The University of the State of New York

INTERMEDIATE ALGEBRA

Wednesday, January 21, 1942 — 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 Find the value of $2^2 + 2^{-2} + 2^0$

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

2 Factor $2x^2 - 5x - 12$

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

3 Express $2\sqrt{-100}$ in terms of i

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

4 Solve the equation $2\sqrt{x+1} = 3$

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

5 Express $\dfrac{2}{\sqrt{6}+1}$ as an equivalent fraction with a rational denominator.

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

6 Write the equation of the straight line which passes through the origin and has a slope of 2.

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

7 One root of the equation $x^2 - 7x + c = 0$ is 3; what is the other root?

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

8 If N varies directly as D and $N = 10$ when $D = 8$, find N when $D = 12$.

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

9 If a pipe fills a cistern in h hours, how much of the cistern does it fill in 1 hour?

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

10 Write the equation expressing the relation between x and y shown in the following table:

x	-2	0	2	4	6
y	-2	-1	0	1	2

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

11 Write the first *two* terms of the expansion $(x + \frac{1}{2})^6$

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

12 If the fraction $\dfrac{3}{x-2}$ is changed to an equivalent fraction whose denominator is $x^2 - 4$, what is the numerator of the resulting fraction?

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

13 In triangle ABC, angle $C = 90°$, angle $A = 32°$ and $AB = 10$; find AC correct to the *nearest tenth*.

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

14 Write the *30th* term of the progression $x - y, x, x + y, \ldots$

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

15 Insert *two* geometric means between 3 and 192.

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

16 Solve for t the formula $V = K + gt$.

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

17 Find the logarithm of 253.4

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

18 If $\log x = 2.3142$, find $\log x^3$.

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

19 Solve the following pair of equations for x:
$$x + 2y = 3$$
$$3x - 2y = 8$$

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

20 Is $x = -1$, $y = 0$ a solution of the pair of equations $y = 3x + 3$ and $y = x^2 + x - 2$? [Answer *yes* or *no*.]

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

[3]

21 A man has 85 cents in nickels and dimes, 12 coins in all; how many coins are nickels?

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

Directions (questions 22–25) — Indicate the correct answer to each question by writing on the dotted line at the right the letter a, b or c.

22 The locus of points whose distance from the origin is r is given by the equation (a) $x^2 + y^2 = r^2$, (b) $y = r$, (c) $x = r$

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

23 The graphs of the equations $y = 3x + 7$ and $2y = 6x + 14$ (a) intersect, (b) are parallel or (c) coincide.

23..................

24 The product of the roots of the equation $2x^2 - 3x - 5 = 0$ is

(a) -5, (b) $\dfrac{3}{2}$ or (c) $\dfrac{-5}{2}$

24..................

25 If, in the equation $x^2 + 6x + k = 0$, k has any value greater than 9, the roots of the equation are (a) real and equal, (b) real and unequal or (c) imaginary.

25..................

See instructions for parts II, III and IV on page 1.

Part II
Answer three questions from this part.

26 Find, correct to the *nearest tenth*, the roots of the equation $2x^2 - 5x + 1 = 0$ [10]

27 Solve the following pair of equations, group your answers and check *one set*:
$$x^2 + y^2 = 10$$
$$2x - y = 5 \qquad [7, 2, 1]$$

28 Using logarithms, find, correct to the *nearest hundredth*, the value of e in the formula
$$e = \frac{G V^2}{32.2R} \text{ when } G = 4.7, V = 45 \text{ and } R = 938 \qquad [10]$$

29 *a* Given the formula $E = \dfrac{F S}{(P + R)d}$; solve for R. [5]

b Simplify: $(\dfrac{1}{y} - \dfrac{1}{x}) \div (1 - \dfrac{x}{y})$ [5]

30 *a* Draw the graph of the equation $y = x^2 - 4x$ from $x = -1$ to $x = 5$ inclusive. [4]
b On the set of axes used in answer to *a*, draw the graph of $xy = 6$ from $x = 1$ to $x = 6$ inclusive. [4]
c From the graphs, estimate, correct to the *nearest tenth*, a value of x and a value of y common to the two equations. [2]

Part III
Answer one question from this part.

31 A boat can travel 8 miles an hour in still water. If it can travel 15 miles down a stream in the same time that it can travel 9 miles up the stream, what is the rate of the stream? [7, 3]

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 How many quarts of pure alcohol must be added to 10 quarts of a mixture that is 15% alcohol to make a mixture that will be 25% alcohol? [5]
b A man wishes to invest a part of $4200 in stocks earning 4% dividends and the remainder in bonds paying $2\frac{1}{2}$%. How much must he invest in stocks to receive an average return of 3% on the whole amount of money? [5]

*33 The length of a rectangular box is 3 inches more than twice the width and the depth is 1 inch less than the width. The capacity of the box is 132 cubic inches. Find its dimensions. [5, 5]

Part IV
Answer one question from this part.

34 A rectangular flower garden is to be inclosed on three sides by wire fencing and on the fourth side by the side of a building; 12 yards of wire fencing are to be used for this purpose.
a Express the area A in terms of the width w. [4]
b Draw the graph of the equation written in answer to *a*. [4]
c From the graph, determine the value of w that will give the greatest area. [2]

35 *a* Prove that, if the fraction $\frac{1}{4}$ is added to the product of any two consecutive integers, the result is a perfect square. [5]
b By what number must the product of any two consecutive even (or odd) integers be increased to make the result a perfect square? [2]
c If two integers differ by k, by what amount must their product be increased to make the result a perfect square? [3]

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

[2]