New York State Education Department

EXAMINATION FOR QUALIFYING CERTIFICATES

ADVANCED ALGEBRA

Monday, September 9, 1912—9.15 a. m. to 12.15 p. m., only

Answer eight questions. Credit will not be granted unless all operations (except mental ones) necessary to find results are given; simply indicating the operations is not sufficient. Each answer should be reduced to its simplest form. Each complete answer will receive 12½ credits. Papers entitled to less than 75 credits will not be accepted.

1 Solve $\begin{cases} x^2y^2 - 6x = 34 - 3y \\ 3xy + y = 2(9 + x) \end{cases}$

2 What is the value of c in the equation $x^2 - 6x + c = 0$ when one root is double the other? What is the value of c in the equation $x^2 - 5x + c = 0$ when one root exceeds the other by 3?

3 How many distinct arrangements of the letters in the word *parallel* can be formed?

4 Transform $2x^3 - \frac{3x^2}{2} - \frac{x}{8} + \frac{3}{16} = 0$ into an equation with integral coefficients and unity for the coefficient of the first term.

5 Find by the use of determinants the values of x and y in the following system of equations:

$$\frac{x}{2} + \frac{y}{3} + \frac{z}{4} = 7$$
$$x + 2y + 3z = 48$$
$$\frac{x}{3} - \frac{2y}{3} + \frac{z}{3} = 4$$

6 If one of the roots of the equation $ax^2 + bx + c = 0$ is double the other, show that $9ac = 2b^2$

7 Find *all* the roots of the equation $x^5 - 6x^3 - x^2 + 8x + 4 = 0$

8 Form the equation whose roots are 2 less than the roots of $x^4 - 2x^3 - 4x^2 + x - 1 = 0$

9 Find the value of the fraction $\frac{\sqrt{3x-2} - \sqrt{x+2}}{x-2}$ when $x = 2$

10 Plot for integral values of x between $x = -1$ and $x = 3$ the equation $y = x^3 + 3x - 20$ and determine, to *two* places of decimals, the positive root of the right hand member set equal to zero.