The University of the State of New York

238th High School Examination

INTERMEDIATE ALGEBRA

Thursday, January 20, 1927 — 9.15 a. m. to 12.15 p. m., only

Fill in the following lines:

Name of school.. Name of pupil..

Instructions

Do not open this sheet until the signal is given.

Answer all questions in part I and five questions from part II.

Part I is to be done first and the maximum time to be allowed for this part is one and one half hours. Merely write the answer to each question in the space at the right; no work need be shown.

If you finish part I before the signal to stop is given you may begin part II. However, it is advisable to look your work over carefully before proceeding to part II, since *no credit will be given any answer in part I which is not correct and reduced to its simplest form.*

When the signal to stop is given at the close of the one and one half hour period, work on part I must cease and this sheet of the question paper must be detached. The sheets will then be collected and you should continue with the remainder of the examination.

INTERMEDIATE ALGEBRA

Thursday, January 20, 1927

Part I

Answer all questions in this part. Each question has 2½ credits assigned to it. Each answer must be reduced to its simplest form.

1 Solve the formula $c = \sqrt{a^2 + b^2}$ for b, where a, b and c are the sides of a triangle.　Ans............

2 If $x = 4$, find the value of $x^{\frac{3}{2}} + 4x^{-1} - 5x^0$　Ans............

3 When t yards of cloth can be bought for s dollars, how many yards can be bought for \$15?　Ans............

4 Factor $a^2 + 13a + 36$　Ans............

5 Factor $25x^2 - 2x + .04$　Ans............

6 Factor $a^3 + 8a^2 + 8a + 1$　Ans............

7 Express $\sqrt{-7}$ in terms of the imaginary unit i, that is, in terms of $\sqrt{-1}$　Ans............

8 Simplify $\dfrac{\frac{1}{a^3 b^3}}{\frac{1}{a^3} + \frac{1}{b^3}}$　Ans............

9 Solve the following equation for x: $3\sqrt{2x} - 5 = 0$　Ans............

10 Write the formula for finding the roots of any quadratic equation, that is, write the roots of $ax^2 + bx + c = 0$ in terms of a, b and c.　Ans............

11 In terms of a and b what is the sum of the roots of $ax^2 + bx + c = 0$?　Ans............

12 What must be the value of r in $4x^2 - 20x + r = 0$, if the roots are real and equal?　Ans............

13 Rationalize the denominator in $\dfrac{1}{\sqrt{7} + 2}$　Ans............

14 Find in terms of n the last or nth term of the progression 2, 6, 10, . . .　Ans............

15 Express as a power of $\frac{1}{2}$ the 20th term of the progression 4, 2, 1, . . .　Ans............

16 Given $7 = 10^{0.8451}$ and $3 = 10^{0.4771}$; express 21 as a power of 10.　Ans............

17 Form a quadratic equation in x with integral coefficients whose roots are $-\frac{1}{2}$ and 4.　Ans............

18 Find the value of $x^2 - 2x - 1$, if $x = 1 + \sqrt{2}$.　Ans............

19 Find the value of c if the graph of $y = 2x + c$ passes through the point whose coordinates are (5, 1).　Ans............

20 Write a quadratic equation with the second member 0, in which the sum of the roots is 3 and the product of the roots is 6.　Ans............

INTERMEDIATE ALGEBRA

Thursday, January 20, 1927

Write at top of first page of answer paper to part II (*a*) name of school where you have studied, (*b*) number of weeks and recitations a week in (1) elementary algebra, (2) intermediate algebra.

The minimum time requirement is five recitations a week for half a school year, or the equivalent, after the completion of elementary algebra.

Part II

Answer five questions from this part. Full 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.

In the examination in intermediate algebra the use of the slide rule will be allowed for checking, provided all computations with tables are shown on the answer paper.

21 Solve for x and y and correctly group your answers:

$$3xy - 2x = 14$$
$$2x - y = 1 \qquad [8, 2]$$

22 Two railroad stations are 96 miles apart. An express train traveling 16 miles per hour faster than a freight train covers the distance between these stations in 1 hour less time. Find the speed of each train. [6, 4]

23 Find a number consisting of two digits such that the tens digit exceeds the units digit by 3 and the number is 4 less than the sum of the squares of its digits. [6, 4]

24 If a body falls 16.08' the first second, 48.24' the second second, 80.4' the third second, etc., how far will it fall in 12 seconds? [10]

25 *a* If P dollars is placed at $r\%$ interest for n years and the interest is compounded annually, the amount A at the end of that time is shown by the formula $A = P(1 + \frac{r}{100})^n$; find the time required for \$143 to amount to \$188 at 4% if the interest is compounded annually. [5]

b Find by use of logarithms the value of $\dfrac{\sqrt[3]{57.3}}{8.693}$ [5]

26 *a* The perimeter of a parallelogram is 70 feet. If one side of the parallelogram is y, represent the adjacent side in terms of y. [1]

b In the parallelogram mentioned in *a* the altitudes on two adjacent sides as bases are in the ratio 3:4. Represent these two altitudes in terms of one letter x. [1]

c Write *two* expressions for the area of the parallelogram in terms of x and y. [2]

d If the area of the parallelogram is 240 square feet, find each side and each altitude. [6]

27 Given the equation $x^2 - 2x + 4 = y$

a Make a graph of this equation for values of x from -2 to 3 inclusive. [8]

b Show how it is possible by the aid of this graph to determine the nature of the roots of the equation $x^2 - 2x + 4 = 0$ [2]

28 Given the equations $x^2 + y^2 = 25$ and $x - y = 1$

a Using the same axes plot the graphs of these equations. [6]

b State how the graphs show that the solutions of the two equations are real numbers. [1]

c From the graph determine *two* pairs of values of x and y that satisfy the equations. [3]

[3]