AN ROINN OIDEACHAIS

(Department of Education).

BRAINSE AN MHEÁN-OIDEACHAIS

(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1931.

PASS.

MATHEMATICS (II).

MONDAY, 15th 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. Show how to find a mean porportional between two given straight lines. Hence explain how geometrical constructions may be found to represent $\sqrt{a}$ when a is (*i*) a positive integer, (*ii*) a positive fraction.

2. Show how to divide a straight line in medial section *i.e.* so that the square on one part may be equal to the rectangle contained by the whole line and the other part.

If P and Q are the two points which divide AB internally in medial section and P is nearer to A than Q is, prove that AQ is also divided internally in medial section at P.

3. C is a point on the circumference and AB is a chord of a circle CAB: show how to draw a chord through C which will be bisected by AB. Is a solution always possible ?

Show how to find a point P (*i*) in the base AB (*ii*) in the base AB produced of a triangle ABC so that $CP^2 = AP.\ PB$.

4. What is a regular pentagon ? Prove that a circle can be described about a given regular pentagon.

Show that the diagonals of a regular pentagon intersect so as to orm another regular pentagon.

5. Prove that the areas of two similar triangles are in the same ratio as the squares on their corresponding sides.

Show how to construct a triangle similar to a given triangle such that its area will be four times that of the given triangle.

6. Show how to construct, without using a protractor, an isosceles triangle such that the equal angles will be each double the third angle.

Explain how this leads to geometrical constructions for the trisection of the angles 108°, 54°, 27° and name two other angles that can be trisected by the same method.

7. Prove that $\sin(A+B)=\sin A\cos B+\cos A\sin B$ where A and B are acute.

Assuming that this expansion is true for all values of A, B, deduce similar expansions for $\sin(A-B)$, $\cos(A+B)$, and $\cos(A-B)$.

8. Prove the identity $\tan 2A = \dfrac{2\tan A}{1-\tan^2 A}$ and use it to find the two values of x which satisfy the equation $x^2+3x=1$

(Note.—Put $x=\tan A$).

9. A framework of four rods forms a cyclic quadrilateral ABCD and is such that AB=9, BC=3, CD=4, DA=3. Find the angle ABC and the radius of the circle which will pass through A,B,C and D.