AN ROINN OIDEACHAIS

(Department of Education).

BRAINNSE AN MHEADHON-OIDEACHAIS

(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1938.

PASS.

MATHEMATICS

(GEOMETRY)

FRIDAY, 17*th* *JUNE*.—Morning, 10 a.m. to 12.30 p.m.

Six questions may be answered.

Mathematical Tables may be obtained from the Superintendent.

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

1. The angle Q of a triangle PQR is a right angle: prove that Q lies on a circle having PR as diameter.

On a given line as base construct a triangle such that the perpendiculars from the extremities of the base on the other sides shall be of given lengths.

[30 marks.]

2. Show that the line joining the mid-points of two sides of a triangle is parallel to the third side.

Prove that the lines joining the mid-points of opposite sides of a quadrilateral and the line joining the mid-points of its diagonals are concurrent.

[30 marks.]

3. Show that the perpendicular from the centre of a circle on a chord bisects the chord.

From a fixed point P on a circle a variable chord PQ is drawn and produced to R, such that PR=2PQ: find the locus of R.

[30 marks.]

4. The lengths of the sides of a triangle are a, b, c respectively, r is the radius of the inscribed circle and Δ is the area of the triangle: prove that $r = \dfrac{2\Delta}{a+b+c}$.

Prove also that the radius of the inscribed circle and the altitude are proportional to the base and the perimeter.

[30 marks.]

5. Give a geometrical construction for finding the mean proportional between two given lines.

Two parallel tangents are drawn to a circle. A third tangent meets the circle at T and intersects the other tangents at P, Q respectively. Prove that the radius of the circle is the mean proportional between PT and TQ.

[30 marks.]

6. Prove that the line which bisects an angle of a triangle divides the opposite side into segments which are proportional to the two other sides.

A,B are two fixed points and P is a variable point such that PA : PB = 1 : 2. Find the locus of P.

[30 marks.]

7. Give a geometrical construction for inscribing a regular decagon in a circle. [Proof need not be given provided that the construction is clear.]

Calculate the length of the side of the regular decagon when the radius of the circle is of *unit* length.

[35 marks.]

8. Prove that the areas of two similar triangles are proportional to the squares on their corresponding sides.

Deduce that the equilateral triangle on the hypotenuse of a right-angled triangle is equal in area to the sum of the equilateral triangles on the two other sides.

[35 marks.]

9. The sides of a triangle are 2·67 inches, 3·82 inches, 4·39 inches respectively in length. Find the area of the triangle and the length of the radius of the circumscribed circle.

[35 marks.]

10. A, B are two boats on the sea and S is the top of a mountain. The line $AB = x$, $\angle BAS = \alpha$, $\angle ABS = \beta$, the angle of elevation of S at B is θ. Prove that $\dfrac{x \sin\alpha \sin\theta}{\sin(\alpha+\beta)}$ represents the height of S above sea-level.

Calculate the height of the mountain when $x = 850$ yards, $\alpha = 73°35'$, $\beta = 65°28'$, $\theta = 68°10'$.

[35 marks.]