AN ROINN OIDEACHAIS
(Department of Education).

BRAINSE AN MHEÁN-OIDEACHAIS
(Secondary Education Branch).

INTERMEDIATE CERTIFICATE EXAMINATION, 1932.

MATHEMATICS (II).

THURSDAY, 2nd JUNE.—MORNING, 10 A.M. TO 12.30 P.M.

Each item (*a*), (*b*), (*c*), (*d*), (*e*), (*f*) in Section I. will be counted as a *half-question.* The total number of questions answered should not exceed *six,* every pair of items from Section I. being counted as a whole question.

(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.

SECTION I.

(Each item (*a*), (*b*), (*c*), (*d*), (*e*), (*f*) in this Section carries 15 marks.)

(*a*) Using ruler and compass only construct a right angle and trisect it. State briefly how you proceed.

(*b*) What is meant by "*the distance of a point from a line*"? Draw any two intersecting straight lines and find a point which shall be $1''$ from one and $1 \cdot 5''$ from the other. Explain your method.

(*c*) Use the theorem that any two sides of a triangle are together greater than the third to prove that the perimeter of a quadrilateral is greater than the sum of the diagonals.

(*d*) On a line $2''$ long describe an equilateral triangle. Then draw (*i*) any triangle, (*ii*) an isosceles triangle whose area shall be treble that of the equilateral triangle. Explain briefly your construction.

(*e*) Prove that the angle in a segment of a circle less than a semicircle is greater than a right angle.

(*f*) A ladder 40′ long rests against a vertical wall and makes an angle of 70° with the ground. Its base is pulled 10′ further away from the wall: find by using an accurate diagram drawn to scale, or by calculation, how far up the wall the top of the ladder now reaches.

Section II.

1. Prove that the area of a triangle is half the product of the base by the perpendicular height.

(*a*) Show that the line which bisects the parallel sides of a trapezium divides the figure into two parts of equal area.

[33 marks.]

2. On a line 2·4″ long describe accurately a segment of a circle which shall contain an angle of 50°, and find the length of the diameter of the circle by measurement and by calculation.

[33 marks.]

3. Show, with proof, how to find a point in a line such that the rectangle contained by the whole line and by one part may be equal to the square on the other part.

Prove that if a line be so divided the sum of the squares on the whole line and on one part shall be equal to three times the square on the other part.

[33 marks.]

4. In the triangle PQR, PQ=10″, QR=7″, RP=5″. From R a perpendicular RS is drawn to PQ: calculate the length of QS and hence find the number of degrees in the angle Q.

[33 marks.]

5. Show that angles in the same segment of a circle are equal.

A, B, C are points on the circumference of a circle; X and Y are the mid-points of the arcs AB, AC respectively. Show that the lines AB, AC, XY intersect at the vertices of an isosceles triangle.

[33 marks.]

6. Prove that the perpendicular from the centre of a circle on a chord bisects the chord.

Show how to construct a triangle ABC being given the base BC, the angle A and the length of the line joining C to the mid-point of AB.

[33 marks.]

7. From the centre O of a circle of radius r two lines OX and OY are drawn at right angles to one another. A tangent to the circle at the point T cuts OX at A and OY at B such that OB= 2OA. Prove that AT=$\frac{1}{2}r$, TB=$2r$.

[33 marks.]

8. A person on a train travelling due East at 50 miles per hour observes that two spires lie in the direction 20° East of North. Six minutes later the directions of the spires make angles of 150° and 160° respectively with that of the train. Calculate the distance between the spires.

[34 marks.]

9. The sides BC, CA, AB of a triangle ABC touch the inscribed circle at the points P, Q, R respectively: prove that AQ=s−a, where 2s=a+b+c (*i.e.* the perimeter of the triangle).

The perimeter of a triangle ABC is 100 feet, the radius of the inscribed circle is 6ft. and the angle A contains 40°: find the length of the side BC.

[34 marks.]