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INTERMEDIATE CERTIFICATE EXAMINATION, 1925

MATHEMATICS (I).

WEDNESDAY, 17*th JUNE*—MORNING, 10 A.M. *to* 1 P.M.

All the questions may be attempted.

[Tables of Logarithms may be obtained from the Superintendent.]

1. (*a*) x oranges are bought for y pence, and sold at the rate of z pence a dozen: what is the percentage profit?

(*b*) Express a speed of a miles in b hours in *feet* per *second*.

(*c*) A rectangle p inches long and q inches wide has its length increased by x inches: by how much must the width be diminished so that the area may remain constant?

2. Find all the factors of:—

(i) $(p-q)^2+(p+x)^2-\{(x-y)^2+(q+y)^2\}$.

(ii) $(2x^2-5x)^2-(10x^2-25x+14)$.

(iii) $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}-\frac{1}{a+b+c}$.

Express $(5x+y+1)(x-9y+13)$ as the difference of two squares.

3. Explain, giving examples, the difference between *conditional* and *identical* equations.

Find to which class each of the following belongs :—

(i) $(3x - 4)(2 - 5x) - (1 - x)(2x + 3) = (3x + 7)(2 - x) + (3 - 2x)(5x - 1)$.

(ii) $(x - 1)(4 - 7x) + (3 - x)^2 = 6 - 5(1 - 2x)^2$.

(iii) $\dfrac{p}{px - x^2} + \dfrac{q}{qx - x^2} + \dfrac{r}{rx - x^2} - \dfrac{3}{x} = \dfrac{1}{p - x} + \dfrac{1}{q - x} + \dfrac{1}{r - x}$.

4. What can be inferred from each of the following :—

(i) $abc = 0$, (ii) $m^2 + n^2 = 0$, (iii) $p^3 + q^3 = 0$?

AB and AC are two straight lines, the angle A being right. A circle touches AB and AC, and is such that the point on the circumference nearest to A is 6 inches from it: find the radius of the circle to one-hundredth of an inch.

5. Rewrite the equation $\dfrac{V + v}{V} = \dfrac{b}{b - p}$ in the form $V = \ldots$

(*a*) Solve for x and y:

$$\left.\begin{aligned} \frac{3}{4x - y} - \frac{5}{2x - y} &= 2. \\ \frac{3}{y - 2x} + \frac{4}{y - 4x} &= 4{\cdot}6 \end{aligned}\right\}$$

6. Define 'logarithm of a number.' Without using tables, find the value of each of the following: $\log_{729}\frac{1}{3}$, $256^{0{\cdot}0625}$, and show why $\log_{10}38{\cdot}49$ and $\log_{10}0{\cdot}03849$ have the same mantissa.

Copy the following into your answer-book, and fill in all blanks :—

$$\sqrt[5]{\frac{4174 \times \cdot 00126 \times (39 \cdot 3)^{\frac{1}{2}}}{0 \cdot 756 \times (0 \cdot 1892)^{\frac{1}{3}}}} = x.$$

log 39·3 =	
$\frac{1}{2}$ log 39·3	=
log 4174	=
log ·00126	=
∴ log Numerator	=
„ Denominator	=
∴ log x^5	=
log x	=
∴ x	=

log 0·1892 =	
$\frac{1}{3}$ log 0·1892	=
log 0·756	=
∴ log Denominator =	

7. Draw the graph of 3^x from $x = 0$ to $x = 2$, giving at least nine points on the graph.

From your graph, show, by three examples, that

$$3^{x+y} = 3^x \times 3^y.$$

[Tables of Logarithms may not be used in answering this question.]

8. Three pieces of wire of equal length are bent, the first to form a square, the second to form a rectangle whose sides are in the ratio 4 : 3, and the third to form an equilateral triangle. Find the ratios of the areas of the three figures.

How should the second piece have been bent so that the resulting rectangle would have been equal in area to the equilateral triangle ?

[*Turn over.*

9. The figure $BCDE$ is a rectangle having BC and CD a inches and b inches, respectively, in length. P is a variable point on DE, x inches from E. The lines CE and PB are drawn: find the area (A) of the shaded portion of the rectangle in terms of a, b, x.

If $a = 12$ inches and $b = 10$ inches, draw a graph showing the relation between x and A as P moves from E to D.

From your graph find the minimum value of A and the corresponding value of x.