INTERMEDIATE CERTIFICATE EXAMINATION, 1945.

MATHEMATICS (Algebra).

TUESDAY, 12th JUNE.—MORNING, 10 TO 12.30.

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

Mathematical Tables may be obtained from the Superintendent.

1. Solve the equations :—

   (i) $\dfrac{5}{x}=\dfrac{3}{2x}+\dfrac{7}{15}$;

   (ii) $\frac{1}{3}(x-4)+1=\frac{1}{5}(x+3)-4$.

   [25 marks.]

2. For what values of x are the following statements true ?

   (i) $x-1=1-x$;

   (ii) $(x-1)^2=(1-x)^2$;

   (iii) $(x-2)^2=(2x-1)^2$.

   [25 marks.]

3. Factorise as fully as possible

   (i) $2a^2-4ab-ac+2bc$;

   (ii) $3x^2+2(a+3b)x+4ab$;

   (iii) $x^4-2x^2y^2-8y^4$;

   (iv) $(1+xy)^2-(x+y)^2$.

   [25 marks.]

4. Solve the equation

$$\frac{2}{x-15}+\frac{x-15}{2}=3+\frac{1}{3}.$$

   [25 marks.]

5. A and B have only one bicycle between them and have to travel a distance of 26 miles. A walks at 4 miles per hour and cycles at 10 miles per hour ; B walks at $4\frac{1}{2}$ miles per hour and cycles at 12 miles per hour. They start on the journey together, A on the bicycle and B on foot. After A has ridden a certain distance he leaves the bicycle and finishes the journey on foot. When B reaches the place where A left the bicycle he mounts it and reaches the end of the journey at the same time as A. Find the time spent on the journey.

   [25 marks.]

6. By using the Remainder Theorem, or otherwise, find all the factors of

$$x^3 + 2x^2 - 23x - 60.$$

[30 marks.]

7. Prove that $x^3 - 6x^2 - 35x - 3 = \pm 3\sqrt{5}$ when $x^2 - 6x = 36$.

[30 marks.]

8. If $x = \dfrac{a - \dfrac{1}{a}}{a + \dfrac{1}{a}}$ and $y = \dfrac{b - \dfrac{1}{b}}{b + \dfrac{1}{b}}$, find the value of $\dfrac{x + y}{1 + xy}$ when

$a = 7.98,\ b = \dfrac{2}{7.98}$.

[30 marks.]

9. (i) Prove that $\log_b N = \log_a N \div \log_a b$.

(ii) Solve the equation

$$(3)^{2x-1} - 11(3)^{x-1} + 6 = 0.$$

[Hint : Put $y = 3^x$.]

[30 marks.]

10. Find, to 2 decimal places, as accurately as you can, by drawing the graph of $x^3 - 3x + 1$ from $x = -2$ to $x = +2$ on suitable scales, the values of x which satisfy the equation

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

[30 marks.]