# AN ROINN OIDEACHAIS
(Department of Education).

## BRAINNSE AN MHEADHON-OIDEACHAIS
(Secondary Education Branch).

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### LEAVING CERTIFICATE EXAMINATION, 1937.

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#### PASS.

# MATHEMATICS
### (ALGEBRA)

*MONDAY*, 21*st JUNE.*—Afternoon, 3.30 to 6 P.M.

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*Seven* questions may be answered.

Mathematical Tables may be obtained from the Superintendent.

1. Solve the equation :
$$3\sqrt{2x+3} - 2\sqrt{6x-2} - \sqrt{4-x} = 0.$$

[25 marks.]

2. Find the factors of
   (i) $a^4 + 3a^2b^2 + 4b^4$ ;
   (ii) $3x^3 - 4x^2 - 25x + 42$ ;
   (iii) $(a+b+c)(ab+bc+ca) - abc.$

[25 marks.]

3. The 7th term of an A.P. is 4 and the 14th term is 9. Find the first term, the common difference and the sum of 30 terms of the series.

[25 marks.]

4. Solve the simultaneous equations :
$$x^3 + y^3 = 3(x+y) = 9.$$
Show that $x(x-1)(2x-1)(2x-3)$ may be expressed in the form $y(y+1)$ and find two values of $x$ which satisfy the equation $x(x-1)(2x-1)(2x-3) = 90.$

[25 marks.]

5. Find four numbers in G.P. such that the sum of the first and fourth is 21 and the sum of the second and third is $-6$.

[25 marks.]

6. Prove that $\log_a N^x = x\log_a N.$
Find the values of $x$ and $y$ from the equations
$$\left. \begin{array}{l} \log_{10}x^3 - \log_{10}y^2 = 2{\cdot}4 \\ \log_{10}x^2 + \log_{10}y^3 = 6{\cdot}8 \end{array} \right\}$$

[30 marks.]

7. A and B are two houses 12 miles apart. Two boys, X and Y, start together from A to cycle to B and back to A. Eight minutes after X had left B on the return journey he met Y and he reached A 36 minutes before him. Find the rates at which X and Y cycled.

[30 marks.]

8. ABC is a triangle in which AB=10 inches, BC=12 inches, and the perpendicular AD from A on BC is $7\frac{1}{2}$ inches. From a point P on AB which is $x$ inches from B two lines are drawn parallel to AD and BC respectively and meeting BC and AC at Q and S respectively. The rectangle PQRS is completed. Express in terms of $x$ the lengths of PQ and PS and the area of the rectangle PQRS. Find also for what value of $x$ the area of the rectangle will be a maximum.

[30 marks.]

9. If the equation $3x^2+2ax+4=0$ has *real* roots show that the value of $a$ cannot lie between $2\sqrt{3}$ and $-2\sqrt{3}$.

Assuming that $x$ and $y$ are both *real numbers* solve the equation :
$$(3x+7y-1)^2+(x-2y-9)^2=0.$$

[30 marks.]

10. The following values of $y$ (correct to the nearest tenth) were found to correspond to the given values of $x$ :—

| $x$ | −2 | −1·5 | −1 | −0·5 | 0 | 0·5 | 1 | 1·5 | 2 |
|---|---|---|---|---|---|---|---|---|---|
| $y$ | −0·2 | 3·2 | 4·4 | 4·1 | 3 | 1·9 | 1·6 | 2·8 | 6·2 |

Mark the corresponding points on graph paper and draw a smooth curve through them.

The shape of the curve suggests a relation between $x$ and $y$ of the form $y=ax^3+bx^2+cx+d$. If this be so, what values must be assigned to $a, b, c, d$ ?

[30 marks.]