

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

Examination in Experimental Ninth Year Mathematics (9X)

June 1965

Time required: 3 hours

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

Part I

Answer 30 of the 35 questions in this part. Write your 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. No partial credit will be given. [60]

- 1 If  $A = \{5,6,7\}$ ,  $B = \{7,8,9\}$  and  $C = \{0,5,9\}$ , write the set  $(A \cup B) \cap C$ . 1.....
- 2 Find the value of  $a^2 - 6ab + 9b^2$  when  $a = -1$  and  $b = 2$ . 2.....
- 3 Express in simplest form:  $21 - [8x - 7(x - 3)]$  3.....
- 4 Give the solution set for the inequality:  
 $-5x - 3 < 2x + 11$  4.....
- 5 What is the number of inches in a yards and b feet? 5.....
- 6 Write the simplest radical expression equivalent to  $\sqrt{18} + 2\sqrt{8}$ . 6.....
- 7 What is the solution set of the equation  $7(x + 1) - 3(2x - 5) = 0$ ? 7.....
- 8 Solve the proportion:  $\frac{1}{x - 1} = \frac{2}{3}$  8.....
- 9 Solve:  $3 + \sqrt{x - 1} = 5$  9.....
- 10 Subtract  $-2x^2 + 3x + 5$  from  $-5x^2 - 3x + 2$ . 10.....

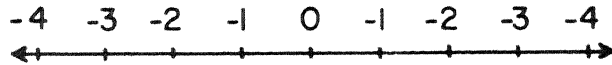
- 11 Express the repeating decimal  $0.\overline{62}\dots$  as the quotient of two integers. 11.....
- 12 What is the solution set of  $|x - 3| = 2$ ? 12.....
- 13 Divide  $6x^2 - x - 15$  by  $2x + 3$ . 13.....
- 14 If  $x \in \{\text{integers}\}$ , what is the solution set of  $2x^2 + x - 3 = 0$ ? 14.....
- 15 If  $n$  represents the first of three consecutive odd integers, express in terms of  $n$  and in simplest form the average of the three integers. 15.....
- 16 Perform the indicated operation and combine similar terms:  $(2x + 1)(x^2 - 2x + 1)$  16.....
- 17 Write the simplest fractional expression equivalent to  $\frac{1 - 2x}{3x} - \frac{3 - 4x}{6x}$ . 17.....
- 18 The point  $(k, 6)$  lies on the graph of  $x + 2y = 7$ . What is the value of  $k$ ? 18.....
- 19 If 2 is an element of the truth set of  $3x - 1 = x + a$ , what is the value of  $a$ ? 19.....
- 20 Solve for  $x$ :  $y = mx + b$  20.....
- 21 Find the solution set of  $.3x - 2.4 = .26x + .36$  21.....
- 22 Given:  $xy > 0$  and  $x < 0$ . State a conclusion concerning  $y$  which logically follows from these given statements. 22.....
- 23 For what value of  $x$  is the expression  $\frac{6}{x - 3} - \frac{x}{4}$  undefined? 23.....

- 24 If  $x$  varies directly as  $y^2$  (that is, if  $x = ky^2$ ), find  $k$  if  $x = 2$  and  $y = -3$ . 24.....
- 25 Express in simplest form, using only positive exponents and without parentheses:  
$$\left(\frac{-2C^3}{K^{-2}}\right)^{-2}$$
 25.....
- 26 Perform the indicated operation and express the result in simplest form:  
 $3x(6x - 2) - 5x(6x - 2)$  26.....
- 27 Find the solution set of the following system of equations:  
 $2x + y = 2$   
 $3x - y = 8$  27.....
- 28 The base of an isosceles triangle is 3 less than each leg. If the base is  $b$ , write in simplest form an expression for the perimeter in terms of  $b$ . 28.....
- 29 The coordinates of points A and B are  $(-1,0)$  and  $(1,1)$ , respectively. What is the slope of the line passing through A and B? 29.....
- 30 If  $x \in \{-3,-2,-1,0,1,2,3\}$ , give the range of the relation  $\{(x,y) \mid y = |x|\}$ . 30.....
- 31 If  $\tan A = \frac{4}{3}$ , find angle A to the nearest degree. 31.....
- 32 The area of a square is represented by  $(x - 1)^2$ . Express the perimeter of the square in terms of  $x$ . 32.....
- 33 The hypotenuse of a right triangle is 5 and one leg is 2. Express in radical form the length of the other leg of the triangle. 33.....

34 If the universe is the set of digits in a base ten number system,  $A = \{x \mid x \geq 5\}$  and  $B = \{0,3,5,9\}$ , write the set  $A \cap B$ .

34.....

35 Graph the solution set of the inequality  $5x + 2 \geq 12$ .



Part II

Answer four questions from this part. Show all work unless otherwise directed.

36 In the space provided, write the numeral preceding the expression that best completes the statement or answers the question. [10]

a If the universe is the set of nonnegative integers less than 20 and if  $A = \{19, 18, 17, 16, \dots, 5\}$ , then the complement of A is

- (1)  $\{20, 4, 3, 2, 1, 0\}$                       (3)  $\{4, 3, 2, 1, 0\}$   
(2)  $\{20, 4, 3, 2, 1\}$                       (4)  $\{4, 3, 2, 1\}$                       a.....

b Which set is equivalent to but not equal to the set  $\{a, b, c, d\}$ ?

- (1)  $\{c, b, d, a\}$                       (3)  $\{4\}$   
(2)  $\{75, 86, 3, 101\}$                       (4)  $\{x \mid x < 5\}$                       b.....

c The set  $\{b, c, d\}$  is disjoint to

- (1)  $\{a, b\}$                       (3)  $\{b, c, d, e\}$   
(2)  $\{b, c, e\}$                       (4)  $\{a, e\}$                       c.....

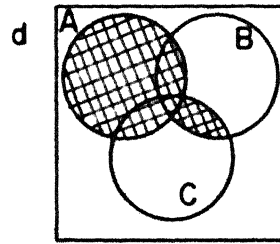
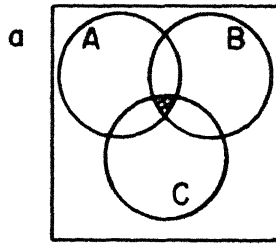
d If the universe is the set of integers, then the cardinal number of the set  $\{x \mid -5 < x \leq 17\}$  is

- (1) 22              (2) 23              (3) 24              (4) 21                      d.....

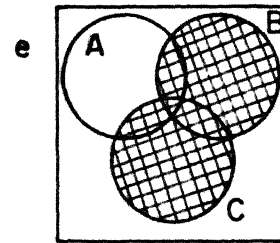
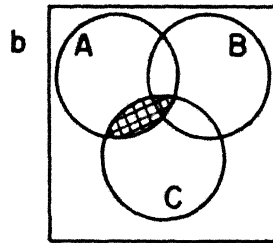
e If  $A = \{1, 2\}$  and  $B = \{3, 4, 5\}$ , how many ordered pairs are there in  $A \times B$ ?

- (1) 5              (2) 10              (3) 6              (4) 12                      e.....

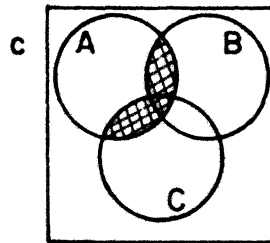
37 Each of the representations of sets pictured below shows a possible relationship with the others. In the space provided after each letter, write the number which indicates the correct relationship shown in the particular diagram. [10]



- (1)  $A \cup B$
- (2)  $B \cup C$
- (3)  $A \cap C$
- (4)  $A \cup (B \cap C)$
- (5)  $(A \cup B) \cup C$
- (6)  $A \cap (B \cup C)$
- (7)  $(A \cap B) \cap C$



- a.....
- b.....
- c.....
- d.....
- e.....



- 38 a Graph the relation  $y = 2x - 3$  if  $-1 < x < 3$ . [4]
- b What is the domain of this relation? [2]
- c What is the range of this relation? [2]
- d Is this relation a function? [Answer Yes or No.] [2]

39 The longest side of a triangle exceeds twice the shortest side by 4 inches. The sum of the lengths of the longest and the shortest side is twice the length of the third side. If the perimeter of the triangle is 51 inches, what is the length of each of the three sides? [5,5]

40 Indicate on a graph the solution set of the following set of inequalities: [10]  
 $x + 3 > y$   
 $-x + 3 > y$

- 41 Write the equation or equations that can be used in solving problem a and problem b. In each case, state what the variable or variables represent. [Solution of the equations is not required.]
- a Joe leaves his house at 9 a.m. At 11 a.m. his brother Tom hurries after him to overtake him. If Joe averages 30 miles per hour and Tom averages 50 miles per hour, in how many hours will Tom overtake Joe? [5]
- b The sum of the digits of a two-digit numeral is 9. This numeral expresses a number which is 45 more than the number expressed by interchanging the digits. What is the two-digit numeral representing the larger number? [5]
- 42 In triangle ABC,  $\angle C = 90^\circ$ ,  $\angle B = 63^\circ$  and  $AB = 9$ .
- a Find the length of AC to the nearest integer. [6]
- b Find the length of BC to the nearest integer. [4]
- 43 How many cubic centimeters of pure acid must be added to 400 cubic centimeters of a 60% acid solution to make a solution which is 80% acid? Check. [6,3,1]
- 44 a Write to the nearest hundredth the values of each of the following: [3]
- |                     |                     |
|---------------------|---------------------|
| (1) $\sin 30^\circ$ | (4) $\sin 60^\circ$ |
| (2) $\sin 40^\circ$ | (5) $\sin 70^\circ$ |
| (3) $\sin 50^\circ$ | (6) $\sin 80^\circ$ |
- b Using the results found in part a, write the set of ordered pairs relating an angle to the sine of the angle if the domain of the relation is  $\{30^\circ, 40^\circ, 50^\circ, 60^\circ, 70^\circ, 80^\circ\}$ . [2]
- c On a sheet of graph paper, plot the points representing the members of the set in part b. [4]
- d Do the points of part c lie on a straight line? [Answer Yes or No.] [1]