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INTERMEDIATE CERTIFICATE EXAMINATION, 1943.

MATHEMATICS (Algebra).

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

The total number of questions answered should not exceed *seven*.
Mathematical Tables may be obtained from the Superintendent.

1. Solve the equation

$$\frac{3x+2}{x+1} - \frac{x+3}{2(x-5)} = \frac{7x+1}{3(x+1)} + \frac{1}{6}$$

[25 marks]

2. (i) Factorise $a^2 - b^2 + 4c^2 - 9d^2 - 4ac + 6bd$;

(ii) Find the H.C.F. of $x^3 - 7x + 6$ and $2x^3 + x^2 - 13x + 6$.

[25 marks]

3. Express in terms of a, b the values of x, y in the simultaneous equations:

$$\begin{aligned} ax + by &= 2, \\ ab(bx + ay) &= a^2 + b^2. \end{aligned}$$

[25 marks]

4. Solve the equation

$$16x^2 + 18x = 243.$$

[25 marks]

5. A man invests £270 in bicycles. He sells them all at £12 10s. each, and finds that he has gained by the transaction as much as two dozen of the bicycles cost him. How many did he buy?

[25 marks]

6. Simplify

$$\frac{a(a-x)}{(a-b)(c-a)} + \frac{b(b-x)}{(b-c)(a-b)} + \frac{c(c-x)}{(c-a)(b-c)}$$

[30 marks]

7. Prove that $a + b + c$ is a factor of

$$a^3 + b^3 + c^3 + (a+b)^3 + (b+c)^3 + (c+a)^3$$

and express the remaining factor in its simplest form.

[30 marks]

8. A and B are stations 12 miles apart. Two trains start at the same time : one from A for B and the other from B for A. From the time at which they meet they take 8 minutes and 18 minutes, respectively, to finish their journeys. Find the rates (assumed uniform) at which they travel.

[30 marks]

9. If $a + \sqrt{b} = c + \sqrt{d}$, where a and c are rational numbers and \sqrt{b} and \sqrt{d} are irrational, prove that $a = c$ and $b = d$.

Express the square root of $10 - \sqrt{91}$ in the form $\sqrt{x} - \sqrt{y}$.

[30 marks]

10. Find the values of $10 \left(\frac{x-4}{x+5} \right)^2$ when $x=0, 1, 2, 3, \dots, 10$.

[The values to 2 decimal places will suffice in each case].

Draw a graph of the expression for values of x between 0 and 10 and use the graph to solve the equation

$$10 \left(\frac{x-4}{x+5} \right)^2 = 1.$$

[30 marks]