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INTERMEDIATE CERTIFICATE EXAMINATION, 1936.

MATHEMATICS (Geometry).

THURSDAY, 18*th JUNE*.—MORNING, 10 A.M. TO 12.30 P.M.

The total number of questions answered should not exceed *six*.

(Candidates should see that answers to questions in excess of *six* are cancelled.)

Mathematical Tables may be obtained from the Superintendent.

Candidates should state the text-book used in order to indicate the sequence followed.

1. Prove that one side of a triangle is less than the sum of the other two.

P is a point within a quadrilateral ABCD: prove that PA+PB+PC+PD cannot be less than AC+BD. [30 marks.]

2. Prove that if two circles touch one another their centres and the point of contact lie in the same straight line.

Two circles, A, B, have their centres 3·5 ins. apart, the radius of A is 1·5 ins., and that of B is 1 inch. Describe a circle 2 ins. in radius to touch A and B. [No proof required.] [30 marks.]

3. The side BC of a triangle ABC is 3 ins. long and the perpendicular from A on BC is 4 ins. Construct accurately a parallelogram PQRS having an area equal to that of the triangle and such that PQ $=4\frac{1}{2}$ ins., QR$=3\frac{1}{2}$ ins. [30 marks.]

4. Prove that equal chords of a circle are equidistant from the centre.

From a point P within a circle whose centre is L two lines PM, PN are drawn to meet the circle at M, N. If $L\hat{P}M=L\hat{P}N$ and if LQ, LR are the perpendiculars from the centre on PM and PN prove that LQ=LR and PM=PN. [30 marks.]

5. Illustrate the following identities by geometrical diagrams:

(i) $(a+b)(p+q)=ap+bp+aq+bq$.

(ii) $(a+b)^2+a^2=2a(a+b)+b^2$.

where a, b, p, q are positive numbers. [30 marks.]

6. The sides of a triangle are 4 ins., 3·5 ins., 3 ins. respectively. Construct geometrically a square equal in area to the triangle.

[Proof not required but all construction lines should be clearly shown.] [30 marks.]

7. Construct geometrically a line $\sqrt{12}$ ins. long.

ABC is a triangle in which AB=1 inch, BC=$\sqrt{12}$ ins. and $\hat{B}=90°$. A circle whose centre is A and radius AB cuts CA at X and CA produced at Y: show that $CX \cdot CY=3XY^2$. [35 marks.]

8. A, B, C, D are the vertices of a rectangle taken in order. Prove that $PA^2+PC^2=PB^2+PD^2$, where P is any point and find the locus of a point Q which moves so that

$$QA^2+QB^2+QC^2+QD^2 = 10(AB^2+BC^2)$$

[35 marks.]

9. Construct accurately two angles A, B, such that tanA=2·8, cosB=0·65 and find the values of sinA and tanB.

[Tables may not be used.] [35 marks.]

10. A pole stands vertically on top of a castle which is on level ground. At a certain point on the ground the angles of elevation of the top and the bottom of the pole are 21° and 16° 6′ respectively. At another point 100 yards nearer to the foot of the castle the angle of elevation of the bottom of the pole is 29° 36′. Calculate the length of the pole. [35 marks.]