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

1. 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.

2. A cylindrical baking tin of diameter 21 cm is 10 cm high. Show that the volume of the tin, correct to the nearest cm$^3$, is 3462 cm$^3$. (Take 3·14 as an approximation for $\pi$).
$\frac{2}{3}$ of the volume of the tin is filled with dough and 80% of the dough is flour. Find, to the nearest cm$^3$, the volume of flour in the dough.

3. (a) Draw a diagram to show two lines $A$ and $B$ and two points $x$ and $y$ such that $x \in A, y \in B$.
(b) The diagram shows three lines $P, Q, C$, where $P \cap Q$, 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:  
(i) $P \cup (Q \cup C)$  
(ii) $P \cap (Q \cup C)$  
(iii) $P \setminus (Q \cup C)$?

4. 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  
(i) $S_{ad}$, the axial symmetry (reflection) in the line $ad$  
(ii) $S_{o}$, the central symmetry in the point $o$  
(iii) the translation $b \varepsilon$  
Say why the line $ad$ is an axis of symmetry of the rectangle $bcxy$ and indicate where you would draw one other axis of symmetry of the rectangle.

5. 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°. Find the values of $x, y, z, w$.  

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6. (a) Show how to construct the bisector of an angle \(bac\). Show all construction lines clearly.

(b) If \(B\) is the bisector of \(bad\) 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.

\(|ab| = 7\ \text{cm}, |ac| = 10\ \text{cm}\) and \(|bd| = 8\ \text{cm}\), 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 \(cg\) is perpendicular to the chord \(|ab|\) as in the diagram. Write out the theorem of Pythagoras for the triangle \(cpb\).

If \(|cb| = 5\ \text{cm}\) and \(|ab| = 8\ \text{cm}\), find each of the following lengths:

\(|pbl|, |cpl|, |pq|, |qbl|.

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 \(\sigma_r\).

Is the image of the semi-circle by \(\sigma_r\) after \(S_c\) the same as the image of the semi-circle by \(S_c\) after \(\sigma_r\)? 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 \(b\) at the rate of 15 metres per minute. How far is he from the point \(b\) after 7 minutes?