

**AN ROINN OIDEACHAIS**  
(Department of Education).

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**INTERMEDIATE CERTIFICATE EXAMINATION, 1948.**

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**MATHEMATICS (Algebra).**

*MONDAY, 21st JUNE.—MORNING, 10 TO 12.30.*

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The total number of questions answered should not exceed *six*.

Mathematical Tables may be obtained from the Superintendent.

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1. (a) Solve the equation  $\frac{15x-1}{7} - \left(x - \frac{3x-1}{11}\right) = 21$ .

(b) Find the values of  $x$  and  $y$  that satisfy the simultaneous equations :

$$\begin{aligned} 7x - y &= 18, \\ 3x + 2y &= 8\frac{1}{2}. \end{aligned}$$

[30 marks.]

2. Factorise as fully as you can

- (i)  $3ac - 2a^2 + 6ab - 9bc$ ;
- (ii)  $2(a-b)^2 - 3(a-b) - 5$ ;
- (iii)  $x^2(a^2 - b^2) + 4abx - (a^2 - b^2)$ ;
- (iv)  $x^6 - y^6$ .

[30 marks.]

3. If the length of a certain rectangle were increased by 15 yards and the breadth decreased by 5 yards, its area would be decreased by 75 square yards; if, on the other hand, its length were decreased by 10 yards and its breadth increased by 5 yards, its area would be increased by 200 square yards. Find the length and the breadth of the rectangle.

[30 marks.]

4. Write down the two numbers which can be formed by using  $x$  and  $y$  as the digits, and show :

- (i) that their sum is a multiple of 11;
- (ii) that their difference is a multiple of 9;
- (iii) that the difference of their squares is a multiple of 99;
- (iv) that the difference of their cubes is a multiple of 27.

OR

If  $a+b+c=0$ , prove that  $a^3+b^3+c^3=3abc$ . Hence, or otherwise, prove the identity

$$(x-y)^3 + (y-z)^3 + (z-x)^3 \equiv 3(x-y)(y-z)(z-x).$$

[30 marks.]

5. Find the remainder when  $x^3+4x^2+kx-30$  is divided by  $x+2$ .  
What will be the value of  $k$  when  $x+2$  is a factor of  $x^3+4x^2+kx-30$ ?  
Find the remaining factors in that case.

[30 marks.]

6. A man having a journey of 20 miles to walk proceeds at a uniform speed for half the distance and then reduces his speed by two-thirds of a mile per hour for the remainder of the journey. He is three-quarters of an hour longer on the road than he would have been had he maintained his faster rate of walking. How long does he take to walk the whole journey?

[35 marks.]

7. What is the logarithm of a number ?

Prove that  $\log_a a = \log_a a \div \log_a b$ .

Find the value of (i)  $\log_2 8$ , (ii)  $\log_3 2$ , (iii)  $\log_2 \left(\frac{1}{8}\right)$ , (iv)  $\log_8 \sqrt{2}$ .

Find, also, the number of digits in  $(3)^{50}$ , given that  $\log_{10} 3 = .4771$ , approximately,

[35 marks.]

8. Solve the equation :

$$\sqrt{5x-2} + \sqrt{6x-7} = \sqrt{36x-41}.$$

[35 marks.]

9. Using the same axes and the same scales draw the graphs of  $y=x^2$  and  $y+2x-4=0$ , for values of  $x$  from  $-4$  to  $+4$ .

Use your graphs to find, as accurately as you can, (a) the values of  $x$  for which  $x^2=4-2x$ , (b) the amount by which  $x^2$  exceeds  $4-2x$  when  $x=-3.8$ .

[35 marks.]