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(Department of Education.)

INTERMEDIATE CERTIFICATE EXAMINATION, 1942.

MATHEMATICS (Algebra).

MONDAY, 15th JUNE.—AFTERNOON, 3 TO 5.30.

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

Mathematical Tables may be obtained from the Superintendent.

1. Solve the equations

(i) $\frac{2}{3}(4x+7)-\frac{4}{9}(5x-4)=\frac{5}{8}(x+4)$;

(ii) $\begin{cases} 2x=3y+14, \\ y=4x-13. \end{cases}$

[25 marks.]

2. The period, t seconds, of a pendulum of length l feet is given by the formula

$$t=2\pi\sqrt{\frac{l}{g}}, \text{ where } g=32.$$

Find the period of a pendulum of length 18 inches. Find also the length of a pendulum of period 2 seconds.

[Take $\pi=\frac{22}{7}$ or 3·14.] [25 marks.]

3. Factorise as fully as possible

(i) $xy-4x-3y+12$;

(ii) $4x^2-(y+z)^2$;

(iii) $(x+1)(x+2)(x+3)-2(x+1)$;

(iv) $a^5+a^3-a^2-1$.

[25 marks.]

4. When the postage on letters was 2d. and on postcards 1d., a man wrote half as many postcards as letters. When the postage was increased to $2\frac{1}{2}$d. per letter and $1\frac{1}{2}$d. per postcard, he calculated that by writing k times as many postcards as letters he would be able to write as many communications as formerly at the same cost. Find k.

[25 marks.]

5. If $\left(x-\frac{1}{x}\right)^2=1$, prove that

(i) $x^2+\frac{1}{x^2}=3$,

(ii) $x^3-\frac{1}{x^3}=4$ or -4.

[25 marks.]

6. State the Remainder Theorem.
Prove that the expression $8x^3-26x^2-51x+108$ is equal to 0 when $x=1\frac{1}{2}$, and factorise the expression fully.

[30 marks.]

7. A rectangular field of area 10 acres requires 902 yards of fencing to enclose it completely. Find the dimensions of the field.

[30 marks.]

8. Draw a graph of $\frac{x}{10}+\log_{10}x$ for values of x from $x=1$ to $x=10$. Use your graph to find an approximate value of x which satisfies the equation $\frac{x}{10}+\log_{10}x=1\frac{1}{2}$.

[30 marks.]

9. (*a*) Prove that $\log_b a=1\div\log_a b$.

(*b*) If $\log_{10}16=x$, prove that $\log_2 5=\frac{4-x}{x}$.

[30 marks.]

10. The attraction of the earth on a body is $\frac{m}{r^2}$, where m is a constant and r is the distance of the body from the centre of the earth. Assuming that the earth is a sphere of radius 4000 miles, find to what height a body must be raised above the earth's surface in order that the attraction on it may be reduced by 1 per cent. Give your answer to the nearest mile.

[30 marks.]