AN ROINN OIDEACHAIS
(Department of Education).

INTERMEDIATE CERTIFICATE EXAMINATION, 1943.

MATHEMATICS (Geometry).

TUESDAY, 8th JUNE.—AFTERNOON, 3 TO 5.30.

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

Mathematical Tables may be obtained from the Superintendent.

1. Construct a triangle ABC having AB=1·5 inches, AC=1·9 inches and BC=2·5 inches. Construct the perpendicular from A to BC and measure its length.

[No proof required, but set-square or protractor must not be used in constructing the perpendicular].

[30 marks]

2. Prove that the internal bisectors of the angles of a triangle meet in a point.

The bisectors of three of the angles of a quadrilateral meet in a point: prove that the bisector of the remaining angle passes through that point.

[30 marks]

3. Prove that the area of a triangle is half the area of the rectangle on the same base and between the same parallels.

Hence, prove the formula for the area of a triangle—viz., half the product of two sides multiplied by the sine of the included angle.

[30 marks]

4. On a given straight line construct a rectangle equal in area to a given square. Give proof.

[30 marks]

5. State in words the geometrical theorem which corresponds to the algebraic identity

$$(a-b)^2 \equiv a^2+b^2-2ab.$$

Draw a diagram to illustrate the identity and indicate by marking the diagram and by a short explanation how the diagram illustrates the identity. Does the diagram fully verify the identity, *i.e.*, for all values of a, b? Explain.

[30 marks]

6. Show, giving proof, how to inscribe in a given circle a triangle equiangular to a given triangle.

If two equiangular triangles are inscribed in a given circle, prove that they are equal in all respects.

[30 marks]

7. State and prove the theorem which shows by how much the square on the side of a triangle opposite an acute angle is exceeded by the sum of the squares on the other two sides.

[30 marks]

8. Prove that equiangular triangles are similar.

ABC is a triangle in which the angle C is double of the angle B. The internal bisector of the angle C meets AB at D : prove that the triangles ACD, ABC are similar.

[35 marks]

9. A ladder is standing against a vertical wall. The foot of the ladder is 5 feet from the wall and the angle which the ladder makes with the ground is 72°. How far up the wall does the top of the ladder reach ? If the foot of the ladder is moved one foot further away from the wall, how far will the top descend ?

[Answer to the nearest inch in each case].

[35 marks]

10. A straight road AB, inclined at an angle of 15° to the horizontal, leads to the base of a vertical monument BC. From A the angle BAC is observed to be 21° and from another point D on the road such that AD=50 feet the angle BDC is observed to be 34°. Calculate the height of the monument.

[40 marks]