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INTERMEDIATE CERTIFICATE EXAMINATION, 1931.

· MATHEMATICS (I).

THURSDAY, 11*th JUNE*.—Morning 10 A.M. TO 12.30 P.M.

Each item (*a*), (*b*), (*c*), (*d*), (*e*), (*f*) in Section I. will be counted as a *half-question*. The total number of questions answered should not exceed *seven*, every pair of items from Section I. being counted as a whole question.

(Candidates should see that answers to questions in excess of *seven* are cancelled).

Mathematical Tables may be obtained from the Superintendent.

SECTION I.
(Each item (*a*), (*b*), (*c*), (*d*), (*e*), (*f*) in this Section carries 13 marks.)

(*a*) Prove that $x+2$ is a factor of the expression $6x^3+11x^2-14x-24$ and find the other factors of the expression.

(*b*) Find the values of x and y which satisfy the equations :
$$\left.\begin{array}{l} 5x+3y=10\cdot3 \\ 6x-5y=\ 33 \end{array}\right\}$$

(*c*) Substitute $\dfrac{2ab}{a+b}$ for x in the expression $\dfrac{x+a}{x-a}+\dfrac{x+b}{x-b}$ and simplify the result as fully as possible.

(*d*) In six years' time a man's age will be double that of his son; twelve years ago the man's age was four times that of the son. Find the man's present age.

(*e*) Find, correct to two places of decimals, the roots of the equation $x^2=5x+7\cdot8$.

(*f*) Write down three consecutive numbers of which x is the middle one.

Prove that the sum of the cubes of any three consecutive numbers is divisible by the sum of the numbers.

SECTION II.

1. Use the Remainder Theorem to find the factors of $x^3+(a-3)x^2-(3a-2)x+2a$. What value of a will make that expression divisible by x^2-4x+3 ?

[28 marks.]

2. The sides AB, BC of a rectangle ABCD are a inches and b inches respectively in length. Points P and Q are taken on AB such that the angles CPD and CQD are right angles. Express the length of PQ in terms of a, b and simplify the result when $a=22$, $b=7$.

[28 marks.]

3. Solve the equation $\sqrt{2x+6}+\sqrt{x-1}=\sqrt{3x+5}$ and verify your solutions.

[28 marks.]

4. The salaries of two men, A and B, are in the ratio $6:5$ and their expenditures are in the ratio $8:7$. A saves £120 a year, and B £85 : find what the salary of each is.

[28 marks.]

5. If $x=p^2+pq+q^2$ and $y=p^2-pq+q^2$ prove that $p^4+q^4=\frac{1}{4}(6xy-x^2-y^2)$ and find, in terms of x and y, the simplest value of p^6+q^6.

[28 marks.]

6. Given that $x=m(2-\sqrt{3})$, find the simplest value of

$$\left(\frac{x+2m}{x-2m}\right)^2-\frac{5x}{3m}+\frac{m}{x}.$$

[29 marks.]

7. Define ' *logarithm of a number* ' and from your definition deduce that

$$\log_a PQ=\log_a P+\log_a Q$$

Use the Tables to evaluate $\sqrt[3]{19\cdot76\div(4\cdot83)^2}$.

[29 marks.]

8. A rectangle is such that its area remains unaltered when its length is increased by four feet and its width diminished by three feet, but the area is reduced by $\frac{1}{6}$ when the length is increased by five feet and the width diminished by six feet. Find the length and the breadth of the rectangle.

[29 marks.]

9. Evaluate $1\cdot5^x$ when $x=-3,-2,-1,0,1,2,3$ and use the results to draw the graph of $y=1\cdot5^x$ from $x=-3$ to $x=3$.

Use your graph to find, approximately, two values of x which satisfy the equation

$$1\cdot5^x=0\cdot6x+1\cdot2.$$

[29 marks.]