ADVANCED ALGEBRA

Monday, JANUARY 25, 1909—9.15 a. m. to 12.15 p. m., only

Answer eight questions.

1 Solve as a quadratic $3x^2 + 15x - 2\sqrt{x^2 + 5x + 1} = 2$

2 If $\dfrac{x}{a-b} = \dfrac{y}{b-c} = \dfrac{z}{c-a}$ find the value of $x + y + z$. [Apply the theorem: "In any continued proportion the sum of all the antecedents is to the sum of all the consequents" etc.]

3 The sum of the first 5 terms of an arithmetical progression is 315; the sum of the first 10 terms is 480. Find the first 12 terms of the series.

4 Find the value of the repetend $0.23\dot{1}$.

5 In an examination paper there are 12 questions arranged in 3 groups of 4 questions each and the pupil is required to answer 8 questions, selecting at least 2 from each group. How many different selections of questions can he make?

6 Log $5 = 0.69897$; find x when $5^x = 10$

7 Construct carefully the graph of the equation
$$x^3 - 4x^2 + x + 2 = 0$$
and determine by measurement the approximate value of each real root.

8 Solve the equation $x^3 - 4x^2 - 3x + 18 = 0$, knowing that two of its roots are equal. [Solution by trial not accepted.]

9 Transform $4x^3 - 8x^2 - 17x + 11 = 0$ into an equation in which the leading coefficient is unity and the other coefficients are integers.

10 Determine the nature of the roots of the equation
$$x^3 - 3x^2 + 3x + 2 = 0$$

11 Show that if $a + b\sqrt{-1}$ is a root of $f(x) = 0$, then $a - b\sqrt{-1}$ is also a root.

12 Evaluate the determinant
$$\begin{vmatrix} 1 & 4 & 3 & 1 \\ 3 & 8 & 2 & 5 \\ 6 & 4 & 1 & 2 \\ 2 & 5 & 3 & 3 \end{vmatrix} = +15$$