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LEAVING CERTIFICATE EXAMINATION, 1941.

PASS.
MATHEMATICS.
(GEOMETRY)

MONDAY, 16th JUNE.—MORNING, 10 A.M. TO 12.30 P.M.

Six questions may be answered.

Mathematical Tables may be obtained from the Superintendent.

1. Prove that angles in the same segment of a circle are equal.

Three straight lines meet at O. Two circles are drawn through O, the first meeting the lines again in X, Y, Z and the second meeting them in A, B, C. Prove that the angles of the triangle XYZ are equal to those of the triangle ABC.

[33 marks.]

2. ABC is a triangle in which the angle ABC is less than 90° . From A a perpendicular AD is drawn to BC. Prove that

$$AC^2 = AB^2 + BC^2 - 2BD \cdot BC.$$

(i) If $\angle ABC = 60^\circ$, prove that

$$AC^2 = AB^2 + BC^2 - BC \cdot AB.$$

[33 marks.]

3. Two chords AB, CD of a circle intersect at Q. prove that $AQ \cdot QB = CQ \cdot QD$.

State and prove the converse theorem.

[33 marks.]

4. Inscribe a regular octagon in a given circle, and then construct a regular octagon whose side will be twice the side of the other. Proof to be given in each case.

[33 marks.]

5. Show, with proof, how to inscribe a circle in a triangle.

I is the centre of the circle inscribed in the triangle ABC. Express the angle BIC in terms of the angle BAC.

[33 marks.]

6. Prove that a line which is parallel to one side of a triangle divides the other two sides into segments which are in the same ratio.

A point S lies between the arms of the angle ABC. Show how to draw through S a line XSY meeting AB, BC at X, Y respectively so that $XS : SY = 3 : 2$.

[33 marks.]

7. AB is a chord of a circle. The tangents at A, B meet at P. From any point Q on the circle, perpendiculars QX, QY, QZ are drawn to PA, AB, PB respectively. Prove that

$$(i) \quad QZ : QY = QB : QA ;$$

$$(ii) \quad QY^2 = QZ \cdot QX.$$

[33 marks.]

8. Show how to inscribe a regular pentagon ABCDE in a circle.

If AC and BE intersect in X, show that AXB is a triangle which has one of its angles equal to three times each of the others.

[33 marks.]

9. The top S of a chimney is seen from two points A, B on the sea. If $AB=a$ yards, $\angle ABS=x^\circ$, and $\angle BAS=y^\circ$, what is the length of BS?

If the angle of elevation of S at B is z° , what is the height of S above sea-level?

Find that height when $a=300$, $x=65$, $y=71$, $z=31$.

[34 marks.]

10. In a triangle ABC, calculate the values of c and A when $C=74^\circ 24'$, $a=54$, $b=49$.

[34 marks.]