The University of the State of New York

316TH HIGH SCHOOL EXAMINATION

INTERMEDIATE ALGEBRA

Wednesday, August 20, 1952 — 12 m. to 3 p. m., only

Instructions

Part I is to be done first and the maximum time allowed for it is one and one half hours. At the end of that time, this part of the examination must be detached and will be collected by the teacher. If you finish part I before the signal to stop is given, you may begin part II.

Write at top of first page of answer paper to parts II, III and IV (*a*) names of schools where you have studied, (*b*) number of weeks and recitations a week in intermediate algebra previous to entering summer high school, (*c*) number of recitations in this subject attended in summer high school of 1952 or number and length in minutes of lessons taken in the summer of 1952 under a tutor licensed in the subject and supervised by the principal of the school you last attended.

The minimum time requirement is four or five recitations a week for half a school year after the completion of elementary algebra. The summer school session will be considered the equivalent of one semester's work during the regular session (four or five recitations a week for half a school year).

For those pupils who have met the time requirement the minimum passing mark is 65 credits; for all others 75 credits.

For admission to this examination attendance on at least 30 recitations in this subject in a registered summer high school in 1952 or an equivalent program of tutoring approved in advance by the Department is required.

Part II

Answer three questions from part II.

26 Two positive numbers are in the ratio 1 : 3. If the smaller is increased by 1 and the result is multiplied by the larger, the product is 12.

a If x represents the smaller number, write an equation in x that can be used to find the numbers. [3]

b Find, to the *nearest tenth,* the smaller of the two numbers. [7]

27 Solve the following system of equations and check the answers: [8, 2]

$$2x + y = 7$$
$$x^2 + 2xy - y = 14$$

28 Given the formula $R = \sqrt[3]{\frac{r^2 h}{1.33}}$. Using logarithms, find R to the *nearest tenth of an inch* when $r = 49.3$ inches and $h = 37.2$ inches. [10]

29 *a* Draw the graph of $y = x^2 - 3x - 1$ from $x = -1$ to $x = 4$ inclusive. [6]

b On the set of axes used in *a,* draw the graph of $x = y + 3$. [2]

c Estimate to the *nearest tenth* the coordinates of one of the points of intersection of the graphs made in answer to *a* and *b*. [2]

*30 Solve for x: $6x^3 + 7x^2 - 9x + 2 = 0$ [10]

*31 *a* Solve for x: $3^{3x+1} = 9^x$ [3]

b Solve for x to the *nearest tenth*: $3^{2x} = 12$ [7]

* This question is based upon one of the optional topics in the syllabus.

Part III

Answer one question from part III.

32 Write the equations that would be used in solving the following problems. In *each* case state what the letter or letters represent. [Solution of the equations is not required.]

a The tens digit of a two-digit number exceeds the units digit by 2. If the number is divided by the sum of the digits, the quotient is 6 and the remainder is 3. Find the numbers. [5]

b An airplane can fly 240 miles with the wind in 1 hour and 20 minutes, and 180 miles against the wind in 1 hour and 30 minutes. Find the speed of the plane in still air. [5]

33 Three numbers are in arithmetic progression and the common difference is 3. If 1 is subtracted from the first of these numbers, the second is left unchanged and 5 is added to the third number, the resulting numbers are in geometric progression. Find the numbers. [6, 4]

Part IV

Answer one question from part IV.

34 If the blank in each of the following statements is replaced by one of the words *always, sometimes* or *never,* the resulting statement will be true. Write the numbers (1)–(5) on your answer paper and opposite *each* number write the word that will correctly complete the corresponding statement.

Given the equation $ax^2 + bx + c = 0$ in which a, b and c are integers.

(1) If one and only one of the roots of the equation is zero, then c is ... zero. [2]

(2) If b is zero, then the roots of the equation are ... real. [2]

(3) If a and c are opposite in sign, the roots of the equation are ... imaginary. [2]

(4) If the roots of the equation are real and if a and c are positive and b is negative, then the roots of the equation are ... positive. [2]

(5) If $\frac{1}{2}b$ is a mean proportional between a and c, then the roots of the equation are ... equal. [2]

35 A train makes a daily run of m miles. One day, because of poor weather conditions, it makes the run at an average rate 5 miles an hour less than usual and arrives at its destination an hour late. Find in terms of m the usual rate of the train. [10]

Fill in the following lines:

Name of pupil.....Name of school.....

Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed.

1 Find the positive root of the equation $6x^2 + 5x - 6 = 0$. 1.....

2 Write the expression $\sqrt{-81} - 4i$ as a single term. 2.....

3 Express $\frac{2}{3-\sqrt{2}}$ as an equivalent fraction with a rational denominator. 3.....

4 Solve the equation $\sqrt{x^2 - 15} = 5 - x$. 4.....

5 Solve for w the equation $nw = s - w$. 5.....

6 Solve the following system of equations for x and y: 6 x.....

$$2x - y = -14$$
$$x - 3y = -17$$

y.....

7 Simplify the fraction $\frac{a-b}{a^2-b^2}$ 7.....

8 A driver drove m miles in h hours and then increased his speed by r miles an hour. Express the new rate in terms of m, h and r. 8.....

9 Simplify the complex fraction $\frac{a - \frac{1}{b}}{\frac{a}{b}}$ 9.....

10 Find the sum of the first 16 terms of the progression 3, 7, 11, ... 10.....

11 Find *two* numbers which when inserted between 7 and 189 form with those numbers a geometric progression of four terms. 11.....

12 Find the sum of the infinite geometric progression 9, 3, 1, ... 12.....

13 Find the logarithm of 55.23 13.....

[OVER]

14 Find the number whose logarithm is 9.3085 — 10 14.....

15 A guy wire 15 feet long meets the ground at a distance of 11 feet from the foot of the pole to which it is fastened. Find to the *nearest degree* the angle that the wire makes with the ground. 15.....

16 Write the *first three* terms in the expansion of $(x - y)^7$. 16.....

17 If x varies inversely as y and $x = 3$ when $y = 20$, find the value of y when $x = 5$. 17.....

18 Find the value of $4^{-\frac{1}{2}} \times y^0$ 18.....

19 Find the sum of the roots of the equation $2x^2 + 3x - 7 = 0$. 19.....

20 Find the product of the roots of the equation $3x^2 + x - 5 = 0$. 20.....

Directions (21–25) — Indicate the correct completion for *each* of the following by writing on the line at the right the letter *a*, *b* or *c*.

21 Given the straight lines whose equations are (1) $3x + 2y = 5$, (2) $6x - 4y = 10$, (3) $9x + 6y = 9$. The two lines which are parallel are (*a*) 1 and 2 (*b*) 1 and 3 (*c*) 2 and 3 21.....

22 The expression $2 \log a - \log b$ is the logarithm of (*a*) $2a - b$ (*b*) $\frac{2a}{b}$ (*c*) $\frac{a^2}{b}$ 22.....

23 The graph of the equation $4x^2 = 9y^2 + 36$ is (*a*) an ellipse (*b*) a hyperbola (*c*) a parabola 23.....

24 For the graph of the equation $ax^2 + bx + c = y$, in which a, b and c are integers, the y axis is the axis of symmetry when b is (*a*) negative (*b*) zero (*c*) positive 24.....

25 The discriminant of a quadratic equation whose roots are rational and unequal may be (*a*) —64 (*b*) 8 (*c*) 16 25.....