MATHEMATICS - LOWER COURSE - PAPER I (150 marks)

MONDAY, 13 JUNE - MORNING - 9.30 to 12

Examination Number

SECTION A (45 marks)

Attempt **all** questions.   You should not spend more than <u>45 minutes</u> on this section.

Answer each question by writing one of (a), (b), (c), (d) in the box under each question number. If you wish to change an answer, cross out your first choice and write your new answer near the box.

Mathematics tables may be obtained from the Superintendent.

THIS PAPER **MUST** BE ENCLOSED IN YOUR ANSWER BOOK.

1. 0·0035 is equal to

   (a) 350×10^{-4} (b) $3·5 \times 10^{-3}$ (c) $0·35 \times 10^{2}$ (d) $3·5 \times 10^{3}$.

2. The length of a side of a solid cube is 5 cm.   The area of the surface of this cube in cm² is

   (a) 25   (b) 100   (c) 125   (d) 150

3. $3\frac{3}{5} \div 2\frac{1}{4}$ is

   (a) $\frac{2}{5}$ (b) $\frac{4}{5}$ (c) $1\frac{1}{5}$ (d) $1\frac{3}{5}$

4. Angela completes a journey of 25 km in 50 minutes.   Her average speed in km per hour is

   (a) 2   (b) 30   (c) 35   (d) 120

5. Each diagonal of a square is 4 cm in length.   One side of the square is of length

   (a) 2 cm   (b) $\sqrt{2}$ cm   (c) $\sqrt{8}$ cm   (d) 8 cm.

6. The set of all couples such that each is equipollent to (h, k) is

   (a) a projection   (b) a translation

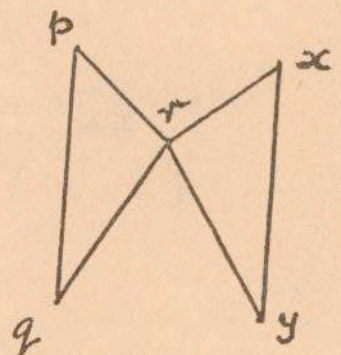   (c) a central symmetry   (d) an axial symmetry

7. $\triangle pqr$ is the image of $\triangle xyr$ by

   (a) a projection

   (b) a translation

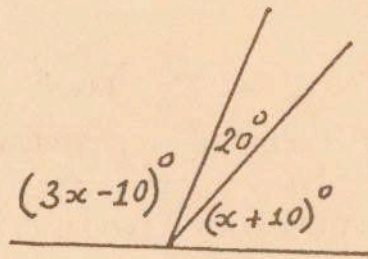   (c) a central symmetry

   (d) an axial symmetry

OVER→
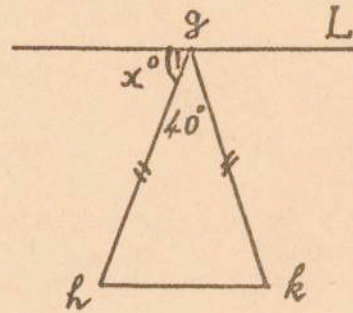
8. The value of x is

   (a) 40   (b) 85

   (c) 50   (d) 95

9. $\triangle ghk$ is isosceles and $L \parallel hk$.
   x° is the measure of the angle as indicated.
   x° is equal to

   (a) 40° (b) 70°

   (c) 140° (d) 50°

10. $pqrs$ is a parallelogram $|pq| \neq |qr|$. The diagonals intersect at x. Which one of the following statements is false ?

   (a) q is the image of p by the translation $\vec{sr}$
   (b) s is the image of q by the central symmetry in x
   (c) r is the image of p by the axial symmetry in sq
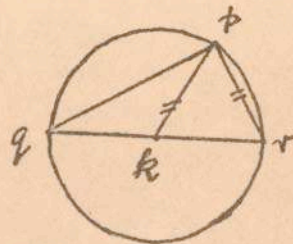   (d) p is the image of x by the projection on pq parallel to rp.

11. The area of the surface enclosed by the isosceles triangle is

   (a) 48   (b) 96

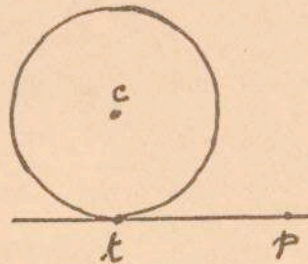   (c) 50   (d) 60
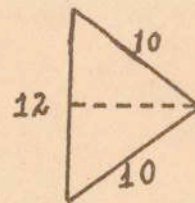
12. k is the centre of the circle and $|pk| = |pr|$. Then $|\angle pqr|$ is equal to

   (a) 45° (b) 30°

   (c) 15° (d) 60°

13. pt is a tangent to the circle, centre c and radius of length 5 cm. If $|pt| = 12$ cm, then $|pc| =$

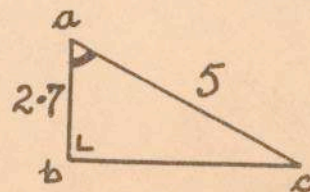   (a) $\sqrt{17}$ cm   (b) 12 cm

   (c) 13 cm   (d) 7 cm

14. A right angled triangle has sides of length 7, 24, 25. If $\cos X = \frac{7}{25}$, then $\sin X$ is equal to

   (a) $\frac{7}{24}$ (b) $\frac{25}{24}$ (c) $\frac{25}{7}$ (d) $\frac{24}{25}$

15. $|\angle bac| =$

   (a) $32^\circ 41'$ (b) $57^\circ 18'$

   (c) $57^\circ 17'$ (d) $57^\circ 19'$

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SECTION B (105 marks)

Attempt **QUESTION 1** and **THREE** other questions

1. Using your tables page 20 to page 27, or otherwise, find

 (i) $(7 \cdot 348)^2$ (ii) $\sqrt{7 \cdot 29}$ (iii) $\dfrac{1}{43 \cdot 47}$

 Simplify: $\dfrac{(7 \cdot 348)^2}{\sqrt{729} \times 43 \cdot 47}$

 and give your answer correct to one significant figure.

(25 marks)

2. (i) An article which cost £80 is increased in price by 20%.   What does the article cost now ?

 (ii) The volume of a cylinder is 308 cm³.   If the area of the base is 38·5 cm², find the height of the cylinder.
 Find also the length of the radius of the base, taking $\frac{22}{7}$ as an approximate value of π.

(20 marks)

3. If two sides of a triangle are equal in length, prove that the measure of the angles opposite these sides are also equal.
 Hence prove that in an equilateral triangle the three angles are equal in measure.

(20 marks)

4. Prove that a central symmetry maps a line onto a parallel line.

 In the diagram c is the midpoint of $[bd]$ and $ba \parallel de$.
 Using the central symmetry S_c , or otherwise, prove that the $\triangle\, abc$ is congruent to the $\triangle\, edc$.
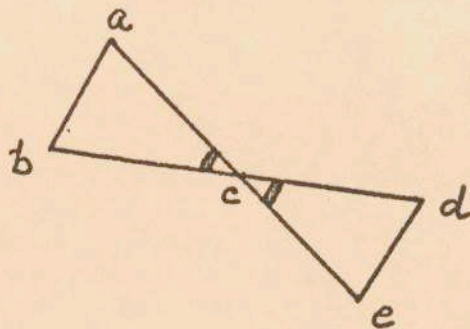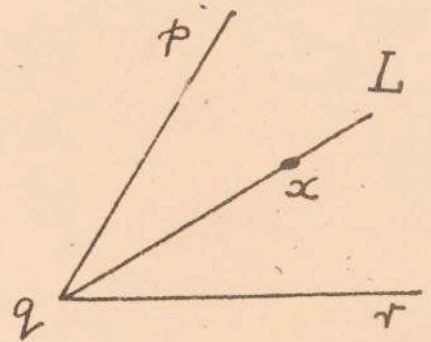

(25 marks)

OVER→

5. Show, with proof, how to construct the bisector of a given angle.   (Use of protractor not allowed).

   L is the bisector of the $\angle pqr$ and x is any point of L.   Prove that the distance of x from qp is equal to the distance of x from qr.

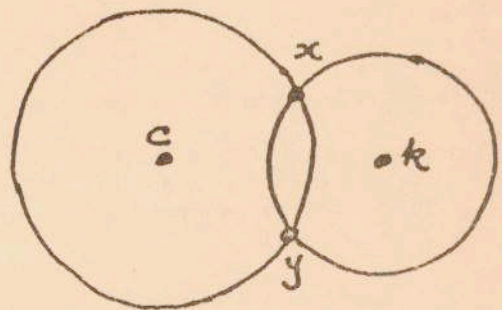(25 marks)

6. Prove that a circle is mapped onto itself by the axial symmetry on any line through its centre.

   Two circles of centres c and k, as in diagram, intersect in x and y.

   Prove that

   $$ck \perp xy.$$

(25 marks)

7. Use your tables to find the value of sin 23°35'.

   An aeroplane taking off from the ground flies in a straight line making an angle measuring 23°35' with the horizontal level ground.   If the aeroplane is flying at a speed of 3 km a minute, find its height above the ground after 2·5 minutes.

(30 marks)