AN ROINN OIDEACHAIS
(Department of Education).

BRAINSE AN MHEÁN-OIDEACHAIS
(Secondary Education Branch).

INTERMEDIATE CERTIFICATE EXAMINATION, 1933.

MATHEMATICS (Geometry).

FRIDAY, 16th JUNE.—MORNING, 10 A.M. TO 12.30 P.M.

The total number of questions answered should not exceed six.
(Candidates should see that answers to questions in excess of six are cancelled).

Mathematical Tables may be obtained from the Superintendent.
Candidates should state the text-book used in order to indicate the sequence followed.

1. Give a geometrical construction for trisecting a straight line.
   Prove your method. [30 marks.]

2. P is a point 2·9 ins. from the centre of a circle of radius 1·7 ins. Show how to draw from P a tangent to the circle and measure the distance between P and the point of contact.
   [Proof need not be given but all lines used in the construction should be clear.] [30 marks.]

3. ABCD is a square of side x inches and E is a point on the diagonal DB such that DE = DC; find the number of degrees in the angles BEC and BCE. [A protractor may not be used.]
   Assuming that BE = 1 inch, calculate to two places of decimals the value of x. [30 marks.]

4. A polygon has n sides: find, in right angles (i) the sum of its interior angles, (ii) the sum of its exterior angles.
   Each of the angles of a polygon contains 175°: how many sides has the polygon? [33 marks.]
5. A and B are two points 3 inches apart and P is a point such \( PA = 2PB \). Plot a large number of positions of P and join them by a smooth curve. What geometrical locus does your curve suggest?

[33 marks.]

6. The shadow of a tower standing on level ground is 80 feet longer when the sun’s altitude is 30° than when it is 45°. Use a large diagram drawn to scale on squared paper to find the height of the tower and check your result by calculation.

[33 marks.]

7. ABC is a triangle: state the relation between the square on AC and the sum of the squares on AB and BC, (i) when the angle B is acute, (ii) when B is obtuse. Prove the relation in the former case.

In a triangle \( PQR \), \( PQ^2 = QR^2 + RP^2 + QR.RP \): find the number of degrees in the angle \( R \).

[33 marks.]

8. Two lines BA and YX when produced meet at P, and \( PA.PB = PX.PY \). Prove that the quadrilateral ABYX is cyclic.

Assuming that \( PA = 2.4 \text{ ins.} \), \( PB = 4.5 \text{ ins.} \), \( PX = 3 \text{ ins.} \), \( PY = 3.6 \text{ ins.} \), angle \( BPY = 46° \): calculate the length of \( AX \) and the number of degrees in the angle \( PBY \).

[34 marks.]

9. Prove that for any triangle \( ABC \),

\[ \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R, \]

where \( R \) is the radius of the circumcircle of the triangle.

The angles of a triangle are in the ratio 2 : 3 : 4, and the longest side is 3-4" long: calculate the lengths of the other sides and the radius of the circumcircle.

[34 marks.]