

(O 25, B,I)

UNIVERSITIES OF MANCHESTER LIVERPOOL
LEEDS SHEFFIELD AND BIRMINGHAM

JOINT MATRICULATION BOARD

GENERAL CERTIFICATE OF EDUCATION

MATHEMATICS (O 25)
SYLLABUS B, PAPER I

ORDINARY

Monday 17 June 1963 9-30—12

Negligently presented or slovenly work will be penalized.

Mathematical tables and one sheet of graph paper will be provided.
Answer **all** questions in Section A and any **three** questions from Section B.

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

Section A

A 1. (a) To build a motorway costs half a million pounds per mile. Find the cost per yard, in pounds, correct to the nearest pound.

(b) Solve the equation

$$\frac{8}{x} - \frac{6}{x+2} = 1$$

(c) In a triangle ABC , $AB = AC = 20$ cm.
 $BC = 32$ cm. Calculate $\angle C$.

[Turn over

A 2. (a) Find the angle whose sine is

$$\frac{1}{2} \sin 62^{\circ} 12'$$

(b) Calculate the side of a regular polygon of 40 sides which is inscribed in a circle of radius 8 cm.

(c) Find x , where $8 = 2\sqrt{9+x}$

A 3. (a) The angle A is obtuse and

$$\sin A = \frac{35}{37}$$

Without using tables, find $\tan A$.

(b) Simplify

$$\frac{x+1}{x-1} - \frac{x^2+1}{x^2-1}$$

(c) A tangent from a point P to a circle with centre O touches the circle at T . The line joining O to P cuts the circle at S and $\angle TPS = 20^{\circ}$. Calculate the obtuse angle of triangle TPS .

A 4. (a) Through how many degrees does the hour hand of a clock rotate in x minutes?

(b) Four angles of a pentagon are 30° , 88° , 112° and 145° . Find the fifth angle.

(c) If $\frac{dy}{dx} = 6x^2$, and $y = 0$ when $x = -1$, find y in terms of x .

A 5. (a) An isosceles right-angled triangle is equal in area to a circle whose radius is $10\cdot5$ in. Calculate the length, of one of the equal sides of the triangle, taking π as $\frac{22}{7}$.

(b) A man is allowed two-ninths of a sum of money tax-free and pays tax at 7s. 9d. in the £ on the remainder. Find the sum if the tax payable is £217.

A 6. (a) Calculate the largest angle of a triangle with sides 4, 5 and 6 cm.

(b) A quantity h is equal to $\frac{ab}{c}$. Find the percentage increase in h when a is increased by 25 per cent, b by 8 per cent and c by 20 per cent.

Section B

Answer **three** questions from this section.

B 7. In a triangle ABC , $AB = 8$ cm., $\angle A = 130^\circ$ and $\angle B = 40^\circ$. Calculate BC and the radius of the circumcircle.

The inscribed circle touches AB at D . Write, down the value of each of AD and DB in terms of the radius of this circle and hence calculate the radius.

B 8. $ABCD$ is a parallelogram and X, Y are the mid-points of AD, BC respectively. AC meets BX at P and XY at Q .

(i) Prove that P is a point of trisection of AC .

(ii) Find the areas of QYC, ABP and $PBYQ$ as fractions of the area of ABC .

[Turn over

B 9. Draw the graph of $y = x^2 - 5x + \frac{6}{x}$ from $x = 1$ to

$x = 5$, taking 1 in. as the unit of both x and y .

From your graph estimate two roots of the equation $x^3 + 6 = 5x^2$.

Calculate the gradient of the curve at the point where $x = 2$, and hence draw the tangent to the curve at this point.

B 10. A factory makes cylindrical pencils 9 in. long and of radius $\frac{3}{20}$ in. The graphite core is cylindrical, of radius $\frac{1}{20}$ in., and it is surrounded by wood. During manufacture there is a wastage of 12 per. cent of graphite and 20 per cent of wood. Taking π as $\frac{22}{7}$, find how many pencils may be made from 50 cu. ft. of graphite and calculate the volume of wood required.

B 11. A 100 h.p. racing car travels at a steady speed of 40 metres per sec. in a race of 300 miles. Taking 8 km. as 5 miles, calculate the time in hours and minutes to complete the course.

Calculate the time taken for a 200 h.p. car to complete the course, assuming that the speed is proportional to the square root of the horsepower. Give your answer to the nearest minute.