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(Department of Education).

INTERMEDIATE CERTIFICATE EXAMINATION, 1952.

MATHEMATICS—GEOMETRY.

FRIDAY, 13th *JUNE*. MORNING, 10 TO 12.30.

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

Mathematical Tables may be obtained from the Superintendent.

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1. Prove that the three angles of a triangle are together equal to two right angles.

Hence show that the sum of the four angles of any quadrilateral is equal to four right angles.

[30 marks.]

2. Using ruler and compass only, construct

    (i) a square whose diagonal shall be 3 inches in length ;

    (ii) an equilateral triangle of perpendicular height 2 inches.

[No proof is required, but the construction lines should be clearly shown.]

[30 marks.]

3. Prove that triangles on the same base and between the same parallels are equal in area.

Show, with proof, how to construct a triangle equal in area to a given quadrilateral.

[30 marks.]

4. Illustrate the following identity by means of a geometrical diagram :

$$(x+y)^2 = x^2 + 2xy + y^2.$$

In a triangle ABC the angle BCA is obtuse and D is the foot of the perpendicular from A on BC produced. Prove that $AB^2 = BC^2 + CA^2 + 2BC.CD$.

[35 marks.]

5. Prove that the sum of a pair of opposite angles of a cyclic quadrilateral is equal to two right angles.

A quadrilateral ABCD is inscribed in a circle. The angle ABC is bisected internally and the angle CDA is bisected externally. Prove that the bisectors meet on the circumference of the circle.

[35 marks.]

Or,

5. P and Q are two fixed points and a point R moves so that the angle PRQ is constant. What is the locus of R ?

AB is a fixed chord in a circle, and a point C moves along the greater of the two arcs of the circle. The bisectors of the angles CAB and CBA meet at D. Prove that the locus of D is an arc of a circle, whose centre is on the smaller arc of the original circle.

[35 marks.]

6. Prove that if two triangles are equiangular their corresponding sides are in proportion.

X is a point inside the triangle ABC. The perpendiculars from X to the sides AB, AC are in the ratio $m : n$. Prove that the perpendiculars to AB, AC from any other point on the straight line AX are also in the ratio $m : n$.

[35 marks.]

7. C is the base of a vertical tower and A, B are two points in the horizontal plane through C, such that A, B, C are in one straight line and AB=30 yards. The angles of elevation of the top of the tower at A, B are 27° and 49°, respectively. Find the height of the tower, correct to the nearest foot.

[35 marks.]