The University of the State of New York

298TH HIGH SCHOOL EXAMINATION

INTERMEDIATE ALGEBRA

Wednesday, August 21, 1946 — 8.30 to 11.30 a. 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 1946 or number and length in minutes of lessons taken in the summer of 1946 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 1946 or an equivalent program of tutoring approved in advance by the Department is required.

Part II

Answer three questions from part II.

26 Solve the equation $3x^2 - 6x + 2 = 0$ for values of x correct to the *nearest tenth*. [10]

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

$$3x^2 - y^2 = 47$$
$$3x - y = 11 \quad [10]$$

28 The formula for finding in feet the ground distance d to a target from a plane flying horizontally at an elevation of S feet is $d = \dfrac{22r}{15} \sqrt{\dfrac{S}{16.1}}$ in which r is the speed of the plane in miles per hour and S is the elevation of the plane in feet. Using logarithms, find d when $r = 250$ miles per hour and $S = 8000$ feet. [10]

29 On July 1, 1946, a young man bought an automobile, making a small cash payment and promising to pay $1000 in monthly instalments of $50 each, with accrued interest at 6% per annum. That is, on Aug. 1, 1946, he had to pay $55, on Sept. 1, 1946, he will have to pay $54.75, on Oct. 1, 1946, $54.50, etc.

    a How long will it take to pay the debt? [2]

    b Find the total amount he will have paid for the car exclusive of the initial cash payment. [8]

*30 A boy started from home at 10 a. m. and rode his bicycle at the rate of 10 miles an hour for 2 hours. After stopping an hour for lunch, he continued at the same rate as before. His older brother started from the same home at 11 a. m. and rode steadily along the same highway at the rate of 12 miles an hour.

    a Using one set of axes, represent these facts graphically for *each* boy for the interval from 10 a. m. to 2 p. m. inclusive. [6]

    b From the graph made in answer to *a*, determine

      (1) How far from home *each* boy was at 2 p. m. [2]

      (2) At what time and at what distance from home the older boy passed the younger. [2]

* This answer is based on one of the optional questions in the syllabus.

Part III

Answer one question from part III.

31 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 A druggist has 3 quarts of a 10% solution of acid. How much water must he add to reduce it to a 6% solution? [5]

    b A merchant sold a radio for $70, thereby gaining 25% on the amount he paid for it. How much did the radio cost him? [5]

32 John left an Albany garage at 9 a. m. and traveled at a uniform rate toward New York. Half an hour later James started from the same garage, traveled along the same road 8 miles an hour faster than John and overtook him 120 miles south of Albany. Find the rate at which *each* man traveled. [5, 5]

Part IV

Answer one question from part IV.

33 Derive the formula for the sum S of a geometric progression in terms of the first term a, the number of terms n and the ratio r. [10]

34 Each of the following statements may be correctly completed by *one or more* of the given choices. Write on your answer paper the numbers (1)–(5) and after each indicate the correct answer to the corresponding question by writing one or more of the letters a, b, c, d. [In each of the five parts of this question one credit will be allowed for each correct choice made and one credit will be deducted for each incorrect choice. The minimum credit on each part will be 0.] [10]

    (1) The roots of a quadratic equation in x are real if (*a*) the discriminant is a perfect square, (*b*) the discriminant is zero, (*c*) the discriminant is negative, (*d*) the discriminant is positive

    (2) An arithmetic progression can be written when we know (*a*) the first term and the last term, (*b*) the first term and the sum, (*c*) the first term and the common difference, (*d*) the sum and the last term

    (3) The expression $a^{\frac{n}{m}}$ may be written in the form (*a*) $\sqrt[n]{a^m}$, (*b*) $\sqrt[m]{a^n}$, (*c*) $(a^m)^{\frac{1}{n}}$, (*d*) $(a^{\frac{1}{m}})^n$

    (4) If a and b are two positive numbers, (*a*) the mantissas of the logarithms of a and b are the same if a and b have the same sequence of digits, (*b*) the characteristic of $\log \dfrac{a}{b}$ is negative if b is greater than a, (*c*) $\log (a + b) = \log a + \log b$, (*d*) $\log \sqrt[b]{a}$ always equals $\log \sqrt[a]{b}$

    (5) In the graph of the parabola $y = 2x^2 + c$, (*a*) the y axis is always the axis of symmetry, (*b*) the graph never passes through the origin, (*c*) the graph opens upwards, (*d*) the graph always crosses the x axis twice

[2]

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 Factor $2a^2 + 7a - 15$

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

2 Find the roots of the equation $\frac{1}{3}x^2 = 27$

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

3 Solve the following system of equations:
$$x + y = 2$$
$$2x + 3y = 1$$

3$\begin{cases} x.............. \\ y.............. \end{cases}$

4 Write the equation whose roots are 3 and —2.

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

5 Solve the equation $\sqrt{4x - 7} = 5$

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

6 Find the logarithm of 384.1

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

7 Find the number whose logarithm is 9.3642 —10

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

8 If one end of a ramp 30 feet long is 6 feet higher than the other, what is the angle of inclination of the ramp? [Find the answer correct to the *nearest degree.*]

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

9 If $\log a = x$ and $\log b = y$, express $\log \sqrt{ab}$ in terms of x and y.

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

10 The formula for the area of a cylinder is $A = 2\pi r(r + h)$. Solve this formula for h in terms of A, π and r.

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

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

x	0	2	6	10
y	1	5	13	21

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

12 Subtract $\dfrac{x^2 - 1}{x}$ from $3 + x$.

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

13 Through what point do the graphs of all equations of the type $y = mx$ pass?

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

14 What is the y intercept of the graph of the equation $y = 2x + 3$?

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

15 How long will it take a boy to walk a miles if he walks b miles in c hours?

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

16 Find the *20th* term of the series 10, 7, 4, ...

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

17 Insert *two* geometric means between 2 and 250.

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

18 Find the first *two* terms in the expansion of $(x^2 - 1)^7$

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

19 Express the fraction $\dfrac{1}{10,000}$ as a power of 10.

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

20 Express $\sqrt{-4x^2}$ in terms of i.

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

21 What is the name of the graph of $x^2 + y^2 = 5$?

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

22 What is the equation of the axis of symmetry of the graph of $y = x^2$?

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

[3]

[OVER]

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

23 The fraction $\dfrac{3}{\sqrt{7}-\sqrt{2}}$ is equal to (*a*) $\dfrac{3\sqrt{7}-\sqrt{2}}{5}$, (*b*) $\dfrac{3\sqrt{7}+\sqrt{2}}{5}$.
(*c*) $\frac{3}{5}(\sqrt{7}-\sqrt{2})$, (*d*) none of these answers   23......

24 The sum of the roots of the equation $2x^2 + 3x + 5 = 0$ is (*a*) 3, (*b*) —5, (*c*) —3, (*d*) none of these answers   24......

25 The fraction $\dfrac{y-x}{2}$ is *not* equal to (*a*) $-\dfrac{x-y}{2}$, (*b*) $\dfrac{x-y}{-2}$,

(*c*) $\dfrac{x-y}{2}$, (*d*) $\dfrac{-x+y}{2}$ 25......

[4]