

## A N R O I N N O I D E A C H A I S

INTERMEDIATE CERTIFICATE EXAMINATION, 1963.

## MATHEMATICS — GEOMETRY.

MONDAY, 10th JUNE. — Morning, 10 to 12.30.

The total number of questions answered should not exceed six.

Mathematical Tables may be obtained from the Superintendent.

1. Prove that the three angles of a triangle are together equal to two right angles.

ABC is a triangle in which  $AB = AC$  and  $\angle BAC = 20^\circ$ . P and Q are two points on AB and AC, respectively, such that  $\angle BCP = 50^\circ$  and  $\angle CBQ = 20^\circ$ . Prove that  $BP = BC$ , that  $BC = BQ$  and that  $\angle PQB = 60^\circ$ .

(30 marks.)

2. If a straight line be drawn through the middle point of a side of a triangle parallel to another side, prove that it will bisect the third side.

In a triangle ABC, X is the middle point of AB and N is the foot of the perpendicular from A to BC. Prove that  $XB = XN$ .

(30 marks.)

3. What is the locus of all points equidistant from two intersecting straight lines? Give a diagram.

Show how to find a point inside a triangle ABC such that it is equidistant from the three sides. If a circle drawn with that point as centre cuts the sides, show that it cuts equal sections from the three sides.

(30 marks.)

4. Prove that the area of a triangle is half the area of the rectangle on the same base and of the same altitude.

P is a point inside a square ABCD such that  $\angle DPC = 90^\circ$ . Prove that the area of the triangle ADP is half the area of the square on DP.

(35 marks.)

5. Prove that the angle at the centre of a circle is double an angle at the circumference standing on the same arc.

A, B, C are three points on the circumference of a circle of centre O and radius  $r$ , and  $\angle BCA = 60^\circ$ . Show that the length of the perpendicular from O to AB is  $\frac{1}{2}r$ .

(35 marks.)

6. In a triangle ABC the internal bisector of the angle BAC cuts BC at D. Prove that  $BD : DC = BA : AC$ .

ABC is a triangle in which  $AB = AC$  and  $\angle BAC = 90^\circ$ . E is a point on BC such that  $\angle BAE = 3\angle EAC$ . Find in simplest surd form the ratio of BE to EC.

(35 marks.)

7. A ladder leaning against a vertical wall makes an angle of  $40^\circ$  with the ground, and the top of the ladder is 5 feet from the ground. Find how far the bottom of the ladder is out from the wall.

Construct a triangle ABC such that  $\sin A = \frac{2}{5}$ ,  $\tan C = \frac{12}{5}$  and the perpendicular from B to AC is one inch long. (Protractor may not be used.)

Write down the value of (i)  $\cos A$ , (ii)  $\sin C$ .

(35 marks.)