AN ROINN OIDEACHAIS
(Department of Education.)

BRAINNSE AN MHEADHON-OIDEACHAIS
(Secondary Education Branch).

INTERMEDIATE CERTIFICATE EXAMINATION, 1941.

MATHEMATICS (Geometry).

MONDAY, 16*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.

1. Prove that the area of a triangle is equal to one half of the area of the rectangle on the same base and between the same parallels.

[30 marks.]

2. Draw a geometrical diagram to illustrate the identity

$(a-b)^2 \equiv a^2 - 2ab + b^2$ [*a* greater than *b*].

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

[30 marks.]

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

[30 marks.]

4. What are the conditions necessary to ensure that a triangle can be constructed from three given straight lines ?

ABC is an equilateral triangle and P is any point in the side BC. Prove that a triangle can always be formed with sides equal to AP, BP, CP respectively.

[30 marks.]

5. Prove that the perpendiculars drawn from the vertices of a triangle to the opposite sides meet in a point.

[30 marks.]

6. Construct a triangle ABC such that AB=6 cms., BC=7½ cms., AC=9 cms.

Construct the circle which passes through A and C and which touches AB at A.

[No proof is required, but the constructions should be briefly explained.]

[30 marks.]

7. If two chords of a circle intersect at a point within the circle, prove that the rectangle contained by the segments of the one is equal to the rectangle contained by the segments of the other.

Explain how this theorem might be used to construct on a given straight line a rectangle equal in area to a given rectangle.

[35 marks.]

8. Prove that the internal bisector of an angle of a triangle divides the opposite side in the ratio of the sides containing the angle bisected.

A straight line is drawn dividing an angle of an equilateral triangle in the ratio 3 : 1. Find, in its simplest surd form, the ratio of the segments into which it divides the opposite side.

[35 marks.]

9. Through a point P, 3 inches from the centre O of a circle whose radius is 2 inches, a secant PQR is drawn such that the angle OPQ=25°. Calculate the length of the chord QR.

[35 marks.]

10. Prove that in a triangle ABC

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

If A=45° and C=60°, prove that $2c = a\sqrt{6}$.

Prove also $2b = a + c\sqrt{2}$ and find the value of sin75° in surd form.

[35 marks.]