

(O 25, B II)

UNIVERSITIES OF MANCHESTER LIVERPOOL
LEEDS SHEFFIELD AND BIRMINGHAM

JOINT MATRICULATION BOARD

GENERAL CERTIFICATE OF EDUCATION

MATHEMATICS (O 25)
SYLLABUS B, PAPER II

ORDINARY

Friday 14 June 1968 2—4-30

Careless work and untidy work will be penalised.

Answer all questions in Section A and three questions from Section B.

In each question necessary details of working, including rough work, must be shown with the answer.

Mathematical tables are provided.

Turn over

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Section A

Answer all questions in this section.

A 1. (a) Find the total cost of 38 threepenny stamps, 48 fourpenny stamps and 95 sixpenny stamps.

(b) Solve the equation

$$\frac{x}{3} + \frac{x}{2} = 2 - \frac{x}{6}$$

(c) Use logarithms to evaluate $\sqrt[3]{0.03791}$.

A 2. (a) Evaluate 0.0325 of 12 tons, giving your answer in cwt.

(b) Calculate the area of a triangle which has sides of 10 cm. and 15 cm. containing an angle of 26° .

(c) Solve the equation

$$x(x+5) = 66.$$

A 3. (a) A chord AB of a circle meets a diameter CD at right angles at the point X . Calculate AX when $CX = 4$ cm. and $XD = 10$ cm.

(b) The rateable value of a house is £75 and the rates are paid in two equal half-yearly instalments. Calculate the half-yearly amount due when the annual rate levied is 12s. 8d. in the £.

(c) A chord of a circle has a length of 26 cm. and subtends an angle of 100° at the centre of the circle. Calculate the radius of the circle.

A 4. (a) The gradient of a curve at any point on it is $3x^2 - 1$. If the curve passes through the point (2, 5), find the equation of the curve.

(b) The sides AB and DC of a cyclic quadrilateral $ABCD$ meet when produced at a point X . If $AB = 7$ cm., $BX = 3$ cm., $CX = 4$ cm. and $BC = 2.5$ cm., calculate AD .

A 5. (a) Two similar solids have heights of 6 cm. and 9 cm. respectively. Given that the volume of the smaller solid is 88 cu. cm., calculate the volume of the larger solid.

(b) A parallelogram has sides of length 10 in. and 9 in. and the shorter diagonal is of length 7 in. Calculate the size of one of the acute angles of the parallelogram.

A 6. (a) Draw a triangle ABC in which $BC = 11$ cm., $AB = 11.5$ cm. and $AC = 9.8$ cm. Construct two points X and Y each of which is 6 cm. from A and 7 cm. from BC . Measure XY .

(b) Solve the equation

$$(2x - 3)^2 = 13$$

giving your answers correct to one place of decimals.

Section B

Answer three questions from this section.

B 7. A flat-bottomed trench is $3\frac{1}{2}$ ft. wide at the top, $1\frac{1}{2}$ ft. wide at the bottom and is 4 ft. deep with a vertical cross-section in the form of a trapezium. Calculate the volume of earth that must be excavated in digging a straight part of this trench of length 140 ft., giving your answer in cu. ft.

A cylindrical pipe of external diameter $1\frac{1}{2}$ ft. is laid along the bottom of this length of trench and the remaining volume is filled with rubble. Calculate the volume of rubble required, giving your answer in cu. ft. Take π as $\frac{22}{7}$.

If the weight of rubble required is 28 tons, calculate the average weight of 1 cu. yd. of rubble, giving your answer in cwt. correct to the nearest tenth of a cwt.

B 8. A shopkeeper purchased a number of articles at x shillings each and added 4 shillings to the cost price of each article to form his selling price. He sold some of these articles for a total of $4a$ shillings. Write down an expression for the number of articles sold.

In order to dispose of the remainder he had to reduce his selling price per article to one shilling below the original cost price of x shillings. He then managed to sell all the remaining articles for a total of a shillings. Prove that the number of articles bought originally was

$$\frac{5ax}{(x+4)(x-1)}$$

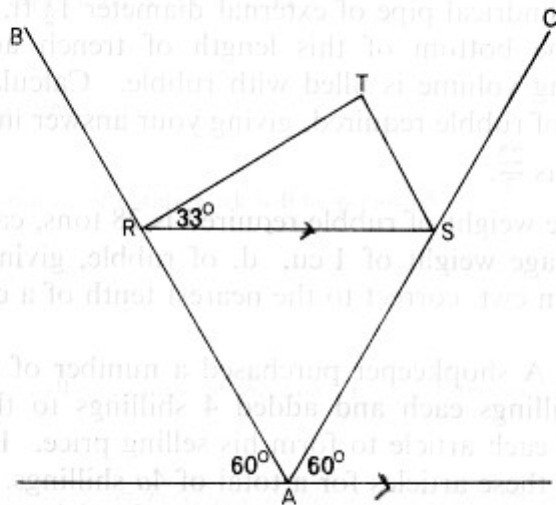
If $a = 360$ and the number of articles originally bought was 96, calculate the value of x and, in this case, calculate the total cost price.

Turn over

B 9. A circle centre O has a diameter AB and a chord AS . A chord AP bisects $\angle BAS$ and AS is produced to Q so that $PQ = PA$. Prove that

- OP is parallel to AQ ,
- $\angle APQ = \angle BPS$,
- $\angle SPQ = 90^\circ$.

B 10.



The diagram represents a vertical cross-section of two inclined planes AB and AC , each at an angle of 60° with the horizontal, supporting a triangular prism whose cross-section is RST in the position where RS is horizontal. Given that $RS = 12$ cm., $RT = 11$ cm. and $\angle TRS = 33^\circ$, calculate

- the vertical height of T above the horizontal through A ,
- the horizontal displacement of T from A ,
- the angle that TA makes with the horizontal.

B 11. A curve is represented by the equation $y = 4x - x^2$. Calculate the gradient of the line joining the points P and Q whose x -coordinates are respectively 2 and 5 and prove that the tangent to the curve at P is parallel to the x -axis.

The region bounded by the x -axis, the line $x = 2$ and the arc of the curve between the origin and the point P is rotated through a complete revolution about the x -axis. Calculate the volume generated, giving your answer as a multiple of π .

Hence calculate the volume obtained by rotating through a complete revolution about the x -axis the region bounded by the y -axis, the tangent at P and the arc of the curve between the origin and the point P , giving your answer as a multiple of π .

The annotation here is mine – an addition given by the invigilator