Answer all 30 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each question, write on the separate answer sheet the numeral preceding the word or expression that best completes the statement or answers the question. [60]

Use this space for computations.

1 It takes Tammy 45 minutes to ride her bike 5 miles. At this rate, how long will it take her to ride 8 miles?

(1) 0.89 hour   (3) 48 minutes

(2) 1.125 hours   (4) 72 minutes

2 What are the roots of the equation $x^2 - 7x + 6 = 0$?

(1) 1 and 7   (3) −1 and −6

(2) −1 and 7   (4) 1 and 6

3 Which expression represents $\dfrac{27x^{18}y^5}{9x^6y}$ in simplest form?

(1) $3x^{12}y^4$ (3) $18x^{12}y^4$

(2) $3x^3y^5$ (4) $18x^3y^5$

4 Marie currently has a collection of 58 stamps. If she buys s stamps each week for w weeks, which expression represents the total number of stamps she will have?

(1) $58sw$ (3) $58s + w$

(2) $58 + sw$ (4) $58 + s + w$

5 Which data set describes a situation that could be classified as qualitative?

(1) the ages of the students in Ms. Marshall's Spanish class

(2) the test scores of the students in Ms. Fitzgerald's class

(3) the favorite ice cream flavor of each of Mr. Hayden's students

(4) the heights of the players on the East High School basketball team

6 The sign shown below is posted in front of a roller coaster ride at the Wadsworth County Fairgrounds.

All riders **MUST** be
at least 48 inches tall.
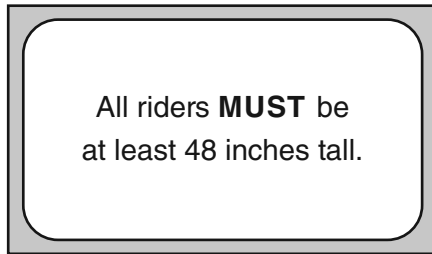
If h represents the height of a rider in inches, what is a correct translation of the statement on this sign?

(1) $h < 48$ (3) $h \leq 48$

(2) $h > 48$ (4) $h \geq 48$

7 Which value of x is the solution of the equation $\dfrac{2x}{3} + \dfrac{x}{6} = 5$?

(1) 6   (3) 15

(2) 10   (4) 30

8 Students in Ms. Nazzeer's mathematics class tossed a six-sided number cube whose faces are numbered 1 to 6. The results are recorded in the table below.

Result	Frequency
1	3
2	6
3	4
4	6
5	4
6	7

Based on these data, what is the empirical probability of tossing a 4?
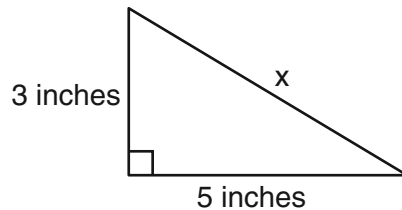
(1) $\dfrac{8}{30}$ (3) $\dfrac{5}{30}$

(2) $\dfrac{6}{30}$ (4) $\dfrac{1}{30}$

9 What is the value of x, in inches, in the right triangle below?

3 inches, x, 5 inches

(1) $\sqrt{15}$ (3) $\sqrt{34}$

(2) 8   (4) 4

10 What is $\sqrt{32}$ expressed in simplest radical form?

  (1) $16\sqrt{2}$ (3) $4\sqrt{8}$

  (2) $4\sqrt{2}$ (4) $2\sqrt{8}$

11 If the speed of sound is 344 meters per second, what is the approximate speed of sound, in meters per hour?

> 60 seconds = 1 minute
> 60 minutes = 1 hour

  (1) 20,640   (3) 123,840

  (2) 41,280   (4) 1,238,400

12 The sum of two numbers is 47, and their difference is 15. What is the larger number?

  (1) 16   (3) 32

  (2) 31   (4) 36

13 If $a + ar = b + r$, the value of a in terms of b and r can be expressed as

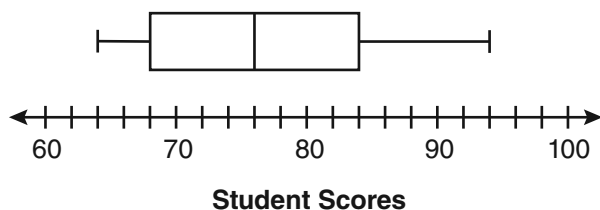 (1) $\dfrac{b}{r} + 1$ (3) $\dfrac{b + r}{1 + r}$

  (2) $\dfrac{1 + b}{r}$ (4) $\dfrac{1 + b}{r + b}$

14 Which value of x is in the solution set of $\frac{4}{3}x + 5 < 17$?

(1) 8   (3) 12

(2) 9   (4) 16

15 The box-and-whisker plot below represents students' scores on a recent English test.

Student Scores

What is the value of the upper quartile?

(1) 68   (3) 84

(2) 76   (4) 94

16 Which value of n makes the expression $\dfrac{5n}{2n-1}$ undefined?

(1) 1   (3) $-\dfrac{1}{2}$

(2) 0   (4) $\dfrac{1}{2}$

17 At Genesee High School, the sophomore class has 60 more students than the freshman class. The junior class has 50 fewer students than twice the students in the freshman class. The senior class is three times as large as the freshman class. If there are a total of 1,424 students at Genesee High School, how many students are in the freshman class?
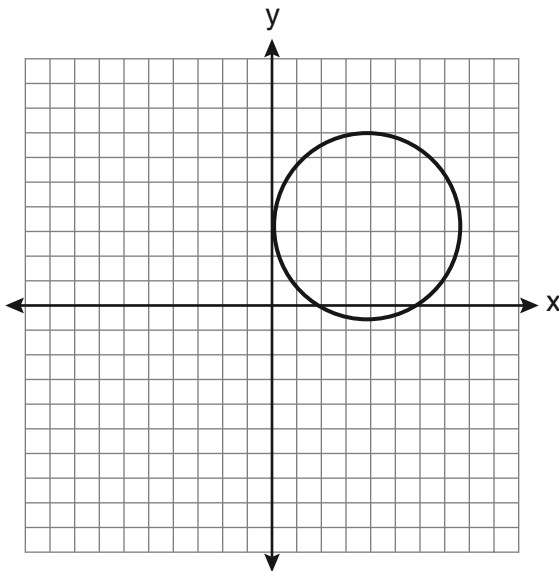
(1) 202   (3) 235

(2) 205   (4) 236

18 What are the vertex and axis of symmetry of the parabola $y = x^2 - 16x + 63$?

(1) vertex: $(8,-1)$; axis of symmetry: $x = 8$

(2) vertex: $(8,1)$; axis of symmetry: $x = 8$

(3) vertex: $(-8,-1)$; axis of symmetry: $x = -8$

(4) vertex: $(-8,1)$; axis of symmetry: $x = -8$

**19** Which statement is true about the relation shown on the graph below?

(1) It is a function because there exists one x-coordinate for each y-coordinate.

(2) It is a function because there exists one y-coordinate for each x-coordinate.

(3) It is *not* a function because there are multiple y-values for a given x-value.

(4) It is *not* a function because there are multiple x-values for a given y-value.
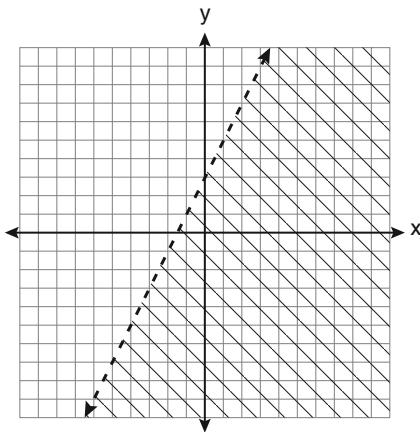
20 Which graph represents the solution of $3y - 9 \leq 6x$?
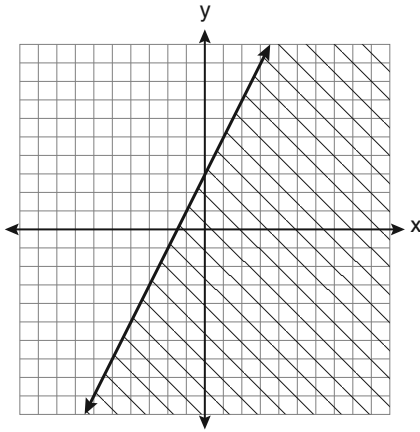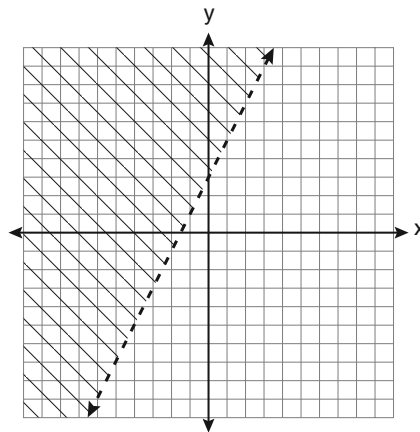

(1)
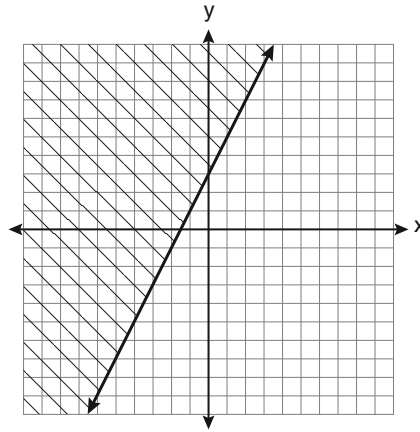
(3)

(2)

(4)

21 Which expression represents $\dfrac{x^2 - 2x - 15}{x^2 + 3x}$ in simplest form?

(1) -5

(2) $\dfrac{x - 5}{x}$

(3) $\dfrac{-2x - 5}{x}$

(4) $\dfrac{-2x - 15}{3x}$

22 What is an equation of the line that passes through the point $(4,-6)$ and has a slope of -3?

(1) $y = -3x + 6$
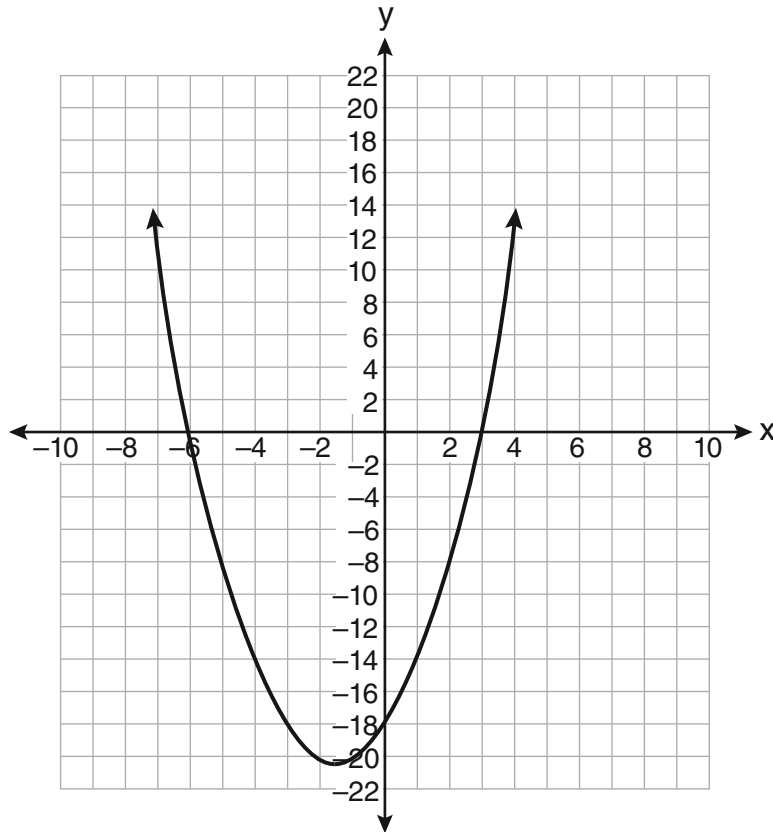
(2) $y = -3x - 6$

(3) $y = -3x + 10$

(4) $y = -3x + 14$

23 When $4x^2 + 7x - 5$ is subtracted from $9x^2 - 2x + 3$, the result is

(1) $5x^2 + 5x - 2$　　　　　　　(3) $-5x^2 + 5x - 2$

(2) $5x^2 - 9x + 8$　　　　　　　(4) $-5x^2 + 9x - 8$

24 The equation $y = x^2 + 3x - 18$ is graphed on the set of axes below.

Based on this graph, what are the roots of the equation $x^2 + 3x - 18 = 0$?

(1) -3 and 6　　　　　　　(3) 3 and -6

(2) 0 and -18　　　　　　　(4) 3 and -18

25 What is the value of the y-coordinate of the solution to the system of equations $x + 2y = 9$ and $x - y = 3$?

(1) 6　　　　　　　(3) 3

(2) 2　　　　　　　(4) 5

26 What is the additive inverse of the expression $a - b$?

(1) $a + b$ (3) $-a + b$

(2) $a - b$ (4) $-a - b$

27 What is the product of 12 and 4.2×10^6 expressed in scientific notation?

(1) 50.4×10^6 (3) 5.04×10^6

(2) 50.4×10^7 (4) 5.04×10^7

28 To calculate the volume of a small wooden cube, Ezra measured an edge of the cube as 2 cm. The actual length of the edge of Ezra's cube is 2.1 cm. What is the relative error in his volume calculation to the *nearest hundredth*?

(1) 0.13   (3) 0.15

(2) 0.14   (4) 0.16

29 What is $\dfrac{6}{4a} - \dfrac{2}{3a}$ expressed in simplest form?

(1) $\dfrac{4}{a}$ (3) $\dfrac{8}{7a}$

(2) $\dfrac{5}{6a}$ (4) $\dfrac{10}{12a}$

30 The set $\{11,12\}$ is equivalent to

(1) $\{x | 11 < x < 12, \text{ where } x \text{ is an integer}\}$

(2) $\{x | 11 < x \leq 12, \text{ where } x \text{ is an integer}\}$

(3) $\{x | 10 \leq x < 12, \text{ where } x \text{ is an integer}\}$

(4) $\{x | 10 < x \leq 12, \text{ where } x \text{ is an integer}\}$

Part II

Answer all 3 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [6]

31 Determine how many three-letter arrangements are possible with the letters *A, N, G, L,* and *E* if no letter may be repeated.

32 Factor completely: $4x^3 - 36x$

33 Some books are laid on a desk. Two are English, three are mathematics, one is French, and four are social studies. Theresa selects an English book and Isabelle then selects a social studies book. Both girls take their selections to the library to read. If Truman then selects a book at random, what is the probability that he selects an English book?

Part III

Answer all 3 questions in this part. Each correct answer will receive 3 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [9]

34 In the diagram below, the circumference of circle O is 16π inches. The length of $\overline{BC}$ is three-quarters of the length of diameter $\overline{AD}$ and $CE = 4$ inches. Calculate the area, in square inches, of trapezoid $ABCD$.
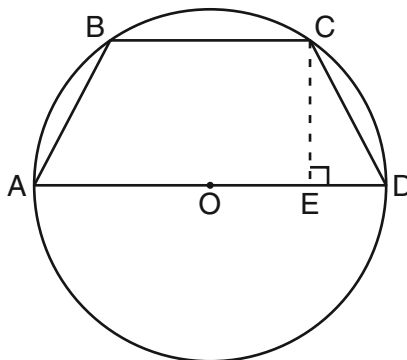
35 A bank is advertising that new customers can open a savings account with a $3\frac{3}{4}\%$ interest rate compounded annually. Robert invests \$5,000 in an account at this rate. If he makes no additional deposits or withdrawals on his account, find the amount of money he will have, to the *nearest cent*, after three years.

36 The table below shows the number of prom tickets sold over a ten-day period.

Prom Ticket Sales

| Day (*x*)	1	2	5	7	10
Number of Prom Tickets Sold (*y*)	30	35	55	60	70

Plot these data points on the coordinate grid below. Use a consistent and appropriate scale. Draw a reasonable line of best fit and write its equation.

Prom Ticket Sales

y

Number of Prom Tickets Sold

x

Day
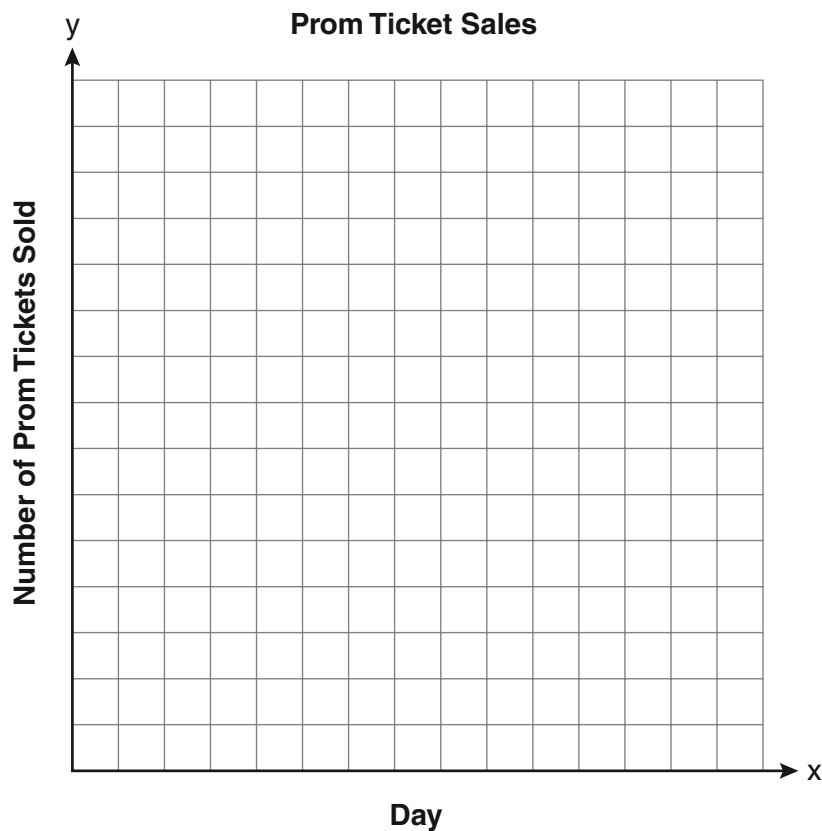
Part IV

Answer all 3 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [12]

37 A stake is to be driven into the ground away from the base of a 50-foot pole, as shown in the diagram below. A wire from the stake on the ground to the top of the pole is to be installed at an angle of elevation of 52°.
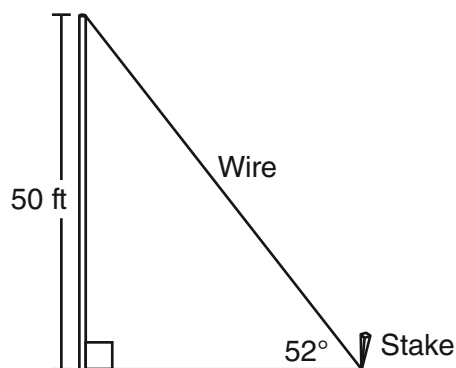
How far away from the base of the pole should the stake be driven in, to the *nearest foot*?

What will be the length of the wire from the stake to the top of the pole, to the *nearest foot*?

**38** The Fahrenheit temperature readings on 30 April mornings in Stormville, New York, are shown below.

41°, 58°, 61°, 54°, 49°, 46°, 52°, 58°, 67°, 43°, 47°, 60°, 52°, 58°, 48°,

44°, 59°, 66°, 62°, 55°, 44°, 49°, 62°, 61°, 59°, 54°, 57°, 58°, 63°, 60°

Using the data, complete the frequency table below.

Interval	Tally	Frequency
40–44		
45–49		
50–54		
55–59		
60–64		
65–69		

On the grid on the next page, construct and label a frequency histogram based on the table.
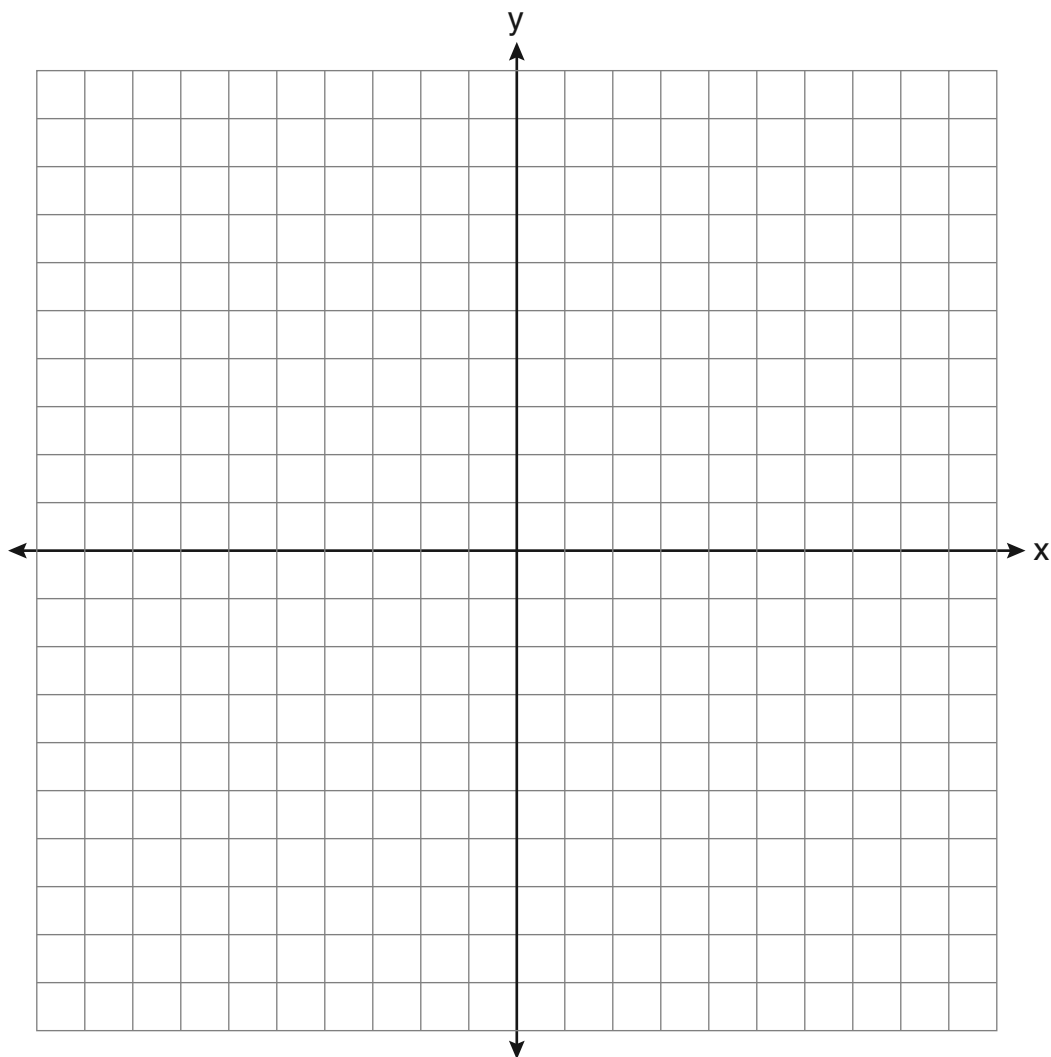
Question 38 continued
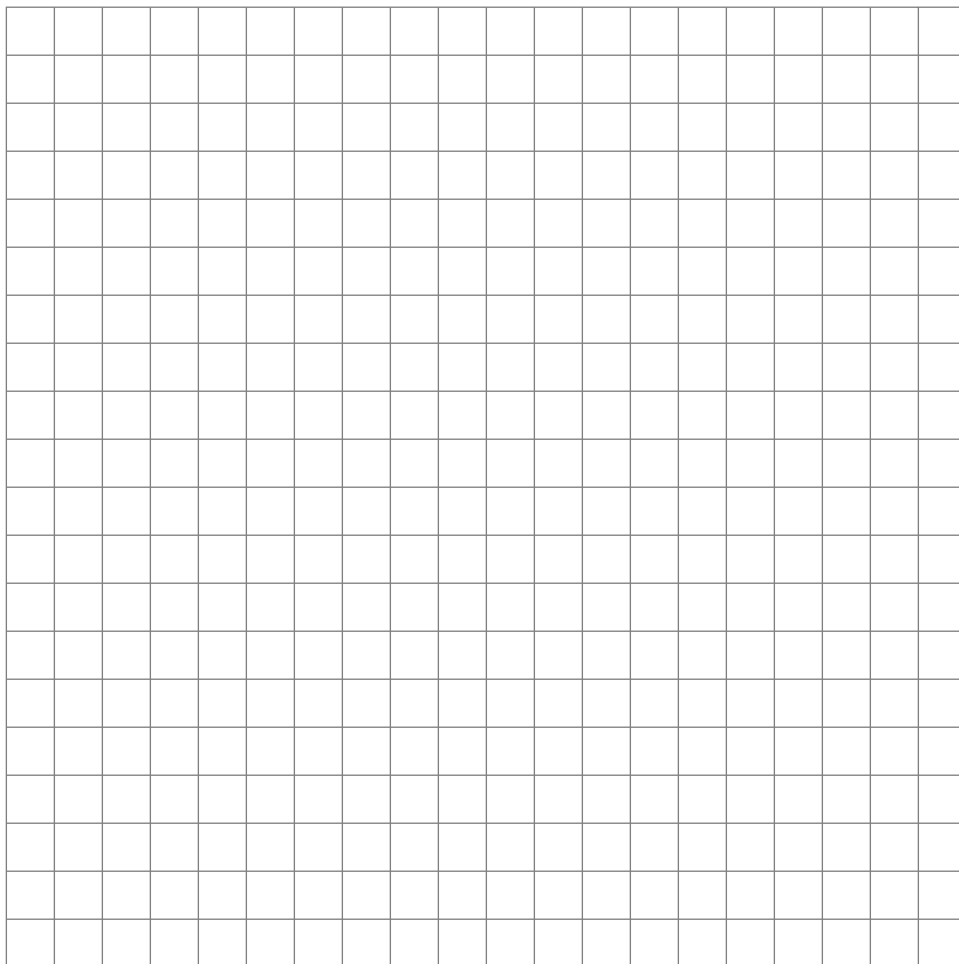
39 On the set of axes below, solve the following system of equations graphically for all values of x and y.

$$y = x^2 - 6x + 1$$

$$y + 2x = 6$$

Part I

Allow a total of 60 credits, 2 credits for each of the following. Allow credit if the student has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 4	(9) 3	(17) 1	(25) 2
(2) 4	(10) 2	(18) 1	(26) 3
(3) 1	(11) 4	(19) 3	(27) 4
(4) 2	(12) 2	(20) 1	(28) 2
(5) 3	(13) 3	(21) 2	(29) 2
(6) 4	(14) 1	(22) 1	(30) 4
(7) 1	(15) 3	(23) 2	
(8) 2	(16) 4	(24) 3	