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(Department of Education.)

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(Secondary Education Branch).

INTERMEDIATE CERTIFICATE EXAMINATION, 1941.

MATHEMATICS (Algebra).

TUESDAY, 17th JUNE.—AFTERNOON, 3 P.M.

TO 5.30 P.M.

The total number of questions answered should not exceed seven.

Mathematical Tables may be obtained from the Superintendent.

1. Solve the equations :—

(i) $\frac{2}{3}(x + \frac{5}{8}) - \frac{1}{3}(x - \frac{1}{4}) = \frac{7}{12}$;

(ii) $\frac{4x-3}{5x-1} = 1 - \frac{3(x-2)}{x-5}$.

[25 marks.]

2. Factorise as fully as possible :—

(i) $(12x^2 - x - 20) - 2y(4x + 5)$;

(ii) $(a-c)(b-d) - (a-b)(c-d)$;

(iii) $(1+ab)^2 - (a+b)^2$.

[25 marks.]

3. Prove that

$$\frac{bc}{(a-b)(a-c)} + \frac{ca}{(b-c)(b-a)} + \frac{ab}{(c-a)(c-b)} = 1.$$

[25 marks.]

4. Express by means of algebraic symbols :
- the cost in pence per dozen of apples at the rate of x apples for y pence ;
 - what fraction a shillings, b pence is of c shillings, d pence ;
 - any odd number ;
 - any number of three digits.

[25 marks.]

5. A merchant buys an article for £10 and sells it to a retailer at a profit of x per cent. The retailer also makes a profit of x per cent. by selling it for £14 8s. Find the value of x .

[25 marks.]

6. Factorise $3y^2 - 16y + 20$ and prove that if
 $y = 6x^2 - 11x + 5$
 then $3y^2 - 16y + 20 = (2x - 3)(3x - 1)(3x - 5)(6x - 1)$.

[30 marks.]

7. Solve the equation

$$\frac{1}{x+1} + \frac{1}{\sqrt{x+1}} = 6.$$

Test your solutions.

[30 marks.]

8. Prove the identity

$$(a-b)^2 + (b-c)^2 + (c-a)^2 = 2(a^2 + b^2 + c^2 - bc - ca - ab).$$

Prove that $a^2 + b^2 + c^2 - bc - ca - ab$ (i) is never negative, (ii) is unaltered in value if a, b, c be increased or decreased by the same amount.

[30 marks.]

9. Prove that $\log \frac{A}{B} = \log A - \log B$.

Without using the Tables (i) find the value of $\log_2 \sqrt[8]{8}$,
 (ii) prove that $\sqrt{5}$ is numerically greater than $\sqrt[3]{11}$.

[30 marks.]

10. Two cyclists, A and B, start together to ride from P to Q. A rides at 10 miles per hour and B at 9 miles per hour. A has to dismount for 20 minutes to mend a puncture and when he remounts B is two miles ahead of him. They both arrive at Q at the same time.

Represent their journeys graphically and find from the graphs the distance between P and Q and the distance A had done when he got the puncture. [Explain briefly your method.]

[30 marks.]