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(Department of Education).

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INTERMEDIATE CERTIFICATE EXAMINATION, 1934.

MATHEMATICS (Geometry).

THURSDAY, 14*th JUNE*.—Morning, 10 a.m. to 12.30 p.m.

The total number of questions answered should not exceed *six*. (Candidates should see that answers to questions in excess of *six* are cancelled).

Mathematical Tables may be obtained from the Superintendent.

Candidates should state the text-book used in order to indicate the sequence followed.

1. Prove that the sum of any two sides of a triangle is greater than the third side.
Deduce that the sum of any three sides of a quadrilateral is greater than the remaining side. [30 marks.]

2. The square on one side of a triangle is equal to the sum of the squares on the other two sides. Prove that the triangle is right-angled.
P, Q, R are squares. Show how to construct another square X such that X=P+Q+R. [30 marks.]

3. Construct geometrical diagrams to illustrate the identities:

(i) $(a+b)^2 = a^2 + 2ab + b^2$;
(ii) $(a-b)^2 = a^2 - 2ab + b^2$, when $a > b$. [31 marks.]

4. Show, without proof, how to construct a square equal in area to a given rectangle.
Prove that the perimeter of the square is never greater than that of the rectangle. [31 marks.]

5. Prove that the opposite angles of a cyclic quadrilateral are together equal to two right angles.
ABCD is a cyclic quadrilateral. The sides BA and CD when produced meet at X; BC and AD produced meet at Y. Prove that the bisectors of the angles BXC and BYA meet at right angles. [31 marks.]

6. The medians AD and BE of the triangle ABC intersect at G. P is the mid-point of AG, and Q is the mid-point of BG. Prove that PEDQ is a parallelogram, and hence show that $GD=\frac{1}{3}AD$, and $GE=\frac{1}{3}BE$.

[32 marks.]

7. Given two sides of a triangle, show that the area is greatest when they contain a right angle.

From a point not on the circumference of a circle, whose centre is O, draw a line cutting the circle at X and Y so that the triangle OXY may be as large as possible.

[33 marks.]

8. An aeroplane passed in succession directly over two observation posts A and B, 1,600 yards apart, and a village C. When passing over C its angles of elevation as observed at A and B were $14° 48'$ and $25° 30'$ respectively. Assuming that A, B, C are in the same horizontal line, calculate :

(i) the height at which the aeroplane was flying.

(ii) the distance between A and C. [34 marks.]

9. ABC is a triangle whose sides are a, b, c units long respectively. Circles are described having A, B, C as centres, and such that each circle touches the other two. Express in terms of a, b, c, the lengths of their radii.

Give a geometrical method for constructing the circles (i) when all three touch *externally* ; (ii) when the circle with A as centre, is touched *internally* by the other two.

[35 marks.]

10. ABCD is a rectangle, 12 ins. by 8 ins., whose diagonals intersect at E ; P is the mid-point of BE. Calculate :

(i) the number of degrees in the angle DPA.

(ii) the length of PA. [35 marks.]