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(Department of Education.)

LEAVING CERTIFICATE EXAMINATION, 1943.

MATHEMATICS—Algebra—Pass.

WEDNESDAY, 9th JUNE.—MORNING, 10 TO 12.30.

Seven questions may be answered.

Mathematical Tables may be obtained from the Superintendent.

1. Express $\sqrt{33-18\sqrt{2}}$ in the form $\sqrt{x}-\sqrt{y}$.

Simplify $\sqrt{33-18\sqrt{2}}-\dfrac{7}{\sqrt{33+18\sqrt{2}}}$.

[28 marks.]

2. Solve the equations

$$x^2+y^2+5x+4y-11=0$$
$$x^2+y^2-6x-3y-10=0.$$

[28 marks.]

3. Define "the logarithm of b to the base a."

Write in their simplest form

$$\log_2\sqrt{8},\ \log_2\left(\tfrac{1}{8}\right),\ \log_a a^x,\ a^{\log_a b}.$$

By what factor must $\log_{10}N$ be multiplied in order to give $\log_e N$, where $e=2{\cdot}718$?

[28 marks.]

4. If $x=4t^2-3t-10$ and $y=t^2+t-3$, express (i) t^2, (ii) t in the form $ax+by+c$.

Hence show that

$$x^2-8xy+16y^2-11x-5y-129=0.$$

[28 marks.]

5. What is meant by an algebraic identity ?

If $3x^3-2x^2+5x-7\equiv A+Bx+Cx(x-1)+Dx(x-1)(x-2)$, find the values of A, B, C, D. Verify your result.

[28 marks.]

6. The speed of a train A is 5 miles per hour greater than that of a train B and 10 miles per hour greater than that of a train C. For a certain journey C takes 40 minutes more than B and 70 minutes more than A. Find the length of the journey and the speed of each train.

[28 marks.]

7. If, in an arithmetical progression, m times the mth term is equal to n times the nth term, prove that the $(m+n)$th term is zero.

How many terms of the arithmetical progression 16, $15\frac{1}{3}$, $14\frac{2}{3}$, . . . , give a sum of 170 ? Account for the two answers.

[29 marks.]

8. The first term in a geometric series is 3 and the second term is 5. Find the least value of n for which the sum of n terms of the series exceeds 10,000.

[29 marks.]

9. Find the sum of all positive integers less than 100 which are (i) not divisible by 3, (ii) not divisible by 5, (iii) divisible neither by 3 nor by 5.

[29 marks.]

10. Using the same axes and the same scales, draw the graphs of the equations

$$y=(1+x)^2(2-x),\ y=3x,$$

from $x=-3$ to $x=3$.

Show that at the point of intersection of the two graphs the value of x satisfies the equation $x^3-2=0$, and hence, from the diagram, find an approximate value for $\sqrt[3]{2}$.

[29 marks.]