

AN ROINN OIDEACHAIS

(Department of Education).

INTERMEDIATE CERTIFICATE EXAMINATION, 1947.

MATHEMATICS—GEOMETRY.

WEDNESDAY, 11th JUNE.—MORNING 10 TO 12.30.

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

Mathematical Tables may be obtained from the Superintendent.

1. Draw a triangle with sides 6 cm., 7 cm. and 8 cm. in length respectively. Then find by construction the centre of the inscribed circle of the triangle and draw the circle.

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

[30 marks.]

2. Prove that the angle at the centre of a circle is double the angle at the circumference standing on the same arc. [One case sufficient.]

Hence, or otherwise, show that the sum of a pair of opposite angles of a cyclic quadrilateral is equal to two right angles.

[30 marks.]

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

The sides AB, DC of a quadrilateral ABCD are parallel and the diagonals AC, DB intersect at E: prove that the triangles AED and BEC are equal in area.

[30 marks.]

4. Show how to construct

(i) a triangle equal in area to a given quadrilateral,

(ii) a square equal in area to a given rectangle.

[Proofs not required.]

[30 marks.]

5. Prove that the medians of a triangle are concurrent.

[30 marks.]

6. Show how to divide a straight line AB internally at X so that $AX^2=AB.XB$.

Give proof.

[30 marks.]

7. The internal bisector of the angle BAC of a triangle ABC meets BC in D: prove that $AB:AC=BD:DC$.

The vertex A of a triangle ABC is joined to M, the middle point of BC, and the angles AMB, AMC are bisected by lines meeting AB, AC in X, Y respectively: prove that XY is parallel to BC.

[35 marks.]

8. ABC is an equilateral triangle of side 2 inches. AD is the perpendicular from A to BC. The bisector AE of the angle BAD meets BD at E. Show that $AD=\sqrt{3}$ inches. Write down the ratio of BE to ED and calculate the length of ED. Hence prove that $\tan 15^\circ=2-\sqrt{3}$.

[35 marks.]

9. Two vertical poles AB, CD of equal height stand on a horizontal plane and are 100 feet apart. At a point in the straight line BD joining the feet of the poles the angles of elevation of the tops of the poles are 35° and 45° respectively. Calculate the height of the poles.

[35 marks.]

10. In a rectangular garden ABCD two trees are situated at points X and Y, such that $AX=10$ feet, $XY=8$ feet and the angles XAD, AXY are equal to 15° and 40° respectively. Find the distances of Y from the sides AD and AB, and hence calculate the distance of Y from A.

[35 marks.]