The University of the State of New York

EXAMINATION FOR QUALIFYING CERTIFICATES

ADVANCED ALGEBRA

Monday, September 15, 1924 — 1.15 to 4.15 p. m., only

Answer eight questions. Each answer should be reduced to its simplest form. Papers entitled to less than 75 credits will not be accepted.

1 *a* Find the value of the expression $\frac{a^3-4a+7}{5}$ when $a = 2+\sqrt{-3}$. [8½]

b Add graphically $3+2\sqrt{-1}$ and $-5-\sqrt{-9}$ [4]

2 *a* Insert *two* geometric means between $-\frac{2}{3}$ and $\frac{144}{125}$ [8½]

b Multiply $x^{-\frac{1}{2}}+x^{-\frac{1}{4}}y^{-\frac{1}{4}}+y^{-\frac{1}{2}}$ by $x^{+\frac{1}{4}}-y^{+\frac{1}{4}}$ [4]

3 Solve the equation $x^3-6x^2-4x+24=0$ two of whose roots are in the ratio of 1:3. [12½]

4 By applying Horner's method to the equation $x^3-16=0$, compute the cube root of 16 to *two* decimal places. [12½]

5 *a* Form a fourth degree equation with rational coefficients two of whose roots are $2-\sqrt{-5}$ and $-1+\sqrt{2}$. [7]

b *Without solving,* determine the nature of the roots of the equation $x^4+15x^2+6x-11=0$ [5½]

6 The number of feet in the diameter of a spheric balloon which is to lift a certain weight, can be calculated from the formula

$$D=\sqrt[3]{\frac{W}{.5236(A-g)}}$$

If $W=1374$, $A=.08072$ and $g=.0056$, find by logarithms the diameter (D) of the balloon. [12½]

7 A gardener fills a rectangular space, 6 by 9 feet, with geranium plants; he buys 304 plants of another variety for a border of uniform width around the geraniums. If the directions for planting the second kind require 36 square inches for each plant, find the width of the border. [12½]

8 Solve the following set of equations and group the results:

$$3x^2-5y^2=28$$
$$3xy-4y^2=8$$ [12½]

9 *a* There are 13 points in a plane no three of which lie in the same straight line. Find the number of triangles that can be formed by joining the points. [6]

b In how many ways can a set of 5 books by one author and a set of 4 by another author be arranged on a shelf if each writer's works are placed together? [6½]

10 Transform the equation $4y^3-36y^2+3y=7$ into an equation lacking the second term. [12½]

11 Plot the graph of the equation $x^3-4x^2-5x+14=y$ from $x=-3$ to $x=+5$ and from the graph estimate to the *nearest tenth* the roots of the equation $x^3-4x^2-5x+14=0$ [12½]