AN ROINN OIDEACHAIS
(Department of Education).

BRAINNSE AN MHEADHON-OIDEACHAIS
(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1940.

PASS.

MATHEMATICS.

(GEOMETRY)

FRIDAY, 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.

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1. M is the mid-point of a line AB and P is another point on AB. Prove that $AP^2 + PB^2 = 2AM^2 + 2MP^2$.

Shew that this is true also when P is not collinear with AB.

[33 marks.]

2. Divide a line AB in X so that $AB.BX = AX^2$. Give proof. If $AB = 4$ ins. what are the lengths of AX and BX ?

[33 marks.]

3. Show how to construct a triangle equal in area to a given quadrilateral. Give proof.

Hence show how to bisect the quadrilateral by a line drawn through one of its vertices.

[33 marks.]

4. Through a point on a circle a chord and a tangent are drawn : prove that the angles between these lines are equal to the angles in the alternate segments of the circle.

Two circles on the same side of a line XY touch it at X. Two lines drawn from X cut the inner circle at A and B and the outer circle at C,D. Prove that AB is parallel to CD.

[33 marks.]

5. What are *similar figures* ? Prove that equiangular triangles are similar.

Shew, in any way you like, that equiangular quadrilaterals need not be similar.

[33 marks.]

6. Prove that the internal bisector of the vertical angle of a triangle divides the base into segments which are proportional to the other two sides.

ABCD is a quadrilateral. If the bisectors of the angles at A and C meet on BD, prove that the bisectors of the angles at B and D meet on AC.

[33 marks.]

7. Define " *regular polygon.*"

Prove that a circle can be inscribed in any regular polygon.

[33 marks.]

8. AX is the bisector of the angle BAC of a triangle ABC and it meets BC at X. If $AX=24$, $BX=12$, $CX=8$, find the angle AXC and the lengths of AB and AC.

[Use the property given in Q. 6.]

[33 marks.]

9. Prove that $\cos(A-B)=\cos A\cos B+\sin A\sin B$.

Express $\cos 15°$ in surd form.

[34 marks.]

10. A straight wall standing on level ground runs East and West. It is 30 yards long and 6 feet high. Find the area covered by its shadow

(i) when the sun is due South and its altitude is 45° ;

(ii) when the sun is in the South-West and its altitude is 30°.

[34 marks.]