AN ROINN OIDEACHAIS

(Department of Education).

BRAINSE AN MHEÁN-OIDEACHAIS

(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1930.

PASS.

MATHEMATICS (II).

TUESDAY, 17*th JUNE*.—AFTERNOON, 3.30 TO 6 P.M.

Six questions may be answered. All questions carry equal marks.

Mathematical Tables may be obtained from the Superintendent.

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

1. Show that the area of a trapezium is found by multiplying half the sum of the parallel sides by the perpendicular distance between them.

Prove that the triangle formed by joining the mid-point of either of the non-parallel sides of a trapezium to the extremities of the other is half the area of the trapezium.

2. Show that if two chords, a and b, of a circle subtend angles A and B respectively at the centre, then A is greater than, equal to or less than B according as a is greater than, equal to, or less than b.

A, B, C, D are points on a circle and the chord BC is double the chord AB: prove that the angle BDC is more than double the angle ADB.

3. P is any point and M is the mid-point of the line AB: state and prove a relation between the squares on PA, PB, AM, PM.

C and D are fixed points and X is a fixed circle: show how to find a point Z on X such that ZC^2+ZD^2 may be as small as possible.

4. (i) Show how to find a point B in a line AP so that $AB^2=AP.BP$.

(ii) Show how to find a point P in a line AB produced so that $AB^2=AP.BP$.

5. If two chords intersect within a circle prove that the rectangle contained by the segments of one is equal to the rectangle contained by the segments of the other.

Hence, or otherwise, construct geometrically a triangle equal in area to the sum of two given triangles.

6. If four lines, a, b, c, d are in proportion, prove geometrically that the rectangles ad and bc are equal.

If a line through the vertex A of a parallelogram ABCD meets BD, BC, CD at E, F, G respectively, prove that the rectangles AE.AF and AG.EF are equal.

7. Define a *radian*. Show that it is invariable, and calculate its value, in degrees, correct to *three* places of decimals.

8. Prove geometrically that $\cos(A-B)=\cos A \cos B+\sin A \sin B$ where $90° > A > B$, and show that

$$\cos x-\cos y = 2 \sin \frac{x+y}{2} \sin \frac{y-x}{2}.$$

9. If A, a, b, of the triangle ABC be given and $b > a > b \sin A$, solve the triangle for c, and calling its two values c_1 and c_2 prove that $c_1^2 - 2c_1c_2\cos 2A + c_2^2 = 4a^2\cos^2 A$.

10. At a point on a straight road running due north a tower bears $\alpha°$ W. of N. and the angle of elevation of its summit is θ. At a point a feet further north the bearing changes to $\beta°$ W. of N. and the angle of elevation to φ. Prove that $\cot\theta \sin\alpha = \cot\varphi \sin\beta$, and show that the height of the tower is $\frac{a \tan\theta \sin\beta}{\sin(\beta-\alpha)}$.