AN ROINN OIDEACHAIS

(Department of Education).

INTERMEDIATE CERTIFICATE EXAMINATION, 1944.

MATHEMATICS (Geometry).

TUESDAY, 13*th* *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. Draw a straight line 5 inches long and divide it into seven equal parts as accurately as you can by means of a geometrical construction. [No proof required but the construction should be briefly explained.]

[30 marks.]

2. Prove that the square on the hypotenuse of a right-angled triangle is equal to the sum of the squares on the other two sides.

[30 marks.]

3. Prove that the perpendiculars drawn from the vertices of a triangle to the opposite sides are concurrent.

[30 marks.]

4. Prove that angles in the same segment of a circle are equal.

Draw a circle and a chord AB. Take any point P on the circumference and in AP produced take a point X so that PX=PB. Repeat for several positions of P on the circumference. What is the locus of X? Give reason.

[30 marks.]

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

P is a point in the base BC produced of a triangle ABC. Show how to find a point Q in AB so that the triangles PQB, ABC may be equal in area. [No proof required.]

[30 marks.]

6. Draw a geometrical diagram to illustrate the identity

$$a^2-b^2\equiv(a+b)(a-b).\ [a \text{ greater than } b.]$$

Give a short explanation showing how your diagram illustrates the identity.

[30 marks.]

7. Define *parallelogram, rectangle, square.*

Prove that (i) the bisectors of the angles of a parallelogram form a rectangle, (ii) the bisectors of the angles of a rectangle form a square.

[35 marks.]

8. A and B are two points on the circumference of a circle and O is a point in the same straight line as A, B. Show how to find by construction a point P on the circumference such that $OP^2 = AO \cdot OB$, when O is (i) outside the circle, (ii) inside the circle.

[35 marks.]

9. (*a*) Without using the Tables, construct an angle A such that $\sin A = 0{\cdot}7$. Measure the angle.

(*b*) ABC is a triangle in which $B = C = 15°$. Draw a perpendicular from C to BA produced. Hence find surd expressions for tan 15°, and sin 15°.

[35 marks.]

10. From a ship sailing South-East at the rate of 12 miles per hour a lighthouse is observed to bear N. 35° E., and two hours later its bearing is due North. Find the distance of the ship from the lighthouse at each observation.

[35 marks.]