April 1961

To: Junior and Senior High School Building Principals

Sample Examination in Ninth Year Mathematics, Course I - Algebra

The Department has prepared the enclosed sample terminal examination in Ninth Year Mathematics, Course 1 - Algebra, for optional use in the schools in June 1961.

The examination was prepared in cooperation with the Division of Educational Testing under the supervision of Frank Hawthorne, State Supervisor of Mathematics Education and his staff: Bruno B. Baker, Aaron L. Buchman, Agnes M. Higgins and Ruth L. Smith, associates. The following mathematics teachers assisted:

Margaret H. Dickson, Scotia-Glenville Senior High School, Scotia
Robert B. Wall, Charles B. Gaskill Junior High School, Niagara Falls.

Sample copies of this examination are being distributed to each of the schools. Teachers may duplicate this test and use it in whole or in part as a terminal examination, or they may use it as a pattern of test construction and selection of content in the preparation of their local examinations.

Students should be provided with four-place tables of natural trigonometric functions for use on this examination. A supply of these may be obtained from the Department upon request.

We would be glad to receive any comments, suggestions, or reports from teachers who use the examination. These should be sent to:

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THE UNIVERSITY OF THE STATE OF NEW YORK
The State Education Department

NINTH YEAR MATHEMATICS
Course I - Algebra
(Sample Examination)
June 1961

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

Instructions

It is wise to divide your time so that you may complete the entire examination in <u>three hours</u>. Excess time may be used in reviewing your paper for errors.

Part I

Answer all 30 questions in this part. Write the answer to each question in the space provided at the right. No work need be shown for this part. Each correct answer will receive 2 credits.   [60]

1 Perform the indicated operations and write the result in simplest form:

$$3x + 2(x - 4y) - (x + y)$$ 1................

2 Using the formula $C = \frac{5}{9}(F - 32)$, find C if F = -4.   2................

3 Find the factors of $x^2 - x - 12$.   3................

4 Express the number of pints in g gallons.   4................

5 The sum of two numbers is x. If one of the numbers is a, represent the other number in terms of x and a.   5................

6 Subtract x + y - 2 from 2x - 4y + 5.   6................

7 Solve for y: 4y - (2y - 1) = 7   7................

8 Solve for x: 4x + 2.7 = 0.6 - 3x   8................

9 Solve this proportion for m: 5:m = 4:(m - 5)   9................

10 If a = -1, b = 2 and c = -3, find the value of a + b(a + c).

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

11 Express the fraction $\dfrac{y^2 - 4}{y^2 + 3y - 10}$ in lowest terms.

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

12 How many <u>minutes</u> will it take a plane to fly 650 miles <u>if its</u> average speed is 520 miles per hour?

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

13 Solve for w: $\dfrac{w}{2} + \dfrac{w}{3} = 25$

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

14 Solve for x: ax + b = c - b

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

15 Solve for the <u>positive</u> value of x: $9x^2 = 4$

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

16 What is the average of 2x, x + 4 and 3x - 1?

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

17 What is the value of $\sqrt{60}$ to the <u>nearest tenth</u>?

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

18 If the point (k, 3) lies on the graph of x + y = 2, what is the value of k?

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

19 If tan A = 4.0000, find angle A to the <u>nearest degree</u>.

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

20 If d = 30 sin 19°, find d to the <u>nearest integer</u>.

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

21 In March a pair of skis sold for $24. This amount was 80% of the original price. What was the original price?

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

<u>Directions</u> (22-28): Indicate the correct completion for <u>each</u> of the following by writing on the line at the right the number 1, 2, 3 or 4.

22 The sum of $\dfrac{x + 2}{2x}$ and $\dfrac{x - 3}{3x}$ is

  (1) 1   (2) $\dfrac{2x - 1}{5x}$ (3) $\dfrac{5}{6}$ (4) $\dfrac{5x + 12}{6x}$

22......

23 The expression $(3a^3)^2$ is equivalent to
  (1) $6a^6$ (2) $6a^9$ (3) $9a^6$ (4) $9a^9$

23......

24 If the trinomial $x^2 + 2x + k$ is a perfect square, then k must be equal to
  (1) 1   (2) -1   (3) -4   (4) 4

24......

25 The reciprocal of $\frac{1}{5}$ is

(1) $-\frac{1}{5}$ (2) $\frac{1}{25}$ (3) -5 (4) 5

25......

26 If $d\sqrt{5}$ is equivalent to $\sqrt{45}$, then d is equal to
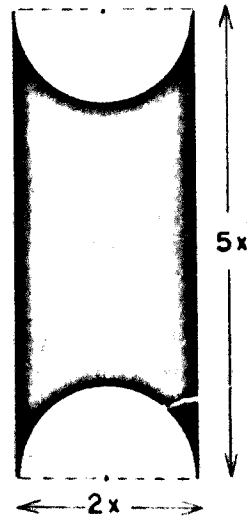(1) 81   (2) 9   (3) 3   (4) $\sqrt{40}$

26......

27 One of the roots of the equation $x^3 + 2x + 3 = 0$ is
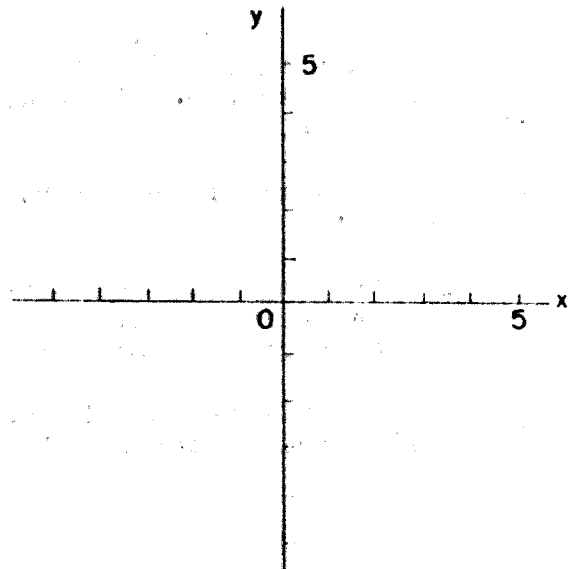(1) 1   (2) -1   (3) 3   (4) -3

27......

28 Semicircles are cut from opposite ends of a rectangular piece of cardboard with dimensions as shown in the diagram. The area represented by the shaded portion of the figure is

(1) $x^2(10 - 2\pi)$

(2) $x^2(10 - \pi)$

(3) $2x(7 - \pi)$

(4) $2x(7 - 2\pi)$

5 x

2 x

28......

29 On the coordinate axes at the right, draw the graph of

$x - y = 3$.

30 Construct a circle with line
   segment MN as a diameter.

$\overline{M \qquad\qquad\qquad N}$

Part II

Answer <u>four</u> questions from this part. Show all work unless
otherwise directed.

31 Solve the following set of equations algebraically for m and n,
   and check your answers in both of the equations: [8,2]

$$\frac{5m}{3} + n = \frac{11}{3}$$

$$\frac{m-1}{3} - \frac{n-2}{5} = 2$$

32 The length of a certain rectangle exceeds the width by 2. A side
   of a certain square is equal to the width of the rectangle. A
   side of a certain equilateral triangle is equal to the length of
   the rectangle.

   <u>a</u> If the width of the rectangle is represented by w, express in
      terms of w

      (1) the length of the rectangle   [1]
      (2) the perimeter of the square   [2]
      (3) the perimeter of the equilateral triangle   [2]

   <u>b</u> If the perimeter of the square is equal to the perimeter of the
      equilateral triangle, find the perimeter of the rectangle. [5]

33 Answer either a or b: [Only an algebraic solution will be accepted.]

    a In a collection of 60 coins the number of half dollars is one-third the number of dimes and the number of quarters is 10 less than twice the number of dimes. Find the value of the collection. [10]

<div align="center">OR</div>

    b The sum of the squares of two positive consecutive odd integers is 130. Find the integers. [10]

34 A vertical flagpole is 75 feet high. A guy wire attached to the pole at a point 6 feet from the top reaches a point on level ground 60 feet from the base of the pole.

    a Find to the nearest degree the angle that the wire makes with the ground. [5]

    b Find the length of the wire to the nearest foot. [5]

35 a Show that $2x + 3$ is a factor of $2x^3 + 5x^2 - x - 6$. [3]

   b Express in simplest form the product of

$$\frac{(a + b)^2}{a} \text{ and } \frac{a^2 b}{ab + b^2}.$$ [3]

    c Simplify and combine like terms: [4]

$$\sqrt{27} + \sqrt{72} - \sqrt{12}$$

36 The accompanying graph pictures the relationships described as follows:

> "At noon Bob started from his home in Kayville to ride to camp at Big Lake on his bicycle, traveling at a speed of 8 miles per hour. At 2:00 p.m. he stopped to rest for 30 minutes and then continued on his way at one-half his original speed. At 4:30 p.m. Bob's father left Kayville in the family car, following the same route and traveling at a constant speed. He overtook Bob after 45 minutes and together they rode on in the car to Big Lake."
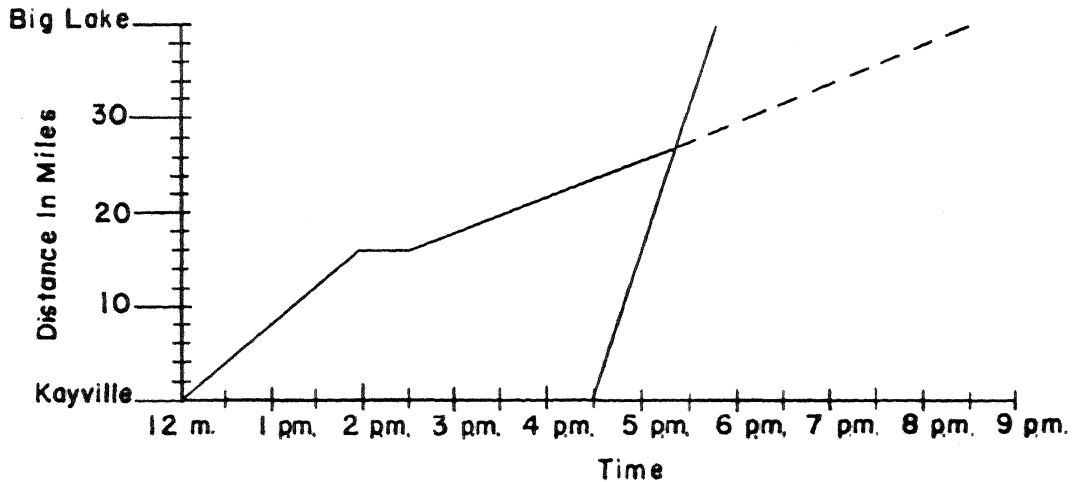
Refer to the graph to answer the following questions:

a How many miles did Bob travel between 2:30 p.m. and 3:30 p.m.? [2]
b At 4:00 p.m., how many miles was Bob from Kayville? [2]
c How many miles did Bob and his father ride together in the car? [2]
d At approximately what time did they arrive at Big Lake in the car? [2]
e If Bob had not ridden with his father for part of the way but instead had completed the journey to Big Lake on his bicycle, how many hours would it have taken him for the entire trip? [2]