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(Department of Education).

BRAINNSE AN MHEÁN-OIDEACHAIS

(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1934.

PASS.

MATHEMATICS

(GEOMETRY)

THURSDAY, 14*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. Prove that the mid-points of the sides of a quadrilateral are the angular points of a parallelogram.

Find what fraction of the area of the quadrilateral lies within that parallelogram. [33 marks.]

2. Prove that the area of a triangle is equal to half the product of the base and the height.

Prove that of all the triangles which can be inscribed in a circle, the equilateral triangle is of greatest area. [33 marks.]

3. At any point P on AB, the diameter of a semi-circle, a perpendicular is drawn to meet the circumference at Q. Prove that

$$PQ^2 = AP.PB.$$

Show how to divide a line so that the rectangle contained by the segments shall be equal in area to the square on a given line. [33 marks.]

4. Show how to find a point which shall be equidistant from three lines, two of which are parallel to one another.

Prove that the points of intersection of the bisectors of the interior angles of a parallelogram are the angular points of a rectangle whose diagonals are parallel to the sides of the parallelogram. [33 marks.]

5. With the usual notation for a triangle $A\hat{B}C$, prove :

$$\cos A = (b^2 + c^2 - a^2) \div 2bc.$$

ABCD is a square whose side is x ins. long, and P is a point within it such that PA=1 in., PB=2 ins., PC= 3 ins. By applying the above formula to the complementary angles PBA and PBC find the value of x, correct to $\frac{1}{10}$ inch.

[33 marks.]

6. When are figures said to be *similar* ?

ABCD and $A_1B_1C_1D_1$ are similar quadrilaterals. Prove that their areas are proportional to the squares on any pair of their corresponding sides.

[The corresponding Theorem for triangles may be assumed.]

[33 marks.]

7. Lines AD, AE are drawn making equal angles with the sides AB, AC of the triangle ABC (both lines lying within the angle BAC). AD meets the base BC at D, and AE meets the circumcircle at E. Prove that $AB \cdot AC = AD \cdot AE$.

Deduce from this that $AB \cdot AC = pd$, where p is the perpendicular from A to BC, and d the diameter of the circumcircle.

[33 marks.]

8. With the usual notation for a triangle ABC, prove that

$$\tan\tfrac{1}{2}A = [(s-b)(s-c)/s(s-a)]^{\frac{1}{2}}, \text{ where } 2s = a+b+c.$$

Find the greatest and the least angles of the triangle whose sides are 798, 637 and 385 units respectively.

[34 marks.]

9. Wishing to determine the distance between two inaccessible objects, X and Y, in the same horizontal plane, a man selected two convenient points, P and Q, in the same plane, and 1,000 yards apart, and found $Q\hat{P}X = 115°12'$, $P\hat{Q}X = 35°38'$, $Q\hat{P}Y = 47°23'$, $P\hat{Q}Y = 107°49'$. From these measurements calculate the distance between X and Y.

[34 marks.]