

INTERMEDIATE CERTIFICATE EXAMINATION, 1974

MATHEMATICS - LOWER COURSE - PAPER I  
(150 marks)

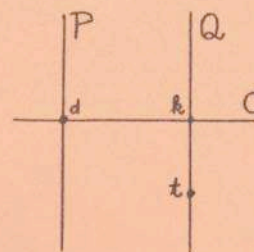
MONDAY, 17 JUNE - MORNING, 9.30 to 12.00

Six questions to be answered.  
All questions are of equal value.  
Mathematics Tables may be obtained from the Superintendent.

- A rectangular floor measuring 4 metres by 2.5 metres is to be covered by square tiles of side 25 cm. How many tiles are required?  
If the tiles cost £1.22 for every 8 tiles and other materials cost £2.60, find the cost of tiling the floor.
- A cylindrical baking tin of diameter 21 cm is 10 cm high. Show that the volume of the tin, correct to the nearest  $\text{cm}^3$ , is  $3462 \text{ cm}^3$ . (Take 3.14 as an approximation for  $\pi$ ).  
 $\frac{3}{5}$  of the volume of the tin is filled with dough and 80% of the dough is flour. Find, to the nearest  $\text{cm}^3$ , the volume of flour in the dough.

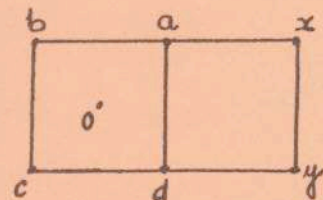
- (a) Draw a diagram to show two lines  $A$  and  $B$  and two points  $x$  and  $y$  such that  $x \in A$ ,  $x \in B$ ,  $y \in A$ ,  $y \notin B$ .

- (b) The diagram shows three lines  $P$ ,  $Q$ ,  $C$ , where  $P \parallel Q$ , and three points  $d$ ,  $k$ ,  $t$ . Draw a Venn diagram of the three lines and shade any empty sets. Show the three points in the diagram. To which of the following sets does the point  $d$  belong:



- $P \cup (Q \cup C)$
- $P \cap (Q \cup C)$
- $P \setminus (Q \cup C)$

- The points  $a$ ,  $b$ ,  $c$ ,  $d$ ,  $x$ ,  $y$  form two squares, as in diagram, and the diagonals of the square  $abcd$  intersect in  $o$ . Without adding to the diagram write down as many couples as you can of

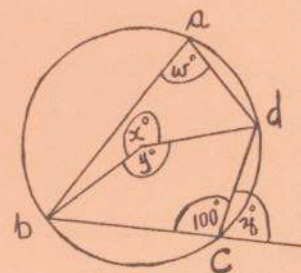


- $S_{ad}$ , the axial symmetry (reflection) in the line  $ad$ ,
- $S_o$ , the central symmetry in the point  $o$ ,
- the translation  $\vec{ba}$ .

Say why the line  $ad$  is an axis of symmetry of the rectangle  $bxyz$  and indicate where you would draw one other axis of symmetry of the rectangle.

- Prove that the measure of the angle at the centre of a circle is twice the measure of an angle at the circumference standing on the same arc.

$abcd$  is a cyclic quadrilateral as illustrated in the diagram. The measure of  $\angle bcd$  is  $100^\circ$ . Find the values of  $x$ ,  $y$ ,  $z$ ,  $w$ .





6. (a) Show how to construct the bisector of an angle  $bac$ . Show all construction lines clearly.  
 (b) If  $B$  is the bisector of  $\angle bac$  and  $x \in B$ , prove that the point  $x$  is equidistant from the two lines  $ab$  and  $ac$ .

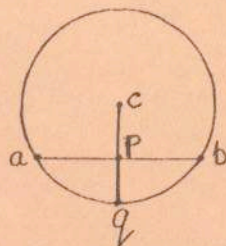
7. When is a quadrilateral said to be a parallelogram?  
 Prove that the diagonals of a parallelogram bisect each other.  
 Is it true to say that the image of a parallelogram by the central symmetry in the point where the diagonals intersect is the same parallelogram? Give your reason.  
 $[ab]$  is a side of a parallelogram  $abcd$  and the two diagonals are  $[ac]$  and  $[bd]$ . If  $|ab| = 7$  cm,  $|ac| = 10$  cm and  $|bd| = 8$  cm, construct the parallelogram.

8. A diameter of a circle is perpendicular to a chord of the circle. Prove that the diameter bisects the chord.

$c$  is the centre of a circle and  $cq$  is perpendicular to the chord  $[ab]$  as in the diagram. Write out the theorem of Pythagoras for the triangle  $cpb$ .

If  $|cb| = 5$  cm and  $|ab| = 8$  cm, find each of the following lengths:

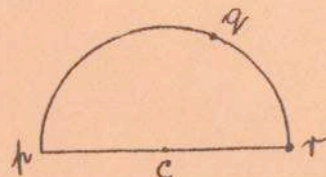
$$|pb|, |cp|, |pq|, |qb|.$$



9.  $pqr$  is a semi-circle, as in diagram, and  $c$  is the centre of  $[pr]$ . On separate diagrams illustrate the image of the semi-circle by

- (i)  $S_c$ , the central symmetry in the point  $c$ ,  
 (ii) the translation  $\vec{cr}$ .

Is the image of the semi-circle by  $\vec{cr}$  after  $S_c$  the same as the image of the semi-circle by  $S_c$  after  $\vec{cr}$ ? Illustrate your answer by diagrams.



10. (a) Use the Tables to find  $\log 1.072$ ,  $\log 0.9278$ ,  $\tan 43^\circ$ ,  $\cos 22^\circ$ .

- (b) The diagram shows a river and its banks, which are parallel. A boy stands at the point  $k$  directly opposite the point  $a$  and he observes the point  $b$  200 metres from  $a$ . His line of vision is at an angle of  $43^\circ$  to the bank on which he stands. What is the width of the river?  
 He begins to swim from  $k$  to  $a$  at the rate of 15 metres per minute. How far is he from the point  $b$  after 7 minutes?

