, in yards, that he covers in 3 minutes.

(iii) Express 13*s*. 9*d*. as an exact decimal of £1.

3. (i) If a cubic foot of water is $6\frac{1}{4}$ gallons, find the number of gallons discharged in 3 hours from a pipe, of radius 2 in., through which water is flowing at the rate of $3\frac{1}{2}$ ft per sec. [Take π as $3\frac{1}{7}$.]

(ii) If the diameter of a bicycle wheel is 28 in., find the number of revolutions of the wheel when the bicycle travels a distance of 1 mile. [Take π as $3\frac{1}{7}$.]

[Turn Over

4. (i) Assuming that a wall costs £5 10*s.* per yard of length to construct, calculate in sq. ft the area of the square which can be walled for £198.

(ii) The gross profits of a business in a year amounted to £6,450. If expenses of £1,700 are deducted from this and the remaining profit is divided between *A* and *B* in the ratio 3 : 7, find the amount received by *A*.

5. (i) Find the cost of 2,450 £1 shares at 24*s.* 6*d.* each. If these shares pay a dividend of 20 per cent, find the income derived from them.

(ii) An American merchant purchases metal from England at a cost of £125 per ton. If the exchange rate is 2 dollars 80 cents to £1, find the price in dollars per ton at which the metal must be sold in order that the merchant shall make a profit of 15 per cent on his outlay.

6. A ladder *PQ* rests against a vertical wall with the lower end *P* on horizontal ground and the top *Q* against the top of the wall. If the ladder makes an angle of 75° with the ground and *P* is 4 ft from the foot of the wall, calculate in feet and inches correct to the nearest inch

(*a*) the height of the wall,

(*b*) the length of the ladder.

Section B

Answer any THREE questions from this section

7. The basic wage of a workman is £12 12*s.* 0*d.* per week of 42 hours. A man is paid 8*s.* 3*d.* for each hour worked in excess of 42. Calculate

(*a*) the weekly wage of a workman who works 47 hours each week,

(*b*) the number of hours worked by a man who earns £16 6*s.* 3*d.* per week,

(*c*) the number of hours worked each week by a workman whose average pay per hour is 6*s.* 6*d.*,

(*d*) the annual income of a workman who works 45 hours per week for 50 weeks and receives £27 10*s.* 0*d.* as holiday pay.

8. (i) A caterer used gas for cooking and agreed to pay a standing charge of £15 15*s.* 0*d.* per quarter plus 1*s.* 5*d.* for each therm of gas used. If he used 660 therms in one quarter, calculate how much less he paid than if he had paid a flat rate of 2*s.* 2*d.* per therm without a standing charge.

(ii) A train, of length 132 yards and travelling at 45 m.p.h., passes through a station. If the length of the platform is 165 yards, calculate the time, in seconds, taken for the train to pass completely through the station. Calculate also the time, in seconds, during which the whole of the train was within the station.

9. A rectangular tank is to hold 1,900 gallons. Taking 1 cu. ft as $6\frac{1}{4}$ gallons, calculate the volume of the tank.

If the tank is to have a square base of side 6 ft, calculate the depth of the tank.

Water can flow into the tank through an inlet tap at the rate of $102\frac{1}{2}$ gallons per minute and out of the tank from an outlet tap at the rate of 140 gallons per minute. If the tank taps are opened simultaneously when the tank is half full, calculate the interval of time before the depth of water in the tank has fallen to $1\frac{1}{3}$ ft.

10. Two points, *A* and *B*, on a horizontal plane are such that *B* is 7 miles from *A* on a bearing 070° (N 70° E). A man at the point *T* on the horizontal plane through *AB* observes the bearing of *A* to be 300° (N 60° W). If $TA = 4$ miles, calculate

(*a*) the distance of *T* from *AB*,

(*b*) the distance *TB*,

(*c*) the bearing of *B* from *T*.

11. A vertical mast *AB* of height 100 ft is erected at a distance of 60 ft from a vertical wall of height 70 ft. The foot of the mast and the foot of the wall are on the same horizontal level. When the elevation of the sun is 43°, the shadow of the mast is cast towards and perpendicular to the wall. Calculate the height above the plane of the top of the shadow of the mast.

If the mast is rotated about its lower end *A* towards and perpendicular to the wall so that it rests on the top of the wall at *C*, calculate *BC*.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

JANUARY, 1961

PURE MATHEMATICS

(Syllabus A)

(1) ARITHMETIC AND TRIGONOMETRY

(Alternative paper)

TWO HOURS

All necessary working must be shown

Answer ALL *questions in* SECTION A *and any* THREE *questions in* SECTION B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalised.

SECTION A

1. (i) Simplify $(1\frac{1}{2}+3\frac{3}{4})(3\frac{2}{3}-2\frac{1}{5})\div(2\frac{1}{4}-\frac{7}{8})$.

(ii) Express 2 cwt 3 qr 14 lb as an *exact* decimal of 1 ton.

(iii) Use factors to evaluate $73^2-(146\times 21)$.

73 (73 − 42) = 73 × 31

2. (i) A man drives at 30 m.p.h. for 2 hours and then at 40 m.p.h. for $1\frac{1}{2}$ hours. Find his average speed for the whole journey.

(ii) Without the use of tables, find the *exact* value of the square root of 0·074529.

(iii) Find the percentage yield obtained by investing in $3\frac{1}{4}$ per cent stock at $97\frac{1}{2}$.

3. (i) A new reservoir is paid for by 4 towns A, B, C and D; A pays one-third of the cost, B and C each pay one-quarter of the cost. If A pays £80,000 more than D, find the cost of the reservoir.

(ii) If 1*s*. 6*d*. a month is charged as interest on a loan of 30 shillings, find the rate per cent per annum.

(iii) A piece of wire 63·6 cm long weighs 10·6 grams. Find the *exact* length, in metres, of a piece of wire of the same material and the same cross-section which weighs $1\frac{1}{2}$ kilograms.

4. A property is divided between A, B and C so that the shares of A and B are in the ratio 5 : 3 and the shares of B and C are in the ratio 4 : 3. If A receives £825 more than C, how much does B receive?

5. A jeweller marks a ring at £78 to give him a profit of 30 per cent on the cost price. Later in the year he has a sale and takes 25 per cent off the marked price. Calculate the sale price of the ring and his profit or loss per cent.

6. In the course of a year of 52 weeks a car covered 5,460 miles, using 176 gallons of petrol at 4*s*. 9*d*. per gallon and 22 pints of oil at 14*s*. per gallon. Taxation and insurance cost £25 15*s*., maintenance charges amounted to £15 16*s*. and the cost of garaging the car was 12*s*. 6*d*. per week.

Excluding the depreciation in the value of the car, calculate the total cost of running and maintaining the car for the year and find, to the nearest tenth of a penny, the cost per mile.

Section B

Answer any THREE *questions in this section.*

7. In the financial year 1958–59, income-tax deductions were allowed as follows:—two-ninths of *earned* income, £240 in respect of a married man, £100 in respect of a child under the age of eleven, £125 in respect of a child over eleven but under sixteen. The balance of the total income, called the taxable income, was chargeable at the following rates:—the first £60 was taxed at 2*s*. 6*d*. in the £1, the next £150 was taxed at 4*s*. 9*d*. in the £1, the next £150 at 6*s*. 9*d*. in the £1 and the remainder at 8*s*. 6*d*. in the £1. Calculate the tax paid by a married man with two children, of ages nine and fifteen respectively, who had an income of £1,590, of which £1,440 was *earned*.

8. A builder estimates that he will make a profit of 5 per cent on the total cost of materials and labour by selling a block of flats for £25,200. If the costs of materials and labour are in the ratio 3: 7 calculate these costs.

The builder obtains the contract, but before the work commences the cost of materials increases by 15 per cent. and the cost of labour increases by $12\frac{1}{2}$ per cent. Calculate the price the builder must charge to make his estimated percentage profit.

9. A rectangular block of wood is 3 ft 4 in. long, 1 ft 3 in. wide and 1 ft 2 in. deep. The block is hollowed out to form a container to hold 20 gallons of water when filled to the brim. If the container weighs 72 pounds when empty, find, to the nearest ounce, the weight of 1 cubic foot of the wood.

A cylindrical drum, 1 foot 9 inches high, is used to carry the water to the container. The drum holds 20 gallons and it is made of thin steel, the thickness of which can be ignored. Calculate the radius of the drum, giving the answer to the nearest tenth of an inch.

(Take π as $3\frac{1}{7}$ and 1 cu. ft as 6·25 gallons.)

[P. T. O.

10. From a window A on a skyscraper the angle of depression of a point X on ground level is $10° 48'$ and from another window B, which is 159 metres vertically above A, the angle of depression of the same point is $24° 30'$. If the horizontal distance of the point from the foot of the skyscraper is d metres, show that

$$d(\tan 24° 30' - \tan 10° 48') = 159.$$

Hence calculate the height of A above ground level.

11. From A, the top of a lighthouse 160 feet above sea level, the angle of depression of a raft is 45° and the raft is at a position B due south of the lighthouse. The raft drifts in a direction 310°(N50°W) and, one minute later it is at C which is due west of A. Calculate

(*a*) the speed of the current in knots,

(*b*) the angle of elevation of A from the raft when it is at C.

(Take 1 knot as 6,080 feet per hour.)

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

JANUARY, 1960

PURE MATHEMATICS

(Syllabus A)

(1) ARITHMETIC AND TRIGONOMETRY

WEDNESDAY, January 13.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

Answer ALL *questions in* SECTION A *and any* THREE *questions from* SECTION B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalised.

SECTION A

1. (i) Express as a single fraction in its lowest terms

$$\frac{2\frac{1}{6}\times 4\frac{1}{5}}{11\frac{1}{7}}.$$

(ii) Multiply 24·91 by 18·62 and express your answer (*a*) exactly, (*b*) correct to one place of decimals and (*c*) correct to three significant figures.

(iii) Find the exact value of $15{\cdot}92977 \div 0{\cdot}0487$.

2. (i) An express train travelled $246\frac{1}{2}$ miles non-stop in 4 hours 15 minutes. Find its average speed in miles per hour.

(ii) Mr. Smith decided to allow pocket money to his three children in proportion to their ages which were 17, 14 and 11 years respectively. If the two younger ones were together allowed 6*s*. 3*d*., how much did the eldest receive?

(iii) A man purchased a car and later sold it for £644 at a loss of $19\frac{1}{2}$ per cent. Calculate the purchase price.

3. A cylindrical tank, standing on a circular base of radius 42 cm and open at the top, is 100 cm high. Calculate the area of sheet metal used in its construction neglecting any overlap. Express your answer in square metres.

Calculate the capacity of the tank in litres correct to the nearest litre. [Take π as $3\frac{1}{7}$.]

4. The value of an agricultural implement depreciates in each year by $27\frac{1}{2}$ per cent of its value at the beginning of that year. If the value on 1st January, 1959 was £1,440, find correct to the nearest £1, what its value will be on 1st January, 1961.

Calculate, correct to two places of decimals, the total percentage depreciation in value between the two given dates.

5. A man invests a sum of money in a 4 per cent stock and an equal sum in a $5\frac{1}{2}$ per cent stock which stands at 132. He receives the same annual dividend from each investment. Calculate

(*a*) the price of the 4 per cent stock,

(*b*) the percentage return on his investment in each case.

6. The managers of a factory agreed to pay a total of £10 towards an outing for 29 of their employees. In addition, the 29 employees each subscribed £1 3*s*. 5*d*. After all expenses had been paid, it was found that there was £2 1*s*. 1*d*. left over. Calculate

(*a*) the total cost of the outing,

(*b*) the amount each employee should have subscribed if nothing was to be left over after all expenses had been paid.

Section B

Answer any THREE *questions from this section.*

7. In 1958, a penny rate yielded £2,412 in a certain town. Calculate the total rateable value of the property in the town.

If the annual rates were charged at 18*s*. 7*d*. in the pound, calculate the total amount raised in rates.

In 1959, the total rateable value of the property in the town increased by £63,360, but the amount raised from the rates remained the same as in the previous year. Find the amount by which the rate in the £1 was reduced.

8. A poultry farmer kept 2,000 laying hens each of which cost £1 2*s*. 6*d*. each. In a year of 52 weeks each hen consumed 35 oz of food per week and the food cost £1 12*s*. 0*d*. per cwt. Other expenses amounted to £1,195. The average number of eggs laid by each hen in the year was 204 and the average selling price of eggs was 3*s*. 9*d*. per doz. At the end of the year, the hens were sold for 10*s*. 6*d*. each. Calculate the gross profit made by the poultry farmer during the year.

[P. T. O.

9. In Fig. 1, A and B are two rectangular water tanks resting on level ground and connected by a horizontal pipe through which water can flow freely from one tank to the other. Tank A is 3 ft wide, 4 ft long and contains water to a depth of 2 ft. Tank B is 2 ft wide and is empty. The connecting pipe is 2 ft 3 in. above the base of tank A.

When a metal sphere of radius 13 in. is lowered gently into tank A and becomes totally immersed, it is found that water flows into the other tank until its depth in tank B is 4 in. Calculate

(*a*) the volume of the sphere,

(*b*) the volume of water which flows into tank B,

(*c*) the length, to the nearest inch, of tank B.

[Take π as 3·142 and the volume of a sphere of radius r as $\frac{4}{3}\pi r^3$.]

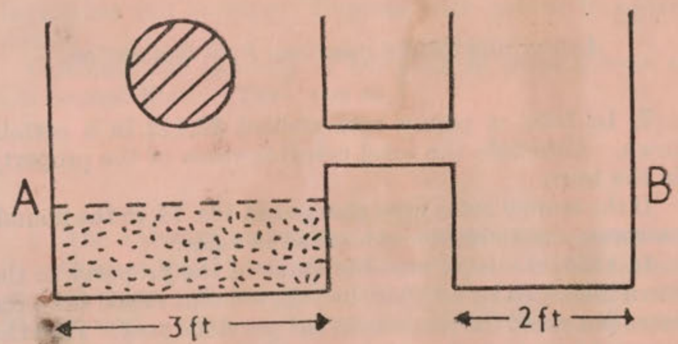


Fig. 1.

10. A sheet of metal is in the shape of a regular polygon with 10 sides each of length 6 in. The largest possible circular disc is cut from the sheet and the remainder is thrown away as waste. Find

(*a*) the ratio of the perimeter of the circular disc to the perimeter of the original sheet, expressing your answer in the form of $n:1$,

(*b*) what percentage of the original sheet is wasted?

[Take π as 3·142.]

11. ABC is a triangle marked out on level ground. If $AB = 85$ ft, $BC = 100$ ft and angle $ABC = 123°$, calculate the distance AC and the area of triangle ABC.

Three vertical pylons AP, BQ and CR are erected at A, B and C. BQ and CR are each 20 ft shorter than AP which is 80 ft high. Calculate

(*a*) the angle of elevation of Q from A,

(*b*) the angle of depression of Q from P.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1959

PURE MATHEMATICS

(Syllabus A)

(a) ARITHMETIC AND TRIGONOMETRY

TUESDAY, June 16.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

Answer ALL *questions in* SECTION A *and any* THREE *questions in* SECTION B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalised.

SECTION A

1. (i) Express as a single fraction in its lowest terms

$$\frac{5\frac{1}{3}-2\frac{4}{5}}{\frac{3}{4}\times 6\frac{1}{5}}.$$

(ii) Find the exact value of $\dfrac{6{\cdot}99482}{3{\cdot}4}$.

(iii) Calculate, to the nearest 10 centimes, the cost of 2 metres 35 centimetres of material at 3 francs 50 centimes per metre.

2. (i) A boy's marks in four examination papers were 33 out of 50 marks, 41 out of 60 marks, 14 out of 25 marks and 24 out of 40 marks. Express the sum of the marks gained by the boy as a percentage of the total obtainable.

(ii) A Building Society pays interest at the rate of $3\frac{1}{2}$ per cent per annum. How much money has a man invested in the Society if, at the end of a year, the interest amounts to £14 17*s.* 6*d.*?

(iii) On a map drawn to the scale of 1 : 6336, two points are found by measurement to be 2·4 in. apart. Calculate, correct to the nearest yard, the distance between the corresponding points on the ground.

3. (i) A square piece of ground of side 52 ft contains two circular flower beds of radius $3\frac{1}{2}$ ft. The remaining area is lawn. Fertilizer is applied to the lawn only (not to the flower beds) at the rate of $1\frac{1}{4}$ oz per sq. yd. Calculate the number of pounds of fertilizer required. [Take π as $\frac{22}{7}$.]

(ii) A man left $\frac{4}{11}$ of his fortune to his wife, $\frac{5}{7}$ of the remainder to be divided equally between his two children and the balance, amounting to £2,500, to charity. How much did each child receive?

4. (i) The combined cost of a dinner and dance ticket is £1 8*s.* 6*d.* If the dinner cost 28 per cent more than the dance, find the cost of the dance alone.

(ii) A cylindrical roller is 0·35 metres in diameter and 0·30 metres wide. Find, in square metres, the area rolled in 100 revolutions. [Take π as $\frac{22}{7}$.]

5. How much stock is obtained by investing £2,286 in a $4\frac{1}{2}$ per cent stock at $95\frac{1}{4}$? After receiving the first annual dividend on this stock, it is immediately resold at 98. Calculate the total gain on the transaction.

6. I have a watch which gains six minutes in every true hour. I put the watch right at 8.30 a.m. What is the latest time indicated by the watch at which I must set out to catch a train which leaves at 10.25 a.m. if it takes me 15 minutes to walk to the station?

Section B

Answer any THREE *questions in this section.*

7. The total rateable value of a town is £588,000. Calculate the amount produced by a penny rate.

The expenditure on education in the town is £164,390. What rate in the £1, to the nearest one-tenth of a penny, must be levied in order to raise this sum?

The total rate for the town is fixed at 17*s.* 4*d.* in the £1. If the owner of a house pays £38 2*s.* 8*d.* in rates, find

(*a*) the rateable value of the house,

(*b*) the amount contributed by the owner to the expenditure on education.

8. A man bought a farm house and 15 acres of land for £10,500, the cost of the farm house and the land being in the ratio of 8 : 13.

He converted 12 acres of the land into plots of one-third of an acre which he sold for building purposes at £250 each. He sold the rest of the land together with the house at a price which showed a loss of 17 per cent on what he originally paid for them. Find the percentage profit on his outlay to the nearest whole number.

9. Following a storm, water is pumped out of a flooded area through a pipe of 8 in. diameter at the rate of 1,000 gallons per minute. Taking 1 cu. ft as $6\frac{1}{4}$ gallons and π as $3\frac{1}{7}$, calculate

(*a*) the speed in ft per sec at which the water is passing through the pipe,

(*b*) how many tons of sediment will be pumped out in two days if it is known that the flood water contains $\frac{1}{2}$ oz of sediment in every cu. ft of water.

10. An air race takes place over a triangular circuit LMN. It is known that L is 185 miles from the direct route between M and N, the angle $LMN = 28°$ and the distance LN is 255 miles Calculate to the nearest mile the total length of the circuit.

11. A man stands on level ground 1,000 ft due South of the mast of a television transmitting station and observes the angle of elevation of the top of the mast to be 36° 22′. He then walks in a direction 041° (N 41° E) until he is due East of the mast. Calculate

(*a*) the height of the mast,

(*b*) how far the man walks,

(*c*) the angle of elevation of the top of the mast from his final position.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

AUTUMN, 1955

PURE MATHEMATICS

(a) ARITHMETIC AND TRIGONOMETRY

MONDAY, November 21.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section. Mathematical tables must* NOT *be used in Questions* 1 *and* 2.]

1. (i) Simplify $(8\frac{4}{5} \times \frac{1}{4}) - (5\frac{2}{5} \div 3)$.

(ii) Find the exact value of $\frac{0 \cdot 7 \times 80}{3 \cdot 5 \times 0 \cdot 04}$.

(iii) Express 0·0383 tons in lb. to the nearest lb.

2. (i) A borough of rateable value £1,600,000 levies an annual rate of 22*s*. 3*d*. in the £. What is the annual revenue produced ?

(ii) Express the ratio of £2 1*s*. 3*d*. to £7 6*s*. 8*d*. as a fraction in its lowest terms.

(iii) A man's salary after being increased by 20% was £810 per annum. What was the amount of the increase ?

3. (i) Express 693 in prime factors and find the smallest number by which it must be multiplied for the product to be a perfect square.

(ii) Find in kilograms correct to three significant figures, the weight of 1 square metre of window glass 1 square foot of which weighs 20 ounces, given that 1 in. = 2·54 cm. and 1 oz. = 28·35 gm.

4. (i) Find the annual income obtained from investing £2088 in $4\frac{1}{2}$% stock at £108.

(ii) Carpet 27 in. wide is sold at 37*s.* 6*d.* per yd. length. Find the cost of the carpet required to cover a rectangular room 18 ft. long and 15 ft. 9 in. wide.

5. (i) A photographic print measuring $3\frac{1}{4}$ in. by $2\frac{1}{4}$ in. is enlarged so that its shorter side becomes 6 in. Find

(*a*) the length of the longer side,

(*b*) the ratio of the area of the enlargement to that of the original print.

(ii) Find the weight in grams of 1 c.c. of an alloy made by fusing together 3 c.c. of tin weighing 7·25 gm. per c.c. with 7 c.c. of copper weighing 8·85 gm. per c.c.

6. A boy walks at 4 miles per hour and runs at 9 miles per hour. Find to the nearest minute how long it will take him for a journey of 7 miles if (i) he walks for $\frac{3}{5}$ of the distance and runs the rest, (ii) he walks for $\frac{3}{5}$ of the time and runs the rest.

Section B

[*Answer any* THREE *questions from this section.*]

7. Find as an exact decimal of £1 the difference between the simple and compound interest on £100 for 3 years at 5%, the interest being payable yearly. Hence find the sum of money on which the difference between the simple and compound interest for 3 years at 5%, payable yearly, is £36 12*s.* 0*d.*

8. A commercial traveller uses a car which covers 35 miles to the gallon of petrol costing 4*s.* 7*d.* per gallon. Each of the four tyres costs £5 7*s*, 6*d.* and for calculating his running costs he estimates that a tyre will last for 24,000 miles. The car is serviced every 1000 miles at a cost of 8*s.* 6*d.* each time. Tax, insurance, and other annual charges cost £22 15*s.* 0*d.* per annum irrespective of the mileage covered. Find, in pence, correct to three decimal places

(*a*) the total cost per mile for petrol, tyres and servicing,

(*b*) the total average cost per mile for a year if the car runs 15,000 miles in the year.

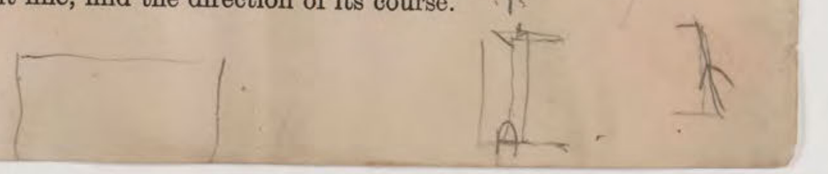
If 3*d.* per mile is allowed by his firm to the traveller for the mileage covered, find his annual gain correct to the nearest ten shillings.

9. A rectangular chest whose internal measurements are 1 ft. 6 in. by 1 ft. 6 in. by 1 ft. 9 in. contains when full 1 cwt. of coffee. For retailing, the coffee is packed in identical cylindrical tins of negligible thickness each of which when full contains $\frac{1}{2}$ lb. of coffee. If the diameter of each tin is $2\frac{3}{4}$ in. find its height to the nearest $\frac{1}{10}$ in. [Take $\pi = 3{\cdot}142$.]

The coffee is also packed in 1 lb. cylindrical tins made of the same material and of the same height as the $\frac{1}{2}$ lb. tins. Find the diameter of a 1 lb. tin correct to the nearest $\frac{1}{10}$ in.

10. B is the point of contact of the tangent drawn from a point A to a circle whose centre is C and whose radius is 8 in., the angle ACB being 54°. If AC cuts the circle at D, which lies between A and C, calculate the lengths of (i) AB, (ii) AC, (iii) the chord BD, (iv) the arc BD. [Take $\pi = 3{\cdot}142$.]

11. A and B are two points at the same level and distant 4000 ft. apart on the top of a cliff 600 ft. high, B being due N. of A. A ship is sighted due E. of A, its angle of depression from A being 9° 12′. Later the ship is due E. of B, its angle of depression as seen from B being 5° 36′. Assuming the ship to be travelling in a straight line, find the direction of its course.



UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1953

PURE MATHEMATICS

(a) ARITHMETIC AND TRIGONOMETRY

Examiners:
M. W. BROWN, Esq., M.A.
H. E. PARR, Esq., M.A.

TUESDAY, *June* 23.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section. Mathematical tables must* NOT *be used in Questions* 1 *and* 2.]

1. (i) Find, in its simplest form, the value of

$$4\tfrac{3}{8} \div \left(\tfrac{2}{3}+1\tfrac{5}{12}\right).$$

(ii) Express 97 yd. 2 ft. 4 in. as a fraction of a mile, giving your answer in its simplest form.

(iii) The product of two numbers is 5·1102 and one of them is 16·7. Find the other.

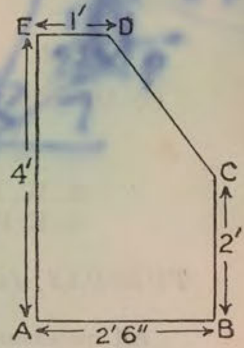
2. (i) Find the average weight of a rowing eight, three of whom weigh 10 st. 5 lb. each, two weigh 10 st. 11 lb. each, and the others weigh 10 st. 9 lb., 11 st. 1 lb. and 11 st. 5 lb.

(ii) In winter a coach leaves its starting-place at 2.40 p.m. and, travelling at an average speed of 28 m.p.h., arrives at its destination at 5.25 p.m. on the same day. In summer it leaves at the same time, but arrives at 5.10 p.m. Find its average speed in the summer.

T. & F.—52/1123 14/4/35,000 [P. T. O.

3. In 1938 the purchasing power of £1 was equal to that of 12*s*. 10*d*. in 1914; in 1951 it was equal to that of 6*s*. 3*d*. in 1914. A man's income was £450 in 1938 and £770 in 1951. Using the 1914 purchasing power as a standard of comparison, express the purchasing power of his 1951 income as a percentage of the purchasing power of his 1938 income.

4. A coal-bin of length 4 ft. 3 in. has the vertical cross-section shown, AB and ED being horizontal and AE and BC vertical.



(i) Calculate the volume of the bin in cubic feet.

(ii) The bin is filled with coke, 1 ton of which occupies 48 cu. ft. Find to the nearest cwt. how much coke the bin holds.

5. (i) A man invests £640 in $3\frac{1}{2}\%$ Conversion Loan, paying £84 cash for each £100 of loan. Find the annual income he will derive from this investment.

(ii) The cost price of a Savings Certificate of the 7th Issue is 15*s*., and after 10 years its value becomes £1 0*s*. 6*d*. With the help of the compound interest table below, find to the nearest $\frac{1}{2}\%$ the annual rate of interest paid on these certificates.

Table showing the amount of £1 *at compound interest for* 10 *years*

2%	1·218994	3%	1·343916
$2\frac{1}{2}\%$	1·280085	$3\frac{1}{2}\%$	1·410599

6. (i) Weight in lb. per foot can be converted into weight in Kg. per metre by the use of the following relation :—

Wt. in Kg. per metre$=1{\cdot}487\times$ *Wt. in lb. per foot.*

Use this relation to find the weight in Kg. per metre of uniform metal piping, a piece of which 2 ft. 3 in. long weighs 44 lb. Give your answer correct to three significant figures.

(ii) Using the data given below, and taking 1 metre to be 1·094 yd., obtain, but do NOT simplify or evaluate, an expression for 1 hectare in acres.

[1 hectare=10,000 sq. m.; 1 acre=4840 sq. yd.]

SECTION B

[*Answer any* THREE *questions from this section.*]

7. A household needs each day 75 gallons of hot water at an average temperature of 100° F., the average temperature of the water before heating being 57° F.

(i) Calculate the number of B.Th.U. of heat needed each day to raise the temperature of this water by the required amount.

[1 British Thermal Unit (B.Th.U.) is the heat required to raise the temperature of 1 lb. of water through 1° F.; 1 gallon of water weighs 10 lb.]

(ii) The water is heated by an electric immersion heater but only 60% of the heat it produces is actually employed in heating the water. Calculate the number of units of electricity that must be used each day.

[1 unit of electricity produces 3440 B.Th.U.]

(iii) The arrangements are improved so that 75% of the heat produced by the heater is used to heat the water. Calculate the daily saving to the nearest $\frac{1}{10}d$. when electricity costs 0·825*d*. per unit.

8. A man held 15,000 £1 shares in a company which paid interest at $4\frac{1}{2}\%$ per annum. Find his annual income.

He then sold 5,000 of these shares, and invested the money in an annuity which gave him £12 for every £100 invested. His total annual income was thus increased by £300. Find the selling price of a £1 share.

[P. T. O.

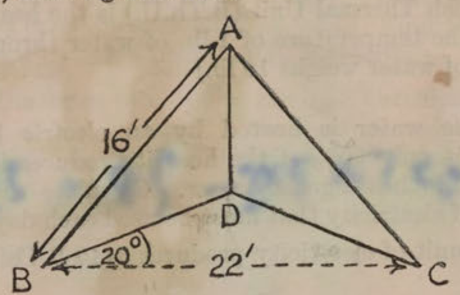
9. A man decides to buy the house which he is at present renting at 32*s.* 3*d.* per week. At present the landlord pays the rates, which are £35 10*s.* per annum, but the man will have to pay these if he buys the house.

In order to buy the house the man borrows £760 from a Building Society, to whom the repayments of the loan and the interest on it, spread over 20 years, will be at the rate of 13*s.* 9*d.* per calendar month for each £100 borrowed.

(i) Find by how much the man's yearly outlay on rates and Building Society repayments will exceed the yearly rent he previously paid.

(ii) Calculate the total sum the man will pay to the Building Society in 20 years, and express the amount paid in interest as a percentage of the original loan.

10. The diagram represents a roof truss in which $AB = AC = 16$ ft., $BC = 22$ ft., $BD = DC$ and angle $DBC = 20°$. Calculate (i) the length of BD; (ii) angle ABC; (iii) the length of AD.



11. Two points A and B are at sea level, B being due south of A and distant 2200 feet from it. A third point C, which is 200 feet above sea level, is due east of A and its bearing from B is 047°(N. 47° E.). Find the horizontal distance between B and C and the angle of elevation of C from B, correct to the nearest 10 feet.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

AUTUMN 1953

PURE MATHEMATICS

(a) ARITHMETIC AND TRIGONOMETRY

Examiners :
M. W. BROWN, Esq., M.A.
H. E. PARR, Esq., M.A.

TUESDAY, November 24.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) Simplify $(3\frac{2}{3}-1\frac{5}{6})\div(3\frac{2}{3}+1\frac{5}{6})$.

(ii) Find the value, to the nearest penny, of £0·7365.

(iii) Express 94,864 in prime factors, and hence or otherwise find its square root.

2. (i) A train travels for 2 hours at 45 m.p.h. and then for 1 hour at 39 m.p.h. Find its average speed for the whole period.

(ii) The simple interest on 1,240 francs for 1 year 3 months is 54 francs 25 centimes. Find the rate per cent per annum.

(iii) The inside measurements of a rectangular box are 4 ft. 6 in., 3 ft. 2 in., and 2 ft. 8 in. Calculate the internal volume of the box in cubic feet.

T. & F.—52/1112 14/2/11000

[P. T. O.

3. An article is marked in a shop at £5 15*s*. The shopkeeper finds that, if he allows a discount of 10% of the marked price, he still makes $12\frac{1}{2}$% profit on his cost price. Find the cost price.

If he sells the article at the marked price, calculate his profit as a percentage of the cost price of the article.

4. (i) The scale of a map is 1 : 25,000. Find the distance in kilometres represented by a length of 16·2 cm. on the map.

(ii) Three men *A*, *B*, *C* are partners in a business. They agree to receive out of the profits £500 per annum each, the rest of the profits to be divided among them in the ratio 3 : 5 : 6 respectively. If the total profits in a year were £4,440, calculate the amount each should receive.

5. (i) An athletic ground is in the form of a rectangle 120 yd. by 70 yd., with a semicircle drawn on each of the shorter sides as diameter. Find in yards the distance round the ground. (Take π as $3\frac{1}{7}$.)

(ii) When £1 is equivalent to 2·81 dollars and also to 987 francs, find, correct to the nearest franc, the value of 10 dollars in francs.

6. Two places *A* and *B* are 12 miles apart. At noon a man *P* sets out from *A* to walk to *B* at 4 m.p.h. At 1 p.m. he rests for half an hour before resuming his journey at the same rate as before. At 2 p.m. a cyclist *Q* leaves *B* and rides towards *A* at a steady speed of 10 m.p.h. Draw a graph of the distances of *P* and *Q* from *A*, using a scale of 2 in. to 1 hour and 1 in. to 2 miles, and hence find the time at which they meet.

SECTION B

[*Answer any* THREE *questions from this section.*]

7. A room in the shape of a rectangle with a semi-circle added at one end, and having the dimensions shown, is to be added to a house. The floor of the room is to be made of concrete laid to a uniform depth of 8 in.

(i) Taking $\pi = \frac{22}{7}$, calculate the number of cubic feet of concrete needed.

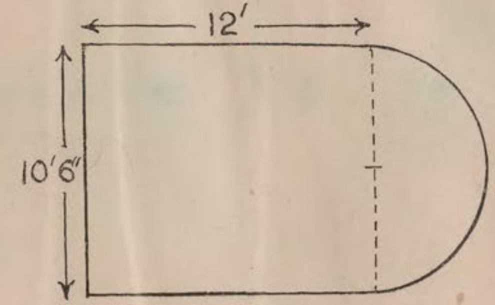
(ii) The concrete is to be made from cement, sand and stone in the ratio by weight of 1 : 2 : 4.

Find (*a*) the number of 112 lb. bags of cement,

(*b*) the number of cu. ft. of sand, to the nearest whole number,

that will be needed to make the required concrete.

[1 cu. ft. of concrete weighs 152 lb.; 1 cu. ft. of sand weighs 1 cwt.]



8. A man borrowed £600 from a bank on Jan. 1st, 1949. He repaid £100 on Jan. 1st in 1950, 1951, 1952, and 4% interest was added to the amount outstanding on Dec. 31st every year. Find how much, to the nearest penny, he had to repay on Jan. 1st, 1953 in order to settle the debt.

[P. T. O.

9. Find, correct to three significant figures, the weight in pounds of a cylindrical iron pipe 10 ft. long, whose outer diameter is 1 ft. 6 in. and inner diameter 1 ft. 4 in., given that 1 cu. ft. of iron weights 494 lb. (Take π as 3·142.)

If the inner diameter is increased to 1 ft. 5 in., the outer diameter and the length remaining unaltered, find the ratio of the new weight to the old.

10. Two lighthouses A and B are 5 miles apart, B being due east of A. A ship at P is due north of A, and on a bearing 322° (N. 38° W.) from B. The ship then sails in a direction 056° (N. 56° E.) to a position Q which is due north of B. Calculate PQ, BQ, and the bearing of Q from A.

11. XY is a chord of a circle of radius 3·2 in. and centre O; the angle $XOY = 143° 28'$, and the tangents to the circle at X and Y meet at T. Calculate the lengths of XY and OT.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1952

PURE MATHEMATICS

(a) ARITHMETIC AND TRIGONOMETRY

Examiners :
C. W. BARTRAM, Esq., M.Sc.
E. D. HODGE, Esq., B.Sc.

TUESDAY, June 17.—*Morning,* 9.30 *to* 11.30

All necessary working must be shown

[*Logarithm tables may be used* ONLY *in questions* 10 *and* 11.]

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) Simplify $\dfrac{\frac{3}{4}+\frac{2}{3}}{\frac{3}{4}-\frac{2}{3}}$.

(ii) Find the value of $1{\cdot}2 \times 0{\cdot}3 \div 0{\cdot}04$.

(iii) Find in francs and centimes the cost of 3 metres 35 centimetres of cloth at 4 fr. 40 c. per metre.

2. (i) A farmer pays the following rents : £1 10*s*. 0*d*. per acre for 120 acres, £2 2*s*. 6*d*. per acre for 80 acres, and £3 1*s*. 0*d*. per acre for 60 acres. Find his average rent per acre.

(ii) A bank pays interest at the rate of $2\frac{1}{2}\%$ per annum. How much money has a man in the bank if his annual interest is £4 12*s*. 6*d*. ?

(iii) The scale of a map is 2 in. to 1 mile. Find in acres the area represented by an area of $1\frac{1}{2}$ sq. in. on the map.

3. The charge for the hire of engineering plant is proportional to the value of the plant and to the length of time for which it is hired. If it costs £220 to hire plant valued at £2,500 for 13 weeks, what will it cost to hire plant valued at £3,250 for 12 weeks ?

4. The rain which falls on a flat roof 33 ft. long and 18 ft. wide is collected in a cylindrical tank of radius $1\frac{1}{2}$ ft. Find the increase in the depth of water in the tank when there is a rainfall of $\frac{1}{2}$ in. (Take $\pi=\frac{22}{7}$.)

5. After paying an agent 4% of the rent collected and then paying 9*s.* 6*d.* in the £ on the remainder in income tax a landlord received a net rental of £126. Find

(i) how much he would get if he did not pay income tax but did pay the agent, and

(ii) how much he would get if he paid neither.

6. The cost of manufacture of a bicycle is divided between materials, labour and overheads in the ratio 6 : 2 : 1. If the cost of materials increases 25% and the cost of labour increases 20% while the overheads remain the same, find the new cost of a bicycle which previously cost £13 10*s.* 0*d.*

Section B

[*Answer any* THREE *questions in this section.*]

7. The total rateable value of a town is £30,000. How much does the town receive in a year if the rate levied is 16*s.* in the £ ?

If the town estimates that it will need an extra £3,750 next year, by how much will the rate in the £ have to be increased if the total rateable value remains unchanged? If the town decided to leave the rate in the £ at 16*s.* but to get the extra £3,750 by increasing the rateable value of all property, what ought to be the new rateable value of a house which was formerly rated at £32 ?

8. A dealer bought articles at 3*s.* 3*d.* each. He employed an agent to sell them at 3*s.* 9*d.* each. If the dealer paid the agent £3 per week and 3*d.* for each article sold, how many articles did the agent sell in a week in which his total earnings were £9 2*s.* 3*d.* ? How much profit did the dealer make in this week ? In a week in which the agent sold 720 articles what profit per cent., correct to 1 decimal place, did the dealer make on the cost price of the articles ?

9. The capital of J. Smith and Co. consists of 40,000 4% £1 A Preference Shares, 70,000 $6\frac{1}{2}$% £1 B Preference Shares, and 200,000 £1 Ordinary Shares. How much profit must the firm make in a year to pay the interest on all its Preference Shares ? If the firm pays all the interest on both sorts of Preference Shares before it pays any interest on its Ordinary Shares, what rate of interest will the firm pay on its Ordinary Shares in a year when the total profit, available for all shareholders is £30,150 ?

In this year a holder of A Preference Shares reckoned that he got a yield of $3\frac{3}{4}$% on the money he invested in these shares. What price did he pay for a £1 A Preference Share ?

10. $ABCD$ is a rectangle in which AB is 15 in. and AD is 8 in. Calculate the angle BAC. The rectangle is held in a vertical plane with AB inclined to the horizontal at 40° and with B, C and D lower than A. Calculate

(i) the depth of B below A,

(ii) the distance of C from the vertical through A.

11. A, B, C, are three points in a horizontal plane. AB and AC are each 100 ft. and the angle BAC is 70°. At A is a vertical pole AO 80 ft. high. Calculate

(i) the length of BC,

(ii) the angle of elevation of the top of the pole from B and

(iii) the angle of elevation of the top of the pole from the mid-point of BC.

كراسات علم الجبر ٢/٥/٧٢

Algebra

Summ. 71
" 70
" 69
Jan. 67
Summ. 66
" 65
Jan. 65

Maths A
Alg
360
Overseas

UNIVERSITY OF LONDON

General Certificate of Education Examination

SUMMER 1971 **ORDINARY LEVEL**

Mathematics 2

Syllabus A

ALGEBRA

for Candidates Overseas

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Find the value of $5c^2 - 2d$ when $c = -3$ and $d = 9$.

(ii) Express in its simplest form without brackets

$$(x + y)^2 - (x - y)^2 - 3xy\,.$$

(iii) Rearrange the formula $s = ut + \frac{1}{2}at^2$ to give u in terms of a, s and t.

Turn over

2. (i) Factorize completely

(*a*) $3x^2 - 12y^2$,

(*b*) $(p+q)^2 - 2p - 2q$.

(ii) If $h^7 \times h^5 = h^x \div h^4$ find the value of x.

(iii) Solve the equation $\frac{2x}{5} - \frac{2(2x-3)}{3} = \frac{2}{15}$.

---

3. (i) Express as a single fraction in its lowest terms

$$\frac{5}{5-x} - \frac{4}{4-x}.$$

(ii) Without using tables, find the values of

$$8^{\frac{2}{3}}, \quad (3^5)^{\frac{1}{5}}, \quad (\tfrac{1}{16})^{-\frac{1}{2}}.$$

(iii) Use logarithm tables to find the value of $\sqrt[3]{0{\cdot}6791}$.

---

4. (i) Solve the equation $3x^2 - 5x + 1 = 0$, giving the roots correct to two decimal places.

(ii) The nth term of a series is

$$\frac{n(-3)^n}{n+3}.$$

Find the numerical value of the third term.

---

5. (i) (*a*) Find the coefficient of x^4 in the product of $(1 - 2x - 2x^2)$ and $(1 + kx - 4x^2)$.

(*b*) If the coefficient of x^3 in this product is 6, find the value of k.

(ii) Find the two values of y which satisfy the equation

$$\frac{3y+2}{2y+3} = \frac{2y+1}{y+2}.$$

---

6. A wholesaler has 104 articles for sale. After selling to three retailers he has 7 articles left. He sells 2 more articles to the first retailer than to the second and twice as many articles to the second retailer than to the third. Find the number of articles sold to each retailer.

Section B

Answer any THREE questions in this section.

7. (i) If $x = -2$ satisfies the equation

$$6x^3 + x^2 + kx + 6 = 0,$$

find the value of k and the other two values of x which satisfy the equation.

(ii) Solve the equations

$$3y^2 - x^2 + 2xy = 7,$$
$$y + 3x - 1 = 0.$$

---

8. (i) Given that $R^2 = \frac{P^3 + Q^3}{72\pi}$,

use tables to find the value of R when $P = 2{\cdot}761$, $Q = 0{\cdot}9197$ and $\pi = 3{\cdot}142$.

(ii) Express in its simplest form and with positive indices

$$\frac{(a^{\frac{1}{3}}b^2)^2 \times (a^{-2}b^{\frac{1}{2}})^{-\frac{1}{2}}}{b^{\frac{1}{2}}}.$$

---

9. A cyclist and a motorist leave a town X at the same time to travel to a town Y which is 45 miles away. The motorist whose average speed is 18 miles per hour more than the average speed of the cyclist, arrives at Y exactly $2\frac{1}{4}$ hours before the cyclist. Find the average speed of each.

Turn over

10. The perimeter of a rectangular enclosure is 160 ft. If the width is x ft, show that the enclosed area is $(80x - x^2)$ ft^2.

Draw a graph of this function for values of x from 10 to 70 taking 1 cm to represent 5 ft on one axis and 100 ft^2 on the other.

From your graph, find

(*a*) the greatest possible area which can be enclosed,

(*b*) the length and the width of the enclosure when its area is greatest.

---

11. (i) If S denotes the sum $1 + 2 + 3 + \ldots\ldots. + n$ and T denotes the sum $1 + 2 + 3 + \ldots\ldots. + (n - 1)$, find in terms of n the values of

(*a*) $S - T$,

(*b*) $S + T$,

(*c*) $S^2 - T^2$.

Give your answers in their lowest terms.

(ii) If the sum of the second and third terms of a geometric progression is 21 and the sum of the fourth and fifth terms is 525, calculate the positive value of the common ratio.

Maths A
Alg
360
Overseas

UNIVERSITY OF LONDON

General Certificate of Education Examination

SUMMER 1971 **ORDINARY LEVEL**

Mathematics 2

Syllabus A

ALGEBRA

for Candidates Overseas

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Find the value of $5c^2 - 2d$ when $c = -3$ and $d = 9$. 27

(ii) Express in its simplest form without brackets

$$(x + y)^2 - (x - y)^2 - 3xy\,. \quad xy$$

(iii) Rearrange the formula $s = ut + \frac{1}{2}at^2$ to give u in terms of a, s and t.

$$\frac{s - \frac{1}{2}at^2}{t}$$

TSE 70/1482 7/3/3/100/17160

Turn over

2. (i) Factorize completely

(*a*) $3x^2 - 12y^2$, 3(x+2y)(x−2y)

(*b*) $(p+q)^2 - 2p - 2q$. (p+q)(p+q−2)

(ii) If $h^7 \times h^5 = h^x \div h^4$ find the value of x. 16

(iii) Solve the equation $\frac{2x}{5} - \frac{2(2x-3)}{3} = \frac{2}{15}$. 2

---

3. (i) Express as a single fraction in its lowest terms

$$\frac{5}{5-x} - \frac{4}{4-x}.$$

x / (5−x)(x−4)

(ii) Without using tables, find the values of

$$8^{\frac{2}{3}},\quad (3^5)^{\frac{1}{5}},\quad (\tfrac{1}{16})^{-\frac{1}{2}},$$

4, 3, 4

(iii) Use logarithm tables to find the value of $\sqrt[3]{0{\cdot}6791}$.

0.8790

---

4. (i) Solve the equation $3x^2 - 5x + 1 = 0$, giving the roots correct to two decimal places. 1.43, 0.23

(ii) The nth term of a series is

$$\frac{n(-3)^n}{n+3}.$$

$-13\frac{1}{2}$

Find the numerical value of the third term.

---

5. (i) (*a*) Find the coefficient of x^4 in the product of $(1 - 2x - 2x^2)$ and $(1 + kx - 4x^2)$. 8

(*b*) If the coefficient of x^3 in this product is 6, find the value of k. 1

(ii) Find the two values of y which satisfy the equation

$$\frac{3y+2}{2y+3} = \frac{2y+1}{y+2}.$$

±1

38, 40, 19

6. A wholesaler has 104 articles for sale. After selling to three retailers he has 7 articles left. He sells 2 more articles to the first retailer than to the second and twice as many articles to the second retailer than to the third. Find the number of articles sold to each retailer.

Section B

Answer any THREE questions in this section.

7. (i) If $x = -2$ satisfies the equation

$$6x^3 + x^2 + kx + 6 = 0,$$

−19, $\frac{3}{2}$, $-\frac{1}{3}$

find the value of k and the other two values of x which satisfy the equation.

(ii) Solve the equations

$$3y^2 - x^2 + 2xy = 7,$$
$$y + 3x - 1 = 0.$$

$-\frac{1}{5}$, $\frac{8}{5}$ | 1, −2

---

8. (i) Given that $R^2 = \frac{P^3 + Q^3}{72\pi}$,

use tables to find the value of R when $P = 2{\cdot}761$, $Q = 0{\cdot}9197$ and $\pi = 3{\cdot}142$.

(ii) Express in its simplest form and with positive indices

$$\frac{(a^{\frac{1}{3}}b^2)^2 \times (a^{-2}b^{\frac{1}{2}})^{-\frac{1}{2}}}{b^{\frac{1}{2}}}.$$

---

9. A cyclist and a motorist leave a town X at the same time to travel to a town Y which is 45 miles away. The motorist whose average speed is 18 miles per hour more than the average speed of the cyclist, arrives at Y exactly $2\frac{1}{4}$ hours before the cyclist. Find the average speed of each.

12, 30

Turn over

10. The perimeter of a rectangular enclosure is 160 ft. If the width is x ft, show that the enclosed area is $(80x - x^2)$ ft^2.

Draw a graph of this function for values of x from 10 to 70 taking 1 cm to represent 5 ft on one axis and 100 ft^2 on the other.

From your graph, find

(*a*) the greatest possible area which can be enclosed,

(*b*) the length and the width of the enclosure when its area is greatest.

---

11. (i) If S denotes the sum $1 + 2 + 3 + \ldots\ldots + n$ and T denotes the sum $1 + 2 + 3 + \ldots\ldots + (n - 1)$, find in terms of n the values of

(*a*) $S - T$, n

(*b*) $S + T$, n^2

(*c*) $S^2 - T^2$. n^3

Give your answers in their lowest terms.

(ii) If the sum of the second and third terms of a geometric progression is 21 and the sum of the fourth and fifth terms is 525, calculate the positive value of the common ratio. 5

Pure Maths A
Alg
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS II

Syllabus A

ALGEBRA

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Find the value of $\dfrac{h^2 - ab}{h^2 + ab}$ when $a = 2, b = -3, h = -4$.

(ii) Solve the equation $10 - 2(3 - x) = 3 - 10(2 - x)$.

(iii) Solve the equations
$$3x - y = 13,$$
$$2x + 3y = 5.$$

TSE 67/1516 11/2/37850

Turn Over

2. (i) Express in its simplest form

$$\frac{x^2 - 4y^2}{x^2 - 5xy + 6y^2}.$$

(ii) If $T = \frac{E}{a}(x - a)$, express a in terms of T, E and x.

3. Given that $\dfrac{u + 1}{2v + 1} = \dfrac{4u + 5}{3v + 4}$, find

(*a*) the value of u if $v = 1$,

(*b*) the value of v if $u = 1$.

4. Cement can be bought either in bags each containing a lb and costing x shillings, or at a cheaper rate in larger bags each containing b lb and costing y shillings. Find an expression for the percentage saving made by using the larger bags instead of the smaller ones, when a concrete floor requiring $100ab$ lb of cement is to be made.

5. (i) If $pv^\gamma = k$, find k

(*a*) when $p = 50$, $v = 8$, $\gamma = \frac{4}{3}$,

(*b*) when $p = 100$, $v = 8$, $\gamma = -\frac{2}{3}$.

(ii) If $p = 0{\cdot}1234$ and $q = 0{\cdot}05677$, use logarithms to calculate

(*a*) $\frac{p}{q}$, (*b*) p^3, (*c*) $\sqrt[3]{q}$,

6. If n is any positive whole number, then $\frac{1}{2}n(n + 1)$ is called the triangular number of order n. Find the triangular number of order 10.

Given that 105 is a triangular number, find its order.

Show that if the triangular number of order n is multiplied by 8 and 1 is added, the result is a perfect square for any value of n.

Section B

Answer any THREE questions in this section.

7. (i) Solve the equation $3x^2 + 2x = 7$, giving the answers correct to two places of decimals.

(ii) Given that $a^2 - 3ab - 2a + 6b = 0$, prove that either $a = 3b$ or $a = 2$. Hence find the four possible values of b, and the corresponding values of a, that satisfy the two equations

$$a^2 - 3ab - 2a + 6b = 0,$$
$$a^2 - ab + b^2 = 28\,.$$

8. Buses, which run at 40 Km.p.h., stop at a bus stop A and later at another stop C, 0·2 Km further along the road. A man who lives at B, on the road between A and C, finds that in order to catch any particular bus he has to leave his house at the same time whether he catches the bus at A or at C. If the man walks at 6 Km.p.h., find the distance from A to B.

Find also the time it takes the man to walk from B to C.

9. (i) Write down five consecutive integers of which the middle one is n. Prove that the sum of the squares of three consecutive integers can never be a multiple of 3, but that the sum of the squares of five consecutive integers is always a multiple of 5.

(ii) Show that whatever value a may have, the expression

$$x^3 - (a + 3)\,x^2 + (3a + 8)\,x - 24$$

is exactly divisible by $x - 3$.

If a is such that this expression is also exactly divisible by $x - 2$, find the value of a and the third factor of the expression.

10. Draw the graph of $y = 7 - x^2$ for values of x from $x = -3$ to $x = +3$, using a scale of 1 inch to 1 unit on the x-axis, and 1 inch to 2 units on the y-axis.

Use your graph to find the positive value of $\sqrt{6}$, marking with a P the point on the graph that you use for this purpose.

On the same scale and with the same axes draw the graphs of $y = 2 - x$ and $y = 2 + x$. Use your graphs to solve the equations

(*a*) $x^2 - x - 5 = 0$,

(*b*) $x^2 + x - 5 = 0$.

Show clearly which graphs give the roots of each equation.

11. (i) The third term of a geometric progression is 27 and the sixth term is 8. Find the first term, the fifth term and the sum of the first six terms.

(ii) A man's salary is £800 in his first year in a new post. Each year his salary increases by the same amount over what it was in the previous year, and in the ninth year it is £1 056. Find

(*a*) his salary in the fourteenth year,

(*b*) in which year his salary first rises above £1 500,

(*c*) the total the man earns in his first ten years.

Pure Maths A
Alg
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS II

Syllabus A

ALGEBRA

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Find the value of $\dfrac{h^2 - ab}{h^2 + ab}$ when $a = 2, b = -3, h = -4$.

(ii) Solve the equation $10 - 2(3 - x) = 3 - 10(2 - x)$.

(iii) Solve the equations $3x - y = 13$,
$2x + 3y = 5$.

TSE 67/1516 11/2/37850

Turn Over

2. (i) Express in its simplest form

$$\frac{x^2 - 4y^2}{x^2 - 5xy + 6y^2}.$$

(ii) If $T = \frac{E}{a}(x - a)$, express a in terms of T, E and x.

3. Given that $\frac{u+1}{2v+1} = \frac{4u+5}{3v+4}$, find

(*a*) the value of u if $v = 1$,

(*b*) the value of v if $u = 1$.

4. Cement can be bought either in bags each containing a lb and costing x shillings, or at a cheaper rate in larger bags each containing b lb and costing y shillings. Find an expression for the percentage saving made by using the larger bags instead of the smaller ones, when a concrete floor requiring $100ab$ lb of cement is to be made.

5. (i) If $pv^{\gamma} = k$, find k

(*a*) when $p = 50$, $v = 8$, $\gamma = \frac{4}{3}$,

(*b*) when $p = 100$, $v = 8$, $\gamma = -\frac{2}{3}$.

(ii) If $p = 0{\cdot}1234$ and $q = 0{\cdot}05677$, use logarithms to calculate

(*a*) $\frac{p}{q}$, (*b*) p^3, (*c*) $\sqrt[3]{q}$.

6. If n is any positive whole number, then $\frac{1}{2}n(n+1)$ is called the triangular number of order n. Find the triangular number of order 10.

Given that 105 is a triangular number, find its order.

Show that if the triangular number of order n is multiplied by 8 and 1 is added, the result is a perfect square for any value of n.

Section B

Answer any THREE questions in this section.

7. (i) Solve the equation $3x^2 + 2x = 7$, giving the answers correct to two places of decimals.

(ii) Given that $a^2 - 3ab - 2a + 6b = 0$, prove that either $a = 3b$ or $a = 2$. Hence find the four possible values of b, and the corresponding values of a, that satisfy the two equations

$$a^2 - 3ab - 2a + 6b = 0,$$
$$a^2 - ab + b^2 = 28.$$

8. Buses, which run at 40 Km.p.h., stop at a bus stop A and later at another stop C, 0·2 Km further along the road. A man who lives at B, on the road between A and C, finds that in order to catch any particular bus he has to leave his house at the same time whether he catches the bus at A or at C. If the man walks at 6 Km.p.h., find the distance from A to B.

Find also the time it takes the man to walk from B to C.

9. (i) Write down five consecutive integers of which the middle one is n. Prove that the sum of the squares of three consecutive integers can never be a multiple of 3, but that the sum of the squares of five consecutive integers is always a multiple of 5.

(ii) Show that whatever value a may have, the expression

$$x^3 - (a+3)x^2 + (3a+8)x - 24$$

is exactly divisible by $x - 3$.

If a is such that this expression is also exactly divisible by $x - 2$, find the value of a and the third factor of the expression.

10. Draw the graph of $y = 7 - x^2$ for values of x from $x = -3$ to $x = +3$, using a scale of 1 inch to 1 unit on the x-axis, and 1 inch to 2 units on the y-axis.

Use your graph to find the positive value of $\sqrt{6}$, marking with a P the point on the graph that you use for this purpose.

On the same scale and with the same axes draw the graphs of $y = 2 - x$ and $y = 2 + x$. Use your graphs to solve the equations

(*a*) $x^2 - x - 5 = 0$,

(*b*) $x^2 + x - 5 = 0$.

Show clearly which graphs give the roots of each equation.

11. (i) The third term of a geometric progression is 27 and the sixth term is 8. Find the first term, the fifth term and the sum of the first six terms.

(ii) A man's salary is £800 in his first year in a new post. Each year his salary increases by the same amount over what it was in the previous year, and in the ninth year it is £1 056. Find

(*a*) his salary in the fourteenth year,

(*b*) in which year his salary first rises above £1 500,

(*c*) the total the man earns in his first ten years.

Pure Maths A
Alg
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS II

Syllabus A

ALGEBRA

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Find the value of $\frac{h^2 - ab}{h^2 + ab}$ when $a = 2, b = -3, h = -4$.

(ii) Solve the equation $10 - 2(3 - x) = 3 - 10(2 - x)$.

(iii) Solve the equations $3x - y = 13$,
$2x + 3y = 5$.

TSE 67/1516 11/2/37850

Turn Over

2. (i) Express in its simplest form

$$\frac{x^2 - 4y^2}{x^2 - 5xy + 6y^2}.$$

(ii) If $T = \frac{E}{a}(x - a)$, express a in terms of T, E and x.

3. Given that $\frac{u+1}{2v+1} = \frac{4u+5}{3v+4}$, find

(*a*) the value of u if $v = 1$,

(*b*) the value of v if $u = 1$.

4. Cement can be bought either in bags each containing a lb and costing x shillings, or at a cheaper rate in larger bags each containing b lb and costing y shillings. Find an expression for the percentage saving made by using the larger bags instead of the smaller ones, when a concrete floor requiring $100ab$ lb of cement is to be made.

5. (i) If $pv^\gamma = k$, find k

(*a*) when $p = 50$, $v = 8$, $\gamma = \frac{4}{3}$,

(*b*) when $p = 100$, $v = 8$, $\gamma = -\frac{2}{3}$.

(ii) If $p = 0{\cdot}1234$ and $q = 0{\cdot}05677$, use logarithms to calculate

(*a*) $\frac{p}{q}$, (*b*) p^3, (*c*) $\sqrt[3]{q}$,

6. If n is any positive whole number, then $\frac{1}{2}n(n + 1)$ is called the triangular number of order n. Find the triangular number of order 10.

Given that 105 is a triangular number, find its order.

Show that if the triangular number of order n is multiplied by 8 and 1 is added, the result is a perfect square for any value of n.

Section B

Answer any THREE questions in this section.

7. (i) Solve the equation $3x^2 + 2x = 7$, giving the answers correct to two places of decimals.

(ii) Given that $a^2 - 3ab - 2a + 6b = 0$, prove that either $a = 3b$ or $a = 2$. Hence find the four possible values of b, and the corresponding values of a, that satisfy the two equations

$$a^2 - 3ab - 2a + 6b = 0,$$
$$a^2 - ab + b^2 = 28\,.$$

8. Buses, which run at 40 Km.p.h., stop at a bus stop A and later at another stop C, 0·2 Km further along the road. A man who lives at B, on the road between A and C, finds that in order to catch any particular bus he has to leave his house at the same time whether he catches the bus at A or at C. If the man walks at 6 Km.p.h., find the distance from A to B.

Find also the time it takes the man to walk from B to C.

9. (i) Write down five consecutive integers of which the middle one is n. Prove that the sum of the squares of three consecutive integers can never be a multiple of 3, but that the sum of the squares of five consecutive integers is always a multiple of 5.

(ii) Show that whatever value a may have, the expression

$$x^3 - (a + 3)x^2 + (3a + 8)x - 24$$

is exactly divisible by $x - 3$.

If a is such that this expression is also exactly divisible by $x - 2$, find the value of a and the third factor of the expression.

Turn Over

10. Draw the graph of $y = 7 - x^2$ for values of x from $x = -3$ to $x = +3$, using a scale of 1 inch to 1 unit on the x-axis, and 1 inch to 2 units on the y-axis.

Use your graph to find the positive value of $\sqrt{6}$, marking with a P the point on the graph that you use for this purpose.

On the same scale and with the same axes draw the graphs of $y = 2 - x$ and $y = 2 + x$. Use your graphs to solve the equations

(*a*) $x^2 - x - 5 = 0$,

(*b*) $x^2 + x - 5 = 0$.

Show clearly which graphs give the roots of each equation.

11. (i) The third term of a geometric progression is 27 and the sixth term is 8. Find the first term, the fifth term and the sum of the first six terms.

(ii) A man's salary is £800 in his first year in a new post. Each year his salary increases by the same amount over what it was in the previous year, and in the ninth year it is £1 056. Find

(*a*) his salary in the fourteenth year,

(*b*) in which year his salary first rises above £1 500,

(*c*) the total the man earns in his first ten years.

Pure Maths A
Alg
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS II

Syllabus A

ALGEBRA

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Find the value of $\dfrac{h^2 - ab}{h^2 + ab}$ when $a = 2, b = -3, h = -4$.

(ii) Solve the equation $10 - 2(3 - x) = 3 - 10(2 - x)$.

(iii) Solve the equations $3x - y = 13$,
$2x + 3y = 5$.

TSE 67/1516 11/2/37850

Turn Over

2. (i) Express in its simplest form

$$\frac{x^2 - 4y^2}{x^2 - 5xy + 6y^2}.$$

(ii) If $T = \frac{E}{a}(x - a)$, express a in terms of T, E and x.

3. Given that $\frac{u + 1}{2v + 1} = \frac{4u + 5}{3v + 4}$, find

(*a*) the value of u if $v = 1$,

(*b*) the value of v if $u = 1$.

4. Cement can be bought either in bags each containing a lb and costing x shillings, or at a cheaper rate in larger bags each containing b lb and costing y shillings. Find an expression for the percentage saving made by using the larger bags instead of the smaller ones, when a concrete floor requiring $100ab$ lb of cement is to be made.

5. (i) If $pv^\gamma = k$, find k

(*a*) when $p = 50$, $v = 8$, $\gamma = \frac{4}{3}$,

(*b*) when $p = 100$, $v = 8$, $\gamma = -\frac{2}{3}$.

(ii) If $p = 0{\cdot}1234$ and $q = 0{\cdot}05677$, use logarithms to calculate

(*a*) $\frac{p}{q}$, (*b*) p^3, (*c*) $\sqrt[3]{q}$.

6. If n is any positive whole number, then $\frac{1}{2}n(n + 1)$ is called the triangular number of order n. Find the triangular number of order 10.

Given that 105 is a triangular number, find its order.

Show that if the triangular number of order n is multiplied by 8 and 1 is added, the result is a perfect square for any value of n.

Section B

Answer any THREE questions in this section.

7. (i) Solve the equation $3x^2 + 2x = 7$, giving the answers correct to two places of decimals.

(ii) Given that $a^2 - 3ab - 2a + 6b = 0$, prove that either $a = 3b$ or $a = 2$. Hence find the four possible values of b, and the corresponding values of a, that satisfy the two equations

$$a^2 - 3ab - 2a + 6b = 0,$$
$$a^2 - ab + b^2 = 28.$$

8. Buses, which run at 40 Km.p.h., stop at a bus stop A and later at another stop C, 0·2 Km further along the road. A man who lives at B, on the road between A and C, finds that in order to catch any particular bus he has to leave his house at the same time whether he catches the bus at A or at C. If the man walks at 6 Km.p.h., find the distance from A to B.

Find also the time it takes the man to walk from B to C.

9. (i) Write down five consecutive integers of which the middle one is n. Prove that the sum of the squares of three consecutive integers can never be a multiple of 3, but that the sum of the squares of five consecutive integers is always a multiple of 5.

(ii) Show that whatever value a may have, the expression

$$x^3 - (a + 3)x^2 + (3a + 8)x - 24$$

is exactly divisible by $x - 3$.

If a is such that this expression is also exactly divisible by $x - 2$, find the value of a and the third factor of the expression.

10. Draw the graph of $y = 7 - x^2$ for values of x from $x = -3$ to $x = +3$, using a scale of 1 inch to 1 unit on the x-axis, and 1 inch to 2 units on the y-axis.

Use your graph to find the positive value of $\sqrt{6}$, marking with a P the point on the graph that you use for this purpose.

On the same scale and with the same axes draw the graphs of $y = 2 - x$ and $y = 2 + x$. Use your graphs to solve the equations

(*a*) $x^2 - x - 5 = 0$,

(*b*) $x^2 + x - 5 = 0$.

Show clearly which graphs give the roots of each equation.

11. (i) The third term of a geometric progression is 27 and the sixth term is 8. Find the first term, the fifth term and the sum of the first six terms.

(ii) A man's salary is £800 in his first year in a new post. Each year his salary increases by the same amount over what it was in the previous year, and in the ninth year it is £1 056. Find

(*a*) his salary in the fourteenth year,

(*b*) in which year his salary first rises above £1 500,

(*c*) the total the man earns in his first ten years.

Pure Maths A
Alg
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS II

Syllabus A

ALGEBRA

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Find the value of $\dfrac{h^2 - ab}{h^2 + ab}$ when $a = 2, b = -3, h = -4$.

(ii) Solve the equation $10 - 2(3 - x) = 3 - 10(2 - x)$.

(iii) Solve the equations $3x - y = 13$,
$2x + 3y = 5$.

TSE 67/1516 11/2/37850

Turn Over

2. (i) Express in its simplest form

$$\frac{x^2 - 4y^2}{x^2 - 5xy + 6y^2}.$$

(ii) If $T = \frac{E}{a}(x - a)$, express a in terms of T, E and x.

3. Given that $\dfrac{u+1}{2v+1} = \dfrac{4u+5}{3v+4}$, find

(*a*) the value of u if $v = 1$,

(*b*) the value of v if $u = 1$.

4. Cement can be bought either in bags each containing a lb and costing x shillings, or at a cheaper rate in larger bags each containing b lb and costing y shillings. Find an expression for the percentage saving made by using the larger bags instead of the smaller ones, when a concrete floor requiring $100ab$ lb of cement is to be made.

5. (i) If $pv^\gamma = k$, find k

(*a*) when $p = 50$, $v = 8$, $\gamma = \frac{4}{3}$,

(*b*) when $p = 100$, $v = 8$, $\gamma = -\frac{2}{3}$.

(ii) If $p = 0{\cdot}1234$ and $q = 0{\cdot}05677$, use logarithms to calculate

(*a*) $\frac{p}{q}$, (*b*) p^3, (*c*) $\sqrt[3]{q}$,

6. If n is any positive whole number, then $\frac{1}{2}n(n+1)$ is called the triangular number of order n. Find the triangular number of order 10.

Given that 105 is a triangular number, find its order.

Show that if the triangular number of order n is multiplied by 8 and 1 is added, the result is a perfect square for any value of n.

Section B

Answer any THREE questions in this section.

7. (i) Solve the equation $3x^2 + 2x = 7$, giving the answers correct to two places of decimals.

(ii) Given that $a^2 - 3ab - 2a + 6b = 0$, prove that either $a = 3b$ or $a = 2$. Hence find the four possible values of b, and the corresponding values of a, that satisfy the two equations

$$a^2 - 3ab - 2a + 6b = 0,$$
$$a^2 - ab + b^2 = 28\,.$$

8. Buses, which run at 40 Km.p.h., stop at a bus stop A and later at another stop C, 0·2 Km further along the road. A man who lives at B, on the road between A and C, finds that in order to catch any particular bus he has to leave his house at the same time whether he catches the bus at A or at C. If the man walks at 6 Km.p.h., find the distance from A to B.

Find also the time it takes the man to walk from B to C.

9. (i) Write down five consecutive integers of which the middle one is n. Prove that the sum of the squares of three consecutive integers can never be a multiple of 3, but that the sum of the squares of five consecutive integers is always a multiple of 5.

(ii) Show that whatever value a may have, the expression

$$x^3 - (a+3)\,x^2 + (3a+8)\,x - 24$$

is exactly divisible by $x - 3$.

If a is such that this expression is also exactly divisible by $x - 2$, find the value of a and the third factor of the expression.

Turn Over

10. Draw the graph of $y = 7 - x^2$ for values of x from $x = -3$ to $x = +3$, using a scale of 1 inch to 1 unit on the x-axis, and 1 inch to 2 units on the y-axis.

Use your graph to find the positive value of $\sqrt{6}$, marking with a P the point on the graph that you use for this purpose.

On the same scale and with the same axes draw the graphs of $y = 2 - x$ and $y = 2 + x$. Use your graphs to solve the equations

(*a*) $x^2 - x - 5 = 0$,

(*b*) $x^2 + x - 5 = 0$.

Show clearly which graphs give the roots of each equation.

11. (i) The third term of a geometric progression is 27 and the sixth term is 8. Find the first term, the fifth term and the sum of the first six terms.

(ii) A man's salary is £800 in his first year in a new post. Each year his salary increases by the same amount over what it was in the previous year, and in the ninth year it is £1 056. Find

(*a*) his salary in the fourteenth year,

(*b*) in which year his salary first rises above £1 500,

(*c*) the total the man earns in his first ten years.

Pure Maths A
Alg
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS II

Syllabus A

ALGEBRA

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Find the value of $\frac{h^2 - ab}{h^2 + ab}$ when $a = 2, b = -3, h = -4$.

(ii) Solve the equation $10 - 2(3 - x) = 3 - 10(2 - x)$.

(iii) Solve the equations $3x - y = 13$,
$2x + 3y = 5$.

TSE 67/1516 11/2/37850

Turn Over

2. (i) Express in its simplest form

$$\frac{x^2 - 4y^2}{x^2 - 5xy + 6y^2}.$$

(ii) If $T = \frac{E}{a}(x - a)$, express a in terms of T, E and x.

3. Given that $\frac{u + 1}{2v + 1} = \frac{4u + 5}{3v + 4}$, find

(*a*) the value of u if $v = 1$,

(*b*) the value of v if $u = 1$.

4. Cement can be bought either in bags each containing a lb and costing x shillings, or at a cheaper rate in larger bags each containing b lb and costing y shillings. Find an expression for the percentage saving made by using the larger bags instead of the smaller ones, when a concrete floor requiring $100ab$ lb of cement is to be made.

5. (i) If $pv^{\gamma} = k$, find k

(*a*) when $p = 50$, $v = 8$, $\gamma = \frac{4}{3}$,

(*b*) when $p = 100$, $v = 8$, $\gamma = -\frac{2}{3}$.

(ii) If $p = 0{\cdot}1234$ and $q = 0{\cdot}05677$, use logarithms to calculate

(*a*) $\frac{p}{q}$, (*b*) p^3, (*c*) $\sqrt[3]{q}$,

6. If n is any positive whole number, then $\frac{1}{2}n(n + 1)$ is called the triangular number of order n. Find the triangular number of order 10.

Given that 105 is a triangular number, find its order.

Show that if the triangular number of order n is multiplied by 8 and 1 is added, the result is a perfect square for any value of n.

Section B

Answer any THREE questions in this section.

7. (i) Solve the equation $3x^2 + 2x = 7$, giving the answers correct to two places of decimals.

(ii) Given that $a^2 - 3ab - 2a + 6b = 0$, prove that either $a = 3b$ or $a = 2$. Hence find the four possible values of b, and the corresponding values of a, that satisfy the two equations

$$a^2 - 3ab - 2a + 6b = 0,$$
$$a^2 - ab + b^2 = 28\,.$$

8. Buses, which run at 40 Km.p.h., stop at a bus stop A and later at another stop C, 0·2 Km further along the road. A man who lives at B, on the road between A and C, finds that in order to catch any particular bus he has to leave his house at the same time whether he catches the bus at A or at C. If the man walks at 6 Km.p.h., find the distance from A to B.

Find also the time it takes the man to walk from B to C.

9. (i) Write down five consecutive integers of which the middle one is n. Prove that the sum of the squares of three consecutive integers can never be a multiple of 3, but that the sum of the squares of five consecutive integers is always a multiple of 5.

(ii) Show that whatever value a may have, the expression

$$x^3 - (a + 3)\,x^2 + (3a + 8)\,x - 24$$

is exactly divisible by $x - 3$.

If a is such that this expression is also exactly divisible by $x - 2$, find the value of a and the third factor of the expression.

2·449

10. Draw the graph of $y = 7 - x^2$ for values of x from $x = -3$ to $x = +3$, using a scale of 1 inch to 1 unit on the x-axis, and 1 inch to 2 units on the y-axis.

Use your graph to find the positive value of $\sqrt{6}$, marking with a P the point on the graph that you use for this purpose.

On the same scale and with the same axes draw the graphs of $y = 2 - x$ and $y = 2 + x$. Use your graphs to solve the equations

(*a*) $x^2 - x - 5 = 0$,

(*b*) $x^2 + x - 5 = 0$.

Show clearly which graphs give the roots of each equation.

11. (i) The third term of a geometric progression is 27 and the sixth term is 8. Find the first term, the fifth term and the sum of the first six terms.

(ii) A man's salary is £800 in his first year in a new post. Each year his salary increases by the same amount over what it was in the previous year, and in the ninth year it is £1 056. Find

(*a*) his salary in the fourteenth year,

(*b*) in which year his salary first rises above £1 500,

(*c*) the total the man earns in his first ten years.

Pure Maths A
Alg
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS II

Syllabus A

ALGEBRA

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Find the value of $\dfrac{h^2 - ab}{h^2 + ab}$ when $a = 2, b = -3, h = -4$.

(ii) Solve the equation $10 - 2(3 - x) = 3 - 10(2 - x)$.

(iii) Solve the equations $3x - y = 13$,
$2x + 3y = 5$.

TSE 67/1516 11/2/37850

Turn Over

2. (i) Express in its simplest form

$$\frac{x^2 - 4y^2}{x^2 - 5xy + 6y^2}.$$

(ii) If $T = \frac{E}{a}(x - a)$, express a in terms of T, E and x.

3. Given that $\dfrac{u+1}{2v+1} = \dfrac{4u+5}{3v+4}$, find

(*a*) the value of u if $v = 1$,

(*b*) the value of v if $u = 1$.

4. Cement can be bought either in bags each containing a lb and costing x shillings, or at a cheaper rate in larger bags each containing b lb and costing y shillings. Find an expression for the percentage saving made by using the larger bags instead of the smaller ones, when a concrete floor requiring $100ab$ lb of cement is to be made.

5. (i) If $pv^\gamma = k$, find k

(*a*) when $p = 50$, $v = 8$, $\gamma = \frac{4}{3}$,

(*b*) when $p = 100$, $v = 8$, $\gamma = -\frac{2}{3}$.

(ii) If $p = 0{\cdot}1234$ and $q = 0{\cdot}05677$, use logarithms to calculate

(*a*) $\frac{p}{q}$, (*b*) p^3, (*c*) $\sqrt[3]{q}$,

6. If n is any positive whole number, then $\frac{1}{2}n(n + 1)$ is called the triangular number of order n. Find the triangular number of order 10.

Given that 105 is a triangular number, find its order.

Show that if the triangular number of order n is multiplied by 8 and 1 is added, the result is a perfect square for any value of n.

Section B

Answer any THREE questions in this section.

7. (i) Solve the equation $3x^2 + 2x = 7$, giving the answers correct to two places of decimals.

(ii) Given that $a^2 - 3ab - 2a + 6b = 0$, prove that either $a = 3b$ or $a = 2$. Hence find the four possible values of b, and the corresponding values of a, that satisfy the two equations

$$a^2 - 3ab - 2a + 6b = 0,$$
$$a^2 - ab + b^2 = 28 .$$

8. Buses, which run at 40 Km.p.h., stop at a bus stop A and later at another stop C, 0·2 Km further along the road. A man who lives at B, on the road between A and C, finds that in order to catch any particular bus he has to leave his house at the same time whether he catches the bus at A or at C. If the man walks at 6 Km.p.h., find the distance from A to B.

Find also the time it takes the man to walk from B to C.

9. (i) Write down five consecutive integers of which the middle one is n. Prove that the sum of the squares of three consecutive integers can never be a multiple of 3, but that the sum of the squares of five consecutive integers is always a multiple of 5.

(ii) Show that whatever value a may have, the expression

$$x^3 - (a+3)x^2 + (3a+8)x - 24$$

is exactly divisible by $x - 3$.

If a is such that this expression is also exactly divisible by $x - 2$, find the value of a and the third factor of the expression.

Turn Over

10. Draw the graph of $y = 7 - x^2$ for values of x from $x = -3$ to $x = +3$, using a scale of 1 inch to 1 unit on the x-axis, and 1 inch to 2 units on the y-axis.

Use your graph to find the positive value of $\sqrt{6}$, marking with a P the point on the graph that you use for this purpose.

On the same scale and with the same axes draw the graphs of $y = 2 - x$ and $y = 2 + x$. Use your graphs to solve the equations

(*a*) $x^2 - x - 5 = 0$,

(*b*) $x^2 + x - 5 = 0$.

Show clearly which graphs give the roots of each equation.

11. (i) The third term of a geometric progression is 27 and the sixth term is 8. Find the first term, the fifth term and the sum of the first six terms.

(ii) A man's salary is £800 in his first year in a new post. Each year his salary increases by the same amount over what it was in the previous year, and in the ninth year it is £1 056. Find

(*a*) his salary in the fourteenth year,

(*b*) in which year his salary first rises above £1 500,

(*c*) the total the man earns in his first ten years.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS II

Syllabus A

ALGEBRA

Two hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. (i) Find the value of $\dfrac{h^2 - ab}{h^2 + ab}$ when $a = 2, b = -3, h = -4$.

(ii) Solve the equation $10 - 2(3 - x) = 3 - 10(2 - x)$.

(iii) Solve the equations $3x - y = 13$,

$2x + 3y = 5$.

TSE 67/1516 11/2/37850

Turn Over

2. (i) Express in its simplest form

$$\frac{x^2 - 4y^2}{x^2 - 5xy + 6y^2}.$$

(ii) If $T = \frac{E}{a}(x - a)$, express a in terms of T, E and x.

3. Given that $\dfrac{u+1}{2v+1} = \dfrac{4u+5}{3v+4}$, find

(*a*) the value of u if $v = 1$,

(*b*) the value of v if $u = 1$.

4. Cement can be bought either in bags each containing a lb and costing x shillings, or at a cheaper rate in larger bags each containing b lb and costing y shillings. Find an expression for the percentage saving made by using the larger bags instead of the smaller ones, when a concrete floor requiring $100ab$ lb of cement is to be made.

5. (i) If $pv^\gamma = k$, find k

(*a*) when $p = 50$, $v = 8$, $\gamma = \frac{4}{3}$,

(*b*) when $p = 100$, $v = 8$, $\gamma = -\frac{2}{3}$.

(ii) If $p = 0{\cdot}1234$ and $q = 0{\cdot}05677$, use logarithms to calculate

(*a*) $\frac{p}{q}$, (*b*) p^3, (*c*) $\sqrt[3]{q}$.

6. If n is any positive whole number, then $\frac{1}{2}n(n+1)$ is called the triangular number of order n. Find the triangular number of order 10.

Given that 105 is a triangular number, find its order.

Show that if the triangular number of order n is multiplied by 8 and 1 is added, the result is a perfect square for any value of n.

Section B

Answer any THREE questions in this section.

7. (i) Solve the equation $3x^2 + 2x = 7$, giving the answers correct to two places of decimals.

(ii) Given that $a^2 - 3ab - 2a + 6b = 0$, prove that either $a = 3b$ or $a = 2$. Hence find the four possible values of b, and the corresponding values of a, that satisfy the two equations

$$a^2 - 3ab - 2a + 6b = 0,$$
$$a^2 - ab + b^2 = 28.$$

8. Buses, which run at 40 Km.p.h., stop at a bus stop A and later at another stop C, 0·2 Km further along the road. A man who lives at B, on the road between A and C, finds that in order to catch any particular bus he has to leave his house at the same time whether he catches the bus at A or at C. If the man walks at 6 Km.p.h., find the distance from A to B.

Find also the time it takes the man to walk from B to C.

9. (i) Write down five consecutive integers of which the middle one is n. Prove that the sum of the squares of three consecutive integers can never be a multiple of 3, but that the sum of the squares of five consecutive integers is always a multiple of 5.

(ii) Show that whatever value a may have, the expression

$$x^3 - (a+3)x^2 + (3a+8)x - 24$$

is exactly divisible by $x - 3$.

If a is such that this expression is also exactly divisible by $x - 2$, find the value of a and the third factor of the expression.

10. Draw the graph of $y = 7 - x^2$ for values of x from $x = -3$ to $x = +3$, using a scale of 1 inch to 1 unit on the x-axis, and 1 inch to 2 units on the y-axis.

Use your graph to find the positive value of $\sqrt{6}$, marking with a P the point on the graph that you use for this purpose.

On the same scale and with the same axes draw the graphs of $y = 2 - x$ and $y = 2 + x$. Use your graphs to solve the equations

(*a*) $x^2 - x - 5 = 0$,

(*b*) $x^2 + x - 5 = 0$.

Show clearly which graphs give the roots of each equation.

11. (i) The third term of a geometric progression is 27 and the sixth term is 8. Find the first term, the fifth term and the sum of the first six terms.

(ii) A man's salary is £800 in his first year in a new post. Each year his salary increases by the same amount over what it was in the previous year, and in the ninth year it is £1 056. Find

(*a*) his salary in the fourteenth year,

(*b*) in which year his salary first rises above £1 500,

(*c*) the total the man earns in his first ten years.

Pure Maths A
Alg
40
O/s

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1967

Ordinary Level

PURE MATHEMATICS II

Syllabus A

ALGEBRA

for Candidates Overseas

Two hours

Answer ALL questions in Section A and any THREE in Section B. All necessary working must be shown.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

TE&S 64/1811 11/2/100/14650

Turn Over

Section A

1. (i) If $a = 2$, $b = -3$, $c = 1$, obtain the value of

$$a^3 + b^3 + c^3 - 3abc\,.$$

(ii) Solve the equation

$$\frac{4}{5}(3x - 1) - \frac{2x - 1}{3} = 3\,.$$

(iii) Find the values of x and y if

$$3x + 4y = 3\,,$$
$$9x - 2y = 2\,.$$

2. (i) Find the value of k if the expression $6x^3 - 13x^2 + 18x + k$ is exactly divisible by $2x^2 - 3x + 4$.

(ii) A man purchased x articles at a pence each. Subsequently 24 articles proved to be unsaleable and he sold the remainder, making a profit of one shilling on each article. Find, in its simplest form, his total profit in shillings.

(iii) If $R = 5a + \dfrac{2b}{3V}$, find an expression for V in terms of the other letters.

3. (i) Factorize

(a) $3p^2 - 12q^2$,

(b) $12a^2 + 23ab - 24b^2$,

(c) $6a^2 - 9ac - 8ab + 12bc$.

(ii) Solve the equation $6x^2 + 5x = 6$.

4. (i) If the nth term of a series is $\dfrac{2n+1}{2n+3}$ write down the first three terms and express the difference between the nth and $(n + 1)$th terms as a single fraction.

(ii) Solve the equation $2x^2 - 3x - 1 = 0$, giving the roots correct to two places of decimals.

5. (i) Without using tables, evaluate

$$(a)\ 8^{-\frac{2}{3}},\quad (b)\ \left(\frac{1}{16}\right)^{-\frac{3}{4}},\quad (c)\ 24^{\frac{1}{2}} \div 6^{\frac{3}{2}}\,.$$

(ii) Use logarithm tables to evaluate

$$(a)\ \sqrt{\frac{17{\cdot}54}{28{\cdot}96}},\quad (b)\ (0{\cdot}9521)^3\,.$$

6. Ten years ago a man was three times as old as his son. Five years from now the man will be twice as old as his son. Find their present ages.

Section B

Answer any THREE questions in this section.

7. (i) If $3x^2 - 4x + 5 = a(x - b)^2 + c$ for all values of x, find the values of a, b and c.

Hence, or otherwise, find the least value of $3x^2 - 4x + 5$.

(ii) Solve the equations

$$6x^2 - 4xy + 3y^2 = 42\,,$$
$$2x - y = 4\,.$$

8. (i) If $x = a + \dfrac{b}{t}$ and $y = b + at$, find an expression for y in terms of a, b, x.

(ii) If $2^{x-y} = 8$ and $3^{x-2y} = 9$, find the values of x and y.

(iii) If $\dfrac{m}{n} = \dfrac{5}{4}$ and $\dfrac{p}{q} = \dfrac{3}{4}$, find the value of $\dfrac{3m + 5p}{n + q}$.

9. (i) Three times the third term of an arithmetic progression is twice the sixth term. The sum of the first, third and fifth terms is 9.

Find

(*a*) the ratio of the ninth term to the sixth term,

(*b*) the sum of the first thirteen terms of the progression.

(ii) The third term of a geometric progression, in which all the terms are positive, is $\frac{2}{3}$ and the sum of the first two terms is $2\frac{1}{2}$. Find the first term, the common ratio and the fourth term of the progression.

10. A manufacturer calculated that, allowing for the initial outlay on equipment, the cost of production of n chairs was £$(300 + 8n)$. Write down the cost of production of 1 chair when

(*a*) n chairs are made,

(*b*) $(50 + n)$ chairs are made.

If the cost of production of one chair decreases by £1 when the extra 50 chairs are made find the value of n and the cost of production of a chair in each case.

11. Taking 1 inch = 1 unit on the x-axis and 1 inch = 2 units on the y-axis draw the graphs of $y = 4 - x^2$ and $4y = 5x + 4$ for values of x from -3 to $+3$.

Find, from your graph,

(*a*) the range of values of x for which $4 - x^2$ is greater than $\frac{5}{4}x + 1$,

(*b*) the values of x for which $4 - x^2 = 2{\cdot}5$,

(*c*) the square root of $5{\cdot}6$.

Pure Maths A
Alg
40
O/s

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1967

Ordinary Level

PURE MATHEMATICS II

Syllabus A

ALGEBRA

for Candidates Overseas

Two hours

Answer ALL questions in Section A and any THREE in Section B. All necessary working must be shown.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

TE&S 64/1811 11/2/100/14650

Turn Over

Section A

1. (i) If $a = 2$, $b = -3$, $c = 1$, obtain the value of

$$a^3 + b^3 + c^3 - 3abc\,.$$

(ii) Solve the equation

$$\frac{4}{5}(3x - 1) - \frac{2x - 1}{3} = 3\,.$$

(iii) Find the values of x and y if

$$3x + 4y = 3\,,$$
$$9x - 2y = 2\,.$$

2. (i) Find the value of k if the expression $6x^3 - 13x^2 + 18x + k$ is exactly divisible by $2x^2 - 3x + 4$.

(ii) A man purchased x articles at a pence each. Subsequently 24 articles proved to be unsaleable and he sold the remainder, making a profit of one shilling on each article. Find, in its simplest form, his total profit in shillings.

(iii) If $R = 5a + \dfrac{2b}{3V}$, find an expression for V in terms of the other letters.

3. (i) Factorize

(a) $3p^2 - 12q^2$,

(b) $12a^2 + 23ab - 24b^2$,

(c) $6a^2 - 9ac - 8ab + 12bc$.

(ii) Solve the equation $6x^2 + 5x = 6$.

4. (i) If the nth term of a series is $\dfrac{2n+1}{2n+3}$ write down the first three terms and express the difference between the nth and $(n + 1)$th terms as a single fraction.

(ii) Solve the equation $2x^2 - 3x - 1 = 0$, giving the roots correct to two places of decimals.

5. (i) Without using tables, evaluate

$$(a)\ 8^{-\frac{2}{3}},\quad (b)\ \left(\frac{1}{16}\right)^{-\frac{3}{4}},\quad (c)\ 24^{\frac{1}{2}} \div 6^{\frac{3}{2}}\,.$$

(ii) Use logarithm tables to evaluate

$$(a)\ \sqrt{\frac{17{\cdot}54}{28{\cdot}96}},\quad (b)\ (0{\cdot}9521)^3\,.$$

6. Ten years ago a man was three times as old as his son. Five years from now the man will be twice as old as his son. Find their present ages.

Section B

Answer any THREE questions in this section.

7. (i) If $3x^2 - 4x + 5 = a(x - b)^2 + c$ for all values of x, find the values of a, b and c.

Hence, or otherwise, find the least value of $3x^2 - 4x + 5$.

(ii) Solve the equations

$$6x^2 - 4xy + 3y^2 = 42\,,$$
$$2x - y = 4\,.$$

8. (i) If $x = a + \dfrac{b}{t}$ and $y = b + at$, find an expression for y in terms of a, b, x.

(ii) If $2^{x-y} = 8$ and $3^{x-2y} = 9$, find the values of x and y.

(iii) If $\dfrac{m}{n} = \dfrac{5}{4}$ and $\dfrac{p}{q} = \dfrac{3}{4}$, find the value of $\dfrac{3m + 5p}{n + q}$.

Turn Over

9. (i) Three times the third term of an arithmetic progression is twice the sixth term. The sum of the first, third and fifth terms is 9.

Find

(*a*) the ratio of the ninth term to the sixth term,

(*b*) the sum of the first thirteen terms of the progression.

(ii) The third term of a geometric progression, in which all the terms are positive, is $\frac{2}{3}$ and the sum of the first two terms is $2\frac{1}{2}$. Find the first term, the common ratio and the fourth term of the progression.

10. A manufacturer calculated that, allowing for the initial outlay on equipment, the cost of production of n chairs was £$(300 + 8n)$. Write down the cost of production of 1 chair when

(*a*) n chairs are made,

(*b*) $(50 + n)$ chairs are made.

If the cost of production of one chair decreases by £1 when the extra 50 chairs are made find the value of n and the cost of production of a chair in each case.

11. Taking 1 inch = 1 unit on the x-axis and 1 inch = 2 units on the y-axis draw the graphs of $y = 4 - x^2$ and $4y = 5x + 4$ for values of x from -3 to $+3$.

Find, from your graph,

(*a*) the range of values of x for which $4 - x^2$ is greater than $\frac{5}{4}x + 1$,

(*b*) the values of x for which $4 - x^2 = 2{\cdot}5$,

(*c*) the square root of $5{\cdot}6$.

Pure Maths A
Alg
40
O/s

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1967

Ordinary Level

PURE MATHEMATICS II

Syllabus A

ALGEBRA

for Candidates Overseas

Two hours

Answer ALL questions in Section A and any THREE in Section B. All necessary working must be shown.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

TE&S 64/1811 11/2/100/14650

Turn Over

Section A

1. (i) If $a = 2$, $b = -3$, $c = 1$, obtain the value of

$$a^3 + b^3 + c^3 - 3abc\,.$$

(ii) Solve the equation

$$\frac{4}{5}(3x - 1) - \frac{2x - 1}{3} = 3\,.$$

(iii) Find the values of x and y if

$$3x + 4y = 3\,,$$
$$9x - 2y = 2\,.$$

2. (i) Find the value of k if the expression $6x^3 - 13x^2 + 18x + k$ is exactly divisible by $2x^2 - 3x + 4$.

(ii) A man purchased x articles at a pence each. Subsequently 24 articles proved to be unsaleable and he sold the remainder, making a profit of one shilling on each article. Find, in its simplest form, his total profit in shillings.

(iii) If $R = 5a + \dfrac{2b}{3V}$, find an expression for V in terms of the other letters.

3. (i) Factorize

(*a*) $3p^2 - 12q^2$,

(*b*) $12a^2 + 23ab - 24b^2$,

(*c*) $6a^2 - 9ac - 8ab + 12bc$.

(ii) Solve the equation $6x^2 + 5x = 6$.

4. (i) If the nth term of a series is $\dfrac{2n + 1}{2n + 3}$ write down the first three terms and express the difference between the nth and $(n + 1)$th terms as a single fraction.

(ii) Solve the equation $2x^2 - 3x - 1 = 0$, giving the roots correct to two places of decimals.

5. (i) Without using tables, evaluate

$$(a)\ 8^{-\frac{2}{3}},\quad (b)\ \left(\frac{1}{16}\right)^{-\frac{3}{4}},\quad (c)\ 24^{\frac{1}{2}} \div 6^{\frac{3}{2}}\,.$$

(ii) Use logarithm tables to evaluate

$$(a)\ \sqrt{\frac{17{\cdot}54}{28{\cdot}96}},\quad (b)\ (0{\cdot}9521)^3\,.$$

6. Ten years ago a man was three times as old as his son. Five years from now the man will be twice as old as his son. Find their present ages.

Section B

Answer any THREE questions in this section.

7. (i) If $3x^2 - 4x + 5 = a(x - b)^2 + c$ for all values of x, find the values of a, b and c.

Hence, or otherwise, find the least value of $3x^2 - 4x + 5$.

(ii) Solve the equations

$$6x^2 - 4xy + 3y^2 = 42\,,$$
$$2x - y = 4\,.$$

8. (i) If $x = a + \dfrac{b}{t}$ and $y = b + at$, find an expression for y in terms of a, b, x.

(ii) If $2^{x-y} = 8$ and $3^{x-2y} = 9$, find the values of x and y.

(iii) If $\dfrac{m}{n} = \dfrac{5}{4}$ and $\dfrac{p}{q} = \dfrac{3}{4}$, find the value of $\dfrac{3m + 5p}{n + q}$.

Turn Over

9. (i) Three times the third term of an arithmetic progression is twice the sixth term. The sum of the first, third and fifth terms is 9.

Find

(*a*) the ratio of the ninth term to the sixth term,

(*b*) the sum of the first thirteen terms of the progression.

(ii) The third term of a geometric progression, in which all the terms are positive, is $\frac{2}{3}$ and the sum of the first two terms is $2\frac{1}{2}$. Find the first term, the common ratio and the fourth term of the progression.

10. A manufacturer calculated that, allowing for the initial outlay on equipment, the cost of production of n chairs was £$(300 + 8n)$. Write down the cost of production of 1 chair when

(*a*) n chairs are made,

(*b*) $(50 + n)$ chairs are made.

If the cost of production of one chair decreases by £1 when the extra 50 chairs are made find the value of n and the cost of production of a chair in each case.

11. Taking 1 inch = 1 unit on the x-axis and 1 inch = 2 units on the y-axis draw the graphs of $y = 4 - x^2$ and $4y = 5x + 4$ for values of x from -3 to $+3$.

Find, from your graph,

(*a*) the range of values of x for which $4 - x^2$ is greater than $\frac{5}{4}x + 1$,

(*b*) the values of x for which $4 - x^2 = 2{\cdot}5$,

(*c*) the square root of $5{\cdot}6$.

Pure Maths A
Alg
40
O/s

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1967

Ordinary Level

PURE MATHEMATICS II

Syllabus A

ALGEBRA

for Candidates Overseas

Two hours

Answer ALL questions in Section A and any THREE in Section B. All necessary working must be shown.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

TE&S 64/1811 11/2/100/14650

Turn Over

Section A

1. (i) If $a = 2$, $b = -3$, $c = 1$, obtain the value of

$$a^3 + b^3 + c^3 - 3abc\,.$$

(ii) Solve the equation

$$\frac{4}{5}(3x - 1) - \frac{2x - 1}{3} = 3\,.$$

(iii) Find the values of x and y if

$$3x + 4y = 3\,,$$
$$9x - 2y = 2\,.$$

2. (i) Find the value of k if the expression $6x^3 - 13x^2 + 18x + k$ is exactly divisible by $2x^2 - 3x + 4$.

(ii) A man purchased x articles at a pence each. Subsequently 24 articles proved to be unsaleable and he sold the remainder, making a profit of one shilling on each article. Find, in its simplest form, his total profit in shillings.

(iii) If $R = 5a + \frac{2b}{3V}$, find an expression for V in terms of the other letters.

3. (i) Factorize

(*a*) $3p^2 - 12q^2$,

(*b*) $12a^2 + 23ab - 24b^2$,

(*c*) $6a^2 - 9ac - 8ab + 12bc$.

(ii) Solve the equation $6x^2 + 5x = 6$.

4. (i) If the nth term of a series is $\frac{2n + 1}{2n + 3}$ write down the first three terms and express the difference between the nth and $(n + 1)$th terms as a single fraction.

(ii) Solve the equation $2x^2 - 3x - 1 = 0$, giving the roots correct to two places of decimals.

5. (i) Without using tables, evaluate

$$(a)\ 8^{-\frac{2}{3}},\quad (b)\ \left(\frac{1}{16}\right)^{-\frac{3}{4}},\quad (c)\ 24^{\frac{1}{2}} \div 6^{\frac{3}{2}}\,.$$

(ii) Use logarithm tables to evaluate

$$(a)\ \sqrt{\frac{17{\cdot}54}{28{\cdot}96}},\quad (b)\ (0{\cdot}9521)^3\,.$$

6. Ten years ago a man was three times as old as his son. Five years from now the man will be twice as old as his son. Find their present ages.

Section B

Answer any THREE questions in this section.

7. (i) If $3x^2 - 4x + 5 = a(x - b)^2 + c$ for all values of x, find the values of a, b and c.

Hence, or otherwise, find the least value of $3x^2 - 4x + 5$.

(ii) Solve the equations

$$6x^2 - 4xy + 3y^2 = 42\,,$$
$$2x - y = 4\,.$$

8. (i) If $x = a + \frac{b}{t}$ and $y = b + at$, find an expression for y in terms of a, b, x.

(ii) If $2^{x-y} = 8$ and $3^{x-2y} = 9$, find the values of x and y.

(iii) If $\frac{m}{n} = \frac{5}{4}$ and $\frac{p}{q} = \frac{3}{4}$, find the value of $\frac{3m + 5p}{n + q}$.

Conditional

9. (i) Three times the third term of an arithmetic progression is twice the sixth term. The sum of the first, third and fifth terms is 9.

Find

(*a*) the ratio of the ninth term to the sixth term,

(*b*) the sum of the first thirteen terms of the progression.

(ii) The third term of a geometric progression, in which all the terms are positive, is $\frac{2}{3}$ and the sum of the first two terms is $2\frac{1}{2}$. Find the first term, the common ratio and the fourth term of the progression.

10. A manufacturer calculated that, allowing for the initial outlay on equipment, the cost of production of n chairs was £$(300 + 8n)$. Write down the cost of production of 1 chair when

(*a*) n chairs are made,

(*b*) $(50 + n)$ chairs are made.

If the cost of production of one chair decreases by £1 when the extra 50 chairs are made find the value of n and the cost of production of a chair in each case.

Cond't.

11. Taking 1 inch = 1 unit on the x-axis and 1 inch = 2 units on the y-axis draw the graphs of $y = 4 - x^2$ and $4y = 5x + 4$ for values of x from -3 to $+3$.

Find, from your graph,

(*a*) the range of values of x for which $4 - x^2$ is greater than $\frac{5}{4}x + 1$,

(*b*) the values of x for which $4 - x^2 = 2{\cdot}5$,

(*c*) the square root of $5{\cdot}6$.

Pure Maths A
Alg
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1965

Ordinary Level

PURE MATHEMATICS II

Syllabus A

ALGEBRA

Two hours

Answer ALL questions in Section A and any THREE questions in Section B. All necessary working must be shown.

Credit will be given for the orderly presentation of material, candidates who neglect this essential will be penalized.

Section A

1. (i) If $x = 2a$ and $y = -a$, express $x^3 - y^3$ in its simplest form in terms of a.

(ii) Simplify

(*a*) $$\frac{2a^2}{b^2} \times \left(\frac{b}{2}\right)^3 \times \left(\frac{2}{ab}\right)^2,$$

(*b*) $$\left(\frac{p^2 - q^2}{r^3}\right) \div \left(\frac{p+q}{r^2}\right).$$

TE&S 63/1593 7/4/2/25/43,000

Turn Over

2. (i) Solve the equation

$$(x-3)^2+(2x+1)^2=5(x-1)^2.$$

(ii) Factorize

(*a*) $x^2+xz-4xy-4yz,$

(*b*) $48k^2-3.$

3. (i) Find the total selling price of p articles whose cost price is q shillings each and which are sold at a profit of r per cent on the cost price.

(ii) If $x=\dfrac{1}{1-y}$ and $y=\dfrac{1}{1-x}$, prove that $y^2-y+1=0$.

4. If $y=a+bx$ and it is given that $y=1$ when $x=-3$ and that $y=-7$ when $x=5$, find the value of y when $x=1$.

5. (i) Solve the equation $x^2-4x=0$.

(ii) Solve the equation $x^2-4x=3$, giving the roots correct to two decimal places.

6. (i) Find a if

$$(3^a)^{-2}=(\tfrac{1}{81})^2.$$

(ii) Use logarithm tables to calculate

(*a*) $\dfrac{39{\cdot}7}{746{\cdot}8\times 0{\cdot}591}$,

(*b*) $\sqrt[3]{28{\cdot}49}$.

Section B

Answer THREE questions in this section.

7. (i) Solve the equations

$$3x+2y=1,$$

$$\frac{1}{x}+\frac{5}{y}=2.$$

(ii) If $V=\pi(R^2-r^2)h$, express r in terms of π, h, R and V.

8. A gang of labourers in one week earned £130 overtime pay, which was to be divided equally among the men in the gang. The following week there were four more men in the gang, the total overtime pay was £153 and each man received £1 less. Find the number of men in the gang during the first week.

9. (i) Use logarithm tables to calculate $(0{\cdot}2967)^{-\frac{1}{4}}$.

(ii) The volume of a sphere of radius r is $\frac{4}{3}\pi r^3$. Calculate correct to two decimal places the radius of a sphere of volume 170 cubic inches.

[Take π as $3{\cdot}142$.]

10. (i) Find the sum of all the numbers between 100 and 1,000 which are exactly divisible by 11.

(ii) The seventh term of a certain geometric progression is $2\frac{1}{2}$ and the tenth term is -20. Find the sum of the first five terms of the progression.

11. Using the same axes and scales, draw the graphs of $y=5-x^2$ and $y=\dfrac{6}{2x+5}$ for values of x from -2 to $2\frac{1}{2}$, taking 1 inch as one unit on each axis.

Use these graphs to obtain approximate values for two roots of the equation

$$2x^3+5x^2-10x-19=0.$$

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1963

Ordinary Level

PURE MATHEMATICS (SYLLABUS A)

(2) ALGEBRA

Two hours

Answer ALL questions in Section A and any THREE in Section B. All necessary working must be shown.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

SECTION A

1. (i) If $a = -1$, $b = -3$ and $c = 0$, obtain the value of $3abc - 4ab^2$.

(ii) Solve the equation

$$\frac{2}{3}(3x - 7) - \frac{x-3}{12} = 3\tfrac{1}{4}.$$

(iii) Find the values of x and y if

$$2x + 3y + 1 = 0,$$
$$7x + 9y = 1.$$

2. (i) Express as a single fraction in its simplest form

$$\frac{3x-4}{2} - \frac{x-9}{6} - \frac{2x+1}{3}.$$

(ii) A path x feet wide, whose outer perimeter is a square, surrounds a square lawn of side y feet. Find, in square feet, the area of the path.

(iii) If $\dfrac{ax+b}{cx+d} = \dfrac{m}{n}$, obtain an expression for x in terms of the other letters.

Turn Over

TE&S 61/852 11/2/25/40000

3. (i) Factorize

(a) $2x^2 - 18$,

(b) $6x^2 - 5x - 21$,

(c) $x^2 - y^2 - x - y$.

(ii) Solve the equation $(x-2)^2 - 4 = 0$.

(iii) If $a(x-b) + 2b(x-a) = c$, find x in terms of a, b and c.

4. (i) Write down the seventeenth term of the series whose nth term is given by the formula $2n - 7$.

(ii) Solve the equation $2x^2 - 5x = 2$, giving the roots correct to two decimal places.

5. (i) Without using tables, find the values of

$$8^{\frac{4}{3}}, \quad 4^{-2}, \quad \left(\frac{8}{27}\right)^{\frac{2}{3}}.$$

(ii) Use logarithm tables to calculate the values of

(a) $(0{\cdot}5831)^4$, (b) $\sqrt[3]{0{\cdot}1284}$.

6. A motorist usually covers the distance between two towns, 104 miles apart, at a certain average speed. If this average speed were increased by one-third of its value the motorist would save 40 minutes on the journey. Find the time he usually takes and his usual average speed.

Section B

Answer any THREE questions in this Section.

7. (i) If $\frac{2a}{x} = \frac{1}{a-4b} - \frac{1}{a-5b}$, express x as a single fraction in terms of a and b.

(ii) Solve the equations

$$3x^2 - 4xy + 4y^2 = 51,$$
$$x + 2y = 9.$$

8. (i) If $V = \pi l\{R^2 - (R-r)^2\}$, express R in terms of the other letters.

(ii) For what values of a and b is the expression $(x-1)(x+3)(x-6)$ equal to $x^3 + ax^2 + bx + 18$ for all values of x?

(iii) Simplify and express with positive indices

$$\left(\frac{x^3y^{-4}}{z^2}\right)^{\frac{1}{2}} \div \frac{x^2z}{y}.$$

9. (i) The sum of the first four terms of an arithmetic progression is 10 and the sum of the four terms from the seventh to the tenth inclusive is 42. Find the sum of the first ten terms.

(ii) The third term of a geometric progression exceeds the second term by $\frac{35}{22}$ and the second term exceeds the first by $\frac{7}{11}$. Calculate the first term and the common ratio.

10. A bath has a hot-water tap and a cold-water tap. The hot-water tap running alone takes 3 minutes longer to fill the bath than the cold-water tap running alone. If both taps were turned on together the bath would be filled in 5 minutes 24 seconds less than if the hot-water tap only were used.

Calculate how long each tap running alone would take to fill the bath.

11. A rectangular parcel of length x feet, width k feet and depth k feet is to be sent through the post. Post Office regulations lay down that the total length and girth (i.e. the distance round) of the parcel must not exceed 6 feet. Show that the volume of a rectangular parcel of greatest dimensions is given by

$$V = \frac{1}{16}x(6-x)^2.$$

Taking 1 inch = $\frac{1}{2}$ unit on the axis of V and 1 inch = 1 unit on the axis of x, draw the graph of $V = \frac{1}{16}x(6-x)^2$ for values of x from 0 to 6.

From your graph, find the dimensions of the rectangular parcel of greatest volume which can be sent through the post.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

JANUARY, 1961

PURE MATHEMATICS

(Syllabus A)

(2) **ALGEBRA**

Alternative paper

TWO HOURS

Answer ALL *questions in Section* A *and any* THREE *from Section* B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalised.

All necessary working must be shown

SECTION A

1. (i) Factorise completely

(*a*) $5x^2 - 5$,

(*b*) $p^2 - px + 4p - 4x$,

(*c*) $(3x-2)^2 - (x-5)^2$.

(ii) One factor of the expression $x(x+1)(x-6) + 4(x+6)$ is $x - 4$. Find the other factors.

2. (i) Divide $\frac{a}{b} + \frac{b}{a} + 2$ by $a + b$.

(ii) Solve the equation $\frac{x-3}{2} = 1 + \frac{x-2}{5}$.

T. & F.—59/823 14/2/6500

3. (i) If $2(p+2)$ pints and p quarts amount to 8 gallons, find the value of p.

(ii) Simplify $a^2(b-c)^2 - c^2(a-b)^2 + b^2(c-a)(c+a)$.

4. A rectangular lawn of length l feet and breadth b feet is surrounded by a path which is x feet wide. Obtain an expression for the total area of the path.

If the total area of the path is $31x^2$, obtain an expression for x in terms of b and l.

5. (i) Express $\dfrac{x^{a-b} \times x^{b-c}}{x^{a-c}}$ in its simplest form.

(ii) Multiply $3x^{\frac{1}{2}} + 2x^{\frac{1}{4}} - 1$ by $3x^{\frac{1}{2}} - 2x^{\frac{1}{4}} - 1$.

6. £400 is divided between A, B and C so that A has £1 more than B and B has three times as much as C. How much does each receive?

Section B

Answer any THREE *questions from this section.*

7. (i) Solve the equations

$$2x - \frac{6}{y} = 9,$$

$$5x + \frac{4}{y} = 13.$$

(ii) Substitute $(r+q)$ for p in the expression

$$\frac{rq}{p^2-r^2-q^2} - \frac{2q}{p^2+q^2-r^2} + \frac{2r}{p^2+r^2-q^2}$$

and express your result as a single fraction in its simplest form.

8. (i) If $A = \pi r^2 + 2\pi rh$, express h in terms of A, r and π.

(ii) Find, by logarithms, the values of

(*a*) $\dfrac{b}{a^{\frac{2}{3}}}$ when $b = 27{\cdot}5$ and $a = 0{\cdot}925$,

(*b*) $\sqrt{\dfrac{h}{r}} - \sqrt{\dfrac{r}{h}}$ when $h = 5{\cdot}70$ and $r = 0{\cdot}522$.

9. A ball is thrown vertically upwards into the air from a point which is 20 feet *above the sea*. After x seconds the height y feet of the ball above the point from which it is thrown is given by $y = 16x\,(4-x)$.

Draw a graph between $x=0$ and $x=5$ showing the relationship between y and x. (Take 1 in. = 1 second and 20 feet respectively.)

From the graph, find

(*a*) the maximum height *above the sea* reached by the ball,

(*b*) how long the ball remains at least 30 feet above the sea,

(*c*) how many seconds elapse from the time the ball was thrown to the time the ball strikes the sea.

10. (i) Obtain an expression in its simplest form for the sum of n terms of the Arithmetic Progression

$$9 + 27 + 45 + 63 + \ldots.$$

Hence, or otherwise, find the sum of all the terms from the sixth to the twentieth terms inclusive.

(ii) A pilot of an aircraft is forced down in a desert at a point which is 100 miles from the nearest village. On the first day he walks 28 miles towards the village but finds that on each subsequent day he can only walk two-thirds of the distance travelled on the previous day. Express this as a progression and calculate, to the nearest mile, how far he will be from the village at the end of the sixth day.

11. A man decides to spend £51 whilst he is away on holiday. He finds that if he reduces his daily expenditure by 4 shillings per day, he can extend his holiday by 4 days. How many days did he originally plan to be away on holiday?

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1959

PURE MATHEMATICS

(Syllabus A)

(2) ALGEBRA

MONDAY, June 22.—Morning, 9.30 *to* 11.30

Answer ALL *questions in Section* A *and any* THREE *from Section* B

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalised.

All necessary working must be shown

SECTION A

1. (i) If $a=1$, $b=2$ and $c=-3$, find the value of
$$a^3+b^3+c^3-3abc.$$

(ii) Solve the equation $6(x-7)-7(2x-11)=51$.

(iii) Express as a single fraction in its simplest form
$$\frac{3}{(p-2)(p+1)}+\frac{1}{(p+1)}-\frac{2}{(p-2)}.$$

2. (i) Factorise

(*a*) $2x^2-7x-4$, (*b*) $(3r+2s)^2-(2r-s)^2$.

(ii) Multiply $2x^2-2x+1$ by $2x^2+2x+1$.

T. & F.—58/818 14/2/35000

[P. T. O.

3. (i) If $x+2y=5$ and $3x+4y=11$, find the value of $3x-2y$.

(ii) If $4x^3-4x^2-11x+k$ is exactly divisible by $(2x-1)$, find the value of k.

(iii) If

$$f=\frac{3(1-a)m^2}{16(1+a)},$$

express a in terms of f and m.

4. (i) If $4x^2-12x+r$ is a perfect square, find the value of r.

(ii) Solve the equation $2x^2+4x-3=0$, giving the roots correct to two places of decimals.

5. (i) Without using tables evaluate

(a) $(256)^{\frac{3}{4}}$, (b) $(\frac{1}{9})^{-\frac{1}{2}}\times(16)^{\frac{1}{4}}$.

(ii) Use logarithm tables to evaluate

(a) $(1{\cdot}74)^{\frac{1}{4}}$, (b) $(0{\cdot}2313)^3$.

6. A man buys $c+d$ articles at n shillings each. He sells c articles at a profit of x shillings each and sells d articles at a loss of y shillings each. Find his profit in shillings and express this as a percentage of his outlay.

Section B

Answer any Three *questions in this section.*

7. (i) Solve the simultaneous equations

$$9y^2-3xy-x^2=11,$$
$$3y-2x=1.$$

(ii) If $4x+3y+7a=0$ and $5x+7y-a=0$, find the ratio $x:y$.

8. Draw the graph of $y=2x^2-5x+8$ from $x=-2$ to $x=+5$ using 1 inch for 1 unit on the x axis and 1 inch for 10 units on the y axis.

Use your graph to find (a) the least value of $2x^2-5x+8$, (b) the range of values of x for which $2x^2-5x-4$ is less than 7.

9. (i) The sum of the fifth and sixth terms of an arithmetical progression is 24. The sum of the first twenty terms is 440. Find the first term of the progression.

(ii) The third term of a geometric progression is 81 and the seventh term is 16. Find the fifth term of this progression.

10. (i) If $\log_{10} 3=0{\cdot}47712$ and $\log_{10} 2=0{\cdot}30103$, find $\log_{10} 72$.

(ii) If $\frac{1}{3}\pi r^2h=279$, use logarithms to find the value of r when $h=17{\cdot}5$. (Take $\log_{10}\pi$ as $0{\cdot}4971$.)

(iii) If $x^3=7{\cdot}34\times10^{-11}$, use logarithms to find the value of x.

11. In 1957 a motor cyclist spent £25 on petrol. In 1958 he spent £27 on petrol but used 20 gallons more than he did in 1957. The petrol he bought in 1958 was 6*d*. per gallon *cheaper* than that he bought in 1957. Find the cost per gallon of the petrol bought in 1957.

$a+4d+a+5d=24$

$2a+5d=24$ —— (1)

$440=\frac{20}{2}\{2a+(20-1)d\}$ — (2)

$$\begin{array}{r} 2x^2 - 2x + 1 \\ 2x^2 + 2x + 1 \\ \hline 4x^4 - 4x^3 + 2x^2 \qquad\qquad \\ + 4x^3 - 4x^2 + 2x \qquad \\ + 2x^2 - 2x + 1 \\ \hline 4x^4 \qquad\qquad + 1 \end{array}$$

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1959

PURE MATHEMATICS

(Syllabus A)

(2) ALGEBRA

MONDAY, June 22.—*Morning*, 9.30 *to* 11.30

Answer ALL *questions in Section* A *and any* THREE *from Section* B

Credit will be given for the orderly presentation of material ; candidates who neglect this essential will be penalised.

All necessary working must be shown

SECTION A

1. (i) If $a=1$, $b=2$ and $c=-3$, find the value of
$$a^3+b^3+c^3-3abc.$$

(ii) Solve the equation $6(x-7)-7(2x-11)=51$.

(iii) Express as a single fraction in its simplest form
$$\frac{3}{(p-2)(p+1)}+\frac{1}{(p+1)}-\frac{2}{(p-2)}.$$

2. (i) Factorise

(*a*) $2x^2-7x-4$, (*b*) $(3r+2s)^2-(2r-s)^2$.

(ii) Multiply $2x^2-2x+1$ by $2x^2+2x+1$.

T. & F.—58/818 14/2/35000

[P. T. O.

3. (i) If $x+2y=5$ and $3x+4y=11$, find the value of $3x-2y$.

(ii) If $4x^3-4x^2-11x+k$ is exactly divisible by $(2x-1)$, find the value of k.

(iii) If

$$f=\frac{3(1-a)m^2}{16(1+a)},$$

express a in terms of f and m.

4. (i) If $4x^2-12x+r$ is a perfect square, find the value of r.

(ii) Solve the equation $2x^2+4x-3=0$, giving the roots correct to two places of decimals.

5. (i) Without using tables evaluate

(*a*) $(256)^{\frac{3}{4}}$, (*b*) $(\frac{1}{9})^{-\frac{1}{2}}\times(16)^{\frac{1}{4}}$.

(ii) Use logarithm tables to evaluate

(*a*) $(1{\cdot}74)^{\frac{1}{4}}$, (*b*) $(0{\cdot}2313)^3$.

6. A man buys $c+d$ articles at n shillings each. He sells c articles at a profit of x shillings each and sells d articles at a loss of y shillings each. Find his profit in shillings and express this as a percentage of his outlay.

Section B

Answer any Three *questions in this section.*

7. (i) Solve the simultaneous equations

$$9y^2-3xy-x^2=11,$$
$$3y-2x=1.$$

(ii) If $4x+3y+7a=0$ and $5x+7y-a=0$, find the ratio $x:y$.

8. Draw the graph of $y=2x^2-5x+8$ from $x=-2$ to $x=+5$ using 1 inch for 1 unit on the x axis and 1 inch for 10 units on the y axis.

Use your graph to find (*a*) the least value of $2x^2-5x+8$, (*b*) the range of values of x for which $2x^2-5x-4$ is less than 7.

9. (i) The sum of the fifth and sixth terms of an arithmetical progression is 24. The sum of the first twenty terms is 440. Find the first term of the progression.

(ii) The third term of a geometric progression is 81 and the seventh term is 16. Find the fifth term of this progression.

10. (i) If $\log_{10} 3=0{\cdot}47712$ and $\log_{10} 2=0{\cdot}30103$, find $\log_{10} 72$.

(ii) If $\frac{1}{3}\pi r^2h=279$, use logarithms to find the value of r when $h=17{\cdot}5$. (Take $\log_{10}\pi$ as $0{\cdot}4971$.)

(iii) If $x^3=7{\cdot}34\times10^{-11}$, use logarithms to find the value of x.

11. In 1957 a motor cyclist spent £25 on petrol. In 1958 he spent £27 on petrol but used 20 gallons more than he did in 1957. The petrol he bought in 1958 was 6*d*. per gallon *cheaper* than that he bought in 1957. Find the cost per gallon of the petrol bought in 1957.

a + 4d + a 5d = 24

S = 25

.125

.025

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1959

PURE MATHEMATICS

(Syllabus A)

(2) ALGEBRA

MONDAY, June 22.—Morning, 9.30 to 11.30

Answer ALL *questions in Section* A *and any* THREE *from Section* B

Credit will be given for the orderly presentation of material ; candidates who neglect this essential will be penalised.

All necessary working must be shown

SECTION A

1. (i) If $a=1$, $b=2$ and $c=-3$, find the value of $a^3+b^3+c^3-3abc$.

(ii) Solve the equation $6(x-7)-7(2x-11)=51$.

(iii) Express as a single fraction in its simplest form

$$\frac{3}{(p-2)(p+1)}+\frac{1}{(p+1)}-\frac{2}{(p-2)}.$$

2. (i) Factorise

(*a*) $2x^2-7x-4$, (*b*) $(3r+2s)^2-(2r-s)^2$.

(ii) Multiply $2x^2-2x+1$ by $2x^2+2x+1$.

T. & F.—58/818 14/2/35000

[P. T. O.

3. (i) If $x+2y=5$ and $3x+4y=11$, find the value of $3x-2y$.

(ii) If $4x^3-4x^2-11x+k$ is exactly divisible by $(2x-1)$, find the value of k.

(iii) If

$$f=\frac{3(1-a)m^2}{16(1+a)},$$

express a in terms of f and m.

4. (i) If $4x^2-12x+r$ is a perfect square, find the value of r.

(ii) Solve the equation $2x^2+4x-3=0$, giving the roots correct to two places of decimals.

5. (i) Without using tables evaluate

(a) $(256)^{\frac{3}{4}}$, (b) $(\frac{1}{9})^{-\frac{1}{2}}\times(16)^{\frac{1}{4}}$.

(ii) Use logarithm tables to evaluate

(a) $(1{\cdot}74)^{\frac{1}{4}}$, ($b$) $(0{\cdot}2313)^3$.

6. A man buys $c+d$ articles at n shillings each. He sells c articles at a profit of x shillings each and sells d articles at a loss of y shillings each. Find his profit in shillings and express this as a percentage of his outlay.

Section B

Answer any THREE *questions in this section.*

7. (i) Solve the simultaneous equations

$$9y^2-3xy-x^2=11,$$
$$3y-2x=1.$$

(ii) If $4x+3y+7a=0$ and $5x+7y-a=0$, find the ratio $x:y$.

8. Draw the graph of $y=2x^2-5x+8$ from $x=-2$ to $x=+5$ using 1 inch for 1 unit on the x axis and 1 inch for 10 units on the y axis.

Use your graph to find (a) the least value of $2x^2-5x+8$, (b) the range of values of x for which $2x^2-5x-4$ is less than 7.

9. (i) The sum of the fifth and sixth terms of an arithmetical progression is 24. The sum of the first twenty terms is 440. Find the first term of the progression.

(ii) The third term of a geometric progression is 81 and the seventh term is 16. Find the fifth term of this progression.

10. (i) If $\log_{10} 3=0{\cdot}47712$ and $\log_{10} 2=0{\cdot}30103$, find $\log_{10} 72$.

(ii) If $\frac{1}{3}\pi r^2 h=279$, use logarithms to find the value of r when $h=17{\cdot}5$. (Take $\log_{10}\pi$ as $0{\cdot}4971$.)

(iii) If $x^3=7{\cdot}34\times10^{-11}$, use logarithms to find the value of x.

11. In 1957 a motor cyclist spent £25 on petrol. In 1958 he spent £27 on petrol but used 20 gallons more than he did in 1957. The petrol he bought in 1958 was 6*d*. per gallon *cheaper* than that he bought in 1957. Find the cost per gallon of the petrol bought in 1957.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

JANUARY, 1959

PURE MATHEMATICS

(Syllabus A)

(b) **ALGEBRA**

THURSDAY, *January* 15.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) Find the value of $3p^2-2pq-q^2$ when $p=2$ and $q=-1$.

(ii) Simplify $3(x-2)^2-4(3x-1)-16$.

(iii) Solve the equation $3x-\dfrac{2x-5}{4}=\dfrac{1}{2}$.

2. (i) Factorise (*a*) $6x^2-x-15$, (*b*) $3x^2-9xy-2x+6y$.

(ii) By resolving into factors find the value of

$\dfrac{22a^2}{7}-\dfrac{22b^2}{7}$ when $a=4{\cdot}3$ and $b=2{\cdot}7$.

(iii) What is the coefficient of x^2 in the product

$$(3x^2-5x-2)(2x^2-3x-4)\ ?$$

3. (i) If p pounds of tea at a pence per pound are mixed with q pounds of tea at b pence per pound, find the cost in shillings of one pound of the mixture.

(ii) Find, without using tables, the value of

$$(a)\ 27^{\frac{4}{3}}, \qquad (b)\ \left(\frac{9}{16}\right)^{-\frac{3}{2}}.$$

(iii) Simplify, giving your answer in positive indices,

$$(a^2b^{\frac{1}{2}})^{-1} \times (a^5b^{\frac{1}{2}})^{\frac{2}{5}}.$$

4. (i) Express as a single fraction in its lowest terms

$$\frac{x}{x^2-3x-4} - \frac{1}{x-4}.$$

(ii) If $a = \dfrac{b(Q+2h)}{1-h}$, express h in terms of a, b and Q.

5. (i) Solve the equation $x(x-2)=2$, giving the roots correct to two decimal places.

(ii) The sum of n terms of a series is $3n^2+4n$. Find the fifth term.

6. A cyclist rides from A to B, a distance of 20 miles partly uphill and partly downhill, and then rides back to A. He can ride uphill at 5 m.p.h. and downhill at 16 m.p.h. He takes 33 minutes longer on the return journey than he does on the outward journey. Find the distance he travels uphill on the outward journey.

Section B

[*Answer any* THREE *questions in this section.*]

7. (i) Solve the equations $2x-y=5$,

$$x^2-6y=xy.$$

(ii) Find the value of k if $(x+2)$ is a factor of

$$6x^3+x^2-19x+k.$$

What are the two remaining factors of the expression when k has this value?

8. (i) Use tables to find the value of $\sqrt[3]{\dfrac{130{\cdot}6}{0{\cdot}0796 \times (25{\cdot}4)^2}}$.

(ii) If $\log_{10} 2 = 0{\cdot}30103$ and $\log_{10} 3 = 0{\cdot}47712$, calculate without using tables (a) $\log_{10}\sqrt{6}$, (b) $\log_{10} 18$.

9. Draw the graph of $y=x^2-x-6$ for values of x from -3 to $+4$, using 1 in. for 1 unit on the x axis and 1 in. for 2 units on the y axis.

By drawing the appropriate straight lines on your graph

(a) find the range of values of x for which x^2-x-6 is less than $2x-3$,

(b) solve the equation $2x^2-2x-14=0$.

10. A dealer buys a number of similar articles for £840 and offers each article for sale at 30 shillings more than he paid for it. Twelve of the articles are damaged and are not sold, but the dealer sells the remainder and makes a total profit of £78. How many articles did the dealer buy?

11. (i) The sum of the first three terms of an arithmetic progression is 36 and the sum of the twelfth, the thirteenth and the fourteenth terms is -96. Find the first term and the sum of the first ten terms of this progression.

(ii) What number must be added to each of the numbers 3, 6, $10\frac{1}{2}$ to form the first three terms of a geometric progression?

Find the sum of the first six terms of this progression.

9. (i) If $a=\dfrac{x-2y}{x+2y}$ express $\dfrac{1+a}{1-a}$ as a single fraction in terms of x and y.

(ii) If $F=av-\dfrac{b}{v^2}$, and if $F=4$ when $v=5$, and $F=36$ when $v=10$, find the values of a and b and the value of F when $v=20$.

10. The total monthly savings of our savings group were £5 10*s*. 0*d*. A new member joined who could only save 4*s*. a month, thus reducing the average monthly saving per member by 6*d*. How many members were there originally in the group ?

11. (i) The first term of an arithmetic progression is 6 and the sum of the fourth, fifth and sixth terms is 0. Find the common difference and the sum of the first 12 terms.

(ii) The sum of n terms of a geometric progression is

$$2(3^n-1).$$

Find the third term and the number of terms that must be taken for their sum to be 1456.

290
5
1200
180

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1958

PURE MATHEMATICS

(Syllabus A)

(b) ALGEBRA

MONDAY, *June* 23.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section*]

1. (i) Verify when $x=2$ and $y=-1$ that
$$x^3-y^3=(x-y)(x^2+xy+y^2).$$
(ii) Solve the equation $\frac{1}{3}(4x-2)=7x-9$.
(iii) Evaluate x^2-y^2 when $x=1002$ and $y=998$.

2. (i) Factorise $2x^2-xy-15y^2$.
(ii) Express as a fraction in its simplest form
$$\frac{x+1}{x+2}-\frac{x-3}{x-4}.$$
(iii) If a train travels at x miles per hour, in how many minutes will it travel y miles ?
(iv) If $s=ut+\frac{1}{2}ft^2$, express f in terms of s, u and t.

T. & F.—57/783 13/2/32850 [P. T. O.

3. (i) If $\frac{3a+2}{a-1}=\frac{a-2}{a+1}$, find the possible values of a, and hence show that each fraction is equal to 2 or -2.

(ii) Find the values of x, correct to 2 decimal places, which make x^2+7x equal to 5.

4. (i) Find the values of x and y if

$$\frac{x}{2}+\frac{y}{4}=4=\frac{x}{4}+\frac{y}{2}.$$

(ii) Find the values of a and b so that $3x^2-4x+1$ can be expressed in the form $a(x-1)^2+b(x-1)$.

5. (i) Divide $3x^3+7x^2-5x+3$ by $x+3$.

(ii) Simplify (*a*) $\sqrt[3]{(64x^6y^9)}$, (*b*) $16^{-\frac{3}{4}}$.

(iii) What is the nth term of the arithmetic progression

$$11+4\tfrac{3}{4}-1\tfrac{1}{2}-\ldots?$$

6. A train travels 180 miles; another train which has an average speed 6 miles per hour faster does the same journey in 1 hour less time. What is the average speed of the slower train?

Section B

[*Answer any* THREE *questions*]

7. (i) Use logarithms to calculate the cube root of 76·93.

(ii) If $x=\left(\log_{10}\frac{a}{b}\right)\div\left(\log_{10}\frac{a}{c}\right)$ calculate x when

$$a=5{\cdot}215;\ b=1{\cdot}793;\ c=3{\cdot}052.$$

8. Draw the graph of the function $y=x(6-x)^2$ from $x=0$ to $x=6$ using a scale of 1 in. to 1 unit on the x axis and 1 in. to 4 units on the y axis.

From your graph find, for values of x between 0 and 6

(*a*) the positive values of x which make $y=24$,

(*b*) by drawing the appropriate straight line, the values of x for which $x(6-x)^2=6+x$.

9. A cubical wooden box, with a lid, is made of wood $\frac{1}{2}$ in. thick. Show that if an outside edge of the box is a in. long, the volume of the wood used is $3a^2-3a+1$ cu. in.

Find the length of the edge if the box weighs 5 lb assuming that 1 cu. in. of the wood weighs $\frac{1}{2}$ oz. Give your answer to the nearest $\frac{1}{16}$th in.

10. (i) The first, second and last terms of an arithmetic progression are x, y and z respectively.

(*a*) Express the number of terms of the progression in terms of x, y and z.

(*b*) Show that the sum of the progression is

$$\frac{(x+z)(y+z-2x)}{2(y-x)}.$$

(ii) Four positive numbers are in geometric progression. The product of the first and third is 36 and the product of the second and fourth is 324. Find the numbers.

11. The perimeter of a rectangle is 18 ft and the length of the diagonal is 7 ft. Find, to the nearest inch, the lengths of its sides.

$$(3x-1)+(x-1) = a(x-1)^2 + b(x-1)$$

$$3x-1 = a(x-1)^2$$

$$a = \frac{3x-1}{(x-1)^2} \quad 3$$

$$x-1 = b(x-1) \qquad b =$$

$$b = \underline{1}$$

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1958

PURE MATHEMATICS

(Syllabus A)

(b) **ALGEBRA**

MONDAY, *June* 23.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section*]

1. (i) Verify when $x=2$ and $y=-1$ that

$$x^3-y^3=(x-y)(x^2+xy+y^2).$$

(ii) Solve the equation $\frac{1}{3}(4x-2)=7x-9$.

(iii) Evaluate x^2-y^2 when $x=1002$ and $y=998$.

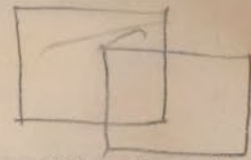
2. (i) Factorise $2x^2-xy-15y^2$.

(ii) Express as a fraction in its simplest form

$$\frac{x+1}{x+2}-\frac{x-3}{x-4}.$$

(iii) If a train travels at x miles per hour, in how many minutes will it travel y miles ?

(iv) If $s=ut+\frac{1}{2}ft^2$, express f in terms of s, u and t.



3. (i) If $\dfrac{3a+2}{a-1} = \dfrac{a-2}{a+1}$, find the possible values of a, and hence show that each fraction is equal to 2 or -2.

(ii) Find the values of x, correct to 2 decimal places, which make x^2+7x equal to 5.

4. (i) Find the values of x and y if

$$\frac{x}{2}+\frac{y}{4}=4=\frac{x}{4}+\frac{y}{2}.$$

(ii) Find the values of a and b so that $3x^2-4x+1$ can be expressed in the form $a(x-1)^2+b(x-1)$.

5. (i) Divide $3x^3+7x^2-5x+3$ by $x+3$.

(ii) Simplify (*a*) $\sqrt[3]{(64x^6y^9)}$, (*b*) $16^{-\frac{3}{4}}$.

(iii) What is the nth term of the arithmetic progression

$$11+4\tfrac{3}{4}-1\tfrac{1}{2}- \ldots ?$$

6. A train travels 180 miles; another train which has an average speed 6 miles per hour faster does the same journey in 1 hour less time. What is the average speed of the slower train?

Section B

[*Answer any* THREE *questions*]

7. (i) Use logarithms to calculate the cube root of 76·93.

(ii) If $x=\left(\log_{10}\dfrac{a}{b}\right)\div\left(\log_{10}\dfrac{a}{c}\right)$ calculate x when

$$a=5{\cdot}215;\ b=1{\cdot}793;\ c=3{\cdot}052.$$

8. Draw the graph of the function $y=x(6-x)^2$ from $x=0$ to $x=6$ using a scale of 1 in. to 1 unit on the x axis and 1 in. to 4 units on the y axis.

From your graph find, for values of x between 0 and 6

(*a*) the positive values of x which make $y=24$,

(*b*) by drawing the appropriate straight line, the values of x for which $x(6-x)^2=6+x$.

9. A cubical wooden box, with a lid, is made of wood $\frac{1}{2}$ in. thick. Show that if an outside edge of the box is a in. long, the volume of the wood used is $3a^2-3a+1$ cu. in.

Find the length of the edge if the box weighs 5 lb assuming that 1 cu. in. of the wood weighs $\frac{1}{2}$ oz. Give your answer to the nearest $\frac{1}{16}$th in.

10. (i) The first, second and last terms of an arithmetic progression are x, y and z respectively.

(*a*) Express the number of terms of the progression in terms of x, y and z.

(*b*) Show that the sum of the progression is

$$\frac{(x+z)(y+z-2x)}{2(y-x)}.$$

(ii) Four positive numbers are in geometric progression. The product of the first and third is 36 and the product of the second and fourth is 324. Find the numbers.

11. The perimeter of a rectangle is 18 ft and the length of the diagonal is 7 ft. Find, to the nearest inch, the lengths of its sides.

a^3

$a^3-(a-1)^3 = 3a^2-3a+1$

$Z_n = x+(n-1)\,y-x$

$Z = x+yn-y-xn+x$

$y+z-2x = n(y-x)$

$n = \dfrac{y+z-2x}{y-x}$

$S = \dfrac{n}{2}\{a+l\}$

$\dfrac{(y+z-2x)(x+z)}{2(y-x)}$

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1958

PURE MATHEMATICS

(Syllabus A)

(b) **ALGEBRA**

MONDAY, *June* 23.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section*]

1. (i) Verify when $x=2$ and $y=-1$ that

$$x^3-y^3=(x-y)(x^2+xy+y^2).$$

(ii) Solve the equation $\frac{1}{3}(4x-2)=7x-9$.

(iii) Evaluate x^2-y^2 when $x=1002$ and $y=998$.

2. (i) Factorise $2x^2-xy-15y^2$.

(ii) Express as a fraction in its simplest form

$$\frac{x+1}{x+2}-\frac{x-3}{x-4}.$$

(iii) If a train travels at x miles per hour, in how many minutes will it travel y miles ?

(iv) If $s=ut+\frac{1}{2}ft^2$, express f in terms of s, u and t.

3. (i) If $\dfrac{3a+2}{a-1}=\dfrac{a-2}{a+1}$, find the possible values of a, and hence show that each fraction is equal to 2 or -2.

(ii) Find the values of x, correct to 2 decimal places, which make x^2+7x equal to 5.

4. (i) Find the values of x and y if

$$\frac{x}{2}+\frac{y}{4}=4=\frac{x}{4}+\frac{y}{2}.$$

(ii) Find the values of a and b so that $3x^2-4x+1$ can be expressed in the form $a(x-1)^2+b(x-1)$.

5. (i) Divide $3x^3+7x^2-5x+3$ by $x+3$.

(ii) Simplify (*a*) $\sqrt[3]{(64x^6y^9)}$, (*b*) $16^{-\frac{3}{4}}$.

(iii) What is the nth term of the arithmetic progression

$$11+4\tfrac{3}{4}-1\tfrac{1}{2}-\ldots ?$$

6. A train travels 180 miles; another train which has an average speed 6 miles per hour faster does the same journey in 1 hour less time. What is the average speed of the slower train?

Section B

[*Answer any* THREE *questions*]

7. (i) Use logarithms to calculate the cube root of 76·93.

(ii) If $x=\left(\log_{10}\dfrac{a}{b}\right)\div\left(\log_{10}\dfrac{a}{c}\right)$ calculate x when

$$a=5{\cdot}215;\ b=1{\cdot}793;\ c=3{\cdot}052.$$

8. Draw the graph of the function $y=x(6-x)^2$ from $x=0$ to $x=6$ using a scale of 1 in. to 1 unit on the x axis and 1 in. to 4 units on the y axis.

From your graph find, for values of x between 0 and 6

(*a*) the positive values of x which make $y=24$,

(*b*) by drawing the appropriate straight line, the values of x for which $x(6-x)^2=6+x$.

9. A cubical wooden box, with a lid, is made of wood $\frac{1}{2}$ in. thick. Show that if an outside edge of the box is a in. long, the volume of the wood used is $3a^2-3a+1$ cu. in.

Find the length of the edge if the box weighs 5 lb assuming that 1 cu. in. of the wood weighs $\frac{1}{2}$ oz. Give your answer to the nearest $\frac{1}{16}$th in.

10. (i) The first, second and last terms of an arithmetic progression are x, y and z respectively.

(*a*) Express the number of terms of the progression in terms of x, y and z.

(*b*) Show that the sum of the progression is

$$\frac{(x+z)(y+z-2x)}{2(y-x)}.$$

(ii) Four positive numbers are in geometric progression. The product of the first and third is 36 and the product of the second and fourth is 324. Find the numbers.

11. The perimeter of a rectangle is 18 ft and the length of the diagonal is 7 ft. Find, to the nearest inch, the lengths of its sides.

(ii) A cubical wooden box, with a lid, is made of wood ¼ in. thick. Show that if an outside edge of the box is x in. long, the volume of the wood used is [illegible] cu. in.

Find the length of the edge, if the box weighs [illegible] lb, assuming that 1 cu. in. of the wood weighs [illegible] oz. Give your answer to the nearest $\frac{1}{10}$th in.

10. (i) The first, second and last terms of an arithmetic progression are x, y and z respectively.

(a) Express the number of terms of the progression in terms of x, y and z.

(b) Show that the sum of the progression is

$$S = \frac{(x+z)(y+z-2x)}{2(y-x)}.$$

(ii) Four positive numbers are in geometric progression. The product of the first and third is 36 and the product of the second and fourth is 324. Find the numbers.

11. The perimeter of a rectangle is [illegible] ft. and the length of the diagonal is [illegible] ft. Find, to the nearest inch, the lengths of its sides.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

AUTUMN, 1957

PURE MATHEMATICS

(b) **ALGEBRA**

MONDAY, November 25.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1\. (i) By how much does the square of $(x+y)$ exceed the square of $(x-y)$?

(ii) Find the value of $3a^2-b$ when $a=-2$, $b=-9$.

(iii) A greengrocer bought a cwt. of potatoes at b shillings per cwt. and sold them at twopence per lb. What was his profit in shillings ? Express your answer as a fraction in its lowest terms.

2\. (i) Factorise completely (*a*) $12x^2-3y^2$

(*b*) $(x-y)^2+3x-3y$.

(ii) Solve the equation $\frac{x}{5}-\frac{2x-1}{3}+1=0$.

(iii) Express as a single fraction in its simplest form

$$\frac{3}{a-3}-\frac{2}{a-2}.$$

3. (i) The nth term of a series is $\frac{n(-2)^n}{n+2}$.

Find the value of the 3rd term.

(ii) Without using tables find the values of

$$8^{\frac{2}{3}}, \quad (2^2)^{-2}, \quad \left(\frac{1}{9}\right)^{-\frac{1}{2}}$$

(iii) Use logarithm tables to calculate the values of

(*a*) $\sqrt[3]{0\cdot5671}$, (*b*) $\frac{7\cdot869}{0\cdot3564}$

4. Solve the equation $3x^2-5x+1=0$, giving the roots correct to two decimal places.

5. (i) If $6x-15=ax+b(x-3)$ for *all* values of x, where a and b are constants, find the values of a and b.

(ii) (*a*) Find the coefficient of x^4 in the product of $(1-2x+x^2)$ and $(1+px-3x^2)$.

(*b*) If the coefficient of x^2 in this product is 2, find the value of p.

6. (i) If $V=\pi r^2h$ and $A=2\pi rh$, find the formula for V in terms of r and A, and which does not involve h.

(ii) A man walks x miles at 4 m.p.h. and a further x miles at 3 m.p.h. Write down expressions showing the times in hours for each part of the journeys. If the second part takes him a quarter of an hour longer than the first, find the value of x.

Section B

[*Answer any* THREE *questions from this section.*]

7. (i) Express as a single fraction in its lowest terms

$$\frac{2}{2x+3}-\frac{3}{x-4}+\frac{8x+1}{2x^2-5x-12}$$

(ii) If $x=-3$ satisfies the equation

$$6x^3+11x^2+kx-9=0,$$

find the value of k, and the other two roots.

8. (i) If $R=r\left(\frac{S+P}{S-P}\right)^{\frac{1}{2}}$

(*a*) express S in terms of R, r and P,

(*b*) find by logarithms the value of R to three significant figures from the original formula if $r=5\cdot73$, $S=3\cdot253$, $P=1\cdot497$.

(ii) Solve the simultaneous equations

$$x^2-xy=10, \quad 3x+2y=0$$

9. On the same axes and with a scale of 1 inch for 1 unit on each axis draw the graphs of $y=(x-1)(4-x)$ and $5x-4y-10=0$. Take values of x from 0 to 5.

From your graphs find the range of values of x for which $(x-1)(4-x)$ is greater than $\frac{5x-10}{4}$.

10. A party of people hired a bus for £5 and agreed to share the cost equally. Later the party was increased by four more people, and the cost per person was thus reduced by 1*s*. 3*d*. How many people were there in the original party ?

11. (i) If S denotes the sum $1+2+3+\ldots+n$, and T denotes the sum $1+2+3+\ldots+(n-1)$, find in terms of n the value of S^2-T^2. Give your answer in its lowest terms.

(ii) The first two terms of a geometric series are $\frac{1}{3}$ and $-\frac{1}{2}$ respectively. Find (*a*) the third term, (*b*) the sum of the first six terms of the series.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1957

PURE MATHEMATICS

(b) **ALGEBRA**

MONDAY, June 24.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) If $x=1$, $y=-2$, $z=-3$, find the value of $(3x-y)^2 \div z^3$.

   (ii) Factorise $(2x+1)^2-(x-2)^2$.

   (iii) Solve the equation $3x^2-4x=0$.

   (iv) Solve the equation $4p^2=25$.

2. (i) Express as a single fraction in its simplest form

$$\frac{a-b}{a+b}-\frac{a+b}{a-b}.$$

   (ii) Find the value of x if $\frac{x}{12}-\frac{5(x-1)}{3}=\frac{3}{4}$.

   (iii) If $y=\frac{a-bx}{1+ax}$, express x in terms of a, b and y.

   (iv) Expand and simplify $(a^2+ab+b^2)(a-b)$.

3. (i) Solve the equation $3x^2-6x+2=0$, giving the roots correct to two places of decimals.

(ii) If the expression y^2+4y-a is equal to -1 when $y=0$, find its value when $y=-\frac{1}{2}$.

4. (i) Find the value of x and the value of y which satisfy the equations

$$2x-y=\frac{3}{7}(2x+y)=6x-7y+4.$$

(ii) Given that $\frac{5a+4b}{a+3b}=\frac{3}{2}$ find the value of $\frac{a}{b}$.

5. (i) Without using tables evaluate

$$(a)\ \left(\frac{25}{9}\right)^{\frac{3}{2}} \qquad (b)\ \left(3\tfrac{3}{8}\right)^{-\frac{4}{3}}.$$

(ii) (a) Express as a power of x, $x^a \times x^b \div x^{a-b}$.

(b) Express, without brackets and with positive indices $xy(x^2y^{-1}+x^{-2}y)$.

(iii) Two motor cars started together to race over a distance of a miles. One car had an average speed of x m.p.h. and crossed the finishing line b minutes ahead of the other. Find an expression for the time in hours taken by the slower car.

6. £5,640 is divided between three people A, B and C in such a way that A receives £1,000 more than B, and B receives $\frac{3}{4}$ of the amount C receives. Find the amount each receives.

Section B.

[*Answer any* THREE *questions in this section.*]

7. (i) Use logarithms to find the value of $\frac{0{\cdot}3818\times 216{\cdot}8}{0{\cdot}0777\times 5{\cdot}691}$.

(ii) If $V^2=\frac{a^3+b^3}{36\pi}$ find the value of V when $a=2{\cdot}671$, $b=0{\cdot}9343$ and $\pi=3{\cdot}142$.

8. A groundsman has 176 ft. of fencing to make a rectangular enclosure. If he makes the width x ft., what is the length? Show that the area enclosed is $(88x-x^2)$ sq. ft.

Draw a graph of this function for values of x from 20 to 80, taking 1 in. to represent 10 ft. on one axis and 200 sq. ft. on the other, and from it find:—

(a) the greatest possible area which can be enclosed and

(b) the length and width of the enclosure when the area is greatest.

9. (i) Find the value of a and of b if $x+2$ and $x-1$ are factors of $3x^3+ax^2-bx+4$. What is the remaining factor of the expression?

(ii) Solve the simultaneous equations

$$x^2-xy+y^2=19$$
$$x+2y=4.$$

10. (i) (a) The first and last terms of an arithmetic progression are 213 and 133, and the sum of the progression is 2,941. Find the number of terms in the progression.

(b) Find the sum of the first twenty terms of the arithmetical progression whose first term is 2 and whose common difference is $\frac{3}{2}$.

(ii) The sum of the first three terms of a geometrical progression is 13 and the common ratio is $\frac{1}{3}$. Find the first term and the seventh term.

11. A and B are two towns 44 miles apart. A cyclist and a motorist travel from A to B. The motorist leaves A 1hr. 36 min. later than the cyclist but they reach B at exactly the same time. If the average speed of the motorist is 18 m.p.h. greater than that of the cyclist, find the average speed of each.

$x^2 + x - 2$

$3x + 2$

$3x^3 + 3x^2 - 6x$

$+2x^2 + 2x - 4$

$x + 2$

$x - 1$

$3x + 2$

$$
\begin{array}{r|l}
3x^3 + x^2 - 8x + 4 & x^2 + x - 2 \\
-3x^3 \mp 3x^2 \pm 6x & 3x - 2 \\
\hline
-2x^2 - 2x + 4 & \\
-2x^2 - 2x + 4 &
\end{array}
$$

$3x^3 + 5x^2 - 4x - 4$

$90x^2 + 144x - 352 = 0$

$x = \dfrac{-144 \pm \sqrt{20736 + \ldots}}{180}$

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1957

PURE MATHEMATICS

(b) **ALGEBRA**

MONDAY, June 24.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) If $x=1$, $y=-2$, $z=-3$, find the value of $(3x-y)^2 \div z^3$.

   (ii) Factorise $(2x+1)^2-(x-2)^2$.

   (iii) Solve the equation $3x^2-4x=0$.

   (iv) Solve the equation $4p^2=25$.

2. (i) Express as a single fraction in its simplest form

$$\frac{a-b}{a+b}-\frac{a+b}{a-b}.$$

   (ii) Find the value of x if $\frac{x}{12}-\frac{5(x-1)}{3}=\frac{3}{4}$.

   (iii) If $y=\frac{a-bx}{1+ax}$, express x in terms of a, b and y.

   (iv) Expand and simplify $(a^2+ab+b^2)(a-b)$.

T. & F.—56/536 10/2/2/32650

3. (i) Solve the equation $3x^2-6x+2=0$, giving the roots correct to two places of decimals.

(ii) If the expression y^2+4y-a is equal to -1, when $y=0$, find its value when $y=-\frac{1}{2}$.

4. (i) Find the value of x and the value of y which satisfy the equations

$$2x-y=\frac{3}{7}(2x+y)=6x-7y+4.$$

(ii) Given that $\frac{5a+4b}{a+3b}=\frac{3}{2}$ find the value of $\frac{a}{b}$.

5. (i) Without using tables evaluate

$$(a)\ \left(\frac{25}{9}\right)^{\frac{3}{2}} \qquad (b)\ \left(3\tfrac{3}{8}\right)^{-\frac{4}{3}}.$$

(ii) (*a*) Express as a power of x, $x^a \times x^b \div x^{a-b}$.

(*b*) Express, without brackets and with positive indices $xy(x^2y^{-1}+x^{-2}y)$.

(iii) Two motor cars started together to race over a distance of a miles. One car had an average speed of x m.p.h. and crossed the finishing line b minutes ahead of the other. Find an expression for the time in hours taken by the slower car.

6. £5,640 is divided between three people A, B and C in such a way that A receives £1,000 more than B, and B receives $\frac{3}{4}$ of the amount C receives. Find the amount each receives.

Section B.

[*Answer any* THREE *questions in this section.*]

7. (i) Use logarithms to find the value of $\frac{0{\cdot}3818\times 216{\cdot}8}{0{\cdot}0777\times 5{\cdot}691}$.

(ii) If $V^2=\frac{a^3+b^3}{36\pi}$ find the value of V when $a=2{\cdot}671$, $b=0{\cdot}9343$ and $\pi=3{\cdot}142$.

$a^3 \quad x - 7.671$

8. A groundsman has 176 ft. of fencing to make a rectangular enclosure. If he makes the width x ft., what is the length? Show that the area enclosed is $(88x-x^2)$ sq. ft.

Draw a graph of this function for values of x from 20 to 80, taking 1 in. to represent 10 ft. on one axis and 200 sq. ft. on the other, and from it find:—

(*a*) the greatest possible area which can be enclosed and

(*b*) the length and width of the enclosure when the area is greatest.

$x = -2$

9. (i) Find the value of a and of b if $x+2$ and $x-1$ are factors of $3x^3+ax^2-bx+4$. What is the remaining factor of the expression?

(ii) Solve the simultaneous equations

$$x^2-xy+y^2=19$$
$$x+2y=4.$$

10. (i) (*a*) The first and last terms of an arithmetic progression are 213 and 133, and the sum of the progression is 2,941. Find the number of terms in the progression.

(*b*) Find the sum of the first twenty terms of the arithmetical progression whose first term is 2 and whose common difference is $\frac{3}{2}$.

(ii) The sum of the first three terms of a geometrical progression is 13 and the common ratio is $\frac{1}{3}$. Find the first term and the seventh term.

11. A and B are two towns 44 miles apart. A cyclist and a motorist travel from A to B. The motorist leaves A 1hr. 36 min. later than the cyclist but they reach B at exactly the same time. If the average speed of the motorist is 18 m.p.h. greater than that of the cyclist, find the average speed of each.

9

$$\frac{4a^{2x}}{2a^{2x}} = 2$$

$$4\,a^{2x} = a^{2x}$$

$$\sqrt{5^2} \quad 5^{\frac{2}{2}}$$

$$\frac{6}{6x^{\frac{1}{2}}} = x^{-\frac{1}{2}}$$

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1957

PURE MATHEMATICS

(b) **ALGEBRA**

MONDAY, June 24.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) If $x=1$, $y=-2$, $z=-3$, find the value of $(3x-y)^2 \div z^3$.

 (ii) Factorise $(2x+1)^2-(x-2)^2$.

 (iii) Solve the equation $3x^2-4x=0$.

 (iv) Solve the equation $4p^2=25$.

2. (i) Express as a single fraction in its simplest form
$$\frac{a-b}{a+b}-\frac{a+b}{a-b}.$$

 (ii) Find the value of x if $\frac{x}{12}-\frac{5(x-1)}{3}=\frac{3}{4}$.

 (iii) If $y=\frac{a-bx}{1+ax}$, express x in terms of a, b and y.

 (iv) Expand and simplify $(a^2+ab+b^2)(a-b)$.

3. (i) Solve the equation $3x^2-6x+2=0$, giving the roots correct to two places of decimals.

(ii) If the expression y^2+4y-a is equal to -1 when $y=0$, find its value when $y=-\frac{1}{2}$.

4. (i) Find the value of x and the value of y which satisfy the equations

$$2x-y=\frac{3}{7}(2x+y)=6x-7y+4.$$

(ii) Given that $\dfrac{5a+4b}{a+3b}=\dfrac{3}{2}$ find the value of $\dfrac{a}{b}$.

5. (i) Without using tables evaluate

$$(a)\ \left(\frac{25}{9}\right)^{\frac{3}{2}} \quad (b)\ \left(3\tfrac{3}{8}\right)^{-\frac{4}{3}}.$$

(ii) (*a*) Express as a power of x, $x^a \times x^b \div x^{a-b}$.

(*b*) Express, without brackets and with positive indices $xy(x^2y^{-1}+x^{-2}y)$.

(iii) Two motor cars started together to race over a distance of a miles. One car had an average speed of x m.p.h. and crossed the finishing line b minutes ahead of the other. Find an expression for the time in hours taken by the slower car.

6. £5,640 is divided between three people A, B and C in such a way that A receives £1,000 more than B, and B receives $\frac{3}{4}$ of the amount C receives. Find the amount each receives.

Section B.

[*Answer any* THREE *questions in this section.*]

7. (i) Use logarithms to find the value of $\dfrac{0{\cdot}3818\times 216{\cdot}8}{0{\cdot}0777\times 5{\cdot}691}$.

(ii) If $V^2=\dfrac{a^3+b^3}{36\pi}$ find the value of V when $a=2{\cdot}671$, $b=0{\cdot}9343$ and $\pi=3{\cdot}142$.

8. A groundsman has 176 ft. of fencing to make a rectangular enclosure. If he makes the width x ft., what is the length? Show that the area enclosed is $(88x-x^2)$ sq. ft.

Draw a graph of this function for values of x from 20 to 80, taking 1 in. to represent 10 ft. on one axis and 200 sq. ft. on the other, and from it find:—

(*a*) the greatest possible area which can be enclosed and

(*b*) the length and width of the enclosure when the area is greatest.

9. (i) Find the value of a and of b if $x+2$ and $x-1$ are factors of $3x^3+ax^2-bx+4$. What is the remaining factor of the expression?

(ii) Solve the simultaneous equations

$$x^2-xy+y^2=19$$
$$x+2y=4.$$

10. (i) (*a*) The first and last terms of an arithmetic progression are 213 and 133, and the sum of the progression is 2,941. Find the number of terms in the progression.

(*b*) Find the sum of the first twenty terms of the arithmetical progression whose first term is 2 and whose common difference is $\frac{3}{2}$.

(ii) The sum of the first three terms of a geometrical progression is 13 and the common ratio is $\frac{1}{3}$. Find the first term and the seventh term.

11. A and B are two towns 44 miles apart. A cyclist and a motorist travel from A to B. The motorist leaves A 1hr. 36 min. later than the cyclist but they reach B at exactly the same time. If the average speed of the motorist is 18 m.p.h. greater than that of the cyclist, find the average speed of each.

$\frac{x}{y^2} r^3 =$

$ar^3 = \frac{y}{}$

$\frac{x}{y^2} r^3 = \frac{y x^3}{x^3}$

6

$2 \times \frac{1}{2} = 1 \quad 3 \times \frac{1}{2} = 1.5 \quad 4 + \frac{1}{2} = 2$

$r^3 = \frac{y}{x^3} \times \frac{x}{y^2}$

x

$\frac{1}{x^2 y}$

$ar^3 x^3 = y$

$r^3 = \frac{y}{a x^3}$

$\frac{x}{y^2} r^3 = \frac{y}{x^3}$

$r^3 = \frac{y}{x^3} \times \frac{y^2}{x} = \frac{y^3}{x^3}$

$r^3 = \frac{y^3}{x^3}$

$r = \frac{y}{x}$

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

AUTUMN, 1957

PURE MATHEMATICS

(b) ALGEBRA

MONDAY, November 25.—Morning, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) By how much does the square of $(x+y)$ exceed the square of $(x-y)$?

   (ii) Find the value of $3a^2-b$ when $a=-2$, $b=-9$.

   (iii) A greengrocer bought a cwt. of potatoes at b shillings per cwt. and sold them at twopence per lb. What was his profit in shillings ? Express your answer as a fraction in its lowest terms.

2. (i) Factorise completely (*a*) $12x^2-3y^2$

   (*b*) $(x-y)^2+3x-3y$.

   (ii) Solve the equation $\frac{x}{5}-\frac{2x-1}{3}+1=0$.

   (iii) Express as a single fraction in its simplest form

$$\frac{3}{a-3}-\frac{2}{a-2}.$$

T. & F.—56/511 10/2/13000

[P.T.O.

3. (i) The nth term of a series is $\frac{n(-2)^n}{n+2}$.

Find the value of the 3rd term.

(ii) Without using tables find the values of

$$8^{\frac{2}{3}}, \quad (2^2)^{-2}, \quad \left(\frac{1}{9}\right)^{-\frac{1}{2}}$$

(iii) Use logarithm tables to calculate the values of

(a) $\sqrt[3]{0{\cdot}5671}$, (b) $\frac{7{\cdot}869}{0{\cdot}3564}$

4. Solve the equation $3x^2-5x+1=0$, giving the roots correct to two decimal places.

5. (i) If $6x-15=ax+b(x-3)$ for *all* values of x, where a and b are constants, find the values of a and b.

(ii) (a) Find the coefficient of x^4 in the product of $(1-2x+x^2)$ and $(1+px-3x^2)$.

(b) If the coefficient of x^2 in this product is 2, find the value of p.

6. (i) If $V=\pi r^2h$ and $A=2\pi rh$, find the formula for V in terms of r and A, and which does not involve h.

(ii) A man walks x miles at 4 m.p.h. and a further x miles at 3 m.p.h. Write down expressions showing the times in hours for each part of the journeys. If the second part takes him a quarter of an hour longer than the first, find the value of x.

Section B

[*Answer any* THREE *questions from this section.*]

7. (i) Express as a single fraction in its lowest terms

$$\frac{2}{2x+3}-\frac{3}{x-4}+\frac{8x+1}{2x^2-5x-12}$$

(ii) If $x=-3$ satisfies the equation

$$6x^3+11x^2+kx-9=0,$$

find the value of k, and the other two roots.

8. (i) If $R=r\left(\frac{S+P}{S-P}\right)^{\frac{1}{2}}$

(a) express S in terms of R, r and P,

(b) find by logarithms the value of R to three significant figures from the original formula if $r=5{\cdot}73$, $S=3{\cdot}253$, $P=1{\cdot}497$.

(ii) Solve the simultaneous equations

$$x^2-xy=10, \quad 3x+2y=0$$

9. On the same axes and with a scale of 1 inch for 1 unit on each axis draw the graphs of $y=(x-1)(4-x)$ and $5x-4y-10=0$. Take values of x from 0 to 5.

From your graphs find the range of values of x for which $(x-1)(4-x)$ is greater than $\frac{5x-10}{4}$.

10. A party of people hired a bus for £5 and agreed to share the cost equally. Later the party was increased by four more people, and the cost per person was thus reduced by 1*s*. 3*d*. How many people were there in the original party ?

11. (i) If S denotes the sum $1+2+3+\ldots+n$, and T denotes the sum $1+2+3+\ldots+(n-1)$, find in terms of n the value of S^2-T^2. Give your answer in its lowest terms.

(ii) The first two terms of a geometric series are $\frac{1}{3}$ and $-\frac{1}{2}$ respectively. Find (a) the third term, (b) the sum of the first six terms of the series.

$\frac{x+1}{2}$, $\frac{2x+3}{4}$, $\frac{x+15}{3}$

are in

1) A.P.

find x

$\frac{2x+3}{4} - \frac{x+1}{2} = \frac{2x+3-2x-2}{4}$

$= \frac{1}{4}$

$\therefore d = \frac{1}{4}$

$l = a+(n-1)d$

$\frac{2x+15}{3} = \frac{x+1}{2} + \frac{1}{2}$

$4x+30 = 3x+...$

$x = -24$

$x^2 - 7x - 5$

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1956

PURE MATHEMATICS

(b) **ALGEBRA**

FRIDAY, June 22.—Morning, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section*]

1. (i) If $x=2, y=1, z=0$ find the value of $2x^2-3y^2+xz$
   (ii) Solve the equation $5(2x-7)-3(x-8)=10$
   (iii) Express as a single fraction $\frac{2}{x-4}-\frac{1}{x-2}$

2. (i) Solve the equation $12x^2-10x-12=0$
   (ii) Factorise (*a*) $16z^2-(2y-3)^2$
   (*b*) $lx-mx-my+ly$

3. (i) Multiply $5x^2-7x-3$ by x^2+x-4
   (ii) Divide $6x^4-3x^3-2x^2+7x-28$ by $3x^2-7$

4. Solve the equation $4x^2-3x-2=0$, giving your answers correct to *two* decimal places.

5. (i) Find, without using tables, the values of

(*a*) $(81)^{\frac{3}{4}}$ (*b*) $(\frac{1}{4})^{-2}$

(ii) Use logarithm tables to evaluate

(*a*) $(0{\cdot}3582)^4$ (*b*) $\sqrt[3]{0{\cdot}0157}$

6. A man bought 6 standard roses and 18 bush roses for £8 2*s*. 0*d*. Another man bought, at the same prices, 14 standard roses and 27 bush roses for £15 18*s*. 0*d*. How much did a standard rose cost ?

Section B

[*Answer any* THREE *questions in this section*]

7. (i) Express as a single fraction in its lowest terms

$$\frac{1}{3x-4}-\frac{2}{2x+1}-\frac{8x-7}{(3x-4)\,(2x+1)}$$

(ii) Solve the simultaneous equations

$$9y^2-2x^2=7, \qquad x+3y=4$$

8. A poultry farmer paid a total of £180 for a certain number of turkeys. Some weeks later he sold, also for a total of £180, all but fifteen of the birds, receiving for them £1 a head more than he had given for them. Find the price per head at which he bought the turkeys.

9. (i) Draw the graph of $y=x^3$ from $x=-3$ to $x=+3$, using 1 inch for 1 unit on the x-axis and 1 inch for 10 units on the y-axis.

(ii) Using the same axes and the same scales draw the graph of $y=7x+3$.

(iii) Use your graphs to find approximate solutions of the equation $x^3=7x+3$.

(iv) Without actually drawing another graph, state briefly how you would solve in a similar way the equation $x^3-5x+2=0$.

10. (i) The fifteenth term of an arithmetic progression is 35 and the tenth is $32\frac{1}{2}$. Find the first term and the sum of the first seventeen terms.

(ii) A ball bearing is dropped on to a horizontal metal plate and allowed to go on bouncing in the same vertical line. At each bounce it rises to one-third of the height from which it has fallen. If it is originally released from a height of 27 inches, show that the total distance it has moved altogether, up and down, by the time it strikes the plate for the nth time is $\left(54-\frac{1}{3^{n-4}}\right)$ inches.

11. (i) If $8d^2+3s^2=3sl$, express d in terms of s and l.

(ii) If $T=2\pi\sqrt{\left(\frac{l}{g}\right)}$, express g in terms of T, l and π.

(iii) If $12x-16=a(x+7)+b(6-2x)$ for *all* values of x, where a and b are constants, find the values of a and b.

$$S = \frac{27\left(\left(\frac{1}{3}\right)^n - 1\right)}{\frac{1}{3} - 1}$$

$$S_m = 27 + S_n$$

$$S_m = 27 + \frac{18\left(\left(\frac{1}{3}\right)^n - 1\right)}{\frac{1}{3} - 1}$$

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

AUTUMN, 1955

PURE MATHEMATICS

(b) **ALGEBRA**

FRIDAY, *November* 18.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) If $a=+2$, $b=-1$, $c=-4$, find the value of b^2-4ac.

(ii) Simplify $(x-2y)^2-4x(x-y)$.

(iii) If $H=a+\frac{b}{P}$, express P in terms of a, b and H.

2. (i) Factorise (*a*) $4x^2-9$;
(*b*) $ay+by-(a+b)^2$.

(ii) Solve the equation $\frac{2x-1}{3}-\frac{x-2}{2}=1$.

T. & F.—54/1167 10/2/13525

[P. T. O.

3. (i) The roots of the equation $x^2+px+q=0$ are $+2$ and -1. Find the values of p and q.

(ii) The length of one side of a rectangle is x ft. and its area is A sq. ft. Find an expression for the perimeter p ft. in terms of A and x.

If $A=2$ and $p=5\frac{2}{3}$, calculate the length of the shorter side of the rectangle.

4. (i) Express in powers of 10

$$\frac{1}{1000}, \quad \sqrt{10}, \quad \sqrt[3]{0{\cdot}01}$$

(ii) Use logarithm tables to find the value of

$$\sqrt[3]{(2{\cdot}65\times 10^{-2})}.$$

5. Show that the equation $x-2=2\left(\frac{3}{x}+4\right)$ can be put into the form $x^2-10x=6$.

Find the roots of the latter equation, correct to one place of decimals.

6. The annual incomes of two workers A and B are in the ratio 6 : 5 and their expenditures are in the ratio 8 : 7. If A saves £80 per annum and B saves £30 per annum, calculate how much each earns per annum.

Section B

[*Answer any* THREE *questions from this section.*]

7. (i) If a and b are two numbers such that

$$a^2+ab+b^2=88$$
$$a^2-ab+b^2=52\ ,$$

calculate in succession the values of (a^2+b^2), ab and $(a-b)^2$.

(ii) Solve the equations $x-2y=1$,

$$3x^2-4xy=15.$$

8. (i) Express as a single fraction in its lowest terms

$$\frac{3}{x-3}-\frac{2x}{x^2-9}+\frac{1}{x+3}.$$

(ii) When an expression E is divided by $3x^2-x+1$, the quotient is $x-2$ and the remainder is $+3$. Find E, giving your answer in its simplest form and show that it is exactly divisible by $x-1$.

9. A theatre contains 500 seats and for an afternoon performance N of these seats are sold at 4*s*. each and the remainder at 6*s*. each. Find a formula for X, the total receipts in shillings, and simplify your formula.

For the evening performance, some of the 4*s*. seats are converted into 6*s*. seats. If the number of 6*s*. seats is now three times as many as for the afternoon performance, find a formula for Y, the total receipts in shillings taken at the evening performance assuming all the seats are again sold.

If the evening receipts exceed the afternoon receipts by £16, find the value of N.

10. On the same axes, draw the graphs of $y=\frac{15}{x+1}$ and $y=(x-1)^2$ from $x=0$ to $x=+5$, taking 1 in. as the unit on the x-axis and 0·5 in. as the unit on the y-axis.

From your diagram, showing clearly how each answer is obtained, find

(i) $\frac{15}{1{\cdot}9}$;

(ii) $\sqrt{10{\cdot}2}$;

(iii) one root of the equation $(x-1)^2=\frac{15}{x+1}$.

11. (i) The first term of an arithmetic progression is (x^2+4) and the second term is $(x+2)^2$. If the sum of the first ten terms is 440, find the possible values of x.

(ii) The third term of a geometric progression is $+2$ and the sixth term is $-\frac{16}{27}$. Find the first term and write down an expression for the nth term.

... Express as a single fraction in its lowest terms

[illegible]

(ii) When an expression E is divided by $3x^2-x+1$, the quotient is ... and the remainder is ... Find E, giving your answer in its simplest form and show that it is exactly divisible by ...

9. A theatre contains 500 seats and for an afternoon performance X of these seats are sold at 4s. each and the remainder at ... each. Find a formula for X, the total takings in shillings, and simplify your formula.

For the evening performance some of the 4s. seats are converted into ... seats. If the number of 4s. seats is now three times as many as for the afternoon performance, find a formula for Y, the total receipts in shillings taken at the evening performance assuming all the seats are again sold.

If the evening receipts exceed the afternoon receipts by £10, find the value of X.

10. On the same axes, draw the graphs of $y=\frac{12}{x+4}$ and $y=\ldots$ from $x=\ldots$ to $x=4$, taking 1 in. as the unit on the x-axis and ... as the unit on the y-axis.

From your diagram showing clearly how each answer is obtained, find ...

(i) ...

(ii) $\sqrt{10}$ ...

(iii) one root of the equation ...

11. (i) The first term of an arithmetic progression is (a^2+4) and the second term is ... If the sum of the first ten terms is 440, find the possible values of a.

(ii) The third term of a geometric progression is ... and the fifth term is $\frac{16}{25}$. Find the first term and write down an expression for the nth term.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1955

PURE MATHEMATICS

(b) ALGEBRA

FRIDAY, June 17.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) If $p=2$ and $q=-1$, find the value of

$$(p-q)^2-(p^2-q^2).$$

(ii) Factorise $8x^2-2x-3$.

(iii) Express in its simplest form

$$\frac{2}{x-1}-\frac{4}{2x+1}.$$

2. (i) Solve the equation $\frac{1}{2}x-\frac{1}{3}(x-4)=\frac{1}{6}$.

(ii) If $2x+3y=5$ and $3x-5y=-21$, find the value of y.

(iii) If $\dfrac{a^{12}}{a^6\times a^2}=a^p$, find the value of p.

3. (i) A rectangular room is $3l$ feet long and $2l$ feet wide. Find the area of a carpet for this room if a border x feet wide is left all round the carpet.

If the area of the border is $96x^2$ square feet, find x in terms of l.

(ii) The *sum* of n terms of a series is $\frac{1}{3}n(4n^2-1)$. Find the first two terms.

4. (i) If $s=ut+\frac{1}{2}at^2$, find the positive value of t which makes $s=-24$ when $u=40$ and $a=-32$.

(ii) Given that $\dfrac{3x+4y}{5x+2y}=\dfrac{3}{4}$, express y in terms of x.

5. Find the number that must be added to x^2-7x to make the expression a perfect square.

Hence or otherwise solve the equation $x^2-7x-11=0$, giving the roots correct to three significant figures.

6. A and B walk to meet each other from towns which are $15\frac{3}{4}$ miles apart. The ratio of their speeds is 6 : 7 and B starts 30 minutes later than A. If they meet after B has walked for three hours, find their speeds.

Section B

[*Answer any* THREE *questions from this section.*]

7. (i) If $\log_{10} 2=0{\cdot}30103$ and $\log_{10} 3=0{\cdot}47712$ calculate, without the use of tables, $\log_{10} 6$ and $\log_{10} 1{\cdot}5$.

(ii) Express in its simplest form $\left(\dfrac{8}{a^{12}}\right)^{-\frac{2}{3}}$.

(iii) If $a=0{\cdot}3157$ and $b=17{\cdot}24$, use logarithms to calculate the square root of a^3b.

8. (i) Find the value of k if $2x+1$ is a factor of $8x^3+2x+k$.

(ii) If $$\frac{x+b}{2}-\frac{a-x}{3} = 3(a+b),$$
express x in terms of a and b.

(iii) Solve the equations
$$x-2y=1,$$
$$3xy-y^2=8.$$

9. A man buys a consignment of garden stone for £90. He keeps 10 tons for his own use and sells the remainder at a profit of 25 shillings per ton. If he receives £70 from the sale find the weight, in tons, of the consignment.

10. (i) Find how many terms of the series 23, 19, 15 . . . must be added for the sum to be 12.

(ii) The third term of a geometric series, in which all the terms are positive, is 18 and the fifth term is 40·5. Find the first term and the sum of the first six terms.

11. Draw the graph of $\frac{1}{4}(3x^2-5x-4)$ for values of x from -2 to $+3$, using a scale of 1 inch to 1 unit on each axis.

Use your graph to find the least value of $3x^2-5x-4$.

By drawing the appropriate straight line on your graph solve the equation $3x^2-5x-6=0$.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1955

PURE MATHEMATICS

(b) ALGEBRA

FRIDAY, *June* 17.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) If $p=2$ and $q=-1$, find the value of
$$(p-q)^2-(p^2-q^2).$$
(ii) Factorise $8x^2-2x-3$.
(iii) Express in its simplest form
$$\frac{2}{x-1}-\frac{4}{2x+1}.$$

2. (i) Solve the equation $\frac{1}{2}x-\frac{1}{3}(x-4)=\frac{1}{6}$.
(ii) If $2x+3y=5$ and $3x-5y=-21$, find the value of y.
(iii) If $\frac{a^{12}}{a^6\times a^2}=a^p$, find the value of p.

T. & F.—54/1204 10/2/33000

[P. T. O.

3. (i) A rectangular room is $3l$ feet long and $2l$ feet wide. Find the area of a carpet for this room if a border x feet wide is left all round the carpet.

If the area of the border is $96x^2$ square feet, find x in terms of l.

(ii) The *sum* of n terms of a series is $\frac{1}{3}n(4n^2-1)$. Find the first two terms.

4. (i) If $s=ut+\frac{1}{2}at^2$, find the positive value of t which makes $s=-24$ when $u=40$ and $a=-32$.

(ii) Given that $\dfrac{3x+4y}{5x+2y}=\dfrac{3}{4}$, express y in terms of x.

5. Find the number that must be added to x^2-7x to make the expression a perfect square.

Hence or otherwise solve the equation $x^2-7x-11=0$, giving the roots correct to three significant figures.

6. A and B walk to meet each other from towns which are $15\frac{3}{4}$ miles apart. The ratio of their speeds is 6 : 7 and B starts 30 minutes later than A. If they meet after B has walked for three hours, find their speeds.

Section B

[*Answer any* THREE *questions from this section.*]

7. (i) If $\log_{10} 2=0{\cdot}30103$ and $\log_{10} 3=0{\cdot}47712$ calculate, without the use of tables, $\log_{10} 6$ and $\log_{10} 1{\cdot}5$.

(ii) Express in its simplest form $\left(\dfrac{8}{a^{12}}\right)^{-\frac{2}{3}}$.

(iii) If $a=0{\cdot}3157$ and $b=17{\cdot}24$, use logarithms to calculate the square root of a^3b.

8. (i) Find the value of k if $2x+1$ is a factor of $8x^3+2x+k$.

(ii) If $$\frac{x+b}{2}-\frac{a-x}{3}=3(a+b),$$
express x in terms of a and b.

(iii) Solve the equations
$$x-2y=1,$$
$$3xy-y^2=8.$$

9. A man buys a consignment of garden stone for £90. He keeps 10 tons for his own use and sells the remainder at a profit of 25 shillings per ton. If he receives £70 from the sale find the weight, in tons, of the consignment.

10. (i) Find how many terms of the series 23, 19, 15 . . . must be added for the sum to be 12.

(ii) The third term of a geometric series, in which all the terms are positive, is 18 and the fifth term is 40·5. Find the first term and the sum of the first six terms.

11. Draw the graph of $\frac{1}{4}(3x^2-5x-4)$ for values of x from -2 to $+3$, using a scale of 1 inch to 1 unit on each axis.

Use your graph to find the least value of $3x^2-5x-4$.

By drawing the appropriate straight line on your graph solve the equation $3x^2-5x-6=0$.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1955

PURE MATHEMATICS

(b) **ALGEBRA**

FRIDAY, *June* 17.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) If $p=2$ and $q=-1$, find the value of

$$(p-q)^2-(p^2-q^2).$$

(ii) Factorise $8x^2-2x-3$.

(iii) Express in its simplest form

$$\frac{2}{x-1}-\frac{4}{2x+1}.$$

2. (i) Solve the equation $\frac{1}{2}x-\frac{1}{3}(x-4)=\frac{1}{6}$.

(ii) If $2x+3y=5$ and $3x-5y=-21$, find the value of y.

(iii) If $\frac{a^{12}}{a^6\times a^2}=a^p$, find the value of p.

3. (i) A rectangular room is $3l$ feet long and $2l$ feet wide. Find the area of a carpet for this room if a border x feet wide is left all round the carpet.

If the area of the border is $96x^2$ square feet, find x in terms of l.

(ii) The *sum* of n terms of a series is $\frac{1}{3}n(4n^2-1)$. Find the first two terms.

4. (i) If $s=ut+\frac{1}{2}at^2$, find the positive value of t which makes $s=-24$ when $u=40$ and $a=-32$.

(ii) Given that $\dfrac{3x+4y}{5x+2y}=\dfrac{3}{4}$, express y in terms of x.

5. Find the number that must be added to x^2-7x to make the expression a perfect square.

Hence or otherwise solve the equation $x^2-7x-11=0$, giving the roots correct to three significant figures.

6. A and B walk to meet each other from towns which are $15\frac{3}{4}$ miles apart. The ratio of their speeds is $6:7$ and B starts 30 minutes later than A. If they meet after B has walked for three hours, find their speeds.

Section B

[*Answer any* THREE *questions from this section.*]

7. (i) If $\log_{10}2=0{\cdot}30103$ and $\log_{10}3=0{\cdot}47712$ calculate, without the use of tables, $\log_{10}6$ and $\log_{10}1{\cdot}5$.

(ii) Express in its simplest form $\left(\dfrac{8}{a^{12}}\right)^{-\frac{2}{3}}$.

(iii) If $a=0{\cdot}3157$ and $b=17{\cdot}24$, use logarithms to calculate the square root of a^3b.

8. (i) Find the value of k if $2x+1$ is a factor of $8x^3+2x+k$.

(ii) If $\dfrac{x+b}{2}-\dfrac{a-x}{3}=3(a+b)$, express x in terms of a and b.

(iii) Solve the equations

$$x-2y=1,$$
$$3xy-y^2=8.$$

9. A man buys a consignment of garden stone for £90. He keeps 10 tons for his own use and sells the remainder at a profit of 25 shillings per ton. If he receives £70 from the sale find the weight, in tons, of the consignment.

10. (i) Find how many terms of the series 23, 19, 15 . . . must be added for the sum to be 12.

(ii) The third term of a geometric series, in which all the terms are positive, is 18 and the fifth term is 40·5. Find the first term and the sum of the first six terms.

11. Draw the graph of $\frac{1}{4}(3x^2-5x-4)$ for values of x from -2 to $+3$, using a scale of 1 inch to 1 unit on each axis.

Use your graph to find the least value of $3x^2-5x-4$.

By drawing the appropriate straight line on your graph solve the equation $3x^2-5x-6=0$.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1955

PURE MATHEMATICS

(b) **ALGEBRA**

FRIDAY, *June* 17.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) If $p=2$ and $q=-1$, find the value of

$$(p-q)^2-(p^2-q^2).$$

(ii) Factorise $8x^2-2x-3$.

(iii) Express in its simplest form

$$\frac{2}{x-1}-\frac{4}{2x+1}.$$

2. (i) Solve the equation $\frac{1}{2}x-\frac{1}{3}(x-4)=\frac{1}{6}$.

(ii) If $2x+3y=5$ and $3x-5y=-21$, find the value of y.

(iii) If $\frac{a^{12}}{a^6\times a^2}=a^p$, find the value of p.

3. (i) A rectangular room is $3l$ feet long and $2l$ feet wide. Find the area of a carpet for this room if a border x feet wide is left all round the carpet.

If the area of the border is $96x^2$ square feet, find x in terms of l.

(ii) The *sum* of n terms of a series is $\frac{1}{3}n(4n^2-1)$. Find the first two terms.

4. (i) If $s=ut+\frac{1}{2}at^2$, find the positive value of t which makes $s=-24$ when $u=40$ and $a=-32$.

(ii) Given that $\dfrac{3x+4y}{5x+2y}=\dfrac{3}{4}$, express y in terms of x.

5. Find the number that must be added to x^2-7x to make the expression a perfect square.

Hence or otherwise solve the equation $x^2-7x-11=0$, giving the roots correct to three significant figures.

6. A and B walk to meet each other from towns which are $15\frac{3}{4}$ miles apart. The ratio of their speeds is $6:7$ and B starts 30 minutes later than A. If they meet after B has walked for three hours, find their speeds.

Section B

[*Answer any* THREE *questions from this section.*]

7. (i) If $\log_{10} 2=0{\cdot}30103$ and $\log_{10} 3=0{\cdot}47712$ calculate, without the use of tables, $\log_{10} 6$ and $\log_{10} 1{\cdot}5$.

(ii) Express in its simplest form $\left(\dfrac{8}{a^{12}}\right)^{-\frac{2}{3}}$.

(iii) If $a=0{\cdot}3157$ and $b=17{\cdot}24$, use logarithms to calculate the square root of a^3b.

8. (i) Find the value of k if $2x+1$ is a factor of $8x^3+2x+k$.

(ii) If $$\frac{x+b}{2}-\frac{a-x}{3}=3(a+b),$$

express x in terms of a and b.

(iii) Solve the equations
$$x-2y=1,$$
$$3xy-y^2=8.$$

9. A man buys a consignment of garden stone for £90. He keeps 10 tons for his own use and sells the remainder at a profit of 25 shillings per ton. If he receives £70 from the sale find the weight, in tons, of the consignment.

10. (i) Find how many terms of the series 23, 19, 15 . . . must be added for the sum to be 12.

(ii) The third term of a geometric series, in which all the terms are positive, is 18 and the fifth term is 40·5. Find the first term and the sum of the first six terms.

11. Draw the graph of $\frac{1}{4}(3x^2-5x-4)$ for values of x from -2 to $+3$, using a scale of 1 inch to 1 unit on each axis.

Use your graph to find the least value of $3x^2-5x-4$.

By drawing the appropriate straight line on your graph solve the equation $3x^2-5x-6=0$.

$\frac{1}{x-10}$ 25

$\frac{5}{4} \times 20 + \frac{90}{30} \times 20 = 70$

25 +

$$\begin{array}{r} 360 \\ 3 \\ \hline 1080 \end{array} \qquad \begin{array}{r} 30 \\ 36 \\ \hline 180 \\ 90 \\ \hline 1080 \end{array}$$

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1955

PURE MATHEMATICS

(b) **ALGEBRA**

FRIDAY, *June* 17.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) If $p=2$ and $q=-1$, find the value of
$$(p-q)^2-(p^2-q^2).$$
(ii) Factorise $8x^2-2x-3$.
(iii) Express in its simplest form
$$\frac{2}{x-1}-\frac{4}{2x+1}.$$

2. (i) Solve the equation $\frac{1}{2}x-\frac{1}{3}(x-4)=\frac{1}{6}$.
(ii) If $2x+3y=5$ and $3x-5y=-21$, find the value of y.
(iii) If $\frac{a^{12}}{a^6\times a^2}=a^p$, find the value of p.

3. (i) A rectangular room is $3l$ feet long and $2l$ feet wide. Find the area of a carpet for this room if a border x feet wide is left all round the carpet.

If the area of the border is $96x^2$ square feet, find x in terms of l.

(ii) The *sum* of n terms of a series is $\frac{1}{3}n(4n^2-1)$. Find the first two terms. n = 1 gives the first term

4. (i) If $s=ut+\frac{1}{2}at^2$, find the positive value of t which makes $s=-24$ when $u=40$ and $a=-32$.

(ii) Given that $\dfrac{3x+4y}{5x+2y}=\dfrac{3}{4}$, express y in terms of x.

5. Find the number that must be added to x^2-7x to make the expression a perfect square.

Hence or otherwise solve the equation $x^2-7x-11=0$, giving the roots correct to three significant figures.

6. A and B walk to meet each other from towns which are $15\frac{3}{4}$ miles apart. The ratio of their speeds is 6 : 7 and B starts 30 minutes later than A. If they meet after B has walked for three hours, find their speeds.

Section B

[*Answer any* THREE *questions from this section.*]

7. (i) If $\log_{10} 2=0{\cdot}30103$ and $\log_{10} 3=0{\cdot}47712$ calculate, without the use of tables, $\log_{10} 6$ and $\log_{10} 1{\cdot}5$.

(ii) Express in its simplest form $\left(\dfrac{8}{a^{12}}\right)^{-\frac{2}{3}}$.

(iii) If $a=0{\cdot}3157$ and $b=17{\cdot}24$, use logarithms to calculate the square root of a^3b.

8. (i) Find the value of k if $2x+1$ is a factor of $8x^3+2x+k$.

(ii) If $$\frac{x+b}{2}-\frac{a-x}{3}=3(a+b),$$

express x in terms of a and b.

(iii) Solve the equations

$$x-2y=1,$$
$$3xy-y^2=8.$$

9. A man buys a consignment of garden stone for £90. He keeps 10 tons for his own use and sells the remainder at a profit of 25 shillings per ton. If he receives £70 from the sale find the weight, in tons, of the consignment.

10. (i) Find how many terms of the series 23, 19, 15 . . . must be added for the sum to be 12.

(ii) The third term of a geometric series, in which all the terms are positive, is 18 and the fifth term is 40.5. Find the first term and the sum of the first six terms.

11. Draw the graph of $\frac{1}{4}(3x^2-5x-4)$ for values of x from -2 to $+3$, using a scale of 1 inch to 1 unit on each axis.

Use your graph to find the least value of $3x^2-5x-4$.

By drawing the appropriate straight line on your graph solve the equation $3x^2-5x-6=0$.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1954

PURE MATHEMATICS

(b) ALGEBRA

Examiners :
L. A. V. ABLEY, Esq., B.A., B.Sc.
M. W. BROWN, Esq., M.A.

FRIDAY, June 18.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) If $a=2$, $b=-3$, $c=5$, find the value of $3a^2-4bc$.

(ii) Factorize completely $2x^2-18$.

(iii) Solve the equation $1-\frac{x}{3}=4(1-x)$.

T. & F.—53/1178 14/2/35000 [P. T. O.

2. (i) Simplify $(2x-1)(x-4)-(x+2)^2$.

(ii) A road rises a feet for every b yards of its length. How many feet does it rise in n miles ?

(iii) Find the second term of the series whose nth term is $\frac{3^n}{n^2+1}$.

3. (i) Given that $y=ax+b$, that $y=11$ when $x=5$, and that $y=20$ when $x=8$, find the values of a and b.

(ii) Express as a single fraction in its lowest terms

$$\frac{6x}{x^2-4}-\frac{3}{x+2}.$$

4. Solve the equation $3x^2+2x-6=0$, giving the roots correct to one place of decimals.

5. Given that $E=\frac{W(a-b)}{2aP}$ find

(i) the value of E when $a=10$, $b=9{\cdot}5$, $W=288$, $P=18$;

(ii) a formula for a in terms of the other letters.

6. The length and breadth of a rectangular plate are $2a$ inches and $(a-1)$ inches respectively. When the length is halved and the breadth increased by 4 inches, the area is decreased by D square inches.

(i) Prove that $D=a(a-5)$.

(ii) Use the result of (i) to find a when $D=2\frac{3}{4}$.

Section B

[*Answer any* THREE *questions from this section.*]

7. (i) Find k if $(x-2)$ is a factor of $2x^3-3x^2+kx+2$. With this value of k solve the equation

$$2x^3-3x^2+kx+2=0.$$

(ii) Solve the equations

$$x-y=4$$
$$(x-2)^2+(y-1)^2=5.$$

8. (i) Simplify

$$a^{\frac{1}{3}}b^{\frac{2}{3}}\div\frac{a^{-\frac{2}{3}}}{b^{\frac{1}{3}}}.$$

(ii) Calculate the value of the expression $\frac{P^2g}{A}$ when $P=1{\cdot}79\times10^3$, $g=9{\cdot}81\times10^2$ and $A=3{\cdot}29\times10^{-1}$.

Express your result in the form $k\times10^n$ where k is a number between 1 and 10, correct to three significant figures, and n is a whole number.

9. A train is scheduled to run 120 miles at a uniform speed of u miles per hour. During the earlier part of its journey it is delayed and takes 10 minutes longer to complete the first 40 miles than it should. The remainder of the journey is completed at a uniform speed of $(u+2)$ miles per hour and the train arrives at the appointed time.

(i) Find expressions in hours for the times taken (*a*) for the first 40 miles; (*b*) for the remainder of the journey.

(ii) With the help of these expressions form an equation from which the value of u can be found, and then solve the equation.

[P. T. O.

10. (i) Of the following three series

$$\tfrac{2}{3},\ 1,\ 1\tfrac{1}{2}\ \ldots\ .$$

$$\tfrac{1}{2},\ \tfrac{1}{3},\ \tfrac{1}{4}\ \ \ldots\ .$$

$$(a-b),\ 2a,\ (3a+b)\ \ldots\ .$$

one is an arithmetic progression, one a geometric progression and one is neither.

(*a*) Find the common difference of the arithmetic progression and the common ratio of the geometric progression.

(*b*) Find, but do *not* simplify, a formula for the nth term of each of the three series.

(ii) The *sum* of n terms of an arithmetic progression is $3n^2-5n$. Find the first term, the common difference and the 20th term.

11. Draw the graph of $y=3x^2-2$ for values of x from -3 to $+3$, taking 1 in. as unit for x and 1 in. as 5 units for y. Using the same scales and axes draw the graph of $y=5-x$.

(i) From your graphs find the range of values of x for which $(5-x)$ is greater than $(3x^2-2)$.

(ii) Give the values of x at the points of intersection of your graphs. Express in the form $ax^2+bx+c=0$ the equation of which these values of x are the roots.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

AUTUMN, 1954

PURE MATHEMATICS

(b) **ALGEBRA**

Examiners :
L. A. V. ABLEY, Esq., B.A., B.Sc.
M. W. BROWN, Esq., M.A.

FRIDAY, November 19.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) Find the value of $\frac{x-y}{x^2+y^2}$, when $x=2$, $y=-1$.

(ii) From $a^3-3a^2b-2ab^2$ subtract $a^2b-ab^2+3b^3$.

(iii) A car uses one gallon of petrol, costing s shillings, in travelling m miles. Find the cost in shillings of the petrol the car uses in travelling 100 miles.

2. (i) Factorise (*a*) $3a^2+5a-2$;

(*b*) x^2-y^2-x-y.

(ii) When $1-2x+x^2$ is multiplied by $1-kx+x^2$ the coefficient of x^2 is zero. Find the value of k.

T. & F.—53/1299 14/2/11000

[P. T. O.

3. (i) Solve the equation $\frac{5x-3}{2}-\frac{3x-1}{5}=12$.

(ii) Express as a single fraction $\frac{3p+q}{3p}-\frac{3p}{3p-q}$.

4. For a uniform beam l feet long, of a certain material, whose section is a rectangle breadth b inches, depth d inches, the safe load at the middle is w lb., where

$$w=\frac{84\,bd^2}{l}.$$

(*a*) Find the safe load at the middle of such a beam of length 6 feet, breadth 1 inch, depth 2 inches.

(*b*) Find a formula for d in terms of l, b, w.

5. Solve the equation $3x^2-4x-5=0$, giving the roots correct to one decimal place.

6. (i) If $x=9$, find *without* the use of tables, the values of (*a*) $x^{3/2}$, (*b*) x^{-2}.

(ii) In a school of 200 juniors and 160 seniors the games subscription for a senior is 1 shilling more than that for a junior. If the subscription were 2 shillings for every member of the school, the total for the whole school would be increased by £10. Find the original subscription for a junior.

SECTION B

[*Answer* THREE *questions from this section.*]

7. (i) If $x-3$ is a factor of $x^3+px^2-21x+18$, find the value of p and the other two factors.

(ii) If $A\,(x+6)+B\,(x+4)=x$ for all values of x, where A and B are numerical constants, find the values of A and B.

8. (i) Solve the equations $x+3y=1$,
$x^2+3y-y^2=12$.

(ii) Calculate by logarithms the value of

$$\sqrt[3]{\frac{1{\cdot}39}{2{\cdot}713^2\times 1{\cdot}427}}.$$

9. Draw the graph of $y=\frac{14}{x+2}$ for values of x from 0 to 5, taking 1 inch as unit on each axis. Find the value of x at the point where this graph is cut by the graph of $y=\frac{x}{2}$. Express in the form of $x^2+px+q=0$ the equation of which this value of x is a root.

10. (i) A truck starting from rest down a certain slope travels 1 foot in the first second, 3 feet in the next second and so on, the distances in successive seconds forming an arithmetic series. What distance does it travel in the tenth second?
If the slope is 900 feet long, what time is taken by the truck to reach the bottom?

(ii) The sum of the first two terms of a geometric series is 5, while the third term exceeds the second by $1\frac{1}{2}$. Find the common ratio. (There are two possible answers.)

11. A householder spends £23 a year on solid fuel. If he buys a better fuel, costing 5 shillings a ton more, he uses half a ton less and spends £21 in the year. What was his original annual consumption?

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1954

PURE MATHEMATICS

(b) ALGEBRA

Examiners :
L. A. V. ABLEY, Esq., B.A., B.Sc.
M. W. BROWN, Esq., M.A.

FRIDAY, June 18.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) If $a=2$, $b=-3$, $c=5$, find the value of $3a^2-4bc$.

(ii) Factorize completely $2x^2-18$.

(iii) Solve the equation $1-\frac{x}{3}=4(1-x)$.

2. (i) Simplify $(2x-1)(x-4)-(x+2)^2$.

(ii) A road rises a feet for every b yards of its length. How many feet does it rise in n miles ?

(iii) Find the second term of the series whose nth term is $\dfrac{3^n}{n^2+1}$.

3. (i) Given that $y=ax+b$, that $y=11$ when $x=5$, and that $y=20$ when $x=8$, find the values of a and b.

(ii) Express as a single fraction in its lowest terms

$$\frac{6x}{x^2-4}-\frac{3}{x+2}.$$

4. Solve the equation $3x^2+2x-6=0$, giving the roots correct to one place of decimals.

5. Given that $E=\dfrac{W(a-b)}{2aP}$ find

(i) the value of E when $a=10$, $b=9{\cdot}5$, $W=288$, $P=18$;

(ii) a formula for a in terms of the other letters.

6. The length and breadth of a rectangular plate are $2a$ inches and $(a-1)$ inches respectively. When the length is halved and the breadth increased by 4 inches, the area is decreased by D square inches.

(i) Prove that $D=a(a-5)$.

(ii) Use the result of (i) to find a when $D=2\frac{3}{4}$.

Section B

[*Answer any* THREE *questions from this section.*]

7. (i) Find k if $(x-2)$ is a factor of $2x^3-3x^2+kx+2$. With this value of k solve the equation

$$2x^3-3x^2+kx+2=0.$$

(ii) Solve the equations

$$x-y=4$$
$$(x-2)^2+(y-1)^2=5.$$

8. (i) Simplify

$$a^{\frac{1}{3}}b^{\frac{2}{3}}\div\frac{a^{-\frac{2}{3}}}{b^{\frac{1}{3}}}.$$

(ii) Calculate the value of the expression $\dfrac{P^2g}{A}$ when $P=1{\cdot}79\times10^3$, $g=9{\cdot}81\times10^2$ and $A=3{\cdot}29\times10^{-1}$.

Express your result in the form $k\times10^n$ where k is a number between 1 and 10, correct to three significant figures, and n is a whole number.

9. A train is scheduled to run 120 miles at a uniform speed of u miles per hour. During the earlier part of its journey it is delayed and takes 10 minutes longer to complete the first 40 miles than it should. The remainder of the journey is completed at a uniform speed of $(u+2)$ miles per hour and the train arrives at the appointed time.

(i) Find expressions in hours for the times taken (*a*) for the first 40 miles ; (*b*) for the remainder of the journey.

(ii) With the help of these expressions form an equation from which the value of u can be found, and then solve the equation.

10. (i) Of the following three series

$$\tfrac{2}{3},\ 1,\ 1\tfrac{1}{2}\ \ldots\ldots$$

$$\tfrac{1}{2},\ \tfrac{1}{3},\ \tfrac{1}{4}\ \ \ldots\ldots$$

$$(a-b),\ 2a,\ (3a+b)\ \ldots\ldots$$

one is an arithmetic progression, one a geometric progression and one is neither.

(*a*) Find the common difference of the arithmetic progression and the common ratio of the geometric progression.

(*b*) Find, but do *not* simplify, a formula for the nth term of each of the three series.

(ii) The *sum* of n terms of an arithmetic progression is $3n^2-5n$. Find the first term, the common difference and the 20th term.

11. Draw the graph of $y=3x^2-2$ for values of x from -3 to $+3$, taking 1 in. as unit for x and 1 in. as 5 units for y. Using the same scales and axes draw the graph of $y=5-x$.

(i) From your graphs find the range of values of x for which $(5-x)$ is greater than $(3x^2-2)$.

(ii) Give the values of x at the points of intersection of your graphs. Express in the form $ax^2+bx+c=0$ the equation of which these values of x are the roots.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1954

PURE MATHEMATICS

(b) ALGEBRA

Examiners :

L. A. V. ABLEY, Esq., B.A., B.Sc.
M. W. BROWN, Esq., M.A.

FRIDAY, June 18.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) If $a=2$, $b=-3$, $c=5$, find the value of $3a^2-4bc$.

(ii) Factorize completely $2x^2-18$.

(iii) Solve the equation $1-\frac{x}{3}=4(1-x)$.

2. (i) Simplify $(2x-1)(x-4)-(x+2)^2$.

(ii) A road rises a feet for every b yards of its length. How many feet does it rise in n miles ?

(iii) Find the second term of the series whose nth term is $\dfrac{3^n}{n^2+1}$.

3. (i) Given that $y=ax+b$, that $y=11$ when $x=5$, and that $y=20$ when $x=8$, find the values of a and b.

(ii) Express as a single fraction in its lowest terms

$$\frac{6x}{x^2-4}-\frac{3}{x+2}.$$

4. Solve the equation $3x^2+2x-6=0$, giving the roots correct to one place of decimals.

5. Given that $E=\dfrac{W(a-b)}{2aP}$ find

(i) the value of E when $a=10$, $b=9{\cdot}5$, $W=288$, $P=18$;

(ii) a formula for a in terms of the other letters.

6. The length and breadth of a rectangular plate are $2a$ inches and $(a-1)$ inches respectively. When the length is halved and the breadth increased by 4 inches, the area is decreased by D square inches.

(i) Prove that $D=a(a-5)$.

(ii) Use the result of (i) to find a when $D=2\frac{3}{4}$.

Section B

[Answer any THREE *questions from this section.]*

7. (i) Find k if $(x-2)$ is a factor of $2x^3-3x^2+kx+2$. With this value of k solve the equation

$$2x^3-3x^2+kx+2=0.$$

(ii) Solve the equations

$$x-y=4$$
$$(x-2)^2+(y-1)^2=5.$$

8. (i) Simplify

$$a^{\frac{1}{3}}b^{\frac{2}{3}}\div\frac{a^{-\frac{2}{3}}}{b^{\frac{1}{3}}}.$$

(ii) Calculate the value of the expression $\dfrac{P^2g}{A}$ when $P=1{\cdot}79\times10^3$, $g=9{\cdot}81\times10^2$ and $A=3{\cdot}29\times10^{-1}$.

Express your result in the form $k\times10^n$ where k is a number between 1 and 10, correct to three significant figures, and n is a whole number.

9. A train is scheduled to run 120 miles at a uniform speed of u miles per hour. During the earlier part of its journey it is delayed and takes 10 minutes longer to complete the first 40 miles than it should. The remainder of the journey is completed at a uniform speed of $(u+2)$ miles per hour and the train arrives at the appointed time.

(i) Find expressions in hours for the times taken (*a*) for the first 40 miles ; (*b*) for the remainder of the journey.

(ii) With the help of these expressions form an equation from which the value of u can be found, and then solve the equation.

10. (i) Of the following three series

$$\tfrac{2}{3},\ 1,\ 1\tfrac{1}{2}\ \ldots\ldots$$

$$\tfrac{1}{2},\ \tfrac{1}{3},\ \tfrac{1}{4}\ \ \ldots\ldots$$

$$(a-b),\ 2a,\ (3a+b)\ \ldots\ldots$$

one is an arithmetic progression, one a geometric progression and one is neither.

(*a*) Find the common difference of the arithmetic progression and the common ratio of the geometric progression.

(*b*) Find, but do *not* simplify, a formula for the nth term of each of the three series.

(ii) The *sum* of n terms of an arithmetic progression is $3n^2-5n$. Find the first term, the common difference and the 20th term.

11. Draw the graph of $y=3x^2-2$ for values of x from -3 to $+3$, taking 1 in. as unit for x and 1 in. as 5 units for y. Using the same scales and axes draw the graph of $y=5-x$.

(i) From your graphs find the range of values of x for which $(5-x)$ is greater than $(3x^2-2)$.

(ii) Give the values of x at the points of intersection of your graphs. Express in the form $ax^2+bx+c=0$ the equation of which these values of x are the roots.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1954

PURE MATHEMATICS

(b) **ALGEBRA**

Examiners :

L. A. V. ABLEY, Esq., B.A., B.Sc.
M. W. BROWN, Esq., M.A.

FRIDAY, *June* 18.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) If $a=2$, $b=-3$, $c=5$, find the value of $3a^2-4bc$.

(ii) Factorize completely $2x^2-18$.

(iii) Solve the equation $1-\frac{x}{3}=4(1-x)$.

T. & F.—53/1178 14/2/35000

[P. T. O.

2. (i) Simplify $(2x-1)(x-4)-(x+2)^2$.

(ii) A road rises a feet for every b yards of its length. How many feet does it rise in n miles ?

(iii) Find the second term of the series whose nth term is $\frac{3^n}{n^2+1}$.

3. (i) Given that $y=ax+b$, that $y=11$ when $x=5$, and that $y=20$ when $x=8$, find the values of a and b.

(ii) Express as a single fraction in its lowest terms

$$\frac{6x}{x^2-4}-\frac{3}{x+2}.$$

4. Solve the equation $3x^2+2x-6=0$, giving the roots correct to one place of decimals.

5. Given that $E=\frac{W(a-b)}{2aP}$ find

(i) the value of E when $a=10$, $b=9{\cdot}5$, $W=288$, $P=18$;

(ii) a formula for a in terms of the other letters.

6. The length and breadth of a rectangular plate are $2a$ inches and $(a-1)$ inches respectively. When the length is halved and the breadth increased by 4 inches, the area is decreased by D square inches.

(i) Prove that $D=a(a-5)$.

(ii) Use the result of (i) to find a when $D=2\frac{3}{4}$.

SECTION B

[*Answer any* THREE *questions from this section.*]

7. (i) Find k if $(x-2)$ is a factor of $2x^3-3x^2+kx+2$. With this value of k solve the equation

$$2x^3-3x^2+kx+2=0.$$

(ii) Solve the equations

$$x-y=4$$
$$(x-2)^2+(y-1)^2=5.$$

8. (i) Simplify

$$a^{\frac{1}{3}}b^{\frac{2}{3}}\div\frac{a^{-\frac{2}{3}}}{b^{\frac{1}{3}}}.$$

(ii) Calculate the value of the expression $\frac{P^2g}{A}$ when $P=1{\cdot}79\times10^3$, $g=9{\cdot}81\times10^2$ and $A=3{\cdot}29\times10^{-1}$.
Express your result in the form $k\times10^n$ where k is a number between 1 and 10, correct to three significant figures, and n is a whole number.

9. A train is scheduled to run 120 miles at a uniform speed of u miles per hour. During the earlier part of its journey it is delayed and takes 10 minutes longer to complete the first 40 miles than it should. The remainder of the journey is completed at a uniform speed of $(u+2)$ miles per hour and the train arrives at the appointed time.

(i) Find expressions in hours for the times taken (a) for the first 40 miles ; (b) for the remainder of the journey.

(ii) With the help of these expressions form an equation from which the value of u can be found, and then solve the equation.

[P. T. O.

10. (i) Of the following three series

$$\tfrac{2}{3},\ 1,\ 1\tfrac{1}{2}\ \ldots\ldots$$

$$\tfrac{1}{2},\ \tfrac{1}{3},\ \tfrac{1}{4}\ \ldots\ldots$$

$$(a-b),\ 2a,\ (3a+b)\ \ldots\ldots$$

one is an arithmetic progression, one a geometric progression and one is neither.

(*a*) Find the common difference of the arithmetic progression and the common ratio of the geometric progression.

(*b*) Find, but do *not* simplify, a formula for the nth term of each of the three series.

(ii) The *sum* of n terms of an arithmetic progression is $3n^2-5n$. Find the first term, the common difference and the 20th term.

11. Draw the graph of $y=3x^2-2$ for values of x from -3 to $+3$, taking 1 in. as unit for x and 1 in. as 5 units for y. Using the same scales and axes draw the graph of $y=5-x$.

(i) From your graphs find the range of values of x for which $(5-x)$ is greater than $(3x^2-2)$.

(ii) Give the values of x at the points of intersection of your graphs. Express in the form $ax^2+bx+c=0$ the equation of which these values of x are the roots.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1953

PURE MATHEMATICS

(b) **ALGEBRA**

Examiners :
C. W. BARTRAM, Esq., M.Sc.
E. D. HODGE, Esq., B.Sc.

FRIDAY, *June* 19.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) Find the value of $4x^2 - \dfrac{x-4}{x+5}$ when $x = -2$.

   (ii) Express as a single fraction $\dfrac{5}{x-1} - \dfrac{2}{x-4}$.

   (iii) If $x+3y=0$ and $2x-5y=11$, find x.

2. (i) Solve the equation $2x^2-5x-12=0$.

   (ii) Factorise $9a^2-(2b+c)^2$.

   (iii) Substitute $(2y+3)$ for x in the expression x^2-x-6, giving your result in factors.

T. & F.—52/1170 14/4/35,000 [P. T. O.

3. (i) Solve the equation $\frac{2x+5}{3} - \frac{3x-8}{12} = 4$.

(ii) What number added to x^2+9x will make the result a perfect square?

(iii) An article costing x shillings is sold at a profit of y per cent on the cost price. What is the selling price in £?

4. Solve the equation $2x^2-12x+15=0$ giving the roots correct to one decimal place.

5. (i) Without using tables find the values of

$$16^{\frac{3}{4}}, \qquad 8^{-\frac{1}{3}}, \qquad (2^{-2})^3.$$

(ii) Use logarithm tables to find the values of $6^{\frac{2}{3}}$ and the fourth root of 0·0012.

6. (i) If $A = \frac{\pi d^2}{4}$ find a formula for d.

(ii) If $\frac{2}{x} = \frac{1}{y} - \frac{1}{z}$ express z in terms of x and y.

Section B

[*Answer any* THREE *questions from this section.*]

7. (i) Find the values of a and b if $(x-1)$ and $(x+3)$ are both factors of x^3-ax-b and find the third factor. a = 14 b = 13

(ii) Find the square of x^2+px+5. Hence, or otherwise, find the values of a and b which make

$$x^4-6x^3+ax^2+bx+25$$ p = -3, a = 19, b = -30

a perfect square. $(x^4-3x+5)^2$

8. (i) The ratio of two lengths is 3 : 5. If the first length is increased by 2 ft. and the second by 12 ft. the ratio becomes 1 : 3. Find the original lengths.

(ii) Solve the equations

$$x+2y=1, \qquad 3x^2+7xy+5y^2=1.$$

9. A wholesaler pays £60 for a motor-cycle which he sells at a profit to a retailer. The retailer sells it to a customer for £85 16*s.* 0*d.* making a percentage profit on his outlay three times as great as the percentage profit made by the wholesaler on his outlay. At what price did the retailer buy the motor-cycle?

10. (i) A piece of wire 12 ft. long is cut into 18 pieces whose lengths are in arithmetic progression, the difference between the length of any one piece and the next larger being one-quarter inch. What are the lengths of the shortest and longest pieces?

(ii) The first and fourth terms of a geometric progression are $\frac{x}{y^2}$ and $\frac{y}{x^5}$. Find the second and third terms.

11. Draw the graph of $5+6x-2x^2$ for values of x from $x=-1$ to $x=4$ taking 1 in. as 1 unit for x and 1 in. as 4 units for y. From your graph find the range of values of x for which the expression $5+6x-2x^2$ is positive.

Using the same axes and scales find, by drawing another graph, the values of x between which $5+6x-2x^2$ is greater than $2x+3$.

9. A wholesaler pays £60 for a motor-cycle which he sells at a profit to a retailer. The retailer sells it to a customer for £85 10s. 0d., making a percentage profit on his outlay three times as great as the percentage profit made by the wholesaler. At what price did the retailer buy the motor-cycle?

10. (i) A piece of wire 4 ft. long is cut into 12 pieces whose lengths are in arithmetic progression, the difference between the length of any one piece and the next larger being one-quarter inch. What are the lengths of the shortest and longest pieces?

(ii) The first and fourth terms of a geometric progression are [illegible] and [illegible]. Find the second and third terms.

11. Draw the graph of [illegible] for values of x from $x = -1$ to $x = 4$, taking 1 in. as 1 unit for x and 1 in. as 4 units for y. From your graph find the range of values of x for which the expression [illegible] is positive.

Using the same axes and scales find, by drawing another graph, the values of x between which [illegible] is greater than [illegible].

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1953

PURE MATHEMATICS

(b) **ALGEBRA**

Examiners :
C. W. BARTRAM, Esq., M.Sc.
E. D. HODGE, Esq., B.Sc.

FRIDAY, June 19.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) Find the value of $4x^2 - \frac{x-4}{x+5}$ when $x = -2$.

   (ii) Express as a single fraction $\frac{5}{x-1} - \frac{2}{x-4}$.

   (iii) If $x+3y=0$ and $2x-5y=11$, find x.

2. (i) Solve the equation $2x^2-5x-12=0$.

   (ii) Factorise $9a^2-(2b+c)^2$.

   (iii) Substitute $(2y+3)$ for x in the expression x^2-x-6, giving your result in factors.

3. (i) Solve the equation $\frac{2x+5}{3}-\frac{3x-8}{12}=4$.

(ii) What number added to x^2+9x will make the result a perfect square ?

(iii) An article costing x shillings is sold at a profit of y per cent on the cost price. What is the selling price in £ ?

4. Solve the equation $2x^2-12x+15=0$ giving the roots correct to one decimal place.

5. (i) Without using tables find the values of

$$16^{\frac{3}{4}}, \qquad 8^{-\frac{1}{3}}, \qquad (2^{-2})^3.$$

(ii) Use logarithm tables to find the values of $6^{\frac{2}{3}}$ and the fourth root of 0·0012.

6. (i) If $A=\frac{\pi d^2}{4}$ find a formula for d.

(ii) If $\frac{2}{x}=\frac{1}{y}-\frac{1}{z}$ express z in terms of x and y.

Section B

[*Answer any* THREE *questions from this section.*]

7. (i) Find the values of a and b if $(x-1)$ and $(x+3)$ are both factors of x^3-ax-b and find the third factor.

(ii) Find the square of x^2+px+5. Hence, or otherwise, find the values of a and b which make

$$x^4-6x^3+ax^2+bx+25$$

a perfect square.

8. (i) The ratio of two lengths is 3 : 5. If the first length is increased by 2 ft. and the second by 12 ft. the ratio becomes 1 : 3. Find the original lengths.

(ii) Solve the equations

$$x+2y=1, \qquad 3x^2+7xy+5y^2=1.$$

9. A wholesaler pays £60 for a motor-cycle which he sells at a profit to a retailer. The retailer sells it to a customer for £85 16*s.* 0*d.* making a percentage profit on his outlay three times as great as the percentage profit made by the wholesaler on his outlay. At what price did the retailer buy the motor-cycle ?

10. (i) A piece of wire 12 ft. long is cut into 18 pieces whose lengths are in arithmetic progression, the difference between the length of any one piece and the next larger being one-quarter inch. What are the lengths of the shortest and longest pieces ?

(ii) The first and fourth terms of a geometric progression are $\frac{x}{y^2}$ and $\frac{y}{x^5}$. Find the second and third terms.

11. Draw the graph of $5+6x-2x^2$ for values of x from $x=-1$ to $x=4$ taking 1 in. as 1 unit for x and 1 in. as 4 units for y. From your graph find the range of values of x for which the expression $5+6x-2x^2$ is positive.

Using the same axes and scales find, by drawing another graph, the values of x between which $5+6x-2x^2$ is greater than $2x+3$.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1953

PURE MATHEMATICS

(b) ALGEBRA

Examiners :
C. W. BARTRAM, Esq., M.Sc.
E. D. HODGE, Esq., B.Sc.

FRIDAY, *June* 19.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) Find the value of $4x^2 - \dfrac{x-4}{x+5}$ when $x = -2$.

   (ii) Express as a single fraction $\dfrac{5}{x-1} - \dfrac{2}{x-4}$.

   (iii) If $x+3y=0$ and $2x-5y=11$, find x.

2. (i) Solve the equation $2x^2-5x-12 = 0$.

   (ii) Factorise $9a^2-(2b+c)^2$.

   (iii) Substitute $(2y+3)$ for x in the expression x^2-x-6, giving your result in factors.

T. & F.—52/1170 14/4/35,000 [P. T. O.

3. (i) Solve the equation $\dfrac{2x+5}{3}-\dfrac{3x-8}{12}=4$.

(ii) What number added to x^2+9x will make the result a perfect square ?

(iii) An article costing x shillings is sold at a profit of y per cent on the cost price. What is the selling price in £ ?

4. Solve the equation $2x^2-12x+15=0$ giving the roots correct to one decimal place.

5. (i) Without using tables find the values of

$$16^{\frac{3}{4}}, \qquad 8^{-\frac{1}{3}}, \qquad (2^{-2})^3.$$

(ii) Use logarithm tables to find the values of $6^{\frac{2}{3}}$ and the fourth root of 0·0012.

6. (i) If $A=\dfrac{\pi d^2}{4}$ find a formula for d.

(ii) If $\dfrac{2}{x}=\dfrac{1}{y}-\dfrac{1}{z}$ express z in terms of x and y.

Section B

[*Answer any* THREE *questions from this section.*]

7. (i) Find the values of a and b if $(x-1)$ and $(x+3)$ are both factors of x^3-ax-b and find the third factor.

(ii) Find the square of x^2+px+5. Hence, or otherwise, find the values of a and b which make

$$x^4-6x^3+ax^2+bx+25$$

a perfect square.

8. (i) The ratio of two lengths is 3 : 5. If the first length is increased by 2 ft. and the second by 12 ft. the ratio becomes 1 : 3. Find the original lengths.

(ii) Solve the equations

$$x+2y=1, \qquad 3x^2+7xy+5y^2=1.$$

9. A wholesaler pays £60 for a motor-cycle which he sells at a profit to a retailer. The retailer sells it to a customer for £85 16*s*. 0*d*. making a percentage profit on his outlay three times as great as the percentage profit made by the wholesaler on his outlay. At what price did the retailer buy the motor-cycle ?

10. (i) A piece of wire 12 ft. long is cut into 18 pieces whose lengths are in arithmetic progression, the difference between the length of any one piece and the next larger being one-quarter inch. What are the lengths of the shortest and longest pieces ?

(ii) The first and fourth terms of a geometric progression are $\dfrac{x}{y^2}$ and $\dfrac{y}{x^5}$. Find the second and third terms.

11. Draw the graph of $5+6x-2x^2$ for values of x from $x=-1$ to $x=4$ taking 1 in. as 1 unit for x and 1 in. as 4 units for y. From your graph find the range of values of x for which the expression $5+6x-2x^2$ is positive.

Using the same axes and scales find, by drawing another graph, the values of x between which $5+6x-2x^2$ is greater than $2x+3$.

9. A wholesaler pays £60 for a motor cycle which he sells at a profit to a retailer. The retailer sells it to a customer for £83 10s. 0d. making a percentage profit on his outlay three times as great as the percentage profit made by the wholesaler on his outlay. At what price did the retailer buy the motor cycle?

10. (i) A piece of wire 12 ft. long is cut into 13 pieces whose lengths are in arithmetic progression, the difference between the length of any one piece and the next larger being one-quarter inch. What are the lengths of the shortest and longest pieces?

(ii) The first and fourth terms of a geometric progression are [illegible] and [illegible]. Find the second and third terms.

11. Draw the graph of $6+4x-2x^2$ for values of x from -1 to 4, taking 1 in. as 1 unit for x and 1 in. as 4 units for y. From your graph find the range of values of x for which the expression $6+4x-2x^2$ is positive.

Using the same axes and scales find, by drawing another graph, the values of x between which $6+4x-2x^2$ is greater than $2x+3$.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

AUTUMN, 1953

PURE MATHEMATICS

(b) **ALGEBRA**

Examiners :
C. W. BARTRAM, Esq., M.Sc.
E. D. HODGE, Esq., B.Sc.

FRIDAY, *November* 20.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) Find the value of n if $\frac{5n+4}{7n-1}=\frac{1}{2}$.

(ii) Simplify $\frac{1}{a+b}+\frac{1}{a-b}$.

(iii) If $x=a+\frac{1}{a}$ and $y=a-\frac{1}{a}$, find, in its simplest form, the value of x^2-y^2.

2. (i) Factorize $a^2-ac+ab-bc$.

(ii) Solve $x^2-5x+6=5(x-2)$.

(iii) Find, in square yards, the area of a path 1 yard wide all round the outside of a square lawn each side of which is x yards. Simplify your answer.

T. & F.—52/1171 14/2/11,000

[P. T. O.

3. (i) Simplify $\dfrac{x^2+2x-35}{(x+4)^2-9}$.

(ii) A car was sold for £S. If this gave the seller a gain of r per cent on his cost price, find his cost price in terms of S and r.

4. (i) Without using logarithms find the values of

$$3^{-1}, \qquad (81)^{\frac{3}{4}}, \qquad \left(\frac{1}{3}\right)^{-2}.$$

(ii) Use logarithm tables to find the value of

$$\frac{4{\cdot}732}{5{\cdot}756}+\frac{5{\cdot}756}{4{\cdot}732}.$$

5. Solve the equation $3x^2-7x=11$, giving the answers correct to one decimal place.

6. A man can walk at an average speed of 4 miles an hour and run at an average speed of 9 miles an hour. He has to do a journey of 8 miles in 1 hour 35 min. Find the greatest distance he can walk in order that he can complete the journey in time.

Section B

[*Answer any* THREE *questions from this section.*]

7. (i) Simplify $\left(\dfrac{x}{2}-\dfrac{x-2}{x+2}\right)\div\left(\dfrac{2}{x}+\dfrac{x-2}{x+2}\right)$.

(ii) The average speeds of two trains are in the ratio 4 : 5. The slower train takes 36 min. longer to travel 180 miles than the faster train takes to travel 198 miles. Find the average speed of the slower train.

8. (i) The sum of n terms of an arithmetic progression is $n(2n+3)$. Find the sum of 20 terms and the 21st term.

(ii) The first term of an arithmetic progression is 6. If the first, seventh and tenth terms of the arithmetic progression are the first three terms of a geometric progression, find these terms.

9. (i) Factorize $y^2-22y+40$. Hence or otherwise factorize completely $(x^2-x)^2-22(x^2-x)+40$.

(ii) Solve the simultaneous equations $x+3y=1$; $2x^2+3xy=20$.

10. (i) If $A=P\left(1+\dfrac{r}{100}\right)^n$, use logarithm tables to calculate the value of P when $A=1000$, $r=3$ and $n=5$.

(ii) Use logarithms to find the least whole number value of x if 3^x exceeds one hundred million.

11. On the same axes draw the graphs of $y=\dfrac{12}{x+2}$ and $y=\dfrac{x^2}{2}$ for values of x from -1 to $+5$, taking a scale of 1 in. to 1 unit for x and 1 in. to 2 units for y. Explain briefly how your graphs can be used to find a solution of the equation $x^3+2x^2=24$ and find this solution as accurately as you can.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1952

PURE MATHEMATICS

(b) ALGEBRA

Examiners:
D. E. ARMIT, Esq., B.Sc.
J. F. GOODGER, Esq., B.Sc.

FRIDAY, *June* 13.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) Find the value of $x^2 - \frac{1}{y}$ when $x = -\frac{1}{2}$, $y = -3$.

   (ii) Solve the equation $\frac{x}{3} + \frac{x-1}{2} = 7$.

   (iii) Find x if $2x + y = 4$,
   $6x - 3y = 14$.

2. Factorise (i) $2x^2 + x - 6$;

   (ii) $(y-4)^2 - 25$;

   (iii) $3 - 2pq - 6p + q$.

T. & F.—51/1481 13/2/28,000 R/5000

[P. T. O.

3. (i) If $2^{2p}=32$, find the value of p without using tables.

(ii) When an expression E is divided by $x-2$, the quotient is $2x+1$ and the remainder is -4. Find E, giving your answer in its simplest form.

(iii) The lowest rung of a ladder of length l feet is x inches from the bottom, the rungs are all x inches apart and the top rung is x inches from the top. Find the number of rungs, assuming them to be of negligible thickness.

4. (i) Find the value of c if $x-2$ is a factor of x^3-5x^2+2x+c.

(ii) If $x=\dfrac{y+1}{3y-2}$, find y in terms of x.

5. Solve the equation $3x^2-5x=4$, giving the roots correct to two decimal places.

6. The denominator of a positive fraction exceeds the square of the numerator by 1. If the numerator and denominator are each increased by 1, the value of the new fraction is $\dfrac{2}{9}$. Find the original fraction.

Section B

[*Answer* THREE *questions from this section.*]

7. (i) Solve the equations $x-3y+1=0$,

$$3x^2-7xy=5.$$

(ii) What must be added to x^2-7x to form a perfect square? If x^2-7x-5 is equal to $(x-a)^2+b$ for all values of x, find a and b.

8. (i) Without using tables, simplify $(27^{\frac{2}{3}}+9^{\frac{3}{2}})\times 81^{-\frac{3}{4}}$.

(ii) If $\log 2=x$ and $\log 3=y$, find expressions for $\log 6$ and $\log 4{\cdot}5$ in terms of x and y.

(iii) If $\frac{4}{3}\pi r^3=328{\cdot}7$, use tables to calculate r taking $\log \pi=0{\cdot}4971$.

9. When a man walks from his home to his work, he uses a footpath and the distance is $2\frac{1}{2}$ miles. When he uses his car, the distance is $\frac{1}{2}$ mile greater, but the journey takes 40 minutes less. If he travels 15 m.p.h. faster by car than when he walks, find his rate of walking.

10. Draw in the same diagram the graph of $y=x(x-\frac{1}{2})$ from $x=0$ to $x=4$ and the graph of $y=\dfrac{6}{x}$ from $x=\frac{1}{2}$ to $x=4$, taking 1 in. as the unit on the x axis and $\frac{1}{2}$ in. as the unit on the y axis.

From your diagram, find as accurately as possible

(i) $\dfrac{6}{1{\cdot}3}$;

(ii) two positive numbers differing by $\frac{1}{2}$ whose product is 9.

Show in your diagram how each answer is obtained.

11. (i) Given that 5, p, q, 7 are in arithmetic progression, find the values of p and q.

(ii) Given that 5, x, y, $16\frac{7}{8}$ are in geometric progression, find the values of x and y.

(iii) Prove that the sum of the first 12 terms of the first series is approximately equal to the sum of the first 6 terms of the second series.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

AUTUMN, 1952

PURE MATHEMATICS

(*b*) **ALGEBRA**

Examiners :
D. E. ARMIT, Esq., B.Sc.
J. F. GOODGER, Esq., B.Sc.

FRIDAY, November 21.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) Find the value of $\frac{(a-b)(b-c)}{(a-c)}$ when $a=2$, $b=-3$, $c=4$.

(ii) Find the coefficient of x^2 in the product of $2x^2-x+2$ and x^2+3x-1.

(iii) Express as a single fraction $\frac{x}{x+1}-\frac{x-1}{x}$.

2. (i) Factorise (*a*) $6-x-5x^2$;

(*b*) a^2-b^2-a+b.

(ii) Simplify $(x+2)^2+(x-3)^2-2(x^2-x)$.

3. (i) Solve the equation $\frac{x}{4}-\frac{2(x-1)}{3}+1=0$.

(ii) Find x and y if $x-4y=1$,

$3x+2y=10$.

4. (i) If $x=\dfrac{p+q}{p-q}$, simplify $\dfrac{px-q}{qx+p}$.

(ii) The examination marks of a class range from 26 to 86. They are converted so that an original mark m becomes M where $M=\frac{5}{3}(m-26)$. Find the new top mark and the mark which remains unaltered.

5. Solve the equation $3x^2-7x-5=0$, giving the roots correct to two decimal places.

6. If the larger of two numbers is divided by the smaller, the quotient and remainder are each 4. If twenty times the smaller is divided by the larger, the quotient and remainder are again 4. Find the two numbers.

Section B

[*Answer* THREE *questions from this section.*]

7. (i) If $\dfrac{x+3y}{xy}=\dfrac{2}{x-y}$, find x in terms of y.

(ii) Of the three statements

$$(x+1)(x-1)(x+2)=x^3+x^2+x-2,$$
$$(x+1)(x-1)(x+2)=x(x^2+2x-1)-2,$$
$$(x+1)(x-1)(x+2)=x(x^2-1)+2(x^2+1),$$

one is always true, one is never true and one is sometimes true. Find which is which; and in the case of the statement which is sometimes true, find the values of x which make it true.

8. (i) Simplify $a^3b \div \sqrt{a^4b^{-2}}$.

(ii) Without using tables, find x if $\log_{10} x=\frac{2}{3}\log_{10} 64$ and y if $\log_{10}\dfrac{1}{y}=-2$.

(iii) Use logarithm tables to express $\sqrt{\dfrac{3{\cdot}8}{85{\cdot}8\times 82^3}}$ in the form $a\times 10^{-b}$ where a is a number between 1 and 10 and b is an integer.

9. Draw the graph of $2x^2-3x-5$ from $x=-2$ to $x=+3$, taking 1 in. as the unit on the x axis and $\frac{1}{2}$ in. as the unit on the y axis. Find from your graph the least value of the expression.

Using the same scales and axes, find, by drawing a straight line, the approximate values of x for which $2x^2-3x-5$ is less than $1-x$.

10. (i) The common difference of twenty-five numbers which are in arithmetic progression is $-0{\cdot}6$ and their sum is zero. Find the first term and show that the middle term is also zero.

(ii) The fifth term of a geometric progression is 8 and the ninth term is $40\frac{1}{2}$. Find the first term and the sum of the first six terms.

11. A cricketer calculates that his average of runs per innings will be increased by 1 if he scores 52 runs in his next innings and decreased by 1 if he scores 10 runs. Calculate his present average and the number of innings he has so far played.

x = average of runs per innings
y = no. of innings
∴ xy = no. of runs
∴ xy + 52 = (x+1)(y+1)
xy + 10 = (x−1)(y+1)
Solving we get x = 30
y = 19

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1952

PURE MATHEMATICS

(b) ALGEBRA

Examiners:
D. E. ARMIT, Esq., B.Sc.
J. F. GOODGER, Esq., B.Sc.

FRIDAY, *June* 13.—*Morning*, 9.30 *to* 11.30

All necessary working must be shown

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) Find the value of $x^2 - \frac{1}{y}$ when $x = -\frac{1}{2}$, $y = -3$.

   (ii) Solve the equation $\frac{x}{3} + \frac{x-1}{2} = 7$.

   (iii) Find x if $2x + y = 4$,
   $6x - 3y = 14$.

2. Factorise (i) $2x^2 + x - 6$;
   (ii) $(y-4)^2 - 25$;
   (iii) $3 - 2pq - 6p + q$.

T. & F.—51/1481 13/2/28,000 R/5000

[P. T. O.

3. (i) If $2^{2p}=32$, find the value of p without using tables.

(ii) When an expression E is divided by $x-2$, the quotient is $2x+1$ and the remainder is -4. Find E, giving your answer in its simplest form.

(iii) The lowest rung of a ladder of length l feet is x inches from the bottom, the rungs are all x inches apart and the top rung is x inches from the top. Find the number of rungs, assuming them to be of negligible thickness.

4. (i) Find the value of c if $x-2$ is a factor of x^3-5x^2+2x+c.

(ii) If $x=\dfrac{y+1}{3y-2}$, find y in terms of x.

5. Solve the equation $3x^2-5x=4$, giving the roots correct to two decimal places.

6. The denominator of a positive fraction exceeds the square of the numerator by 1. If the numerator and denominator are each increased by 1, the value of the new fraction is $\dfrac{2}{9}$. Find the original fraction.

Section B

[*Answer* THREE *questions from this section.*]

7. (i) Solve the equations $x-3y+1=0$,

$$3x^2-7xy=5.$$

(ii) What must be added to x^2-7x to form a perfect square? If x^2-7x-5 is equal to $(x-a)^2+b$ for all values of x, find a and b.

8. (i) Without using tables, simplify $(27^{\frac{2}{3}}+9^{\frac{3}{2}})\times 81^{-\frac{3}{4}}$.

(ii) If $\log 2=x$ and $\log 3=y$, find expressions for $\log 6$ and $\log 4{\cdot}5$ in terms of x and y.

(iii) If $\dfrac{4}{3}\pi r^3=328{\cdot}7$, use tables to calculate r taking $\log \pi=0{\cdot}4971$.

9. When a man walks from his home to his work, he uses a footpath and the distance is $2\frac{1}{2}$ miles. When he uses his car, the distance is $\frac{1}{2}$ mile greater, but the journey takes 40 minutes less. If he travels 15 m.p.h. faster by car than when he walks, find his rate of walking.

10. Draw in the same diagram the graph of $y=x(x-\frac{1}{2})$ from $x=0$ to $x=4$ and the graph of $y=\dfrac{6}{x}$ from $x=\frac{1}{2}$ to $x=4$, taking 1 in. as the unit on the x axis and $\frac{1}{2}$ in. as the unit on the y axis.

From your diagram, find as accurately as possible

(i) $\dfrac{6}{1{\cdot}3}$;

(ii) two positive numbers differing by $\frac{1}{2}$ whose product is 9.

Show in your diagram how each answer is obtained.

11. (i) Given that 5, p, q, 7 are in arithmetic progression, find the values of p and q.

(ii) Given that 5, x, y, $16\frac{7}{8}$ are in geometric progression, find the values of x and y.

(iii) Prove that the sum of the first 12 terms of the first series is approximately equal to the sum of the first 6 terms of the second series.

[illegible] سلم البيرة ٤/٥/٧٢

Geometry

Summ.	71
"	70
"	69
Jan.	67
Summ.	66
Jan.	65
"	64
Summ.	64

Maths A
Geom
360
Overseas

UNIVERSITY OF LONDON

General Certificate of Education Examination

SUMMER 1971 **ORDINARY LEVEL**

Mathematics 3

Syllabus A

GEOMETRY

for Candidates Overseas

Two and a half hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working and construction lines must be shown.

Section A

1. (i) Calculate the interior angle of a regular 15 sided figure.

If A, B and C are three consecutive vertices of this 15 sided figure, calculate the angle ACB.

(ii) T is a point 3·25 cm from the centre, O, of a circle of radius 1·25 cm. Calculate the length of the tangent from T to the circle.

TSE 70/1483 7/3/3/100/17160

Turn over

2.

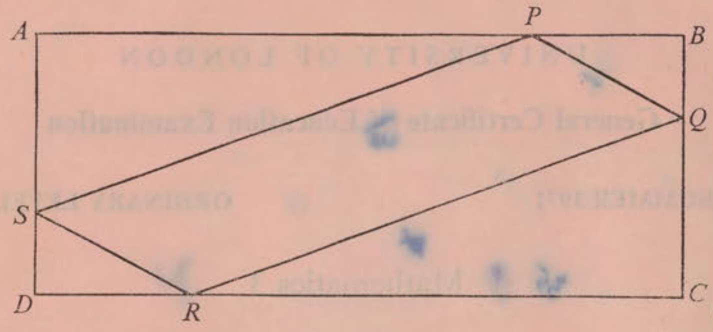


Fig. 1

In Fig. 1, $ABCD$ is a rectangle, in which $AB = 25$ cm and $AD = 10$ cm. Points P, Q, R and S are taken on the sides AB, BC, CD and DA respectively such that $PB = DR = 6$ cm and $BQ = DS = 3$ cm.

Prove that $PQRS$ is a parallelogram and calculate its area.

---

3. (i) A chord AB of a circle meets the diameter CD at right angles at the point X. If $CX = 4$ cm and $DX = 9$ cm, calculate the length of AB.

(ii) $PQRS$ is a parallelogram and M is the mid-point of QR. If SM is produced to meet PQ produced at N, prove that Q is the mid-point of PN.

---

4. Construct a quadrilateral $ABCD$ in which $AB = 5$ cm, $BC = 4$ cm, $CD = 10$ cm, $DA = 9$ cm and $AC = 8$ cm.

Construct a triangle ADK where K is a point on AB produced such that the area of the triangle ADK is equal to the area of the quadrilateral $ABCD$.

Measure the length of DK.

(*All construction lines must be clearly shown.*)

5.

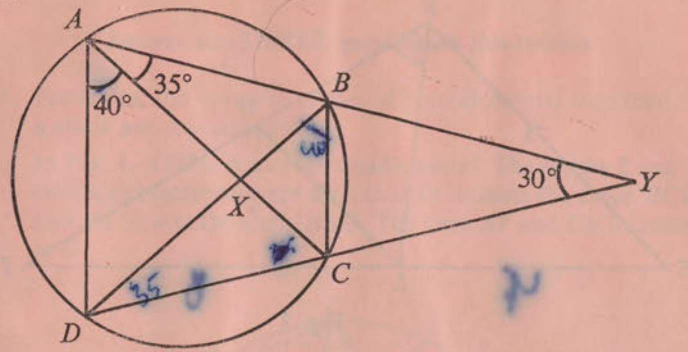


Fig. 2

In Fig. 2, $ABCD$ is a cyclic quadrilateral. The lines AB, DC when produced meet at Y and the lines AC, BD intersect at X. If the angle $BYC = 30°$, the angle $BAC = 35°$ and the angle $DAC = 40°$, calculate the angles BDY, DBC and CBY. Hence prove that $AB = DC$.

Turn over

6.

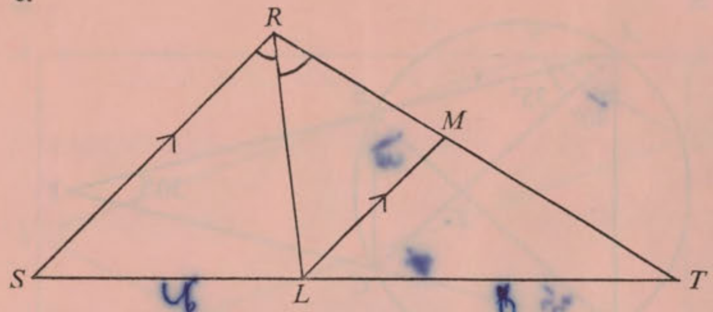


Fig. 3

In Fig. 3, RL is the bisector of the angle SRT and LM is parallel to SR.

If $RS = 6$ cm, $RT = 9$ cm and $ST = 10$ cm, calculate

(*a*) SL,

(*b*) LT,

(*c*) RM,

(*d*) LM,

(*e*) $\dfrac{\text{area of triangle } RSL}{\text{area of triangle } RLT}$,

(*f*) $\dfrac{\text{area of triangle } TLM}{\text{area of quad. } RMLS}$.

Section B

Answer any THREE questions in this section.

7. Prove that the opposite angles of a quadrilateral inscribed in a circle are supplementary.

In Fig. 4, $ABCD$ is a cyclic quadrilateral. The points E and F on the circumference are such that EC bisects the angle BCD and FA bisects the angle BAD. The lines AF and CE intersect at G.

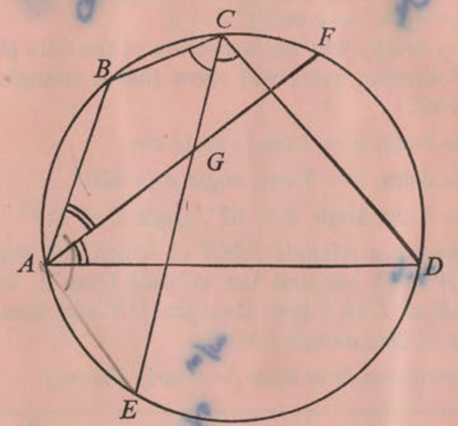


Fig. 4

Prove that

(*a*) the angle $FAE = 90°$,

(*b*) angle ABC + angle $AGC = 270°$.

---

8. Prove that, in any triangle, the sum of the squares on any two sides is equal to twice the square on half the third side together with twice the square on the median which bisects the third side.

PQR is an isosceles triangle in which $PQ = PR$. The line RQ is produced to X so that $QX = RQ$. Prove that

$$PX^2 = PQ^2 + 2QR^2.$$

9.

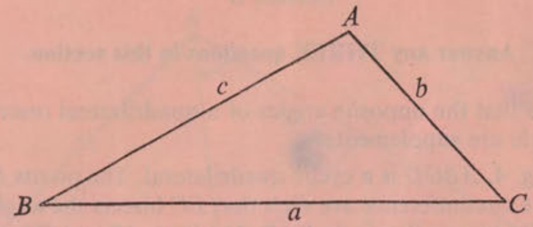


Fig. 5

(i) Fig. 5 shows the usual notation applied to a triangle ABC i.e. $AB = c$, $BC = a$ and $CA = b$.

State *very briefly* why an inspection of the data given in each of the following cases will show that a triangle cannot be constructed.

(*a*) $a = 6$ cm, $b = 7$ cm, $c = 14$ cm.

(*b*) $a = 6$ cm, $b = 7$ cm, angle $A = 120°$.

(*c*) $a = 6$ cm, angle $B = 62°$, angle $C = 119°$.

(ii) Construct a triangle LMN in which the angle LMN is 100°, $LN = 11$ cm and the altitude from L to meet NM produced at X is 5 cm. Measure MN and hence calculate the area of the triangle LMN.

(*All construction lines must be clearly shown.*)

---

10. Two circles PAB, QAB meet at A and B and PAQ is a straight line. The tangents at P and Q meet at T. Prove that the quadrilateral $PTQB$ is cyclic.

If BA produced meets either PT or PT produced at Z and ZL is a tangent from Z to the circle ABQ meeting the circle at L, prove that $ZP = ZL$.

---

11. Prove that the ratio of the areas of similar triangles is equal to the ratio of the squares on corresponding sides.

In the triangle LMN, perpendiculars NR, MS are drawn from N and M respectively to meet LM, LN in R and S.

Prove that

(*a*) $RSNM$ is a cyclic quadrilateral,

(*b*) the triangles LRS, LNM are similar.

If $RS = 3$ cm and $\dfrac{\text{area of triangle } LRS}{\text{area of triangle } LMN} = \dfrac{9}{16}$,

calculate MN.

Pure Maths A
Geom

40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS III

Syllabus A

GEOMETRY

Two and a half hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. $ABCDE$ is a pentagon inscribed in a circle centre O such that BOD and COE are straight lines.

If angle $EAB = 130°$ calculate

(*a*) the angle BCE,

(*b*) the angle ECD,

(*c*) the angle DEC,

(*d*) the angle DOC.

TSE 67/1517 11/2/37850

Turn Over

2.

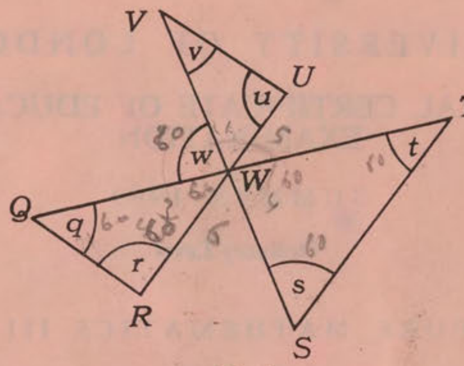


Fig 1

In Fig 1 *QWT*, *RWU* and *SWV* are straight lines.
Find in degrees

(*a*) the angle w, if $w = s + t$,

(*b*) the angle q, if $r = s = t = u = v = w$,

(*c*) the value of $q + r + s + t + u + v$.

3. *EFGH* is a semicircle, centre *O*, with *EOH* as diameter. If $EF = FG = EO$ prove that *FG* is parallel to *EH* and that $EF = GH$.

4. *ABCD* is a square of side 6 in. and *X*, *Y* and *Z* are points on the sides *AB*, *CD* and *DA* respectively such that $BX = 2$ in., $CY = 3$ in. and $AZ = 2$ in.
Find the area of

(*a*) the trapezium *BCYX*,

(*b*) the triangle *DZY*,

(*c*) the triangle *XYZ*.

5. In Fig 2 *HJLN*, is a straight line. *MLK* and *IH* are parallel and *IJK* and *MN* are parallel. If $HJ = 1$ cm, $JL = 2$ cm and $LN = 1$ cm prove that

(*a*) the triangles *HIJ* and *LMN* are congruent,

(*b*) $HI = LM$,

(*c*) *IM* is parallel to *HN*,

(*d*) $IM = 3$ cm.

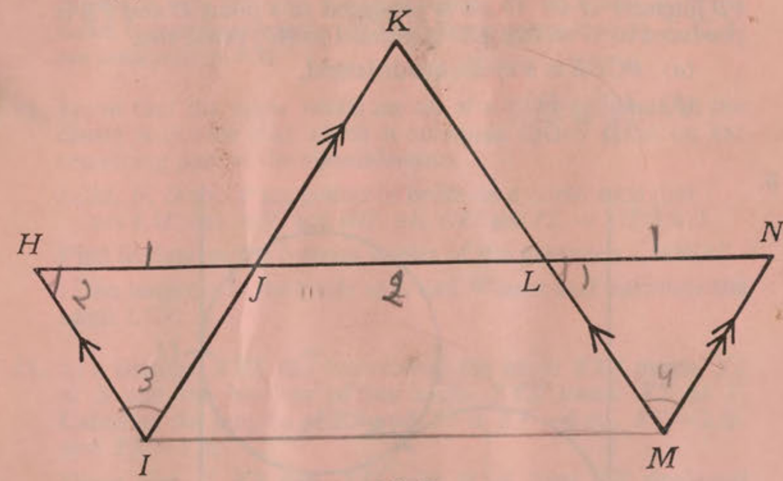


Fig 2

6. *Ruler and compasses only may be used in this question.* Construct a triangle *PQR* such that $PQ = 5$ cm, $QR = 8$ cm and $RP = 7$ cm. Construct the internal bisectors of the angles *QPR* and *PQR* to meet at *X*. Construct the perpendicular bisectors of the sides *PR* and *QR* to meet at *Y*. Measure the length *XY*.

Section B

Answer any THREE questions in this section.

7. Prove that if two chords of a circle intersect *inside* the circle, the rectangle contained by the parts of one is equal to the rectangle contained by the parts of the other.

   A, B, E and F are points taken in order on a circle. AE and FB intersect at O. If AE is produced to a point D and FB is produced to C so that CD is parallel to AF, prove that

   (*a*) $BCDE$ is a cyclic quadrilateral,

   (*b*) $\dfrac{AO}{OD} = \dfrac{FO}{OC}$.

8.

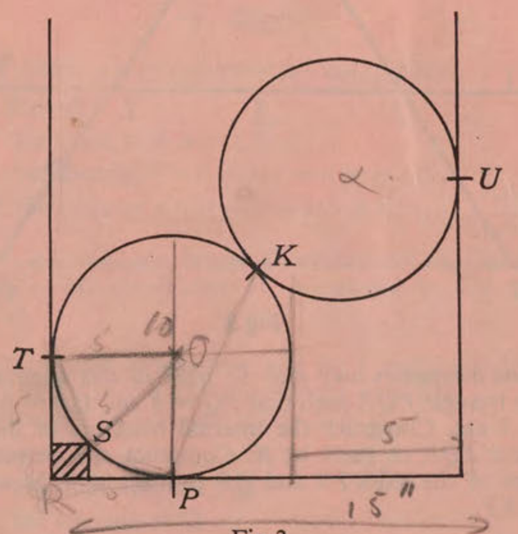


Fig 3

A circular plate, 10 inches in diameter, touches two sides of a tray at T and P respectively. A pickle jar, of square cross section, rests between the plate and the corner of the tray touching the plate at S as illustrated in Fig 3. Calculate the length of one side of the pickle jar.

A second plate of the same size touches the first plate at K and another side of the tray at U. Calculate the shortest distance between a point on the second plate and the edge of the tray that contains the point P, if the two parallel sides of the tray illustrated in the diagram are 1 ft 3 in. apart.

9. Prove that if, from any point outside a circle, a secant and a tangent are drawn, the rectangle contained by the whole secant and the part of it outside the circle is equal to the square on the tangent.

   Two circles touch internally at T, and P is a point on the common tangent at T. A line $PACDB$ drawn from P cuts one circle at A and B and the other at C and D. A third circle is drawn to pass through A and B cutting PT at X and Y. Write down two expressions for PT^2 and hence prove that X, Y, C, D are concyclic points.

10. Prove that the angle which an arc of a circle subtends at the centre is double that which it subtends at any point on the remaining part of the circumference.

    L, M, N, O and P are points in order on a circle such that
    arc LM: arc MN: arc NO: arc OP: arc PL = 1:2:3:4:5.

    Find in degrees the interior angles of the pentagon $LMNOP$.

    If the tangents to the circle at L and N meet at T calculate the angle LTN.

11. In a triangle XYZ the bisector of the angle YXZ meets YZ at S and the bisector of the angle XYZ meets XZ at T. Calculate the lengths of ZS and ZT if XY =6 in., XT =2 in. and YS =3 in.

    Prove that if XS and YT meet at R then ZR produced divides XY in the ratio 3: 4.

Pure Maths A
Geom

40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1969

Ordinary Level

PURE MATHEMATICS III

Syllabus A

GEOMETRY

Two and a half hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

Section A

1. *ABCDE* is a pentagon inscribed in a circle centre *O* such that *BOD* and *COE* are straight lines.

If angle $EAB = 130°$ calculate

(*a*) the angle *BCE*,

(*b*) the angle *ECD*,

(*c*) the angle *DEC*,

(*d*) the angle *DOC*.

TSE 67/1517 11/2/37850

Turn Over

2.

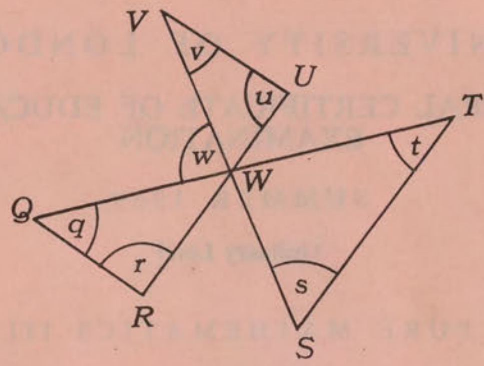


Fig 1

In Fig 1 QWT, RWU and SWV are straight lines.
Find in degrees

(*a*) the angle w, if $w = s + t$,

(*b*) the angle q, if $r = s = t = u = v = w$,

(*c*) the value of $q + r + s + t + u + v$.

3. $EFGH$ is a semicircle, centre O, with EOH as diameter. If $EF = FG = EO$ prove that FG is parallel to EH and that $EF = GH$.

4. $ABCD$ is a square of side 6 in. and X, Y and Z are points on the sides AB, CD and DA respectively such that $BX = 2$ in., $CY = 3$ in. and $AZ = 2$ in.

Find the area of

(*a*) the trapezium $BCYX$,

(*b*) the triangle DZY,

(*c*) the triangle XYZ.

5. In Fig 2 $HJLN$, is a straight line. MLK and IH are parallel and IJK and MN are parallel. If $HJ = 1$ cm, $JL = 2$ cm and $LN = 1$ cm prove that

(*a*) the triangles HIJ and LMN are congruent,

(*b*) $HI = LM$,

(*c*) IM is parallel to HN,

(*d*) $IM = 3$ cm.

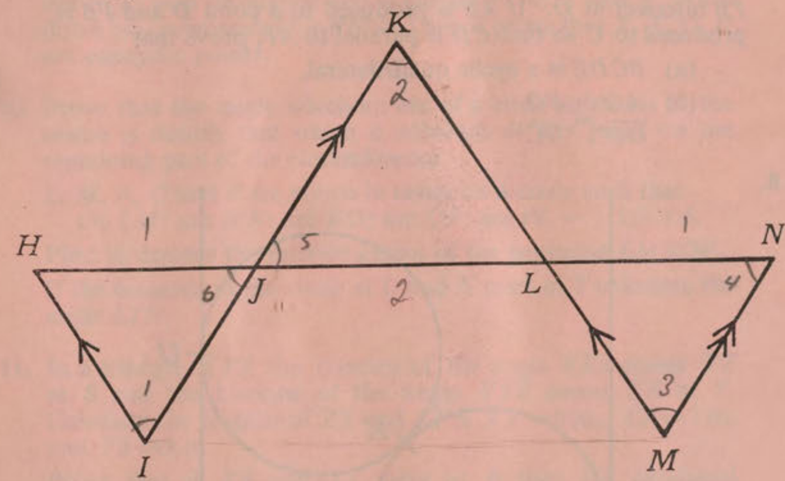


Fig 2

6. *Ruler and compasses only may be used in this question.* Construct a triangle PQR such that $PQ = 5$ cm, $QR = 8$ cm and $RP = 7$ cm. Construct the internal bisectors of the angles QPR and PQR to meet at X. Construct the perpendicular bisectors of the sides PR and QR to meet at Y. Measure the length XY.

Section B

Answer any THREE questions in this section.

7. Prove that if two chords of a circle intersect *inside* the circle, the rectangle contained by the parts of one is equal to the rectangle contained by the parts of the other.

A, B, E and F are points taken in order on a circle. AE and FB intersect at O. If AE is produced to a point D and FB is produced to C so that CD is parallel to AF, prove that

(*a*) $BCDE$ is a cyclic quadrilateral,

(*b*) $\frac{AO}{OD} = \frac{FO}{OC}$.

8.

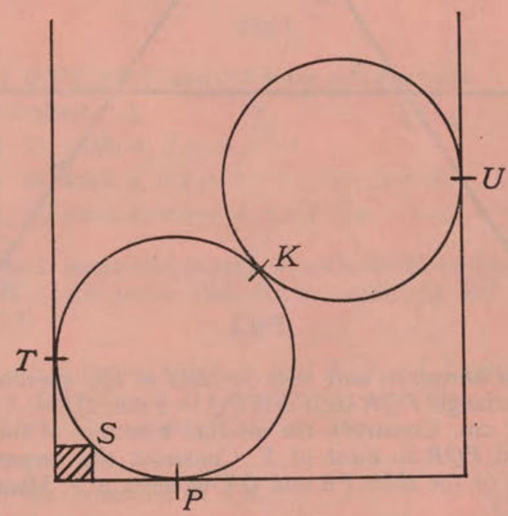


Fig 3

A circular plate, 10 inches in diameter, touches two sides of a tray at T and P respectively. A pickle jar, of square cross section, rests between the plate and the corner of the tray touching the plate at S as illustrated in Fig 3. Calculate the length of one side of the pickle jar.

A second plate of the same size touches the first plate at K and another side of the tray at U. Calculate the shortest distance between a point on the second plate and the edge of the tray that contains the point P, if the two parallel sides of the tray illustrated in the diagram are 1 ft 3 in. apart.

9. Prove that if, from any point outside a circle, a secant and a tangent are drawn, the rectangle contained by the whole secant and the part of it outside the circle is equal to the square on the tangent.

Two circles touch internally at T, and P is a point on the common tangent at T. A line $PACDB$ drawn from P cuts one circle at A and B and the other at C and D. A third circle is drawn to pass through A and B cutting PT at X and Y. Write down two expressions for PT^2 and hence prove that X, Y, C, D are concyclic points.

10. Prove that the angle which an arc of a circle subtends at the centre is double that which it subtends at any point on the remaining part of the circumference.

L, M, N, O and P are points in order on a circle such that
arc LM: arc MN: arc NO: arc OP: arc PL = 1:2:3:4:5.

Find in degrees the interior angles of the pentagon $LMNOP$.

If the tangents to the circle at L and N meet at T calculate the angle LTN.

11. In a triangle XYZ the bisector of the angle YXZ meets YZ at S and the bisector of the angle XYZ meets XZ at T. Calculate the lengths of ZS and ZT if XY = 6 in., XT = 2 in. and YS = 3 in.

Prove that if XS and YT meet at R then ZR produced divides XY in the ratio 3: 4.

Pure Maths A
Geom
40
O/S

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1967

Ordinary Level

PURE MATHEMATICS III

Syllabus A

GEOMETRY

for Candidates Overseas

Two and a half hours

Answer ALL questions in Section A and any THREE questions in Section B.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.
All necessary working must be shown.

Section A

1. In a circle $ABCD$ centre O a chord DC is drawn parallel to the diameter AOB.

If the angle $BOC = 80°$ find

(*a*) the angle DOC,
(*b*) the angle BAC,
(*c*) the angle OAD,
(*d*) the angle CAD.

2. $ABCDE$ is a regular pentagon and ABX is an equilateral triangle such that X lies inside the pentagon. Calculate the angles of the triangle CEX.

TE&S 64/1418 11/2/100/14650

Turn Over

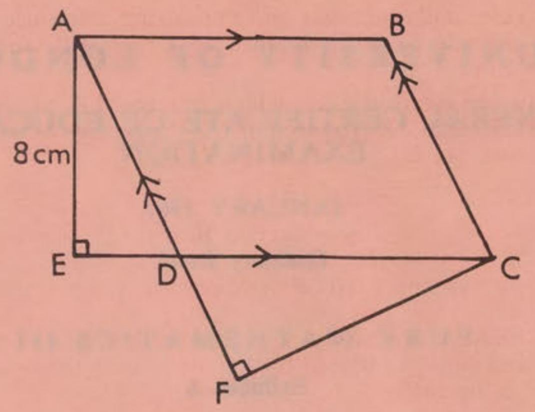


Fig 1

3. In Fig 1, $ABCD$ is a parallelogram and the angles AED and DFC are right-angles.

Given that AE is 8 cm, the area of the triangle AED is 24 sq cm and the area of the parallelogram $ABCD$ is 120 sq cm, calculate the lengths of AD and DC and the area of the triangle DFC.

4. $ABCD$ is a trapezium with AB parallel to DC and in which AC and BD meet at K. If $AB = BK$ prove that $DK = DC$.

5.

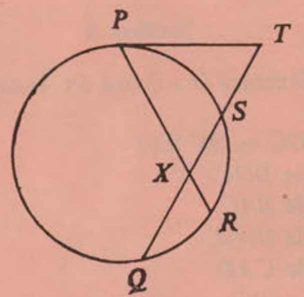


Fig 2

In Fig 2, the tangent at P to the circle $PQRS$ meets QS produced at T. If $QX = 5$ in., $XS = 4$ in., $ST = 3$ in. and $XR = 2$ in., calculate the lengths of PX and PT.

6. *Using ruler and compasses only*, construct a triangle XYZ in which the side $YZ = 2\frac{1}{2}$ in., the side $XY = 3\frac{1}{2}$ in. and the side $XZ = 4$ in.

Draw the escribed circle which touches YZ internally and touches XY and XZ produced. If E is the centre of this escribed circle, measure EX.

Section B

Answer any THREE questions from this section.

7. Prove that the tangents to a circle from an external point are equal and equally inclined to the line joining the point to the centre of the circle.

In Fig 3, $BPCQ$ is a circle with centre O. The tangents at B and C meet at A; AO meets the circle at P and Q. If BP and QC are produced to meet at R prove that

(*a*) the angle ABP = the angle AQC,

(*b*) the angle BAP = the angle PRQ.

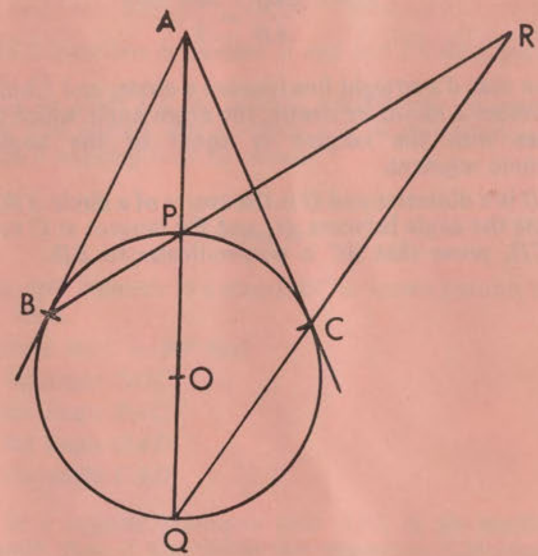


Fig 3

Turn Over

8. A, B, C, D and E are points, in this order, on a circle such that AB is parallel to EC, BC is parallel to AD and AD meets EC at F.

Prove that

(*a*) $AE = AF$,

(*b*) the angle BAD = the angle BCE,

(*c*) $BD = BE$.

9. Prove that if a straight line is drawn parallel to one side of a triangle, the other two sides are divided proportionally.

In a triangle ABC the mid-points of BC and CA are D and E respectively. If BE and AD intersect at O prove that $BO = 2OE$.

10. ABC is a triangle in which $AB = 21$ cm, $AC = 28$ cm and the angle BAC is a right-angle. If the bisector of the angle BAC meets BC at Q, calculate the lengths of BQ and QC.

If D is the foot of the perpendicular from C to AQ produced show that

$$\frac{AQ}{AD} = \frac{6}{7}.$$

11. Prove that if a straight line touches a circle, and from the point of contact a chord be drawn, the acute angle which this chord makes with the tangent is equal to the angle in the alternate segment.

BD is a diameter and O is the centre of a circle $ABCD$. If BC bisects the angle between AC and the tangent at C to the circle $ABCD$, prove that AC is perpendicular to BD.

Pure Maths A
Geom
40
O/S

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1967

Ordinary Level

PURE MATHEMATICS III

Syllabus A

GEOMETRY

for Candidates Overseas

Two and a half hours

Answer ALL questions in Section A and any THREE questions in Section B.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.
All necessary working must be shown.

Section A

1. In a circle $ABCD$ centre O a chord DC is drawn parallel to the diameter AOB.

If the angle $BOC = 80°$ find

(*a*) the angle DOC,
(*b*) the angle BAC,
(*c*) the angle OAD,
(*d*) the angle CAD.

2. $ABCDE$ is a regular pentagon and ABX is an equilateral triangle such that X lies inside the pentagon. Calculate the angles of the triangle CEX.

TE&S 64/1418 11/2/100/14650

Turn Over

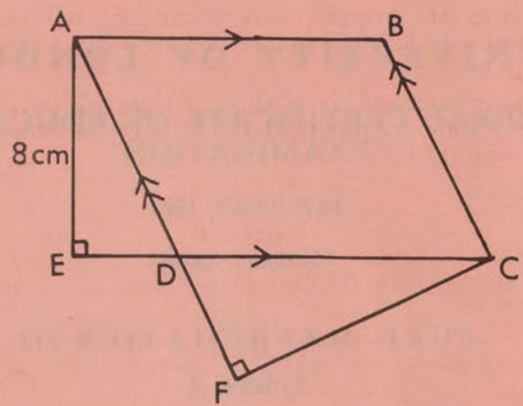


Fig 1

3. In Fig 1, $ABCD$ is a parallelogram and the angles AED and DFC are right-angles.

Given that AE is 8 cm, the area of the triangle AED is 24 sq cm and the area of the parallelogram $ABCD$ is 120 sq cm, calculate the lengths of AD and DC and the area of the triangle DFC.

4. $ABCD$ is a trapezium with AB parallel to DC and in which AC and BD meet at K. If $AB = BK$ prove that $DK = DC$.

5.

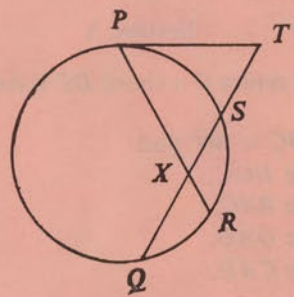


Fig 2

In Fig 2, the tangent at P to the circle $PQRS$ meets QS produced at T. If $QX = 5$ in., $XS = 4$ in., $ST = 3$ in. and $XR = 2$ in., calculate the lengths of PX and PT.

6. *Using ruler and compasses only*, construct a triangle XYZ in which the side $YZ = 2\frac{1}{2}$ in., the side $XY = 3\frac{1}{2}$ in. and the side $XZ = 4$ in.

Draw the escribed circle which touches YZ internally and touches XY and XZ produced. If E is the centre of this escribed circle, measure EX.

Section B

Answer any THREE questions from this section.

7. Prove that the tangents to a circle from an external point are equal and equally inclined to the line joining the point to the centre of the circle.

In Fig 3, $BPCQ$ is a circle with centre O. The tangents at B and C meet at A; AO meets the circle at P and Q. If BP and QC are produced to meet at R prove that

(*a*) the angle ABP = the angle AQC,

(*b*) the angle BAP = the angle PRQ.

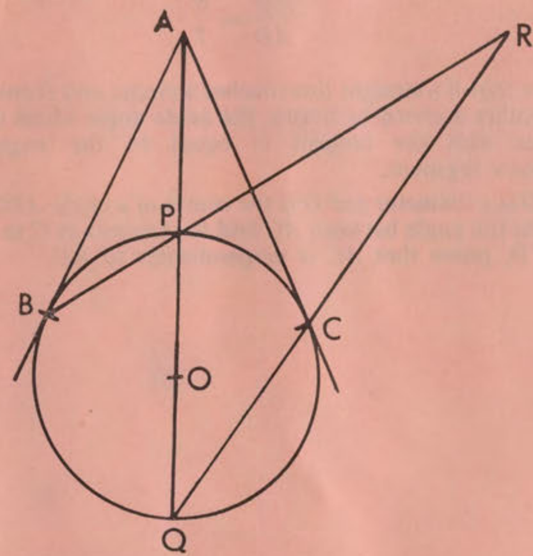


Fig 3

8. A, B, C, D and E are points, in this order, on a circle such that AB is parallel to EC, BC is parallel to AD and AD meets EC at F.

Prove that

(*a*) $AE = AF$,

(*b*) the angle BAD = the angle BCE,

(*c*) $BD = BE$.

9. Prove that if a straight line is drawn parallel to one side of a triangle, the other two sides are divided proportionally.

In a triangle ABC the mid-points of BC and CA are D and E respectively. If BE and AD intersect at O prove that $BO = 2OE$.

10. ABC is a triangle in which $AB = 21$ cm, $AC = 28$ cm and the angle BAC is a right-angle. If the bisector of the angle BAC meets BC at Q, calculate the lengths of BQ and QC.

If D is the foot of the perpendicular from C to AQ produced show that

$$\frac{AQ}{AD} = \frac{6}{7}.$$

11. Prove that if a straight line touches a circle, and from the point of contact a chord be drawn, the acute angle which this chord makes with the tangent is equal to the angle in the alternate segment.

BD is a diameter and O is the centre of a circle $ABCD$. If BC bisects the angle between AC and the tangent at C to the circle $ABCD$, prove that AC is perpendicular to BD.

Pure Maths A
Geom
40
O/S

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1967

Ordinary Level

PURE MATHEMATICS III

Syllabus A

GEOMETRY

for Candidates Overseas

Two and a half hours

Answer ALL questions in Section A and any THREE questions in Section B.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.
All necessary working must be shown.

Section A

1. In a circle $ABCD$ centre O a chord DC is drawn parallel to the diameter AOB.

If the angle $BOC = 80°$ find

(*a*) the angle DOC,
(*b*) the angle BAC,
(*c*) the angle OAD,
(*d*) the angle CAD.

2. $ABCDE$ is a regular pentagon and ABX is an equilateral triangle such that X lies inside the pentagon. Calculate the angles of the triangle CEX.

TE&S 64/1418 11/2/100/14650

Turn Over

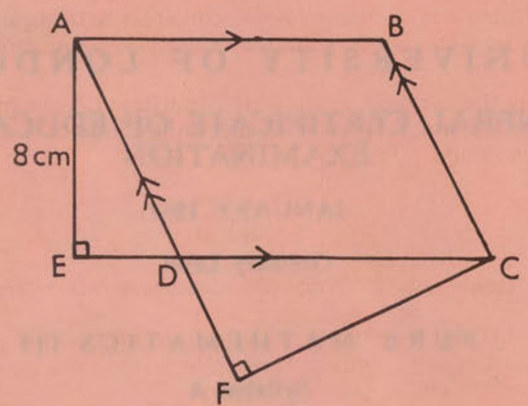


Fig 1

3. In Fig 1, *ABCD* is a parallelogram and the angles *AED* and *DFC* are right-angles.

Given that *AE* is 8 cm, the area of the triangle *AED* is 24 sq cm and the area of the parallelogram *ABCD* is 120 sq cm, calculate the lengths of *AD* and *DC* and the area of the triangle *DFC*.

4. *ABCD* is a trapezium with *AB* parallel to *DC* and in which *AC* and *BD* meet at *K*. If $AB = BK$ prove that $DK = DC$.

5.

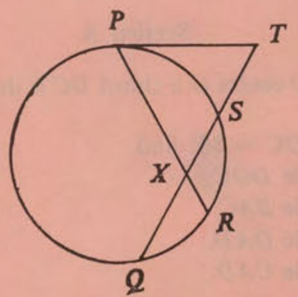


Fig 2

In Fig 2, the tangent at *P* to the circle *PQRS* meets *QS* produced at *T*. If $QX = 5$ in., $XS = 4$ in., $ST = 3$ in. and $XR = 2$ in., calculate the lengths of *PX* and *PT*.

6. *Using ruler and compasses only*, construct a triangle *XYZ* in which the side $YZ = 2\frac{1}{2}$ in., the side $XY = 3\frac{1}{2}$ in. and the side $XZ = 4$ in.

Draw the escribed circle which touches *YZ* internally and touches *XY* and *XZ* produced. If *E* is the centre of this escribed circle, measure *EX*.

Section B

Answer any THREE questions from this section.

7. Prove that the tangents to a circle from an external point are equal and equally inclined to the line joining the point to the centre of the circle.

In Fig 3, *BPCQ* is a circle with centre *O*. The tangents at *B* and *C* meet at *A*; *AO* meets the circle at *P* and *Q*. If *BP* and *QC* are produced to meet at *R* prove that

(*a*) the angle *ABP* = the angle *AQC*,

(*b*) the angle *BAP* = the angle *PRQ*.

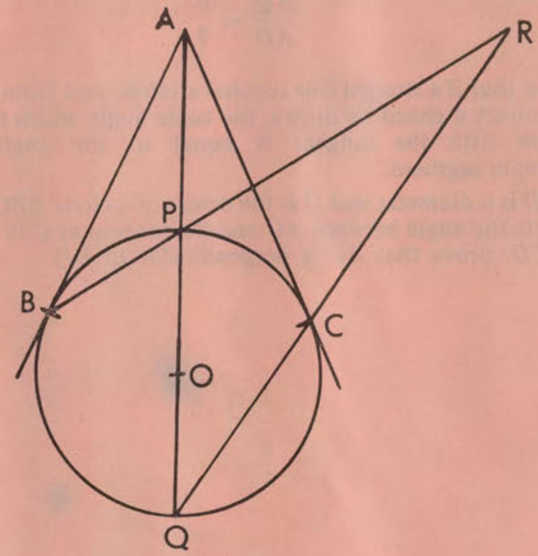


Fig 3

Turn Over

8. A, B, C, D and E are points, in this order, on a circle such that AB is parallel to EC, BC is parallel to AD and AD meets EC at F.

Prove that

(*a*) $AE = AF$,

(*b*) the angle BAD = the angle BCE,

(*c*) $BD = BE$.

9. Prove that if a straight line is drawn parallel to one side of a triangle, the other two sides are divided proportionally.

In a triangle ABC the mid-points of BC and CA are D and E respectively. If BE and AD intersect at O prove that $BO = 2OE$.

10. ABC is a triangle in which $AB = 21$ cm, $AC = 28$ cm and the angle BAC is a right-angle. If the bisector of the angle BAC meets BC at Q, calculate the lengths of BQ and QC.

If D is the foot of the perpendicular from C to AQ produced show that

$$\frac{AQ}{AD} = \frac{6}{7}.$$

11. Prove that if a straight line touches a circle, and from the point of contact a chord be drawn, the acute angle which this chord makes with the tangent is equal to the angle in the alternate segment.

BD is a diameter and O is the centre of a circle $ABCD$. If BC bisects the angle between AC and the tangent at C to the circle $ABCD$, prove that AC is perpendicular to BD.

Pure Maths A
Geom
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1966

Ordinary Level

PURE MATHEMATICS III

Syllabus A

GEOMETRY

Two and a half hours

Answer ALL questions in Section A and any THREE questions in Section B.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.
All necessary working must be shown.

TE&S 64/1417 11/2/100/42150

Turn Over

Section A

1. (i) $ABCDEFGH$ is a regular octagon. Calculate the angle AFC.

(ii) In Fig 1 the angle $XPY = 114°$ and the angle $PXS = 16°$. Calculate the angle PYQ.

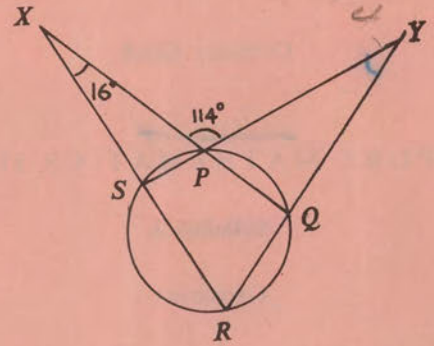


Fig 1

2. In an acute-angled triangle ABC the internal and external bisectors of the angle A meet BC at X and Y respectively. The perpendicular to BC at C meets AY at K. Prove that

(*a*) $AKCX$ is a cyclic quadrilateral,

(*b*) the angle BAX = the angle XKC.

3. (i) Points E and F are taken on the sides DG and DH respectively of a triangle DGH so that EF is parallel to GH. If $DE = 5$ cm, $DF = 6$ cm, $EG = 2$ cm and $GH = 7$ cm, calculate the lengths of EF and DH.

(ii) The circle inscribed in a triangle LMN touches the sides MN, NL and LM at X, Y and Z respectively. If $LM = 11$ in., $LN = 12$ in. and $LZ = 8$ in. calculate the lengths of NY and MN.

4. In Fig 2 the two circles have O as their common centre. $AEFG$ and $AHKL$ are any two lines through a point A on the larger circle. Prove that

(*a*) $AE = FG$,

(*b*) $AE.EG = AH.HL$.

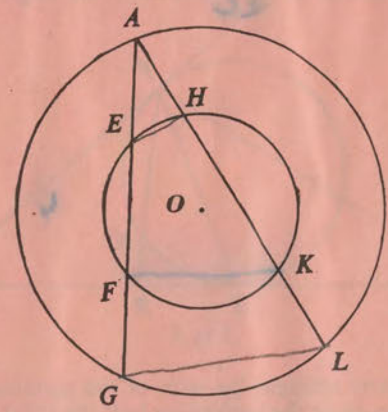


Fig 2

5. Construct a convex quadrilateral $PQRS$ such that $PQ = 3$ in., angle $P = 48°$, $PS = 2{\cdot}8$ in., $QR = 1{\cdot}2$ in. and $SR = 1{\cdot}6$ in. *Using ruler and compasses only*, construct a triangle PSX, with X on PQ produced, equal in area to the quadrilateral. Hence, by suitable measurements in the figure, calculate the area of the quadrilateral.

6. A, B, C and D are four points, taken in order, on a circle such that $AB = CD$. X and Y are the mid-points of AB and CD respectively. Prove that the angle BXY and the angle CYX are equal.

Section B

Answer any THREE questions from this section.

7. The mid-points of the sides AB and AC of an acute-angled triangle ABC are F and E respectively. Prove that FE is parallel to BC.

The altitudes of the triangle meet at H; the mid-points of BH and CH are Q and R respectively. Prove that $EFQR$ is a rectangle.

Turn Over

8. (i) A circle C_2 passes through the centre O of a given circle C_1. The circles intersect at A and B. Any line through B meets C_1 and C_2 again at P and Q respectively. Prove that $AQ = PQ$.

(ii) In Fig 3, PX bisects the angle QPR, and the circle passes through P and touches QR at X. The tangent at P to the circle meets QR produced at Z. Prove that the angle RPZ = the angle PQR.

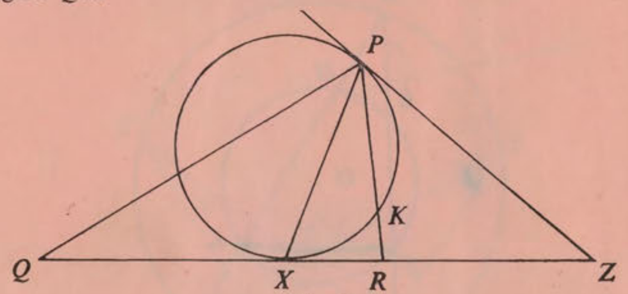


Fig 3

9. Prove that in any triangle the sum of the squares on any two sides is equal to twice the square on half the third side together with twice the square on the median which bisects the third side.

In a triangle ABC, points D and E on BC are such that $BD = DE = EC$. If $BC = 9$, $CA = 4$ and $AB = 7$, prove that $AD^2 = 20$ and that $AE^2 = 9$.

10. A triangle XYZ is such that $XY = XZ$. The internal bisectors of the angles Y and Z meet XZ and XY at M and N respectively and intersect at L. The mid-point of YZ is P. Prove that

(*a*) triangles LNY and LMZ are equal in area,

(*b*) $PM = PN$,

(*c*) NM is parallel to YZ.

11. Prove that the internal bisector of an angle of a triangle divides the opposite side in the ratio of the sides containing the angle.

Draw a circle of radius 2 in., and mark on it two points G and H such that $GH = 3{\cdot}7$ in. *Using ruler and compasses only*, find the mid-point of the minor arc GH of the circle, and divide the chord GH in the ratio 3 : 2. Hence obtain the point F on the major arc GH of the circle such that $FG : FH = 3 : 2$.

Pure Maths A
Geom
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1966

Ordinary Level

PURE MATHEMATICS III

Syllabus A

GEOMETRY

Two and a half hours

Answer ALL questions in Section A and any THREE questions in Section B.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.
All necessary working must be shown.

TE&S 64/1417 11/2/100/42150

Turn Over

Section A

1. (i) *ABCDEFGH* is a regular octagon. Calculate the angle *AFC*.

(ii) In Fig 1 the angle $XPY = 114°$ and the angle $PXS = 16°$. Calculate the angle *PYQ*.

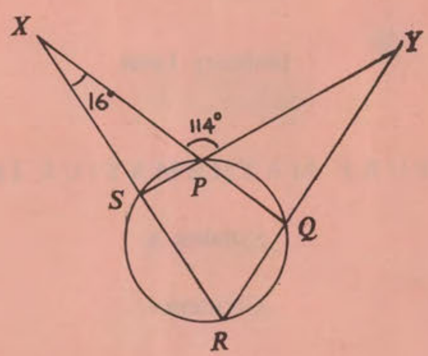


Fig 1

2. In an acute-angled triangle *ABC* the internal and external bisectors of the angle *A* meet *BC* at *X* and *Y* respectively. The perpendicular to *BC* at *C* meets *AY* at *K*. Prove that

(*a*) *AKCX* is a cyclic quadrilateral,

(*b*) the angle *BAX* = the angle *XKC*.

3. (i) Points *E* and *F* are taken on the sides *DG* and *DH* respectively of a triangle *DGH* so that *EF* is parallel to *GH*. If *DE* = 5 cm, *DF* = 6 cm, *EG* = 2 cm and *GH* = 7 cm, calculate the lengths of *EF* and *DH*.

(ii) The circle inscribed in a triangle *LMN* touches the sides *MN*, *NL* and *LM* at *X*, *Y* and *Z* respectively. If *LM* = 11 in., *LN* = 12 in. and *LZ* = 8 in. calculate the lengths of *NY* and *MN*.

4. In Fig 2 the two circles have *O* as their common centre. *AEFG* and *AHKL* are any two lines through a point *A* on the larger circle. Prove that

(*a*) *AE* = *FG*,

(*b*) *AE.EG* = *AH.HL*.

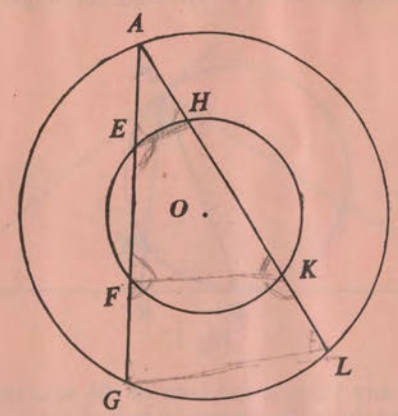


Fig 2

5. Construct a convex quadrilateral *PQRS* such that *PQ* = 3 in., angle $P = 48°$, *PS* = 2·8 in., *QR* = 1·2 in. and *SR* = 1·6 in. *Using ruler and compasses only*, construct a triangle *PSX*, with *X* on *PQ* produced, equal in area to the quadrilateral. Hence, by suitable measurements in the figure, calculate the area of the quadrilateral.

6. *A*, *B*, *C* and *D* are four points, taken in order, on a circle such that *AB* = *CD*. *X* and *Y* are the mid-points of *AB* and *CD* respectively. Prove that the angle *BXY* and the angle *CYX* are equal.

Section B

Answer any THREE questions from this section.

7. The mid-points of the sides *AB* and *AC* of an acute-angled triangle *ABC* are *F* and *E* respectively. Prove that *FE* is parallel to *BC*.

The altitudes of the triangle meet at *H*; the mid-points of *BH* and *CH* are *Q* and *R* respectively. Prove that *EFQR* is a rectangle.

Turn Over

8. (i) A circle C_2 passes through the centre O of a given circle C_1. The circles intersect at A and B. Any line through B meets C_1 and C_2 again at P and Q respectively. Prove that $AQ = PQ$.

(ii) In Fig 3, PX bisects the angle QPR, and the circle passes through P and touches QR at X. The tangent at P to the circle meets QR produced at Z. Prove that the angle RPZ = the angle PQR.

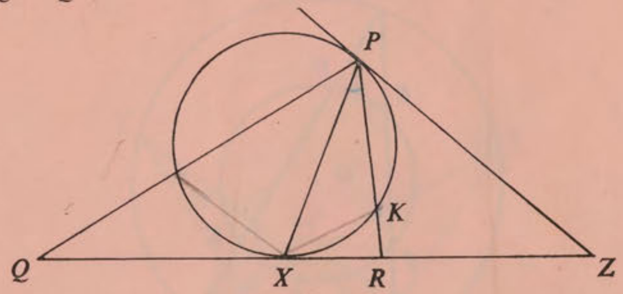


Fig 3

9. Prove that in any triangle the sum of the squares on any two sides is equal to twice the square on half the third side together with twice the square on the median which bisects the third side.

In a triangle ABC, points D and E on BC are such that $BD = DE = EC$. If $BC = 9$, $CA = 4$ and $AB = 7$, prove that $AD^2 = 20$ and that $AE^2 = 9$.

10. A triangle XYZ is such that $XY = XZ$. The internal bisectors of the angles Y and Z meet XZ and XY at M and N respectively and intersect at L. The mid-point of YZ is P. Prove that

(*a*) triangles LNY and LMZ are equal in area,

(*b*) $PM = PN$,

(*c*) NM is parallel to YZ.

11. Prove that the internal bisector of an angle of a triangle divides the opposite side in the ratio of the sides containing the angle.

Draw a circle of radius 2 in., and mark on it two points G and H such that $GH = 3{\cdot}7$ in. *Using ruler and compasses only*, find the mid-point of the minor arc GH of the circle, and divide the chord GH in the ratio 3 : 2. Hence obtain the point F on the major arc GH of the circle such that $FG : FH = 3 : 2$.

Pure Maths A
Geom
40

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1965

Ordinary Level

PURE MATHEMATICS (SYLLABUS A)

(3) GEOMETRY

Two and a half hours

Answer ALL questions in Section A and any THREE questions in Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

All necessary working must be shown.

TE&S 62/1572 11/2/25/14375

Turn Over

Section A

Answer ALL questions in this section.

1. (i) Four of the angles of a pentagon taken in order are 72°, 100°, 120°, and 140°. Find the remaining angle and prove that two of the sides are parallel.

(ii) AB is a chord of a circle of radius 17 cm. If $AB = 30$ cm, calculate the distance of AB from the centre of the circle.

(iii) In Fig. 1, $AB = AC = AD$, AD is parallel to BC and the angle $BAC = 36°$. Calculate the size of the angles ADC and ABD.

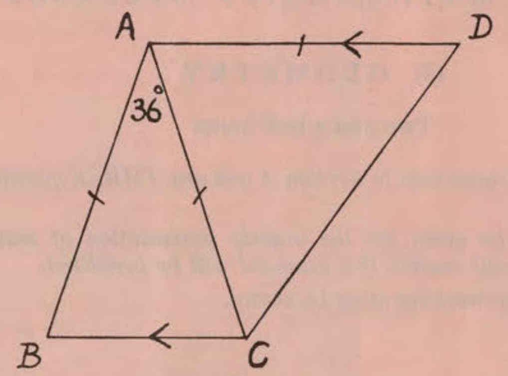


FIG. 1

2. (i) XYZ is a triangle and the parallelograms $YXZM$ and $XYZN$ are completed. Prove that M, Z and N lie on a straight line and that Z is the mid-point of MN.

(ii) $ABCD$ is a parallelogram with X the mid-point of AB. BY is drawn parallel to XD to meet AD produced in Y. Prove that $DY = BC$.

3. Construct, without the use of a protractor, a triangle XYZ having $XY = 8$ cm, $YZ = 10$ cm and the angle $XYZ = 30°$. Find by construction and without calculation:

(*a*) the length of the equal sides AY and AZ of an isosceles triangle AYZ with the same base YZ and the same area as the triangle XYZ,

(*b*) the length of the sides of a right-angled triangle BYZ having YZ as the hypotenuse, BY greater than BZ, and with the same area as the triangle XYZ.

4. State the locus of a point which is equidistant from two fixed points.

$ABCD$ is a quadrilateral with unequal sides. Show how to find a point P such that $PA = PB$ and $PC = PD$.

5. (i) TA, TB are two tangents drawn to a circle from a point T. X is a point on the major arc of the circle. If the angle $AXB = 63°$, calculate the angle ATB.

(ii) $ABCD$ is a quadrilateral inscribed in a circle with AD produced to any point T. The angle ABC is bisected by a line BX which intersects the circle at X. Prove that XD, produced if necessary, is the bisector of the angle CDT.

6. In a triangle ABC, a line CX is drawn bisecting the angle C and cutting AB in X. The line XY, drawn parallel to BC, meets AC in Y and the line CZ, drawn parallel to BA, meets XY produced in Z. If $AB = 8$ cm, $BC = 10$ cm and $AC = 6$ cm, calculate

(*a*) AX and AY,

(*b*) the ratio of the areas of the triangles AXY and CYZ.

Section B

Answer any THREE questions in this section.

7. (i) Two triangles have sides of 4, 5, 6 cm and 6, 9, 11 cm respectively. Prove that one of these triangles is obtuse angled.

(ii) Prove that in any triangle the sum of the squares on any two sides is equal to twice the square on half the third side together with twice the square on the median which bisects the third side.

ABC is a triangle and X and Y are the mid-points of AC and AB respectively. Prove that

$$3(AB^2 - AC^2) = 4(BX^2 - CY^2).$$

8. Using ruler and compasses only and without any calculation, construct a rectangle equal in area to two-thirds of a given rectangle of dimensions 10 cm by 4 cm.

Construct a square equal in area to the rectangle you have obtained.

Measure the side of this square.

Turn Over

9. If a straight line touch a circle, and from the point of contact a chord be drawn, prove that the acute angle which this chord makes with the tangent is equal to the angle in the alternate segment.

In Fig. 2, TP, TQ are tangents to a circle with centre O and R is a point on the circumference. $TABC$ is a line drawn parallel to PR meeting the circle at A, C and QR at B. Prove that

(*a*) T, P, B and Q are concyclic,

(*b*) TO is a diameter of the circle through T, P, B and Q,

(*c*) B is the mid-point of AC.

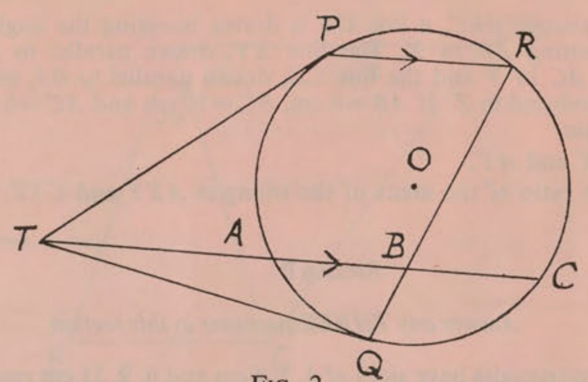


FIG. 2

10. Prove that the internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the sides containing the angle.

The internal bisector of the angle A of a triangle ABC meets the circumcircle of the triangle in D. The bisector of the angle ADB meets AB in P and the bisector of the angle ADC meets AC in Q.

Prove that PQ is parallel to BC.

11. In Fig. 3, APB is a semi-circle on AB as diameter and OP is the radius perpendicular to AB. A chord AMN meets OP at M and the circle at N. Prove that

(*a*) O, M, N and B are concyclic,

(*b*) the triangles APO, APB are similar,

(*c*) $AP^2 = AO.AB$,

(*d*) AP touches the circle through M, N and P.

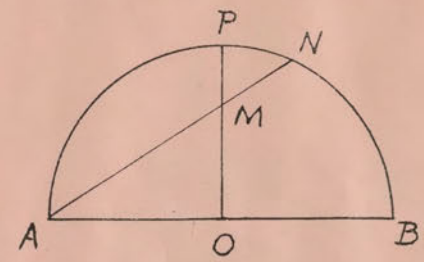


FIG. 3

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

JANUARY 1964

Ordinary Level

PURE MATHEMATICS (SYLLABUS A)

III GEOMETRY

Two and a half hours

Answer ALL questions in Section A and any THREE in Section B. All necessary working must be shown.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

Section A

1. (i) A rhombus has diagonals of length 24 cm and 10 cm. Calculate

(*a*) the length of a side of the rhombus,

(*b*) the area of the rhombus.

(ii) Find the number of sides of a regular polygon in which each interior angle is equal to 140°.

TE&S 61/818 11/2/25/18350

Turn Over

2. (i) In Fig. 1, $AB = AC$, the angle $BAE = 90°$, $AE = BC$ and $ACDE$ is a parallelogram. If the angle BAC is $56°$, calculate the angle CBD.

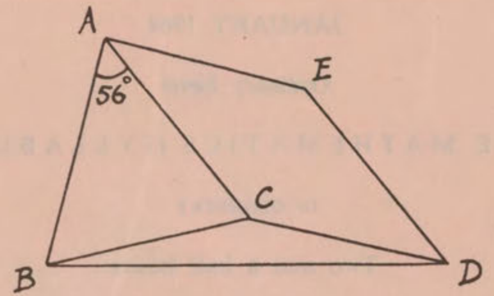


FIG. 1

(ii) In the square $ABCD$, X is the mid-point of the side CD. AX meets the diagonal BD at K. Prove that $BK = 2KD$.

3. *Use ruler and compasses only in this question.*
Draw a line BC of length 3 in. and construct a point P on BC between B and C such that $BP = 4PC$. Construct a triangle ABC of area $1\frac{1}{2}$ sq. in. such that AP is perpendicular to BC.

4. Equilateral triangles PAB and QBC are drawn on the outside of a square $ABCD$. Prove that the four points A, P, Q and C lie on a circle.

5. In a triangle ABC, D is the mid-point of BC and the bisector of the angle ADC meets AC at K. If $BC = 9$ in., $CA = 4$ in. and $AB = 7$ in., calculate the length of AD and prove that the ratio of the areas of the triangles ABC and KDC is $32 : 9$.

6. In Fig. 2 the smaller circle touches the larger circle and also touches the diameter AB of the larger circle at P. If $AP = 11$ in. and $PB = 5$ in., calculate the radius of the smaller circle.

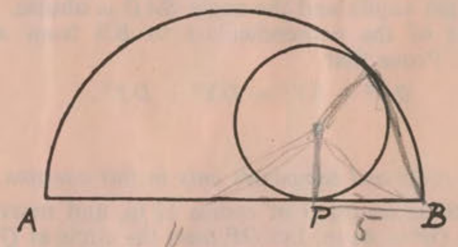


FIG. 2

SECTION B

Answer any THREE questions in this section.

7. Prove that chords of a circle equidistant from the centre are equal.

In Fig. 3, A and B are the centres of equal circles, P is the mid-point of AB and XY is any line through P. M and N are the feet of the perpendiculars to XY from A and B respectively. Prove that $PX = PY$.

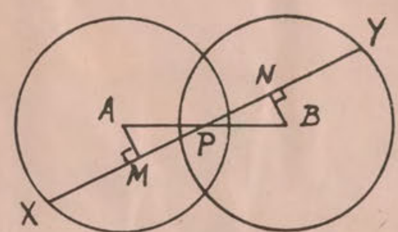


FIG. 3

8. Prove that the ratio of the areas of similar triangles is equal to the ratio of the squares on corresponding sides.

A, B and C are three points on a circle and BC is greater than AC. The line through C parallel to BA and the tangent to the circle at A meet at D. Prove that

$$\frac{BC^2}{AD^2} = \frac{AB}{CD}.$$

Turn Over

9. Prove that in a right-angled triangle, the square described on the hypotenuse is equal to the sum of the squares described on the sides containing the right angle.

ABCD is a quadrilateral in which the angles *ABC* and *ADC* are right angles and the angle *BAD* is obtuse. *X* and *Y* are the feet of the perpendiculars to *BD* from *A* and *C* respectively. Prove that

$$BX^2 + BY^2 = DX^2 + DY^2.$$

10. *Use ruler and compasses only in this question.*

Draw a circle centre *O* of radius $1\frac{1}{2}$ in. and mark a point *P* such that $OP = 4\frac{1}{2}$ in. Let *OP* meet the circle at *Q* between *O* and *P*. Construct a tangent to the circle from *P* to touch the circle at *T*. Construct the tangent at *Q* to meet *PT* at *N*. Bisect the angle *PNQ* and construct a circle with centre on *PQ* to touch both *PT* and the circle already drawn.

11. *ABCD* is a trapezium in which *BC* is parallel to *AD*. The lines through *B* and *C* parallel to *CD* and *BA* respectively meet at *X*. If *XB* and *XC* meet *AD* at *P* and *Q* respectively, prove that

(*a*) the triangles *ABP* and *QCD* are congruent,

(*b*) the triangles *XAB* and *XCD* are equal in area.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1963

Ordinary Level

PURE MATHEMATICS (SYLLABUS A)

(3) GEOMETRY

Two and a half hours

Answer ALL questions in Section A and any THREE in Section B. All necessary working must be shown.

Credit will be given for the orderly presentation of material. Candidates who neglect this essential will be penalized.

SECTION A

1. (i) In the triangle ABC, the side AB is greater than the side AC and the angle $BAC = 40°$. If P is the point in AB such that $AP = AC$ and the angle $PCB = 20°$, calculate the angle ABC.

(ii) Two of the interior angles of a five-sided polygon are right angles and the remaining three interior angles are equal to one another. Calculate the size of each of these three angles.

2. (i) The diagonals of a cyclic quadrilateral $PQRS$ intersect at N. If the angle $SNR = 100°$, the angle $SPR = 40°$ and the angle $PQS = 20°$, calculate each of the angles PRQ, SRQ and SPQ.

(ii) The mid-points of the sides BC, CA and AB of a triangle ABC are L, M and N respectively. Prove that AL and MN bisect each other.

Turn Over

Th.P. 61/817 11/2/25/39000

3. The inscribed circle of a triangle ABC in which $AB = AC$ touches the sides BC, CA and AB at P, Q and R respectively. Prove that the angle $RPQ =$ the angle ABC and that $PQ = PR$.

4. *Using ruler and compasses only*, construct a triangle XYZ in which $XY = 3$ in., the angle $XZY = 90°$, M is the mid-point of XY and the angle $ZMY = 45°$. On the same diagram construct the triangle RYZ in which the angle $ZRY =$ the angle ZXY and $RZ = RY$.

5. From a point P outside a circle, of radius 13 cm and centre O, two straight lines PAB and PCD are drawn to cut the circle at A, B and C, D respectively. $AB = 10$ cm, $PA = 4$ cm and $CD = 1$ cm. Calculate

(*a*) the distance of O from AB,

(*b*) the length of OP,

(*c*) the length of PC.

6. (i) The internal and external bisectors of the angle BAC of a triangle ABC, in which $AB = 5$ in., $AC = 3$ in. and $BC = 6$ in., meet BC and BC produced at P and Q respectively. Calculate the length of PQ.

(ii) In a triangle XYZ, the side $YZ = 14$ in., the side $XY = 9$ in. and the median $XM = 4$ in. Calculate the length of XZ.

SECTION B

Answer any THREE questions in this section.

7. In the parallelogram $ABCD$, the side AB is greater than the side BC, the diagonals intersect at P and the line through P perpendicular to BD cuts AB at S, DC at R and BC produced at T. Prove that

(*a*) $TB = TD$,

(*b*) $PR = PS$,

(*c*) $SBRD$ is a rhombus.

8. Draw a straight line DE of length 4 in. *Using ruler and compasses only*, construct a point P in DE which divides DE in the ratio 2 : 1. Construct circles on DP and PE as diameters.

Construct geometrically the three common tangents to these circles.

9. Prove that equal chords of a circle are equidistant from the centre.

In Fig. 1, AB and CD are two equal chords of a circle, centre O, which intersect at P. Prove that

(*a*) $PB = PD$,

(*b*) $CB = AD$.

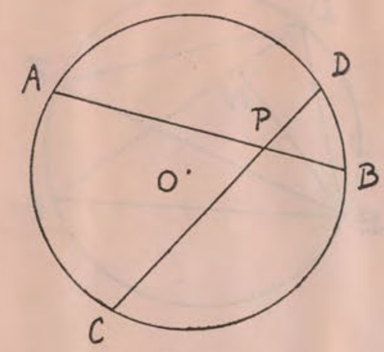


FIG. 1

10. Prove that triangles on the same base and of the same altitude are equal in area.

In a triangle ABC, the mid-point of BC is L and the mid-point of AC is M. The medians AL and BM intersect at G, and CG produced meets AB at T. *Without making any assumptions about the concurrency of the medians of the triangle*, prove that

(*a*) area of triangle $AGB =$ area of triangle $AGC =$ area of triangle BGC ,

(*b*) $AT = TB$.

11. Prove that if two triangles are equiangular their corresponding sides are proportional.

In Fig. 2, the triangle *DEF* is inscribed in a circle. The diameter of the circle through *E* cuts the circle again at *T* and the perpendicular from *E* to *DF* meets *DF* at *N*. Prove that

(*a*) the triangles *DTE* and *NFE* are similar,

(*b*) $\frac{NE}{DE} = \frac{NF}{DT}$.

If the radius of the circle is 6 cm and $FE = 8$ cm, calculate the ratio of the area of the triangle *DTE* to the area of the triangle *NFE*.

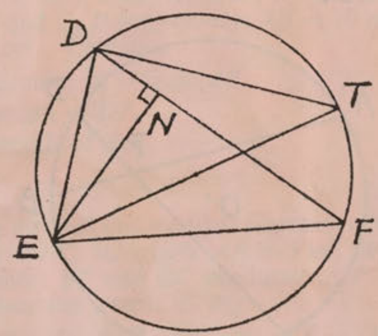


FIG. 2

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1962

Ordinary Level

PURE MATHEMATICS

Syllabus A

(3) GEOMETRY

Two and a half hours

Answer all questions in Section A and any THREE questions in Section B. All necessary working must be shown.
Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

SECTION A

1. (i) Fig. 1 shows a square $ABPQ$ and part of a regular polygon $XABC$ drawn on opposite sides of AB. If the angle $BPC = 27°$, calculate the number of sides in the polygon.

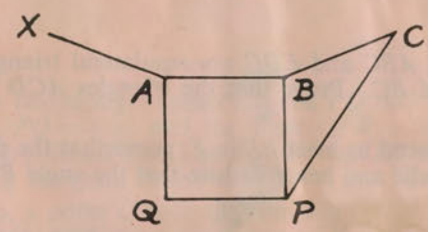


FIG. 1

(ii) A chord AB, equal in length to the radius, is drawn in a circle, centre O. Y is any point on the major arc AB and X is a point on the minor arc AB such that the arc AX is twice the arc BX. Calculate the angle AOB, the angle AYB, the angle AXB and the angle ABX.

Turn Over

2. (i) P is the point of contact of a tangent TP to a circle, centre R and radius 8 cm. If $TR = 17$ cm, calculate the area of the triangle TPR and the length of the perpendicular from P to TR.

(ii) The diagonals of a rhombus $ABCD$ intersect at X and the circle, with diameter BX, cuts AB at Y. If $AC = 6$ in. and $BD = 8$ in., calculate the lengths of AB and BY.

3. In Fig. 2, $PQRS$ is a quadrilateral with parallelograms $PQRT$ and $PQLS$ having a common side PQ; RS and TL intersect at M. Prove that $TM = ML$.

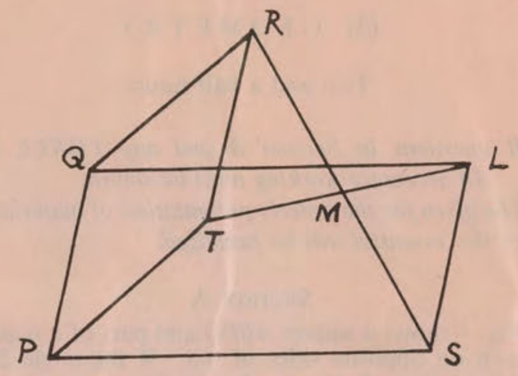


FIG. 2

4. In Fig. 3, ABC and EDC are equilateral triangles drawn on opposite sides of BC. Prove that the triangles ACD and BCE are congruent.

If AD is produced to meet BE in F, prove that the points B, A, C and F are concyclic and hence deduce that the angle $BFA = 60°$.

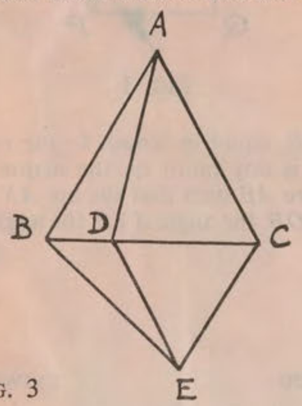


FIG. 3

5. *Using ruler and compasses only*, construct the triangle ABC in which $AB = 5$ in., $BC = 3$ in. and the angle $ABC = 45°$. Inside the triangle find, by construction, a point D which is 2·5 in. from B and equidistant from AB and AC. Through D, construct a straight line to cut AB in X and AC in Y so that $AX = AY$. Measure AY.

6. (i) A triangle has sides of lengths 8 cm, 7 cm and 12 cm. Prove, by calculation, that the triangle is obtuse-angled and calculate the length of the median drawn to the longest side.

(ii) In a triangle ABC, AD bisects the angle BAC and meets BC at D; DE is drawn parallel to BA meeting AC at E. If $AB = 8$ in. and $AC = 6$ in., calculate the length of AE.

SECTION B

Answer any THREE questions in this section.

7. Prove that the opposite angles of any quadrilateral inscribed in a circle are supplementary.

AD is an altitude of a triangle ABC and E is the point such that EA is the tangent at A to the circumcircle of the triangle and DE is parallel to BA. Prove that the angle CEA is a right angle.

8. Draw two straight lines PAB and PQ such that $PA = 1·5$ in., $AB = 2$ in., $PQ = 6$ in. and the angle $QPB = 50°$. Find, by construction two points X and Y on PQ at which AB subtends an angle of 30°, X being the point nearer to P.

Find, also, a point C such that the angle $ACB = 30°$ and the area of the triangle ACB is twice the area of the triangle AXB.

9. Prove that the internal bisector of an angle of a triangle divides the opposite side in the ratio of the sides containing the angle.

LM and PQ are chords of a circle which are produced to meet outside the circle at A and the bisector of the angle LAP meets MQ at Y and PL at X. If $AQ = 2AM$, prove that $MY = \frac{1}{3} MQ$ and $PX = \frac{1}{3} PL$.

Turn Over

10. In Fig. 4, $ABED$ and $ACFG$ are squares drawn on the sides AB and AC of the triangle ABC and BAH is a straight line with $AH = BA$. Prove that $DG = HC$ and that the triangles GAD and ABC are equal in area.

If the angle $ACB = 45°$, prove that the triangles GAD and BCF are equal in area.

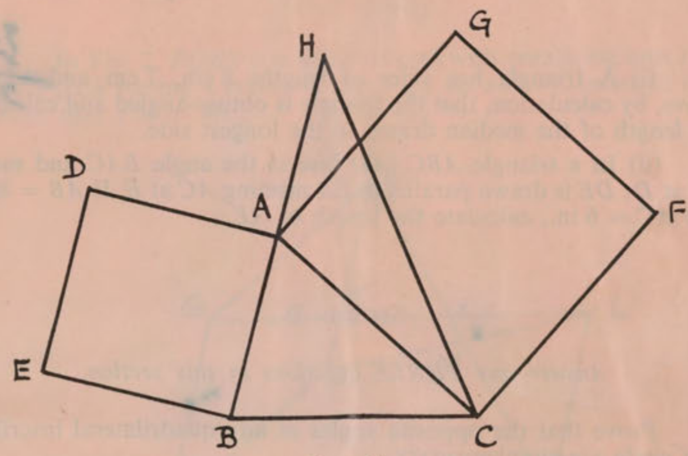


FIG. 4

11. Prove that if two triangles have one angle of one equal to one angle of the other and the sides about these equal angles proportional, the triangles are similar.

In a triangle ABC, the angle BAC is obtuse and D and E are points in BC such that

$$\frac{BA}{BD} = \frac{BC}{BA} \text{ and } \frac{CE}{CA} = \frac{CA}{CB}.$$

Prove that

(*a*) the triangles ABD and CAE are similar,

(*b*) $AD = AE$.

10. In Fig. 4, $ABED$ and $ACFG$ are squares drawn on the sides AB and AC of the triangle ABC and BAH is a straight line with $AH = BA$. Prove that $DG = HC$ and that the triangles GAD and ABC are equal in area.

If the angle $ACB = 45°$, prove that the triangles GAD and BCF are equal in area.

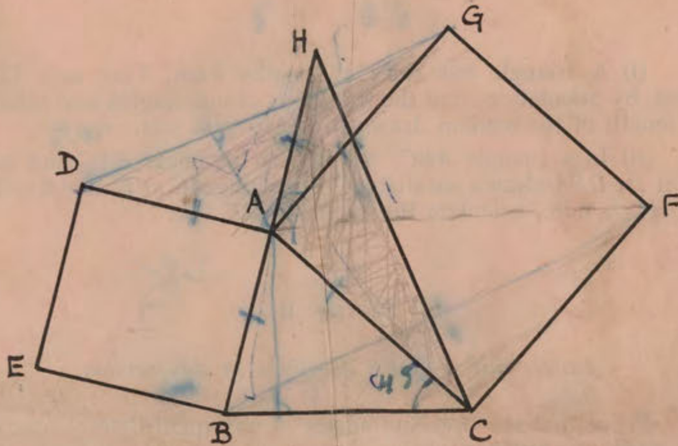


Fig. 4

11. Prove that if two triangles have one angle of one equal to one angle of the other and the sides about these equal angles proportional, the triangles are similar.

In a triangle ABC, the angle BAC is obtuse and D and E are points in BC such that

$$\frac{BA}{BD} = \frac{BC}{BA} \text{ and } \frac{CE}{CA} = \frac{CA}{CB}.$$

Prove that

(*a*) the triangles ABD and CAE are similar,

(*b*) $AD = AE$.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

SUMMER 1962

Ordinary Level

PURE MATHEMATICS

Syllabus A

(3) GEOMETRY

Two and a half hours

Answer all questions in Section A and any THREE questions in Section B. All necessary working must be shown.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

Section A

1. (i) Fig. 1 shows a square $ABPQ$ and part of a regular polygon $XABC$ drawn on opposite sides of AB. If the angle $BPC = 27°$, calculate the number of sides in the polygon.

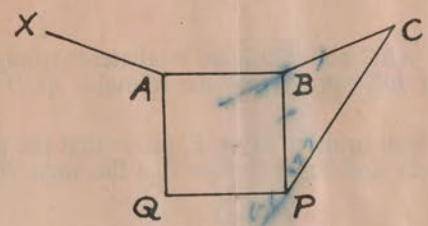


Fig. 1

(ii) A chord AB, equal in length to the radius, is drawn in a circle, centre O. Y is any point on the major arc AB and X is a point on the minor arc AB such that the arc AX is twice the arc BX. Calculate the angle AOB, the angle AYB, the angle AXB and the angle ABX.

Turn Over

Th.P. 60/1421 13/2/36250

2. (i) P is the point of contact of a tangent TP to a circle, centre R and radius 8 cm. If $TR = 17$ cm, calculate the area of the triangle TPR and the length of the perpendicular from P to TR.

(ii) The diagonals of a rhombus $ABCD$ intersect at X and the circle, with diameter BX, cuts AB at Y. If $AC = 6$ in. and $BD = 8$ in., calculate the lengths of AB and BY.

3. In Fig. 2, $PQRS$ is a quadrilateral with parallelograms $PQRT$ and $PQLS$ having a common side PQ; RS and TL intersect at M. Prove that $TM = ML$.

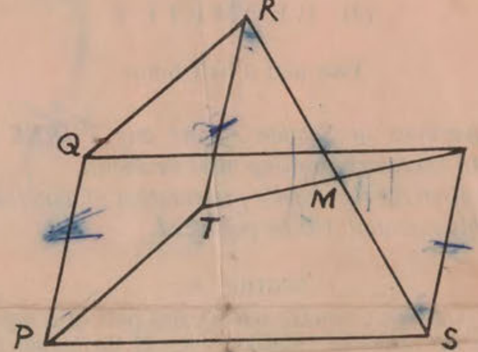


FIG. 2

4. In Fig. 3, ABC and EDC are equilateral triangles drawn on opposite sides of BC. Prove that the triangles ACD and BCE are congruent.

If AD is produced to meet BE in F, prove that the points B, A, C and F are concyclic and hence deduce that the angle $BFA = 60°$.

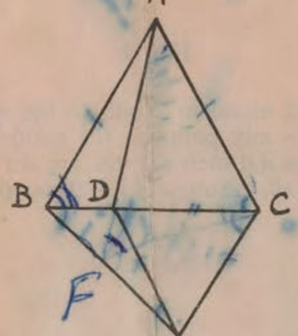


FIG. 3

5. *Using ruler and compasses only*, construct the triangle ABC in which $AB = 5$ in., $BC = 3$ in. and the angle $ABC = 45°$. Inside the triangle find, by construction, a point D which is 2·5 in. from B and equidistant from AB and AC. Through D, construct a straight line to cut AB in X and AC in Y so that $AX = AY$. Measure AY.

6. (i) A triangle has sides of lengths 8 cm, 7 cm and 12 cm. Prove, by calculation, that the triangle is obtuse-angled and calculate the length of the median drawn to the longest side.

(ii) In a triangle ABC, AD bisects the angle BAC and meets BC at D; DE is drawn parallel to BA meeting AC at E. If $AB = 8$ in. and $AC = 6$ in., calculate the length of AE.

SECTION B

Answer any THREE questions in this section.

7. Prove that the opposite angles of any quadrilateral inscribed in a circle are supplementary.

AD is an altitude of a triangle ABC and E is the point such that EA is the tangent at A to the circumcircle of the triangle and DE is parallel to BA. Prove that the angle CEA is a right angle.

8. Draw two straight lines PAB and PQ such that $PA = 1·5$ in., $AB = 2$ in., $PQ = 6$ in. and the angle $QPB = 50°$. Find, by construction two points X and Y on PQ at which AB subtends an angle of 30°, X being the point nearer to P.

Find, also, a point C such that the angle $ACB = 30°$ and the area of the triangle ACB is twice the area of the triangle AXB.

9. Prove that the internal bisector of an angle of a triangle divides the opposite side in the ratio of the sides containing the angle.

LM and PQ are chords of a circle which are produced to meet outside the circle at A and the bisector of the angle LAP meets MQ at Y and PL at X. If $AQ = 2AM$, prove that $MY = \frac{1}{3} MQ$ and $PX = \frac{1}{3} PL$.

UNIVERSITY OF LONDON

General Certificate of Education Examination

Summer 1961

Ordinary Level

PURE MATHEMATICS (SYLLABUS A)

(3) GEOMETRY

Wednesday, 28 June: 9.30 to 12

Answer ALL questions in Section A and any THREE from Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

SECTION A

1. (i) *ABCDE* is a pentagon with *BC* parallel to *ED*. The angle *B* is 70° more than the angle *C* and the angle *E* is 20° more than the angle *D*. Prove that the angle *A* is a right angle.

   (ii) *PQR* is a triangle with $PQ = 5$ cm, $PR = 12$ cm and the angle *QPR* a right angle. If *PX* is the perpendicular drawn from *P* to meet *QR* in *X*, find the lengths of *QR* and *PX*.

2. (i) Two chords, *BA* and *DC*, of a circle when produced meet at *O*. If $AB = 5$ cm, $OA = 4$ cm and $OC = 3$ cm, calculate the length of the chord *CD*.

   (ii) In Fig. 1 two circles *ABH* and *ABK* with centres *O* and *P* respectively intersect in *A* and *B*. Any line *HAK* cuts the circles in *H* and *K*. Prove that

   (*a*) *OP* bisects the angle *AOB*,

   (*b*) the angle $OAP =$ the angle *HBK*.

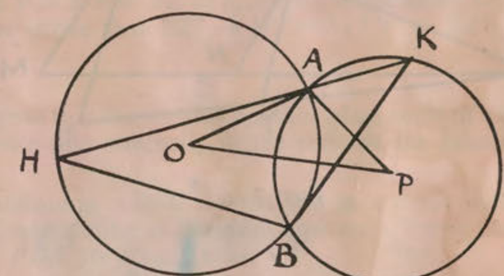


FIG. 1

[**Turn Over**

3. (i) In the cyclic quadrilateral $ABCD$ the sides AB and DC produced meet at E, and DA and CB produced meet at F. The angle $AFB = 70°$ and the angle $ADC = 30°$. Calculate the angle BEC.

(ii) E and F are the mid-points of the sides AC and AB of a triangle ABC. If BE and CF intersect in H, prove that the triangles FHB and EHC are equal in area.

4. A quadrilateral $ABCD$ is circumscribed about a circle whose centre is O. Prove that

(a) $AB + CD = AD + BC$,

(b) the angle AOB + the angle COD = 2 right angles.

5. State the locus of the centres of circles which touch at a fixed point a given circle whose centre is O.

AB is a line of length 8 cm. If A and B are the centres of two circles of radii 3 cm and 4 cm respectively, construct a circle of radius 3 cm to touch each of these circles externally.

6. In Fig. 2 PQR is an acute-angled triangle with X any point on PQ. Through P and on the side of PR away from Q draw PM equal to PR. From X draw XN parallel to PM meeting QM in N and draw XY parallel to PR meeting QR in Y. Write down two ratios equal to $\frac{QX}{QP}$ and prove that $XY = XN$.

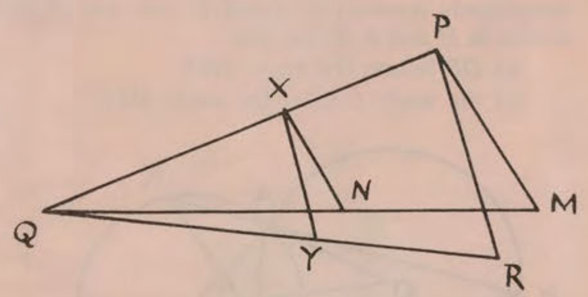


FIG. 2

SECTION B

7. Draw a quadrilateral $ABCD$ with $AB = 6$ cm, $AD = 6$ cm, $BD = 7$ cm, $CB = 5$ cm and the angle $ABC = 70°$.

Construct a rectangle equal in area to this quadrilateral and hence construct the square which is equal in area to the quadrilateral $ABCD$.

8. In an acute-angled triangle ABC the lines BE and CF are drawn perpendicular to AC and AB respectively. Prove that the quadrilateral $BFEC$ is cyclic.

Hence prove that, if M is the mid-point of BC and N the mid-point of EF, MN is perpendicular to EF.

9. If a straight line touch a circle, and from the point of contact a chord be drawn, prove that the acute angle which this chord makes with the tangent is equal to the angle in the alternate segment.

The tangents XM and ZM to the circumcircle of an acute-angled triangle XYZ meet at M. The chord YX is produced to a point P outside the circle so that $MP = MX$. If PM and YZ are produced to meet at Q prove that

(a) the triangle MPZ is isosceles,

(b) the triangles XYZ and QYP are similar,

(c) the quadrilateral $PXZQ$ is cyclic.

10. Prove that in a right-angled triangle, the square described on the hypotenuse is equal to the sum of the squares described on the sides containing the right angle.

X, Y and Z are three points in order on a straight line. Squares $XYAB$ and $YZPQ$ are described on the same side of this straight line. If $XY = a$ and $YZ = b$, obtain expressions for AP^2 and BZ^2 and hence prove that $BZ^2 + AP^2 = 3(XY^2 + YZ^2)$.

11. Prove that the internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the sides containing the angle.

A quadrilateral $ABCD$ is inscribed in a circle with AB and DC produced intersecting at P outside the circle. Prove that the triangles PBC and PDA are equiangular.

If the line PQR, meeting BC in Q and AD in R, bisects the angle APD, prove that

$$\frac{AR}{RD} = \frac{CQ}{QB}.$$

UNIVERSITY OF LONDON

General Certificate of Education Examination

Summer 1961

Ordinary Level

PURE MATHEMATICS (SYLLABUS A)

(3) GEOMETRY

Wednesday, 28 June: 9.30 to 12

Answer ALL questions in Section A and any THREE from Section B.

Credit will be given for the orderly presentation of material; candidates who neglect this essential will be penalized.

SECTION A

1. (i) *ABCDE* is a pentagon with *BC* parallel to *ED*. The angle *B* is 70° more than the angle *C* and the angle *E* is 20° more than the angle *D*. Prove that the angle *A* is a right angle.

   (ii) *PQR* is a triangle with $PQ = 5$ cm, $PR = 12$ cm and the angle *QPR* a right angle. If *PX* is the perpendicular drawn from *P* to meet *QR* in *X*, find the lengths of *QR* and *PX*.

2. (i) Two chords, *BA* and *DC*, of a circle when produced meet at *O*. If $AB = 5$ cm, $OA = 4$ cm and $OC = 3$ cm, calculate the length of the chord *CD*.

   (ii) In Fig. 1 two circles *ABH* and *ABK* with centres *O* and *P* respectively intersect in *A* and *B*. Any line *HAK* cuts the circles in *H* and *K*. Prove that

   (*a*) *OP* bisects the angle *AOB*,

   (*b*) the angle *OAP* = the angle *HBK*.

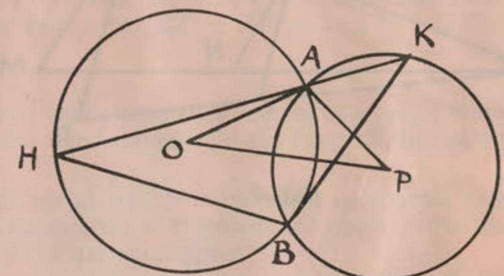


FIG. 1

[Turn Over

Th.P. 60/1167 10/4/36000

3. (i) In the cyclic quadrilateral $ABCD$ the sides AB and DC produced meet at E, and DA and CB produced meet at F. The angle $AFB = 70°$ and the angle $ADC = 30°$. Calculate the angle BEC.

(ii) E and F are the mid-points of the sides AC and AB of a triangle ABC. If BE and CF intersect in H, prove that the triangles FHB and EHC are equal in area.

4. A quadrilateral $ABCD$ is circumscribed about a circle whose centre is O. Prove that

(a) $AB + CD = AD + BC$,

(b) the angle AOB + the angle COD = 2 right angles.

5. State the locus of the centres of circles which touch at a fixed point a given circle whose centre is O.

AB is a line of length 8 cm. If A and B are the centres of two circles of radii 3 cm and 4 cm respectively, construct a circle of radius 3 cm to touch each of these circles externally.

6. In Fig. 2 PQR is an acute-angled triangle with X any point on PQ. Through P and on the side of PR away from Q draw PM equal to PR. From X draw XN parallel to PM meeting QM in N and draw XY parallel to PR meeting QR in Y. Write down two ratios equal to $\dfrac{QX}{QP}$ and prove that $XY = XN$.

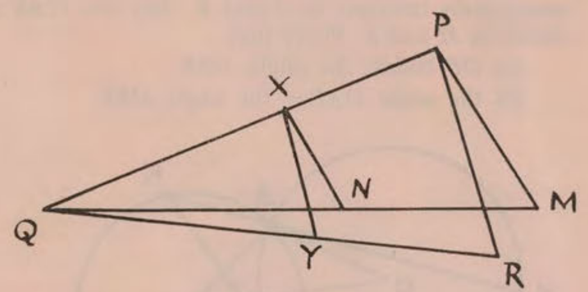


FIG. 2

SECTION B

7. Draw a quadrilateral $ABCD$ with $AB = 6$ cm, $AD = 6$ cm, $BD = 7$ cm, $CB = 5$ cm and the angle $ABC = 70°$.

Construct a rectangle equal in area to this quadrilateral and hence construct the square which is equal in area to the quadrilateral $ABCD$.

8. In an acute-angled triangle ABC the lines BE and CF are drawn perpendicular to AC and AB respectively. Prove that the quadrilateral $BFEC$ is cyclic.

Hence prove that, if M is the mid-point of BC and N the mid-point of EF, MN is perpendicular to EF.

9. If a straight line touch a circle, and from the point of contact a chord be drawn, prove that the acute angle which this chord makes with the tangent is equal to the angle in the alternate segment.

The tangents XM and ZM to the circumcircle of an acute-angled triangle XYZ meet at M. The chord YX is produced to a point P outside the circle so that $MP = MX$. If PM and YZ are produced to meet at Q prove that

(a) the triangle MPZ is isosceles,

(b) the triangles XYZ and QYP are similar,

(c) the quadrilateral $PXZQ$ is cyclic.

10. Prove that in a right-angled triangle, the square described on the hypotenuse is equal to the sum of the squares described on the sides containing the right angle.

X, Y and Z are three points in order on a straight line. Squares $XYAB$ and $YZPQ$ are described on the same side of this straight line. If $XY = a$ and $YZ = b$, obtain expressions for AP^2 and BZ^2 and hence prove that $BZ^2 + AP^2 = 3(XY^2 + YZ^2)$.

11. Prove that the internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the sides containing the angle.

A quadrilateral $ABCD$ is inscribed in a circle with AB and DC produced intersecting at P outside the circle. Prove that the triangles PBC and PDA are equiangular.

If the line PQR, meeting BC in Q and AD in R, bisects the angle APD, prove that

$$\frac{AR}{RD} = \frac{CQ}{QB}.$$

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

JANUARY, 1961

PURE MATHEMATICS

(Syllabus A)

(3) GEOMETRY

(Alternative Paper)

TWO AND A HALF HOURS.

Answer ALL *questions in* SECTION A *and any* THREE *from* SECTION B.

Credit will be given for the orderly presentation of material. Candidates who neglect this essential will be penalised.

SECTION A

1. (i) Each interior angle of a regular polygon is 140°. Calculate the number of sides of the polygon.

(ii) The area of a triangle ABC is 48 sq. in. The mid-point of AB is X and a point R is taken on CX such that $CR = 3RX$. A point L is taken on AR such that $AL = 2LR$. Calculate the areas of the triangles ACR and CRL.

T. & F.—59/780 14/2/6500 [P. T. O.

2. (i) In the quadrilateral $ABCD$, $AB = AD = 24$ cm, $BC = DC = 7$ cm and $AC = 25$ cm. Show that $ABCD$ is a cyclic quadrilateral. If AC and BD intersect at K, calculate the length of AK.

(ii) The tangents at the points M and N on a circle with centre O intersect at T. If the angle $MTN = 86°$ and P is a point on the major arc MN, calculate the angle MPN and the angle MNO.

3. (i) The triangle ABC is right angled at B. A circle centre O touches AB at A and passes through C. If $AB = 8$ in. and $BC = 4$ in., calculate OA.

(ii) The triangle XYZ is right angled at X. If r is the radius of the circle inscribed in this triangle, show that $XY + XZ = YZ + 2r$.

4. In a parallelogram $ABCD$, P is the point in AB such that $2AP = PB$ and Q is the point in CD such that $2CQ = QD$. The lines PD and BQ intersect the diagonal AC in X and Y respectively. Prove that

(a) $PBQD$ is a parallelogram,

(b) $AX = \frac{1}{4}AC$.

Calculate the ratio of the area of the triangle AXP to the area of the quadrilateral $DQYX$.

5. Using ruler and compasses only, construct the triangle ABC in which $AB = 2\frac{1}{2}$ in., $BC = 3$ in. and the angle $ABC = 60°$. Construct also the circumcircle of the triangle ABC.

On the same figure construct the triangle DBA in which the angle $BDA =$ the angle BCA and the angle $BAD = \frac{1}{2}$ the angle BAC. Measure BD.

6. (i) The diameter AB of a circle with centre O is produced to P and a tangent from P touches the circle at T. If $TP = AT$, show that the triangles AOT and PBT are congruent.

(ii) In a triangle ABC the internal bisector of the angle BAC meets BC at X If $AB = 10$ in., $BC = 12$ in., $CA = 14$ in. and M is the mid-point of AB, calculate the lengths of BX and CM.

Section B

Answer any THREE *questions from this section.*

7. Prove that the tangent at any point of a circle and the radius through the point are perpendicular to each other.

The line AB is a diameter of a circle with centre O. The point C lies on the circle. The perpendicular from B to the tangent at C to the circle meets this tangent at N. Prove that

(a) BC bisects the angle OBN,

(b) $BC^2 = AB \cdot BN$.

8. Draw a line AB of length 3 in. Using ruler and compasses only construct an angle $BAC = 75°$. Complete the triangle ABC by making its area $3\frac{3}{4}$ sq. in. Measure AC.

Construct the points P and Q which are equidistant from B and C and which are distance 1 in. from A. Measure BP and BQ.

9. Prove that the ratio of the areas of similar triangles is equal to the ratio of the squares on corresponding sides.

The square $ABCD$ is of side $5x$ in. Points P and Q are taken in AB and BC respectively so that $AP = BQ = 2x$ in. The lines AQ and DP meet at R. Show that the triangles APR and AQB are similar.

Calculate the area of the triangle APR.

10. Prove that the internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the sides containing the angle.

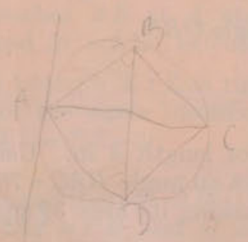
In a triangle ABC the mid-point of BC is D. The internal bisector of the angle ADB meets AB at X. The line XY is drawn parallel to BC and meets AC at Y. Prove that DY is the internal bisector of the angle ADC.

If the angle BAC is a right angle show that A, D, X and Y lie on a circle whose centre is the point of intersection of AD and XY.

11. Prove that if a straight line touches a circle, and from the point of contact a chord is drawn, the angles which this chord makes with the tangent are equal to the angles in the alternate segments.

The quadrilateral $ABCD$ is inscribed in a circle. If the tangent to the circle at A is parallel to BD, prove that $AB = AD$. Prove also that CA bisects the angle BCD.

If AC and BD meet at X, show that AD is a tangent to the circle passing through X, C and D.



UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1959

PURE MATHEMATICS

(Syllabus A)

(3) GEOMETRY

TUESDAY, June 23.—Afternoon, 2 to 4.30

Answer ALL *questions in Section A and any* THREE *from Section B.*

Credit will be given for the orderly presentation of material. Candidates who neglect this essential will be penalised.

SECTION A

1. (i) ABC is a triangle with angle $BAC = 30°$ and angle $ACB = 70°$. BC is produced to D so that $CD = AC$ and a line through C parallel to BA cuts AD in F.

Calculate the angles of the triangle CFD. Which is the largest side of this triangle ? Give a reason for your answer.

(ii) What is a regular polygon ?

$ABCD$ are four consecutive vertices of a regular polygon of 10 sides. Calculate the angle ABC and the acute angle between AC and BD.

2. (i) $ABCD$ is a rhombus with diagonals $AC = 8$ in. and $BD = 6$ in. A line through C parallel to DB meets AB produced in E. Calculate the length of AE.

(ii) $PQRS$ is a quadrilateral inscribed in a circle, the arcs PQ and RS are equal and the arc QR is twice the length of the arc PQ. If the diagonals PR, QS meet at O and the angle $POQ = 50°$, calculate the angles of the quadrilateral.

T. & F.—58/836 14/2/2/35000 [P. T. O.

3. (i) Draw an equilateral triangle with its sides 3 in. Construct the circle circumscribing the triangle and measure its diameter. *Calculate* the diameter of the circle which could be inscribed in the triangle.

(ii) Fig. 1 shows a circle, centre O, inscribed in a square $ABCD$. X and W are two of the points at which the circle touches the square. The circle meets OB in T and the tangent at T meets WO produced in R. Prove that the triangles AXW and TRO are congruent.

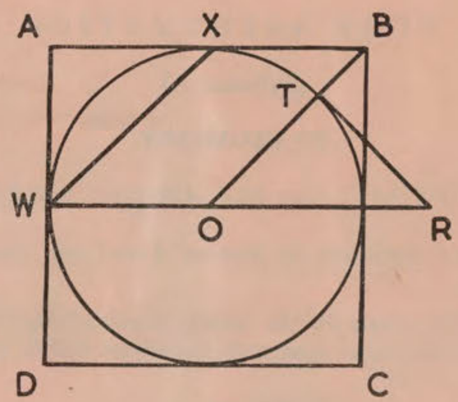


Fig. 1.

4. In Fig. 2, ABC is a triangle right-angled at C and a circle, centre B, passing through C cuts AB at D. The perpendicular from B to DC cuts AC in E.

(*a*) Prove that the triangles ABE and ACD are similar.

(*b*) If $BC=5$ in. and $AC=12$ in., calculate the length of AE.

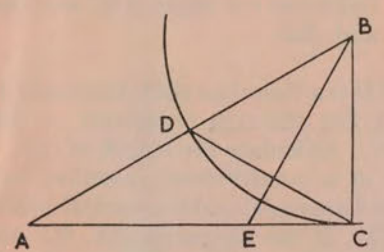


Fig. 2

5. ABC is a triangle of area 2 sq. in. and D is the midpoint of AC. BD is produced to E so that $BE=3BD$ and BC is produced to F so that EF is parallel to AC. Find the area of the quadrilateral $AEFC$.

6. The circle inscribed in a triangle ABC touches the sides BC, CA and AB in the points X, Y and Z respectively. If the angles at X and Y of the triangle XYZ are $30°$ and $80°$ respectively, calculate

(*a*) the angles of the triangle ABC,

(*b*) the angle between ZY and the diameter through Y of the circle.

Section B

Answer any THREE *questions from this section*

7. (*a*) A and B are two points on a circle. What is the locus of a point equidistant from A and B?

(*b*) What is the locus of a point equidistant from two intersecting straight lines?

(*c*) Draw a circle of radius 2 in. Without further use of a ruler for *measuring lengths*, construct a chord AB of length 3 in. and produce this to O so that $AO=4$ in. Construct a line PQ passing through O and touching the circle at a point P such that APB is a major arc of the circle. Construct the points equidistant from A and B and equidistant from the lines PQ, AO. Show *all* your construction lines.

8. Prove that two triangles on equal bases and between the same parallels are equal in area.

$ABCD$ is a quadrilateral with equal angles at A and B, and with $BC=AD$. Prove

(*a*) that AB and DC are parallel,

(*b*) that, if AC and BD meet in E and a line through E parallel to AB meets AD and BC in Z and Y respectively, then $EZ=EY$.

9. (*a*) A, B, C, D are four points such that C and D lie on the same side of the line AB. Prove that if the angles ACB and ADB are equal, the circle through the points A, B, C also passes through the point D.

(*b*) ABC is a triangle right-angled at A and AP is an altitude of the triangle. The circle with AP as diameter cuts AB and AC in X and Y respectively. Prove that the quadrilateral $CBXY$ is cyclic.

10. Fig. 3 shows two circles which cut in A and B and whose common tangents CD and EF cut the line AB produced in X and Y respectively.

Prove that (a) $CX = XD$,

(b) $XA = BY$,

(c) $XY^2 = AB^2 + CD^2$.

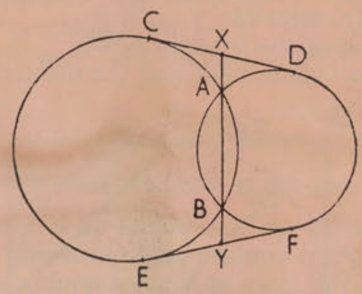


Fig. 3.

11. (a) D is a point of the side BC of a triangle ABC such that $BD : DC = BA : AC$. Prove that AD bisects the angle BAC.

(b) I is the centre of the circle inscribed in a triangle ABC and AI produced meets BC in E. If $AI : IE = 3 : 1$ prove that $AB + AC = 3BC$.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1958

PURE MATHEMATICS

(Syllabus A)

(c) GEOMETRY

TUESDAY, June 24.—Afternoon, 2 to 4.30

SECTION A

[*Answer* ALL *questions in this section.*]

1.

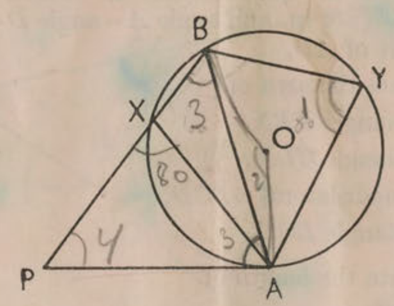


Fig. 1.

In Fig. 1, PA is a tangent and AB, equal in length to PA, is a chord of the circle whose centre is O. Y is a point on the circumference on the same side of AB as O.

If the angle $AXP = 80°$, calculate the number of degrees in the following angles,

(*a*) AYB, (*b*) AOB, (*c*) PAB, (*d*) ABX, (*e*) APB.

2. (i) Prove that if two sides of a triangle are equal, the angles opposite to those sides are equal.

(ii)

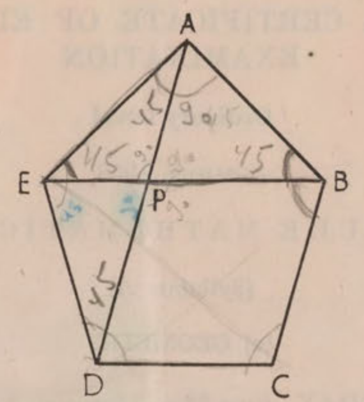


Fig. 2.

ABCDE is a regular pentagon. Calculate the number of degrees in each of the angles of the quadrilateral *BCDP*.

3. *ABCD* is a quadrilateral in which $AB = 2$ in., $CD = 5$ in., $DA = 4$ in. and angle $A =$ angle $D = 90°$. *X* is the mid point of *AD*.

(i) Calculate the area of

(*a*) triangle *ABX*,

(*b*) triangle *CDX*,

(*c*) quadrilateral *ABCD*,

(*d*) triangle *BCX*.

(ii) Calculate the length of

(*a*) *BC*,

(*b*) the perpendicular from *X* to *BC*.

4.

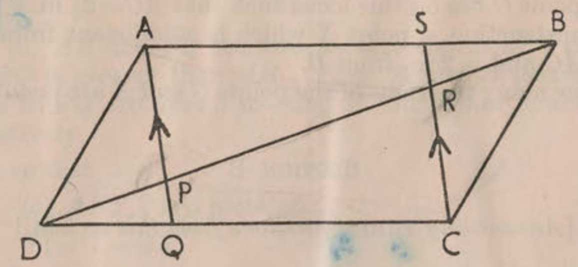


Fig. 3.

In Fig. 3, *ABCD* is a parallelogram. *QA* is parallel to *CS*.

(i) Prove that the triangles *ADP* and *BCR* are congruent.

(ii) Prove that the quadrilateral *ARCP* is a parallelogram.

5.

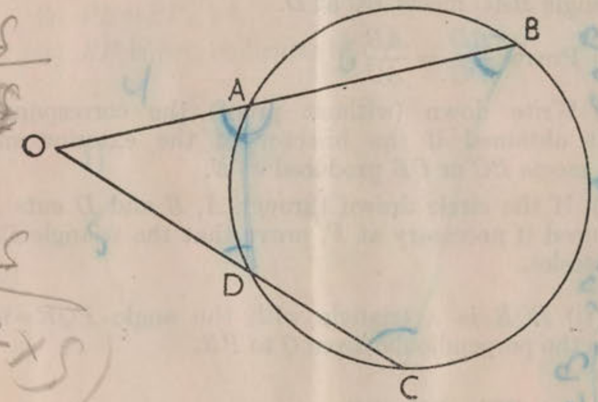


Fig. 4.

Fig. 4 shows two secants *OAB* and *ODC* of the circle *ABCD*.

If $OA = 4$ in., $AB = 6$ in. and $OD = 5$ in., calculate

(i) the length of *DC*,

(ii) the numerical value of the ratio $\dfrac{AD}{BC}$.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

AUTUMN, 1957

PURE MATHEMATICS

(c) GEOMETRY

TUESDAY, November 26.—*Morning*, 9.30 *to* 12

SECTION A

[*Answer* ALL *questions in this section.*]

1. (i) $ABCDE$ is a pentagon. The angles at A, B, C and D are 120°, 95°, 136° and 104° respectively. *Calculate* the angle AED.

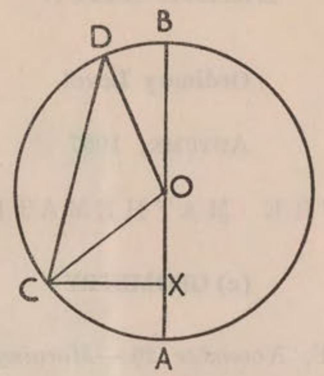
(ii) The diagonals of a rhombus are 14 inches and 48 inches long. *Calculate* the length of a side.

(iii) Show *by calculation* that a triangle whose sides are 8, 9 and 14 inches long is obtuse angled.

2. (i) ABC is a triangle such that the angles A, B, and C are 40°, 60° and 80° respectively. The inscribed circle of the triangle touches BC at P, CA at Q, AB at R. *Calculate* the size of the angle PQR.

(ii) LMN is a triangle with LM produced to Y. The bisector of the *exterior* angle NMY meets LN (produced) at X. $LM=3$ inches, $MN=2$ inches and $LX=4$ inches. *Calculate* LN.

3. In the given figure, AOB is a diameter and O is the centre of the circle. CX is perpendicular to AB. The angle OCX = the angle OCD. Prove that the angle AOD is equal to three times the angle AOC.



4. O is the centre of a circle. A is a point outside the circle such that $AO=10$ inches. The tangents from A to the circle touch it at B and C. $AB=8$ inches.

Calculate (i) OB, (ii) BC.

5. Construct a triangle ABC such that $AB=4$ inches, the angle $ACB=47°$, the area of the triangle $ABC=6$ sq. ins., and $AC<CB$. Measure AC.

6. ABC is a triangle. Y and Z are the mid-points of AC and AB respectively. AC is produced to D so that $CD=AY$. DP is drawn parallel to BA to meet BC and ZY (both produced) at P and W respectively. Show that the triangles DCP and AYZ are congruent.

Calculate the ratio of the area of the parallelogram $ZBPW$ to that of the triangle ABC.

Section B

[*Answer any* THREE *questions from this Section.*]

7. Two circles, whose centres A and B are 13 inches apart, have radii 5 inches and 10 inches respectively. The circles cut at X and Y. A common tangent touches these circles at P and Q respectively, and when produced cuts the line of centres produced at R.

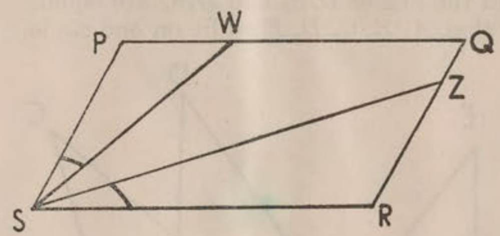
(i) *Calculate* (*a*) PQ, (*b*) RB.

(ii) If the line passing through X and Y cuts RB in W and PQ in Z, prove that the triangles RZW and RAP are similar and hence calculate ZW. You may assume, without proof, that Z is the mid point of PQ.

8. Prove that if two triangles are equiangular their corresponding sides are proportional.

In the given figure $PQRS$ is a parallelogram. SW and SZ are straight lines. The angles PSW and ZSR are equal.

Prove that $PW.PQ=RZ.RQ$



9. Prove that the angle which a major arc of a circle subtends at the centre is double that which it subtends at any point on the remaining part of the circumference.

Two unequal circles intersect in A and B. The centre, P, of one of these circles lies on the circumference of the other. R is a point on the circumference of the circle centre P such that it lies outside the circle APB. S is a point on the circumference of the circle APB such that it lies outside the circle ARB.

Prove that the sum of the angles ARB and ASP is a right angle.

10. Prove that if, from any point outside a circle, a secant and a tangent are drawn the rectangle contained by the whole secant and the part of it outside the circle is equal to the square on the tangent.

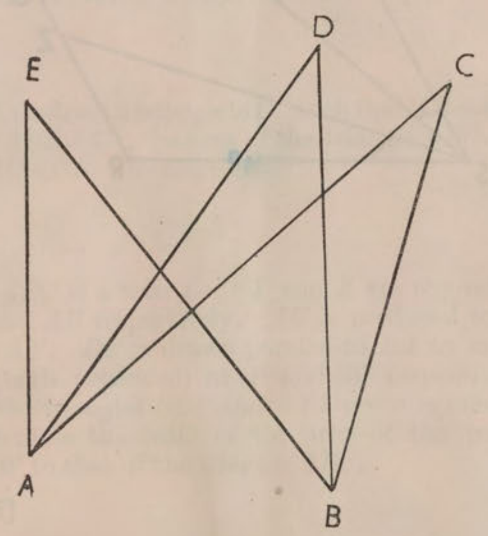
Two circles intersect at P and Q. The tangent at Q to one circle meets the other at R. RP meets the first circle at S. ST is the tangent from S to the second circle, T being the point of contact.

Prove that $ST^2+QR^2=RS^2$.

11. Prove that, if the line joining two points subtends equal angles at two other points on the same side of it, the four points lie on a circle.

In the given figure the angles AEB and ACB are equal and the angles DAC and DBC are equal.

Prove that A, B, C, D, E all lie on one circle.



UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1957

PURE MATHEMATICS

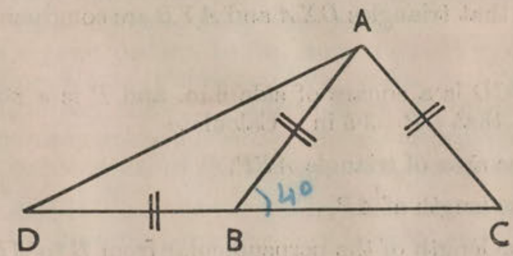
(c) GEOMETRY

TUESDAY, June 25.—*Morning,* 9.30 *to* 12

SECTION A

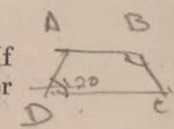
[*Answer* ALL *questions in this section.*]

1. (i) In the figure $AB=AC=BD$ and the angle $ABC=40°$.



Calculate the number of degrees in the angle CAD.

(ii) $ABCD$ is a trapezium with AB parallel to DC. If the angle $B=50°$ and the angle $D=120°$ find the number of degrees in each of the angles A and C.



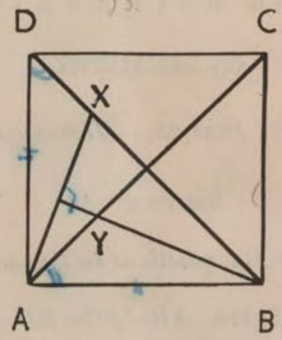
(iii) Three interior angles of a pentagon are 90°, 120° and 130°. If the remaining angles are equal find their common value.

2. $PQRS$ is a trapezium in which PQ is parallel to SR; $PQ=10$ in., $PS=3$ in., and $SR=4$ in. If PS and QR are produced to meet in X find

(i) the length of XS,

(ii) the ratio of the area of triangle XSR to the area of trapezium $PQRS$.

3. In the figure, $ABCD$ is a square, X is a point in the diagonal BD and the perpendicular from B to AX meets AC in Y.



Prove that triangles DXA and AYB are congruent.

4. $ABCD$ is a square of side 6 in. and P is a point in CD such that $CP=3{\cdot}5$ in. Calculate

(i) the area of triangle ABP,

(ii) the length of AP,

(iii) the length of the perpendicular from B to AP.

5. Construct the quadrilateral $ABCD$ given that $AB=AD=8$ cm., $BC=CD=6$ cm., and the angle $ABC=75°$.

Construct the point K on AB produced such that triangle AKD is equal in area to the quadrilateral $ABCD$. Measure AK.

6. (i) E is a point outside a circle. EBA, EDC are two straight lines drawn to cut the circle in B, A and D, C respectively. If $AD=DE$ prove that $BC=BE$.

(ii) P, Q and R, are points on the circumference of a circle, centre O. The angle $ORP=20°$, the angle $ROQ=80°$ and P, Q lie on the same side of the diameter through R. Calculate the number of degrees in the angle PQO.

Section B

[Answer any THREE *questions from this section.]*

7. P is any point on the median AD of a triangle ABC. BP is produced to meet AC in L and CP is produced to meet AB in M. AD is produced to X so that $DX=PD$.

Prove that (i) $\dfrac{AM}{AB}=\dfrac{AP}{AX}$ and

(ii) ML is parallel to BC.

8. Prove that tangents to a circle from an external point are equal, and equally inclined to the line joining the point to the centre of the circle.

Two parallel tangents to a circle, centre O, are cut by a third tangent in X and Y. Prove that XOY is a right angle.

9. Prove that if two circles touch, the point of contact lies on the line joining their centres.

P is a point distant 10 cm. from the centre of a circle of radius 5 cm. Construct two circles each of radius 3·5 cm. to pass through P and to touch the original circle. If these two circles intersect again in Q measure the length of the common chord PQ. Show all construction lines.

10. $ABCD$ is a quadrilateral in which AB is parallel to DC. By drawing perpendiculars from C and D to AB prove that

$$AC^2+BD^2=AD^2+BC^2+2AB.CD.$$

11. Prove that the line which bisects the vertical angle of a triangle internally divides the base internally in the ratio of the sides containing the angle.

The tangent at a point T of a circle, centre O, meets a radius OA produced in X. TN is the perpendicular from T to OA. Prove that $NA : AX=NT : TX$.

Farid Salman Alitayat

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

AUTUMN, 1955

PURE MATHEMATICS

(c) GEOMETRY

TUESDAY, November 22.—*Morning*, 9.30 *to* 12

SECTION A

[*Answer* ALL *questions in this section.*]

In Questions 1 and 2, no proofs are required, but all necessary working must be shown.

1. (i) $ABCDE$ is a regular pentagon. Calculate the angle EAD.

(ii) An isosceles triangle ABC has $AB=AC$ and angle $ABC=64°$. The bisectors of the exterior angles at A and C meet at X. Calculate the angle AXC.

(iii) $ABCD$ is a trapezium in which AB is parallel to DC, $AB=2$ in., $DA=6$ in., $CD=5$ in. DA and CB are produced to meet at P. Calculate the length of AP.

2. (i) Construct an angle ABC of $55°$, making $AB=3\frac{1}{2}$ in. Using ruler and compasses only, find a point P which is equidistant from the points A and B and also from the lines AB and BC. Measure BP.

(ii) AB is a diameter of a circle and P a point on the circumference such that angle $PAB=34°$. The tangent at P cuts AB produced at T. Calculate the angles BPT and BTP.

3. ABC is an isosceles triangle with $AB=AC$ and the angle at A obtuse. Equilateral triangles BCD, CAE, ABF are drawn outside the triangle ABC. Prove $DE=DF$.

4. Construct a triangle ABC in which $AB=2\frac{1}{2}$ in., angle $CAB=70°$, angle $ABC=25°$. Find a point D such that $CD=2$ in. and the area of triangle ABD is twice that of triangle ABC. Measure BD.

5. (i) A, B, C, D are points on a circle such that $AB=BC=CD$ and AB subtends an angle of $23°$ at the circumference. E is a point on the circle such that AE is parallel to CD. Calculate the angles EDC and EBC.

(ii) T is a point outside a circle and from T a tangent TP is drawn to touch the circle at P. Through T a line TAB is drawn to cut the circle at A and B, A being between T and B. If $TA=9$ cm., $AB=7$ cm., calculate the length of TP.

6. ABC is a triangle in which $AB=6$ in., $BC=5$ in., $CA=4$ in. The bisector of the exterior angle at A meets BC produced at D. A line CE is drawn through C parallel to DA to meet AB at E. Calculate

(i) the length of CD;

(ii) the ratio of the area of triangle BEC to that of triangle BAD.

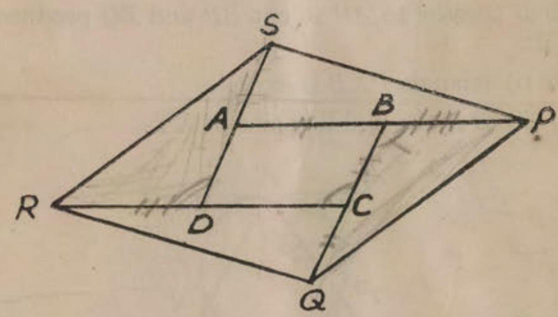
Section B

[Answer any THREE *questions from this section.]*

7. The figure shows a parallelogram $ABCD$ with its sides produced to P, Q, R, S so that $AB=BP$, $BC=CQ$, $CD=DR$, $DA=AS$.

Prove (i) triangles RDS, PBQ are congruent ;

(ii) the area of triangle RDS is equal to that of the parallelogram $ABCD$.



8. Prove that in a right-angled triangle, the square described on the hypotenuse is equal to the sum of the squares described on the sides containing the right angle.
ABC is a triangle right-angled at C. D is a point on BC between B and C such that $BD=14$ in., $DC=10$ in. and angle $ADC=45°$.

(i) Calculate the length of AB.

(ii) By the use of the theorem of Apollonius or otherwise, calculate correct to 1 decimal place the length of DM, where M is the middle point of AB.

[P. T. O.

9. Draw a triangle ABC in which $AB=2$ in., $AC=3{\cdot}5$ in., $BC=2{\cdot}5$ in.

(i) On AB as chord, and on the same side of AB as C, construct a segment of a circle to contain an angle of 42°.

(ii) Using the figure you have drawn in (i), find

(*a*) a point P such that angle $APB=42°$ and $PB=PC$;

(*b*) a point Q such that angle $AQB=42°$ and BQC is a right angle.

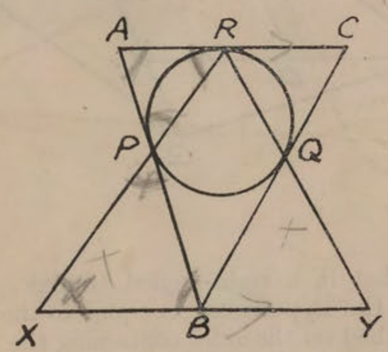
Measure PA and QA.

10. Prove that the tangents drawn to a circle from an external point are equal.

In the figure shown the circle inscribed in triangle ABC touches the sides at P, Q and R. XY is a line drawn through B parallel to AC to cut RP and RQ produced at X and Y.

Prove (i) triangle PXB is isosceles;

(ii) B is the middle point of XY.



11. Prove that if two triangles are equiangular, their corresponding sides are proportional.

ABC is a triangle inscribed in a circle. A chord XY is drawn parallel to BC and cuts AC at L, B and X being on the same side of AC.

Prove (i) angle ALX = angle AYB;

(ii) $AL \,.\, AB = AY \,.\, AX$.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1954

PURE MATHEMATICS

(c) GEOMETRY

Examiners :
C. W. BARTRAM, Esq., M.Sc.
H. H. F. MILLER, Esq., M.A.

MONDAY, June 21.—*Morning*, 9.30 *to* 12

SECTION A

[*Answer* ALL *questions in this section.*]

In Questions 1 and 2, no proofs are required, but all necessary working must be shown.

1. (i) Each interior angle of a polygon is 144°. How many sides has the polygon ?

(ii) In an isosceles triangle ABC, $AB=AC$ and the angle $BAC=52°$. AC is produced to D making $CD=BC$. Calculate the angle ABD.

(iii) The area of a parallelogram $ABCD$ is 168 sq. in. If AB is 21 in. calculate the distance between AB and CD.

T. & F.—53/1277 14/2/35000 [P. T. O.

2. (i) ABC is an acute-angled triangle. The perpendicular from A to BC meets it at D. If $AD=12$ in., $AC=15$ in., and $AB=13$ in., calculate the length of BC.

(ii) Points Y and Z are taken in the sides PQ and PR respectively of a triangle PQR such that YZ is parallel to QR. If $PY=4$ in., $PQ=6$ in., $PZ=3$ in., and $QR=7\frac{1}{2}$ in., calculate ZR and YZ.

3. AB is a diameter and AC a chord of a circle. The tangents to the circle at A and C intersect in P. Prove that $\angle APC=2\angle BAC$.

4. The sides of a rectangle are $1\frac{1}{2}$ in. and $2\frac{3}{4}$ in. Obtain by a geometrical construction the length of the side of a square equal in area to the rectangle. State *briefly* the steps in your construction. Measure and write down the length of the side.

5. Three circles, each of which touches the other two externally have radii 3 cm., 5 cm. and 12 cm. respectively. Prove that the triangle formed by joining the centres of these circles is right-angled, and find the radius of the circumscribed circle of this triangle.

6. ABC is a triangle. P and Q are points in AB and AC respectively such that PQ is parallel to BC. If $AQ=4$ in. and $QC=3$ in. state the values of the ratios

$$\frac{\text{area } PAQ}{\text{area } PQC}, \frac{\text{area } PAQ}{\text{area } BAC}, \frac{\text{area } PAQ}{\text{area } PQCB}.$$

SECTION B

[*Answer any* THREE *questions from this section.*]

7. $ABCD$ is a trapezium in which AB is parallel to DC. A parallel to BD through A meets CD produced in E. Prove that the area of the triangle AEC is equal to the area of the trapezium $ABCD$.

Draw a trapezium $ABCD$ in which $\angle DAB=108°$, $AB=2{\cdot}2$ in., $AD=2{\cdot}4$ in., and DC which is parallel to AB is of length $3{\cdot}5$ in. Find a point E in CD produced such that the area AEC is equal to the area $ABCD$. Measure CE.

8. State

(i) The locus of the vertex A of a triangle ABC of given area and fixed base BC.

(ii) The locus of the vertex P of a right angled triangle with a fixed hypotenuse QR.

(iii) The locus of a point Q, where Q is the mid-point of the hypotenuse BC of a triangle ABC with a right angle at the fixed point A, with AB, AC fixed in direction, and BC of given length.

[Do *not* prove your statements, but draw sketches to show the locus in each case.]

9. AT is the tangent at A to a circle and AB is a chord, the angle BAT being acute. Prove that the angle BAT is equal to the angle subtended by AB at any point on the major arc of the circle.

PT is the tangent at T to a circle and PQR is a secant cutting the circle at Q and R. TQ and TR are joined and a point S is taken in QR so that $PT=PS$. Prove that TS bisects the angle QTR.

10. Prove that angles in the same segment of a circle are equal.

AB and CD are two perpendicular chords of a circle which intersect inside the circle at X. E is a point in XC or XC produced such that $EX=XD$.

Prove—

(i) the triangles EAX and DAX are congruent;

(ii) $\angle EAX=\angle XCB$;

(iii) CB and AE are perpendicular.

11. AB is a diameter and AC a chord of a circle. The bisector of the angle BAC cuts BC at D, and the circumference of the circle at E. If $AB=50$ cm., $AC=14$ cm., calculate the length of BC and prove that $CD=10{\cdot}5$ cm. Prove that the triangles ACD and AEB are similar, and hence calculate the length of BE.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1952

PURE MATHEMATICS

(c) GEOMETRY

Examiners :

M. W. BROWN, Esq., M.A.
H. E. PARR, Esq., M.A.

MONDAY, *June* 16.—*Morning*, 9.30 *to* 12

SECTION A

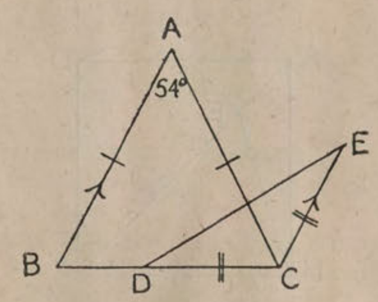
[*Answer* ALL *questions in this section.*]

In Questions 1 and 2, no proofs are required, but all necessary working must be shown.

1. (i) Three angles of a pentagon are 82°, 104° and 120°, and of the remaining two, one is twice the other. Calculate their values.

(ii) In the figure $AB=AC$, $CD=CE$, and CE is parallel to BA. Calculate angle EDC.

(iii) Calculate the area of a rhombus whose diagonals are of lengths 9 cm. and 14 cm.



2. (i) Construct a triangle ABC in which $AB = 3\frac{1}{2}$ in., angle $ABC = 48°$ and angle $CAB = 66°$. Find a point P within the triangle ABC which is equidistant from B and C and 2 in. from A. Measure BP.

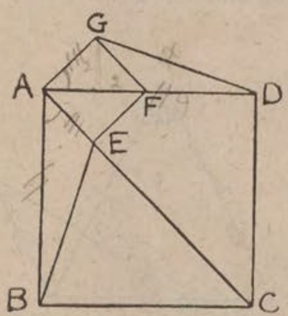
(ii) P is a point outside a circle centre O; PT is the tangent from P to the circle; PO is produced to cut the circle again at A. If angle $APT = 48°$, calculate angle TAP.

3. Draw a semi-circle centre O on a line AB of length 14 cm. as diameter. Construct a circle of radius 3 cm. to touch the semi-circle *internally* and AB at a point D between O and B. Describe briefly the steps of your construction, and measure DB.

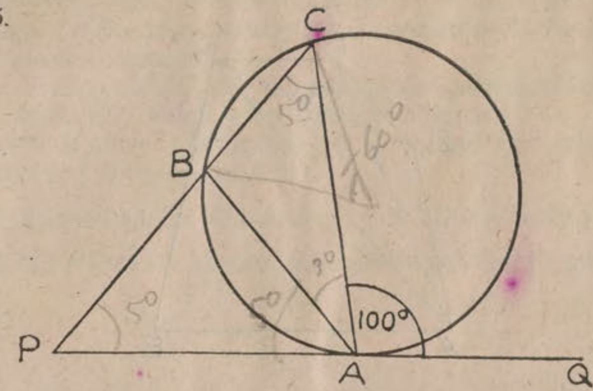
4. In the figure $ABCD$ and $AEFG$ are squares.

(i) Prove that $BE = DG$.

(ii) If $AB = 8$ in. and F is the middle point of AD, calculate GD correct to 0·1 in.



5.



In the figure PAQ is a tangent to the circle.

(i) If BC is equal to the radius of the circle,

(*a*) find the angle subtended by BC at the centre of the circle;

(*b*) prove that $BP = BA$.

(ii) If $PB = 4$ in., $BC = 5$ in., calculate PA.

6. ABC is a triangle in which $AB = 8$ cm., $BC = 10$ cm., $CA = 12$ cm. D and E are points in AB, AC such that $AD = 6$ cm. and $AE = 4$ cm.

(i) Prove that the triangles AED and ABC are similar and find the length of DE.

(ii) EF is a line drawn through E parallel to AB to cut BC in F. Find the ratio of the areas of the triangles ABC and EFC.

Section B

[*Answer* THREE *questions in this section.*]

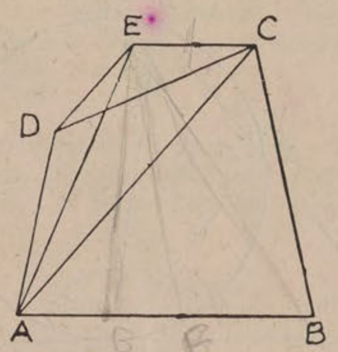
7. Prove that equal chords of a circle are equidistant from the centre.

Draw a circle centre O of radius 5 cm. Construct the locus of the middle points of chords of this circle whose length is 6 cm.

Take a point P at a distance of 9 cm. from O. Construct accurately a line through P cutting the circle at Q and R such that $QR = 6$ cm. Measure PQ.

[P. T. O.

8.



In the figure quadrilaterals $ABCD$ and $ABCE$ are equal in area. Prove that AC is parallel to DE.

If also AB is parallel to EC, EF is drawn through E parallel to CB to meet AB in F, and G is the middle point of AF, prove that the area of triangle EGB is equal to half that of quadrilateral $ABCD$.

9. Prove that the angle subtended by an arc of a circle at the centre is double the angle subtended by the same arc at any point on the remaining part of the circumference.

Two circles centres P and Q intersect at A and D. Through D a line BDC is drawn to cut the circle centre P at B and the circle centre Q at C, and such that angle $BAC = 90°$. Prove that $APDQ$ is cyclic.

10. A straight line is drawn to touch a circle and from the point of contact a chord is drawn. Prove that the acute angle which the chord makes with the tangent is equal to the angle in the alternate segment.

$ABCD$ is a quadrilateral inscribed in a circle. The diagonals AC, BD intersect at E and the tangent to the circle at A is parallel to BD. Prove that

(i) AC bisects angle BCD;

(ii) AD is a tangent to the circle through D, E and C.

11. Prove that the internal bisector of an angle of a triangle divides the opposite side in the ratio of the sides containing the angle.

In a triangle ABC, AB is fixed in position and of length 5 in. while BC, which is not fixed, is of length 3 in. The bisector of angle ABC meets AC at D, and DO is drawn parallel to CB to meet AB in O.

(i) Prove that, for all positions of BC, O is a fixed point.

(ii) Show that the locus of D is a circle and find its radius.

UNIVERSITY OF LONDON

GENERAL CERTIFICATE OF EDUCATION EXAMINATION

Ordinary Level

SUMMER, 1951

PURE MATHEMATICS

GEOMETRY

Examiners :
E. D. HODGE, Esq., B.Sc.
M. A. PORTER, Esq., M.A.

THURSDAY, *June* 14.—*Morning*, 9.30 *to* 12

SECTION A

[*Answer* ALL *questions in this section.*]

In Questions 1 and 2, no proofs are required, but all necessary work must be shown.

1. (i) *ABCDE* is a regular pentagon. *AB* and *DC* are produced to meet at *F*. Calculate $B\widehat{F}C$.

(ii) *ABCD* is a parallelogram in which *AB* is 18 in. and *BC* 12 in. long. The distance between *AB* and *DC* is 9 in. . Calculate the distance between *AD* and *BC*.

(iii) *BC* is a diameter of a circle and *A* is a point on the circle, such that $A\widehat{B}C=40°$. The tangent to the circle at *A* meets *BC* produced in *T* ; calculate $A\widehat{T}C$.

2. A and B are two given points in a plane. State fully and clearly, in each of the following cases, the locus of a point P which moves in this plane so that :—

(*a*) $PA=PB$;
(*b*) $PA=AB$;
(*c*) the area of the triangle PAB is constant ;
(*d*) the angle APB is a right angle.

3. ABC is a triangle in which $AB=AC$. D is a point in AB so that $AD=DC=BC$. Calculate $B\widehat{A}C$, giving your reasons briefly.

4. ABC is an acute-angled triangle in which BE and CF are the perpendiculars from B and C to the opposite sides. BE and CF cut at H. If $H\widehat{F}E=36°$ and $H\widehat{E}F=24°$, calculate each of the angles of the triangle ABC, stating your reasons briefly.

5. Draw a circle centre O and radius $1\frac{1}{2}$ in. Mark a point B on its circumference and make $B\widehat{O}A=30°$ and $OA=3\frac{1}{2}$ in. Construct, with ruler and compasses only, a circle to touch the first circle at B and to pass through A. Describe your construction *briefly* and measure the radius of your circle.

6. ABC is a triangle in which $\frac{AB}{AC}=\frac{3}{2}$. The internal bisector of $\widehat{A}$ meets BC at D. DE, drawn parallel to BA, cuts AC at E.

(i) State the value of the ratio $AE : EC$.

(ii) Find the ratio of the area of ΔADE to the area of ΔADC.

(iii) If the area of ΔABC is 25 sq. in., calculate the area of ΔEDC.

Section B.

[*Answer* THREE *questions in this section.*]

7. Prove that the opposite sides of a parallelogram are equal.

$ABCD$ is a parallelogram in which the bisectors of angles A and B meet at a point X on DC.

Prove (i) $A\widehat{X}B=90°$

(ii) $AB=2BC$.

8. ABC is a triangle in which M is the midpoint of AB and X is a point in AM. A line through M parallel to XC cuts BC at Y. Prove that the area of the quadrilateral $AXYC$ is half the area of the triangle ABC.

Construct a ΔABC in which $AB=3{\cdot}5$ in., $AC=3$ in. and $BC=4{\cdot}5$ in. Mark a point X in AB 1 in. from A. Construct a line through X to cut BC at Y so that XY bisects the area of ΔABC. Measure BY.

9. Prove that angles in the same segment of a circle are equal.

ABC is a triangle inscribed in a circle. The bisectors of angles A and C meet at I and AI produced cuts the circle at X. Prove $XI=XC$. Name the centre of the circle through B, I and C and justify your answer.

10. Prove the extension of Pythagoras' theorem for an acute-angled triangle.

AOB and COD are two perpendicular diameters of a circle. P is a point on the circle between A and C. Prove PB^2-PA^2 is equal to four times the area of the triangle PDC.

11. A, B, C are three points on a circle. The tangent at A meets BC produced in T. Prove, without assuming the theorem on intersecting chords, that $TA^2=TC.TB$.

P is a point on the diameter AB of a circle. The chord through P perpendicular to AB meets the circle in Q and R. C is a point on the circle between Q and B, and AC cuts QP at T. Prove (i) $A\widehat{C}Q=A\widehat{Q}T$ and hence or otherwise

(ii) $AQ^2=AT.AC$.