

The University of the State of New York

286TH HIGH SCHOOL EXAMINATION

INTERMEDIATE ALGEBRA

Wednesday, January 20, 1943 — 9.15 a. m. to 12.15 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) 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.

Part II

Answer three questions from part II.

- 26 a What is the discriminant of the equation $x^2 + 4x - 16 = 0$? [1]
b What is the nature of the roots of this equation as judged by the discriminant? [1]
c Find, correct to the *nearest tenth*, the roots of the equation $x^2 + 4x - 16 = 0$ [8]
- 27 Solve the following pair of equations, group your answers and check *one* set:
$$x^2 + y^2 - 25 = 0$$
$$x - y - 1 = 0 \quad [7, 2, 1]$$
- 28 The formula for the lift of an airplane wing is $L = \frac{1}{2} C D A V^2$ in which $L =$ lift in pounds, $C =$ a constant, $D =$ air density in pounds per cubic foot, $A =$ area of the wing in square feet and $V =$ speed in feet per second.
Using logarithms, find the value of L when $C = 1.3$, $D = .002$, $A = 450$, and $V = 125$ [10]
- 29 Derive the formula for the sum S of a geometric progression in terms of the number of terms n , the first term a and the common ratio r . [10]
- 30 a Draw the graph of $y = x^2 - 2x - 1$ from $x = -2$ to $x = 4$ inclusive. [5]
b Write the equation of the axis of symmetry. [2]
c Write the coordinates of the minimum point. [1]
d From the graph estimate, correct to the *nearest tenth*, the roots of the equation $x^2 - 2x - 1 = 0$ [2]
- *31 Find the *three* roots of the equation $x^3 + 2x^2 - x + 6 = 0$ [10]

* This question is based on 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 unknown letter or letters represent. [Solution of the equations is not required.]

- a The units digit of a two-digit number is 5 less than the tens digit. If the digits are reversed a new number is formed which is $\frac{1}{4}$ of the original number. What is the original number? [5]
- b It takes Bill 6 hours longer than John to plow a certain field. Together they can plow it in 4 hours. How long would it take each alone to plow the field? [5]

33 A manufacturer of cans is told to use 1% tin and 99% steel in the making of cans. He has in stock 200 pounds of tin and 40,000 pounds of steel. He decides to buy a stock of used cans that yield 2% tin and 98% steel. How many pounds of used cans should he buy so that his total stock will be 1% tin? [7, 3]

Part IV

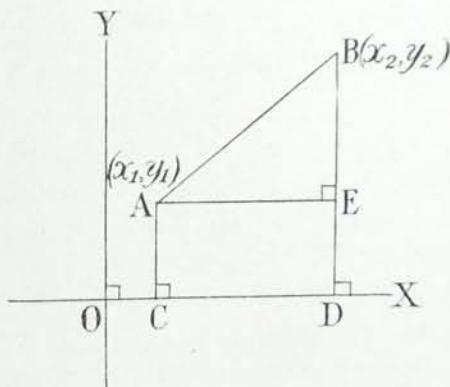
Answer one question from part IV.

34 If the blank in each of the following statements is filled by one of the words *always*, *sometimes* or *never*, the resulting statement will be true. Write the letters *a*, *b*, *c*, *d*, *e* and opposite each write the word that will correctly complete the corresponding statement.

- a The positive square root of a number is ... less than the number. [2]
- b The product of two binomials is ... a binomial. [2]
- c If a and b are positive numbers, the roots of the equation $ax^2 + b = 0$ are ... imaginary. [2]
- d The graph of $ax^2 = 25 + ay^2$ is ... a circle. [2]
- e If both the numerator and the denominator of a proper fraction are increased by the same amount, then the new fraction is ... greater than the given fraction. [2]

35 In the drawing at the right the coordinates of points A and B are (x_1, y_1) and (x_2, y_2) respectively. AC and BD are perpendicular to the horizontal axis OX and a line through A parallel to OX intersects BD at E .

- a Express AE in terms of x_1 and x_2 . [3]
- b Express BE in terms of y_1 and y_2 . [2]
- c Express AB in terms of x_1 , x_2 , y_1 and y_2 . [5]



Fill in the following lines:

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

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.

Directions (questions 1-3) — Write on the line at the right of each statement the expression which when inserted in the blank will make the statement true.

1 If the product of two or more factors is zero, one of the factors must be 1.....

2 If a man travels m miles in h hours, his average speed is ... miles per hour. 2.....

3 To reduce $\frac{x^2-1}{2x-2}$ to lowest terms, both numerator and denominator should be divided by 3.....

4 Supply the missing term in the following geometric series: $-1, 2, -4, \dots, -16$. 4.....

5 When the equation $\sqrt{y+5} = 7 - y$ is solved, the roots 4 and 11 are obtained. Do both of these roots satisfy the given equation? [Answer yes or no.] 5.....

6 Write the prime factors of $16x - x^3$ 6.....

7 The number of foot-pounds of work w expended in stretching a certain coiled spring s feet is indicated by the following table:

s	$\frac{1}{2}$	1	$1\frac{1}{2}$	2
w	$2\frac{1}{2}$	5	$7\frac{1}{2}$	10

Express w in terms of s . 7.....

8 Find, correct to the nearest tenth, the value of $\frac{3}{\sqrt{2}}$ 8.....

9 What is the name of the graph of $y = x^2$? 9.....

10 Find the logarithm of 238.3 10.....

11 Find x correct to the nearest tenth if $\log x = 2.6518$ 11.....

12 Find the value of $\frac{E}{r+R}$ when $E = \frac{5}{2}$, $r = \frac{3}{4}$ and $R = \frac{7}{8}$ 12.....

13 The arithmetic mean between two numbers is $4\frac{1}{2}$. If one of the numbers is 3, find the other number. 13.....

14 What is the slope of the line whose equation is $y - 3x = 2$? 14.....

15 Find the value of $x^2 - 3x^{\frac{1}{2}}$ if $x = 4$ 15.....

16 Express the sum of $\sqrt{-49}$ and $\sqrt{-16}$ in terms of i . 16.....

17 In how many points do the graphs of $x^2 + 4y^2 = 36$ and $y = 2$ intersect? 17.....

18 In triangle ABC , angle $C = 90^\circ$, $AB = 100$ and angle $A = 15^\circ$; find BC correct to the nearest integer. 18.....

19 A side of a square is s and its area is k . Express k as a function of s . 19.....

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Directions (questions 20-25) — Indicate the correct answer to *each* question by writing on the line at the right the letter *a*, *b*, *c* or *d*.

20 If the discriminant of a quadratic equation is -2 , the roots of the equation are (a) real and equal, (b) real, unequal and rational, (c) real, unequal and irrational or (d) imaginary. 20.....

21 $\text{Log } \frac{a^2}{b}$ is equal to (a) $2 \log a - b$, (b) $\log 2a - \log b$, (c) $2a - b$ or (d) $2 \log a - \log b$. 21.....

22 The number of terms in the expansion of $(a + b)^n$ is (a) n , (b) $n + 1$, (c) $2n$ or (d) $n - 1$. 22.....

23 The sum of the roots of the equation $2x^2 - 3x - 5 = 0$ is (a) $\frac{3}{2}$, (b) $\frac{3}{4}$, (c) $-\frac{3}{2}$ or (d) 3. 23.....

24 The graph of the equation $y = 4$ (a) is parallel to the x axis, (b) is parallel to the y axis, (c) passes through the origin or (d) makes equal angles with the axes. 24.....

25 In the following problem, have you been given (a) too little, (b) just enough or (c) more than enough, information to answer the question?

A rectangular lot contains 200 square yards. How much will it cost to fence the lot at \$1.25 a foot if that price includes the cost of labor? 25.....