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INTERMEDIATE CERTIFICATE EXAMINATION, 1938.

MATHEMATICS (Algebra).

TUESDAY, 21st JUNE.—Afternoon, 3.30 p.m. to 6 p.m.

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

Mathematical Tables may be obtained from the Superintendent.

1. a articles cost b pence : find

   (i) the cost in pence of c articles ;

   (ii) how many dozen could be got for £d ;

   (iii) what total profit, in shillings, would be made by reselling the articles purchased for £d at a profit of x pence per dozen.

   [25 marks.]

2. Solve the equation

   $$\frac{5x^2+4x-15}{x^2-1}=2+\frac{x+2}{x-1}$$ and verify your results.

   [25 marks.]

3. Write down *four* consecutive odd integers of which $2n-3$ is the least. Prove

   (i) that their sum is divisible by 8 ;

   (ii) that the product of the second and the third exceeds the product of the first and the fourth by 8 ;

   (iii) that the sum of their cubes is divisible by the sum of the numbers.

   [25 marks.]

4. Prove that the two numbers, $\frac{1}{2}(3+\sqrt{5})$ and $\frac{1}{2}(1+\sqrt{5})$, are such that their sum, their product, and the difference of their squares are equal to one another.

   [25 marks.]

5. Factorise fully :

    (i) $(6x^2+5ab-6b^2)^2-(3a^2-5ab+2b^2)^2$;

    (ii) $6x^3-13x^2-10x+24$.

[25 marks.]

6. $\dfrac{x}{y}$ and $\dfrac{2x+6}{2y-1}$ are fractions of which $\dfrac{x}{y}$ is the smaller. Their sum is $\dfrac{29}{15}$ and their difference is $\dfrac{11}{15}$: find the fractions and the values of x and y.

[30 marks.]

7. A, B, C are three points on a road such that AB $=8$ miles, BC $=4$ miles. By running from A to B and walking thence to C a man covered the distance from A to C in two hours. If he had walked from A to B and run from B to C the journey from A to C would have taken him an hour longer. Find, in miles per hour, at what rate he (i) ran ; (ii) walked.

[30 marks.]

8. Prove that $\log_a MN = \log_a M + \log_a N$. Without using the Tables find the value of : $\log_2 32$; $\log_{32} 2$; $\log_{10} 1000\sqrt{10}$.

[30 marks.]

9. The sides BC, CA, AB of a triangle ABC are produced in order to D, E, F respectively so that CD $=$ AE $=$ BF $=p$, and DE, EF, FD are joined. If BC $=a$, CA $=b$, AB $=c$ and $\triangle =$ area of a triangle, prove :

    (i) $\triangle ACD = \dfrac{p}{a}(\triangle ABC)$:

    (ii) $\triangle EAD = \dfrac{p}{b}(\triangle ACD)$;

    (iii) $\triangle DEF = \left\{ \dfrac{p^2(a+b+c)+p(ab+bc+ca)+abc}{abc} \right\} \triangle ABC$

[30 marks.]

10. Using the same axes and the same scales draw the graphs of $(1.5)^x$ $[=y]$ and $2x-1$ $[=y]$ from $x=0$ to $x=7$.

Using your graphs determine the roots of the equation $2x-1=(1.5)^x$ to *one* place of decimals.

[30 marks.]