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LEAVING CERTIFICATE EXAMINATION, 1943.

MATHEMATICS.—GEOMETRY.—PASS.

TUESDAY, 8th JUNE.—Afternoon, 3 to 5.30.

Seven questions to be attempted, of which not more than *five* may be selected from Section A.

Mathematical Tables may be obtained from the Superintendent.

Section A.

1. From a point P, outside a circle, a secant PAB is drawn. If T is a point on the circumference such that $PT^2 = PA . PB$, prove that PT is a tangent to the circle.

Two circles intersect at C and D and through a point P in CD produced two lines are drawn, cutting the circles in X, Y, Z, W. Prove that XYZW is a cyclic quadrilateral.

[28 marks].

2. O, A, B, C are four points, taken in order, on a straight line. Prove geometrically that $OB . AC = OC . AB + OA . BC$.

(Hint: On OC describe a square and draw parallels through A and B. Also draw the diagonal through C).

Also give an algebraic proof by denoting OA, OB, OC by x, y, z, respectively.

[28 marks.]

3. Show, with proof, how to construct an isosceles triangle having each of the base angles double the vertical angle.

[28 marks.]

4. Define similar figures. Prove that equiangular triangles are similar.

ABC is a triangle inscribed in a circle. The bisector of the angle A meets the side BC in D and the circumference of the circle in E. Prove that $AB . AC = AD . AE$.

[28 marks.]

5. Show, with proof, how to draw a direct common tangent to two non-intersecting circles.

If the radii of the circles are 1 inch and 6 inches respectively and the centres are 13 inches apart, calculate the length of the direct common tangent.

[29 marks.]

6. ABC is an acute angled triangle and AD, BE, CF are the perpendiculars from the vertices on the sides Prove that

(i) Angle CDE=angle BDF,

(ii) angle FDE=$180°-2$A.

[29 marks.]

SECTION B.

7. Write down the values of (i) sin $30°$, (ii) tan $45°$, (iii) sec $60°$.

For what values of x is each of the following statements correct ?

(*a*) $\sin x > \frac{1}{2}$, (*b*) $\tan x > 1$, (*c*) $\sec x < 2$.

[28 marks.]

8. From B and C, two points 350 yards apart on a straight road, a point A is observed and the angles ABC and ACB are found to be $43°$ and $74°15'$ respectively. Find (i) the distance of A from C, (ii) the nearest distance from A to the road.

[28 marks.]

9. Show that in a triangle ABC,

$$\sin A = \sin(B+C).$$

Hence find the angle A in a triangle ABC when

$$\cos B = \tfrac{12}{13}, \quad \cos C = \tfrac{4}{5}.$$

Also, using the sine rule, find the ratio of the three sides.

[29 marks.]

10. A field ABCD is in the form of a quadrilateral. The following measurements are taken :—AB=50 yards, BC=60 yards, CD=75 yards, DA=90 yards, angle ABC=$60°$.

Calculate the length of the diagonal AC, and also the area of the field.

[29 marks.]