AN ROINN OIDEACHAIS

(Department of Education).

BRAINSE AN MHEÁN-OIDEACHAIS

(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1929.

PASS

MATHEMATICS (II).

TUESDAY, 18*th JUNE*.—Afternoon, 3.30 to 6 p.m.

Six questions may be answered. All questions carry equal marks.

Mathematical Tables may be obtained from the Superintendent.

Candidates should state the text-book used in order to indicate the sequence followed.

1. A, B, C, D are four points taken in order on the circumference of a circle: Show that the angles ABD and ACD are equal.

The diagonals of a quadrilateral inscribed in a circle intersect at right angles and from the point of intersection a perpendicular is drawn to one of the sides: prove that this perpendicular produced will bisect the opposite side.

2. Show that if two triangles are equiangular their corresponding sides are proportional.

Prove that the line joining one vertex of a parallelogram to the mid-point of a side not passing through this vertex divides a diagonal in the ratio 1 : 2.

3. A diagonal of a quadrilateral is divided into n equal parts and the points of section are joined to the opposite angular points of the quadrilateral. Show that the quadrilateral is divided into n equal parts.

ABCD is a quadrilateral and P a point such that the figure ABCP is half of ABCD: show that the locus of P is a straight line parallel to one of the diagonals.

4. A, B, C, D are points on a straight line such that AB = CD, and $BC^2 = AB^2 + CD^2$. If AD is one unit in length, find the length of AB.

Hence, or otherwise, obtain a geometrical method for cutting off the corners of a square so as to leave a regular octagon.

5. Give, with proof, a geometrical construction for a mean proportional between two given lines.

Two circles have external contact and one of their common tangents meets the circles at T and T_1: Show that TT_1 is the mean proportional between the diameters of the circles.

6. Prove that the areas of similar figures are to one another as the squares on their corresponding sides.

7. Without tables or measurements from a diagram calculate sin 15° and tan $22\frac{1}{2}°$.

8. By drawing the graphs of $y = \operatorname{cosec} x$ and $y = 3 \tan x$ determine to the nearest degree a value of x lying between 0° and 45° such that $\operatorname{cosec} x = 3 \tan x$.

Verify your result by solving the equation $\operatorname{cosec} x = 3 \tan x$.

9. Show that, in a triangle ABC, $\sin \frac{1}{2}(B+C) = \dfrac{a \sin \frac{1}{2}(B-C)}{b-c}$.

If $a = 4 \cdot 7$, $b - c = 1 \cdot 3$, $B - C = 17° 28'$, find the angles of the triangle.