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(Department of Education).

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(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1939.

PASS.

MATHEMATICS

(GEOMETRY)

THURSDAY, 15*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. Show, with proof, how to construct on a given line a segment of a circle which shall contain an angle equal to a given angle.

Construct accurately a triangle ABC such that AB=3ins., $\angle ACB = 60°$, area of ABC=3 sq. ins.

[30 marks.]

2. Through a point D on the side AB of a triangle ABC a line DE is drawn parallel to BC. DE meets AC at E. Prove that

$$AD : DB = AE : EC.$$

P is a fixed point while Q moves on a fixed straight line. What is the locus of a point R which divides PQ in a constant ratio ?

[30 marks.]

3. Through a point P outside a circle whose centre is X three lines are drawn, one of which cuts the circle at A and B and the other two touch it at C and D respectively. Prove that the triangles PCA, PCB are equiangular and hence show that $PA . PB = PC^2$.

If CD and XP meet at O, prove that $XO . XP = XC^2$.

[30 marks.]

4. A diameter of a circle and a chord intersect at an angle of 45° : prove that the sum of the squares on the segments of the chord is double the square on the radius of the circle.

[30 marks.]

5. Show how to inscribe a regular octagon in a circle.

A square and a regular octagon are inscribed in a circle. Find the ratio of the perimeter of the square to the perimeter of the octagon.

[30 marks.]

6. a and b are two lines. Show, with proofs, how to construct two other lines, x and y, such that

(i) $a : x = x : b$;

(ii) $a : b = b : y$.

[30 marks.]

7. Show geometrically how to construct a triangle whose angles are in the ratios 2 : 2 : 1.

Prove that the sides of that triangle are in the ratios

$$2 : 2 : (\sqrt{5} - 1).$$

[35 marks.]

8. ABCD is a square. Points E,F,G,H are taken on AB,BC, CD,DA respectively such that AE=BF=CG=DH=$\frac{1}{3}$AB. The lines AF, BG, CH, DE are drawn thus forming the figure PQRS, which you may assume, without proof, to be a square. P and Q are the vertices lying on AF. If AB=3 inches,

(i) calculate the lengths of AF, AQ, AP, and

(ii) prove that the area of PQRS : area of ABCD=2 : 5.

[35 marks.]

9. Prove that $\tan(A - B) = \dfrac{\tan A - \tan B}{1 + \tan A \tan B}$.

Find the value of $\tan 15^\circ$ in simplest surd form.

[35 marks.]

10. An attempt is made to carry a 12-foot pole horizontally round a rectangular bend in a corridor which has the same width on both sides of the bend. The pole jams when making an angle of 30° with one of the walls. What is the width of the corridor ?

[35 marks.]