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(Department of Education).

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(Secondary Education Branch).

INTERMEDIATE CERTIFICATE EXAMINATION, 1928.

MATHEMATICS (I).

THURSDAY, 14th JUNE.—Morning 10 A.M. TO 12.30 P.M.

Seven questions may be answered.

Mathematical Tables may be obtained from the Superintendent.

1. (i) Simplify $\dfrac{1}{(a+b)^2}\left\{\dfrac{1}{a^2}+\dfrac{1}{b^2}\right\}+\dfrac{2}{(a+b)^3}\left\{\dfrac{1}{a}+\dfrac{1}{b}\right\}$.

    (ii) Find in its simplest form the value of

$$\frac{x+2a}{2b-x}+\frac{2a-x}{2b+x}-\frac{4ab}{4b^2-x^2}$$

    when $x=\dfrac{ab}{a+b}$.   [25 marks.]

2. Find all the factors of :

    (i) $(ab+c^2)^2-c^2\,(a+b)^2$.

    (ii) $1-a-b(1-a)-c(1-a)(1-b)-d\,(1-a)(1-b)(1-c)$.

    (iii) $25n^4+50n^3-n^2-2n$.   [25 marks.]

3. Solve without use of a formula

$$3\cdot67x^2-4\cdot3x=2\cdot87$$

giving the best approximations to two places of decimals.   [25 marks.]

4. Divide $5a+b$ into two parts such that the sum of their squares will be $13\,(a^2+b^2)$.

    Verify the result when $a=9$, $b=2$.   [27 marks.]

5. (i) Show that the difference between any three-digit number and the number formed by reversing the digits is divisible by 99.

(ii) When the integer n is divided by 7 there is a remainder of 4 : write down the four multiples of 7 nearest in value to n, two of them greater and the other two less than n.

(iii) If a is x per cent. greater than b, by what percentage must a be reduced so as to be equal to b?

[27 marks.]

6. Without using the tables, find to four significant figures the numbers whose logarithms to base 10 are $1 \cdot 50$ and $3 \cdot 25$.

Use the tables to find x in each of the equations :—

(i) $\log_{10}x = 1 \cdot 9754$, (ii) $\log_{10}0 \cdot 003716 = x$, (iii) $\log_x 67 = 4 \cdot 605$.

[28 marks.]

7. A school contains 18 boys under ten years of age, 78 between ten and thirteen and 54 over thirteen. Some new boys, all under thirteen, come, with the result that the boys under ten are now 24 per cent. of the whole and the boys between ten and thirteen are 52 per cent. How many of the new boys are between ten and thirteen? [31 marks.]

8. Graph on the same axes from $x = -3$ to $x = 2$ the functions $\frac{1}{x} + 1$ and $x^2 + 2x$ taking one inch as the unit.

Show how to find from the graphs the approximate roots of

$$x^3 + 2x^2 - x - 1 = 0$$

and give them as accurately as possible. [31 marks.]

9. If $x = \dfrac{1}{\sqrt{3} - \sqrt{2}}$, find the best approximation, to three decimal places, to the value of $3x^4 - 26x^2 + 7$. Using a geometrical method, show how to draw a line of length $\dfrac{1}{\sqrt{3} - \sqrt{2}}$ inches.

[31 marks.]