AN ROINN OIDEACHAIS.
(Department of Education).

BRAINNSE AN MHEADHON-OIDEACHAIS
(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1938.

PASS.
MATHEMATICS
(ALGEBRA)

TUESDAY, 21st JUNE.—AFTERNOON, 3.30 TO 6 P.M.

Seven questions may be answered.

Mathematical Tables may be obtained from the Superintendent.

1. Find the common factor of $3x^3-11x^2-24x+20$ and $2x^3-3x^2-30x-25$.

   Solve the equations

   (i) $3x^3-11x^2-24x+20=0$,

   (ii) $2x^3-3x^2-30x-25=0$.

   [25 marks.]

2. Prove that $(a+b+c)^n-a^n-b^n-c^n$ is divisible by $b+c$ when n is an odd positive integer.

   Factorise $(a+b+c)^3-a^3-b^3-c^3$.

   [25 marks.]

3. If $a+\dfrac{1}{a}=k$, express $a^2+\dfrac{1}{a^2}$ and $a^2-\dfrac{1}{a^2}$ in terms of k.

   [25 marks.]

4. A man purchased a certain quantity of coal at a certain price. If it were five shillings a ton cheaper he would have got two tons more for the money, but if it were three shillings a ton dearer he would have got one ton less. Find the number of tons purchased and the cost price per ton.

   [25 marks.]

5. Express the square root of $57-12\sqrt{15}$ in the form $a\sqrt{x}-b\sqrt{y}$, where a, b, x, y are rational quantities.

   [25 marks.]

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6. Solve the simultaneous equations

$$(x+y)^2+2(x+y)=15 \atop (x-y)^2-4(x-y)=12$$

[30 marks.]

7. AD is a perpendicular of an equilateral triangle ABC; EF is a perpendicular of an equilateral triangle ADE; GH is a perpendicular of an equilateral triangle EFG and so on. Prove that the sides of those triangles are in Geometrical Progression and find the common ratio.

If BC is *one foot* in length determine which one of the triangles is the first to have a side not more than *one inch* in length.

[30 marks.]

8. Insert n Arithmetic Means between a and b and find the sum of those Means.

Show that the sum of the n Arithmetic Means and the sum of the m Arithmetic Means between a and b are in the ratio $n : m$.

[30 marks.]

9. ABC is a triangle which is right-angled at C, and CD is the perpendicular from C on AB. Prove that $AB.CD=CA.CB$ and calculate the length of AB when $CD=12$ inches, $BC+CA=35$ inches.

[30 marks.]

10. Using the same axes and the same scales draw graphs of
$5+x-x^2(=y)$ and $\dfrac{3-x}{1+x}(=y)$;

Using your graphs determine approximately

(a) the maximum value of $5+x-x^2$,

(b) the roots of the equation $(1+x)(5+x-x^2)=3-x$.

[30 marks.]