

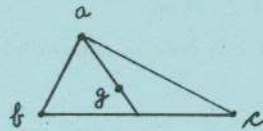
MATHEMATICS—ORDINARY LEVEL—PAPER I (300 marks)

THURSDAY, 8 JUNE—MORNING, 9.45 to 12.15

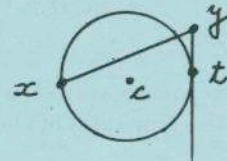
Attempt **QUESTION 1** and **FOUR** other questions.

1. (i) The boundary of a rectangular field is 280 m long. If one side measures 60 m, calculate the length of a diagonal of the field.
- (ii) If $V = \frac{1}{3}\pi r^2 h$, express r in terms of V and h .
- (iii) Calculate $|ab|$ if a is $(-5, 4)$ and the mid-point of $[ab]$ is $(-1, 1)$.
- (iv) Find the coordinates of the image of the point $(1, 3)$ under the central symmetry in the point $(5, -2)$.
- (v) If $x : y = 2 : 3$ and $y : z = 5 : 4$ find the ratio $x : z$.

- (vi) In the triangle abc , $|bc| = 2$, $|\angle bac| = 90^\circ$, $|\angle abc| = 60^\circ$. If g is the centroid of $\triangle abc$, find $|ag|$.

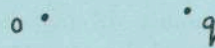


- (vii) The diagram shows a circle, centre c , and a tangent yt to the circle. If $|xy| = 9$ cm, $|cx| = 5$ cm and c is 3 cm from xy , calculate $|yt|$.



- (viii) The length of a diameter of a circle is 28 cm. Find the length of an arc of the circle which subtends an angle of 2 radians at the centre of the circle.

- (ix) The diagram shows three points o, p, q . Construct the point k which represents \vec{pq} , where o is the origin.



- (x) In a $\triangle abc$, $|ab| = 5$ cm, $|bc| = 6$ cm, and $\cos \angle abc = \frac{3}{5}$. Calculate the area of the $\triangle abc$.

(100 marks)

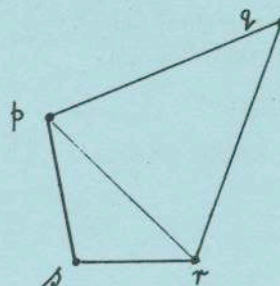
2. A solid cone is 12 cm in height and the diameter of its base is 6 cm in length. Express the volume of the cone in terms of π .

If the cone is cut parallel to the base at a height of 6 cm, find the ratio of the volume of the smaller cone to the volume of the original cone.

(40 marks)

3. Prove that two triangles on the same base and on the same side of the base and between the same parallel lines are equal in area.

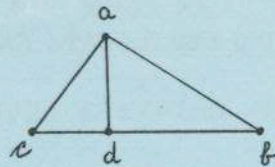
$pqrs$ is a quadrilateral. k is a point on sr , produced, such that $qk \parallel pr$. Find two triangles that are equal in area and hence find one triangle that is equal in area to $pqrs$.



(40 marks)

[P.T.O.]

4. Prove that if the angles of two triangles are equal in measure, then the lengths of their corresponding sides are proportional.



In a $\triangle abc$, $|\angle bac| = 90^\circ$ and $ad \perp bc$ (see diagram). Prove that

$$|da|^2 = |db| \cdot |dc|.$$

(50 marks)

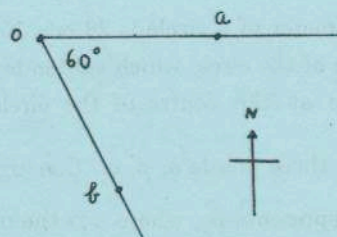
5. The coordinates of a and b are $(-1, 7)$ and $(7, -1)$, respectively. Find
- the slope of ab and the equation of the line ab
 - the equation of the line L through the origin, o , perpendicular to ab
 - the coordinates of $L \cap ab$
 - the coordinates of c if $boac$ is a parallelogram

(50 marks).

6. (a) C is the circle $x^2 + y^2 = 25$. H is the line $4x = 3y$. Find the equations of the two tangents to C which are parallel to H .
- (b) The vertices of a square are $(-1, 1)$, $(5, 1)$, $(5, -5)$ and $(-1, -5)$. Find the equation of the circle which touches each of the four sides of the square.

(50 marks)

7. Two motorists A and B leave the junction o at the same time and travel along the straight roads oa and ob respectively, $|\angle aob| = 60^\circ$. If A drives at a steady speed of 80 km/hr and B at a steady speed of 70 km/hr, calculate the distance between them after 30 minutes. Give your answer correct to the nearest km.



If A stops after one hour's driving, find the distance between them, to the nearest km, when B is due south of A .

(50 marks)

8. (a) If $\vec{a} = 2\vec{i} + 6\vec{j}$; $\vec{b} = 4\vec{i} - \vec{j}$ and $\vec{c} = 2\vec{b}$,

(i) express \vec{c} in terms of \vec{i} and \vec{j}

(ii) express \vec{ac} in terms of \vec{i} and \vec{j}

(iii) calculate $|\vec{ac}|$.

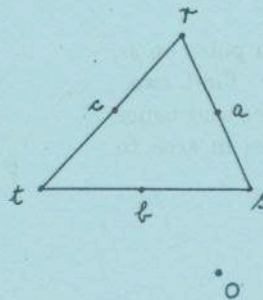
- (b) oxy is a triangle and m is the mid-point of $[xy]$. Taking o as origin prove

$$\vec{m} = \frac{1}{2}(\vec{x} + \vec{y}).$$

a , b , c are the mid-points of the three sides of the triangle rst , as in the diagram.

Taking o as the origin, prove

$$\vec{r} + \vec{s} + \vec{t} = \vec{a} + \vec{b} + \vec{c}$$



(50 mark)