The University of the State of New York

287TH HIGH SCHOOL EXAMINATION

INTERMEDIATE ALGEBRA

Friday, April 30, 1943 — 1.15 to 4.15 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 Find, correct to the *nearest tenth*, the roots of the equation $2x^2 - 4x - 5 = 0$ [10]

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

$$x^2 - 2y^2 = 17$$
$$x - 2y - 9 = 0 \qquad [7, 2, 1]$$

28 A formula frequently used in trigonometry is $r = \sqrt{\frac{(s-a)(s-b)(s-c)}{s}}$

Using logarithms, find, correct to the *nearest tenth*, the value of r when $s = 139$, $s - a = 61.1$, $s - b = 44.4$ and $s - c = 33.5$ [10]

29 *a* Plot the graph of $5x = 7y$ [2]

b On the same set of axes, plot the graph of $x^2 - 3x = y$ from $x = -1$ to $x = 4$ inclusive. [6]

c From the graphs made in answer to *a* and *b*, obtain the values of x and y common to the two equations, estimating the fractional values to the *nearest tenth*. [2]

30 A man paid his creditor $12.50 in January and 50 cents less each month thereafter for 10 months. How much did he pay in July and what was the total amount paid in 10 months? [Solve by using formulas.] [10]

*31 *a* State the theorem known as the Factor Theorem. [4]

b Using the Factor Theorem, factor $x^3 - 3x^2 - 10x + 24$ [6]

* 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 On one trip to the store Mrs Clark bought 2 cans of soup and 6 cans of vegetables, for which the grocer took 90 points from her ration books. On another trip Mrs Clark purchased 3 cans of soup and 2 cans of vegetables, for which 44 points were removed from her ration books. What was the point value of a can of soup? [5]

b A certain type of bomber averages 200 miles an hour when loaded and 240 miles an hour when not loaded. On one round trip the bomber was gone 6 hours. If $\frac{1}{2}$ hour is allowed for time spent over the target, how far was the target from the starting point? [5]

33 A man has \$7500 to invest. How much of it must be invested at $4\frac{1}{2}\%$ and how much at 5% if he is to receive an income of \$360 from the two investments? [10]

Part IV

Answer one question from part IV.

34 Without the use of tables, find the value of *each* of the following, showing all work:

a $10^{2.4} \times \sqrt{10^{1.2}}$ [3]

b $\dfrac{\log 27}{\log 3}$ [3]

c $\log .125 + \log 8$ [4]

35 *a* The expression $2n$ represents an even number for all integral values of n. Represent two *consecutive* even integers. [2]

b *Prove* that 8 must be a factor of the product of any two consecutive even integers. [8]

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.

1 Is $x = 7$ a root of the equation $x + \sqrt{x + 2} = 4$? [Answer *yes* or *no*.] 1.....

2 Write the first *three* terms of $(a - 2)^5$ 2.....

3 What are the roots of the equation $6 + x = x^2$? 3.....

4 Write an equation whose graph is a straight line. 4.....

5 What is the name of the graph of the equation $y = 3x^2 + 4x + 1$? 5.....

6 Write a formula involving a, b and c which expresses the relationship found in the following table:

a	2	1	4	8
b	3	5	7	9
c	6	5	28	72

6.....

7 Find the sum of the first *40* positive odd integers. 7.....

8 Find the *seventh* term of the series 6, 3, 1.5, ... 8.....

9 Factor $a^2 c^2 - a^2 d^4$ 9.....

10 What is the value of $27^{\frac{2}{3}}$? 10.....

11 Express $2\sqrt{-25}$ in terms of $\sqrt{-1}$ 11.....

12 From a bank of a river 300 feet wide the angle of elevation of the top of a cliff on the opposite bank is 51°. How high is the cliff? [Find answer correct to the *nearest foot*.] 12.....

13 Solve $\sqrt[3]{x + 2} = 3$ 13.....

14 The length of a certain wire is increased $\frac{1}{8}$ of an inch for every 100 pounds of weight attached to it. If its length is 4 feet when carrying no load, write the formula for finding the number of inches in its length L when N 100-pound weights are attached to it. 14.....

15 The formula $A = \pi (R^2 - r^2)$ gives the area of a circular washer whose outer and inner radii are R and r respectively. Find, correct to the *nearest square inch*, the area of a washer in which $R = 1\frac{1}{2}$ inches and $r = \frac{1}{4}$ inch. [Use $\pi = \frac{22}{7}$] 15.....

16 If m varies directly as r and if m is 2 when r is 3, find m when r is 60. 16.....

17 In the formula $y = mx - 1$, $x = 8$ when $y = 23$; what is the value of x when $y = 8$? 17.....

18 If $\frac{a - b}{c - d} = \frac{b - a}{x}$, what is the value of x in terms of c and d? 18.....

[OVER]

Directions (questions 19–25) — Indicate the correct answer to *each* question by writing on the line at the right the letter *a*, *b* or *c*.

19 The roots of the equation $2x^2 + 4x + 1 = 0$ are (*a*) real and unequal, (*b*) real and equal, (*c*) imaginary 19.....

20 The logarithm of 2.481 is (*a*) 0.3946, (*b*) 394.6, (*c*) 0.3947 20.....

21 The number whose logarithm is .0385 is (*a*) 5.855, (*b*) 8.5855 — 10, (*c*) 1.093 21.....

22 The sum of the roots of the equation $3x^2 - 2x + 1 = 0$ is (*a*) greater than 2, (*b*) less than 2, (*c*) equal to 2 22.....

23 $\dfrac{\sqrt{2}+\sqrt{3}}{\sqrt{3}}$ is equal to (*a*) $\sqrt{2}+1$, (*b*) $\frac{1}{3}(\sqrt{6}+3)$, (*c*) $\sqrt{2}$ 23.....

24 The product of 2^n and 2^{-n} is (*a*) 2, (*b*) 1, (*c*) 4 24.....

25 A man can do a piece of work in m ($m > 2$) hours, but stops working after 2 hours. The part of the work that remains to be done is (*a*) $\dfrac{m}{m-2}$, (*b*) $\dfrac{m-2}{m}$, (*c*) $1 - \dfrac{1}{2m}$ 25.....