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(Department of Education).

BRAINSE AN MHEÁN-OIDEACHAIS
(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1933.

PASS.

MATHEMATICS
(GEOMETRY)

FRIDAY, 16*th JUNE*.—MORNING, 10 A.M. TO 12.30 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. Prove that the opposite angles of a cyclic quadrilateral are together equal to two right angles.

State and prove the converse theorem.

2. Show, with proof, how to describe a triangle equal in area to a given pentagon. Hence bisect the pentagon by a line drawn from one of its vertices.

3. M is the mid-point of the line AB, and X is any other point (not in the line AB); prove that $XA^2+XB^2=2AM^2+2MX^2$.

ABCD is a parallelogram whose diagonals intersect at O, and P is any other point: prove that $OA^2+OB^2+OC^2+OD^2$ is less than $PA^2+PB^2+PC^2+PD^2$.

4. ABC is a triangle in which AB=AC and X is a point in AB such that $BX \cdot BA=BC^2$. If AX=BC, prove that the angle ABC is double the angle BAC and express the ratio of BC to CA in the form of a surd.

5. Prove that a line drawn parallel to one side of a triangle divides the other sides in equal ratios.

X is any point between the arms of the angle PQR; show how to draw a line YXZ meeting PQ at Y and QR at Z such that XY=2XZ.

6. Construct a square such that the diagonal shall be an inch longer than the side. Prove your construction and calculate the length of the side.

(Protractor may not be used.)

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

Construct an equilateral triangle equal in area to the sum of two given equilateral triangles.

8. Prove that $\cos(A-B)=\cos A\cos B+\sin A\sin B$, for the case when $90°>A>B$.

Show that $\dfrac{\sin 2x}{1-\cos 2x}=\cot x$.

9. Observed from a ship sailing N.E. at 18 knots, a lighthouse bears 31° 18′ north of E. at 1 p.m. and 20° 45′ north of E. at 1.20 p.m. Find :

(i) the distance of the lighthouse from the ship at the time of the second observation.

(ii) what will be its shortest distance from the ship.

(One " Knot "=6,080 feet per hour).