The University of the State of New York

281st High School Examination

INTERMEDIATE ALGEBRA

Wednesday, June 18, 1941 — 9.15 a. m. to 12.15 p. m., only

Instructions

Do not open this sheet until the signal is given.

Part I

This part is to be done first and the maximum time allowed for it 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, since *no credit will be given any answer in part I which is not correct and in 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.

Parts II, III and IV

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

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

The use of the slide rule will be allowed for checking but all computations with tables must be shown on the answer paper.

Fill in the following lines:

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

Detach this sheet and hand it in at the close of the one and one half hour period.

Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Each answer must be reduced to its simplest form.

1 Write the three factors of $x^3 - x$.

1...................

2 Write the fractional root of the equation $2x^2 - 3x + 1 = 0$

2...................

3 What value of x satisfies the equation $\sqrt{x^2 - 2x + 4} = x$?

3...................

4 Perform the indicated operations: $(1 - \dfrac{3}{x}) \div (1 + \dfrac{3}{x})$

4...................

5 Find the logarithm of 7.292

5...................

6 Find the four-digit number whose logarithm is 1.6525

6...................

7 A diagonal of a rectangle is 6.0 inches and makes an angle of 38° with one of the sides. Find, correct to the *nearest tenth of an inch*, the side of the rectangle adjacent to that angle.

7...................

8 If $\log x = a$ and $\log y = b$, express the value of $\log xy$ in terms of a and b.

8...................

9 Express $\sqrt{-5}$ in terms of the imaginary unit i.

9...................

10 Express $\dfrac{1}{\sqrt{7} - 2}$ as a fraction with a rational denominator.

10...................

11 Find the value of $8^{-\frac{1}{3}} \times (2)^0$

11...................

12 Divide a^{6m} by a^{2m}.

12...................

13 What is the name of the graph of the equation $ax^2 + by^2 = c$, in which a, b and c are positive and a is not equal to b?

13...................

14 What is the slope of the line whose equation is $y = 3x + 4$?

14...................

15 Write the equation which expresses the relation between x and y as shown in the following table:

x	0	1	2	3
y	1	4	7	10

15...................

16 What is the product of the roots of the equation $x^2 - px - 2 = 0$?

16...................

17 If n represents the smallest of three consecutive *odd* integers, express their sum in terms of n.

17...................

18 What is the *fifth* term of the series, 2, 6, 18, ... ?

18...................

19 Insert *two* arithmetic means between 8 and 23.

19...................

20 Write the *first two* terms of the expansion $(a + b)^8$.

20...................

21 Solve for d the following formula: $l = a + (n - 1)d$.

21...................

22 If x varies directly as y and $x = 12$ when $y = 4$, what is the value of y when $x = 5$?

22...................

[3]

[OVER]

Directions (questions 23–25) — Indicate the correct answer to each question by writing on the dotted line at the right the letter *a*, *b* or *c*.

23 If the roots of a quadratic equation are real, unequal and rational, the discriminant of the equation may be (*a*) 0, (*b*) 1 or (*c*) 2.   23.....................

24 The graph of the equation $y = x$ (*a*) is parallel to the y axis, (*b*) is parallel to the x axis or (*c*) passes through the origin.   24.....................

25 The graph of the equation $x^2 + y^2 = 16$ (*a*) intersects the x axis but not the y axis, (*b*) intersects the y axis but not the x axis or (*c*) intersects both the x axis and the y axis.   25.....................

[4]

Part II

Answer three questions from this part.

26 Find, correct to the *nearest tenth*, the roots of the equation $2x^2 - 2x = 3$ [10]

27 Solve the following set of equations, group your answers and check *one* set:

$$x^2 + y^2 = 25$$
$$3x^2 - 2y^2 = 30 \qquad [7, 2, 1]$$

28 The volume V of a circular cylinder whose altitude is h and whose radius is r is given by the formula $V = \pi r^2 h$. Using logarithms, find, correct to the *nearest tenth*, the value of r if $V = 906$ and $h = 14.6$ [Use $\pi = 3.14$]   [10]

29 Solve graphically the following set of equations:

$$y = x^2 - 2x + 4$$
$$y = 2x + 1 \qquad [6, 2, 2]$$

*30 Find, correct to the *nearest year*, the time in which \$100 will amount to \$200 if interest is compounded annually at 3%. [Use the formula: $A = P(1 + r)^n$]   [10]

Part III

Answer one question from this part.

31 A workman received \$40 for a certain number of days work. If he had received \$1 less per day, it would have taken him two days longer to earn the same amount. How many days did he work?   [6, 4]

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

   a The cost of sending a telegram of 14 words from one city to another is 33 cents and the cost of sending one of 26 words is 57 cents. The charge in each case is a certain amount for the first 10 words and an extra amount for each additional word. Find the cost of the first 10 words and of each additional word.   [5]

   b The sum of the digits of a two-digit number is 12. If the digits are reversed, a new number is formed which is 12 less than twice the original number. Find the number.   [5]

33 The sum of the first two terms of an infinite geometric series is $\frac{3}{4}$ and the ratio is $\frac{2}{3}$; find the sum of the series.   [10]

Part IV

Answer one question from this part.

34 Each of the following statements is sometimes true and sometimes false, depending on the values of a, b and c. In each case give *one* illustration in which it is true and *one* in which it is false.

   a The sum of the roots of the quadratic equation $ax^2 + bx + c = 0$ is equal to the coefficient of x with the sign changed.   [2]

   b The product of $\sqrt[3]{a}$ and $\sqrt[3]{b}$ is a rational number.   [2]

   c The roots of the equation $x^2 + a = 0$ are imaginary.   [2]

   d The parabola whose equation is $y = ax^2 + bx + c$ intersects the x axis.   [2]

   e The expression $\dfrac{a + b}{2a}$ equals the expression $\dfrac{2b}{a + b}$ [2]

35 A motorist finds that if he travels r miles per hour he can cover a certain distance in h hours. By how many miles must he increase his rate per hour if he is to cover the same distance in one hour less time?   [10]

* This question is based on one of the optional topics in the syllabus.   [2]