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(Department of Education).

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INTERMEDIATE CERTIFICATE EXAMINATION, 1938.

MATHEMATICS (Geometry).

FRIDAY, 17*th JUNE*.—MORNING, 10 A.M. TO 12.30 P.M.

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

Mathematical Tables may be obtained from the Superintendent.

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

1. The opposite sides of a quadrilateral are equal: prove that those sides must be parallel.

Prove also that the diagonals bisect each other.

[30 marks.]

2. Prove that any point on the bisector of an angle is equidistant from the arms of the angle.

Two lines, AB, AC intersect at A: show how to describe a circle of radius 1·2 inches which shall touch AB, AC.

[30 marks.]

3. The sides of a triangle are 3 inches, 3·5 inches, 4 inches respectively. Construct geometrically two parallelograms, X, Y, each equal in area to the triangle and such that

(i) one angle of X shall contain 60°,

(ii) one side of Y shall be 5 inches long.

[30 marks.]

4. Prove that if two circles touch each other their centres and the point of contact lie in the same straight line.

Two concentric circles have radii of a, b respectively ($a>b$). Find the locus of the centres of the circles which touch both of those circles and express the length of their radii in terms of a and b.

[30 marks.

5. Through a point P which is x inches from the centre of a circle of radius r ins. $(r>x)$ a chord APB is drawn: prove that $AP.PB=r^2-x^2$.

Show how to find a point Q on the circumference of the circle such that $PQ^2=AP.PB$.

[30 marks.]

6. Show how to find a point P on a straight line AB such that $AP^2+PB^2=\frac{3}{4}AB^2$.

[30 marks.]

7. Prove that in general a triangle has no axis of symmetry and show in what special cases a triangle has

(*a*) one axis of symmetry,

(*b*) three axes of symmetry.

Construct two quadrilaterals such that one of them may have only *one* axis of symmetry and the other may have only *two* axes of symmetry.

[35 marks.]

8. Two circles intersect at P: show how to draw through P a line which shall meet the circles again at Q, R, respectively, such that QPR shall be of maximum length.

[35 marks.]

9. L, M are two points on the same side of a straight line X, Y; from L a perpendicular LN is drawn to XY and produced to L^1 such that $LN=NL^1$. If L^1M cuts XY at P prove that LP+PM is less than the sum of the lines joining L and M to any other point on XY.

A and B are two fixed points each of which lies between the arms of the angle DEF: show how to find points G, H on ED, EF respectively, such that AG+GH+HB shall be of minimum length.

[35 marks.]

10. A spire S is visible from two points, X, Y, three miles apart on a straight road running due north. Viewed from X the spire bears 15° east of north, and viewed from Y it bears 35° east of north. Find by calculation how far the spire is from X, from Y, and from the road.

[35 marks.]