ALGEBRA

I

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA I

Wednesday, January 22, 2025 — 1:15 to 4:15 p.m., only

Student Name _____

School Name _____

The possession or use of any communications device is strictly prohibited when taking this examination. If you have or use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

Print your name and the name of your school on the lines above.

A separate answer sheet for **Part I** has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet.

This examination has four parts, with a total of 35 questions. You must answer all questions in this examination. Record your answers to the Part I multiple-choice questions on the separate answer sheet. Write your answers to the questions in **Parts II**, **III**, and **IV** directly in this booklet. All work should be written in pen, except for graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale.

The formulas that you may need to answer some questions in this examination are found at the end of the examination. You may remove this sheet from this booklet.

Scrap paper is not permitted for any part of this examination, but you may use the blank spaces in this booklet as scrap paper. A sheet of scrap graph paper is provided at the end of this booklet for any question for which graphing may be helpful but is not required. You may remove this sheet from this booklet. Any work done on this sheet of scrap graph paper will *not* be scored.

When you have completed the examination, you must sign the statement printed at the end of the answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet cannot be accepted if you fail to sign this declaration.

Notice …

A graphing calculator and a straightedge (ruler) must be available for you to use while taking this examination.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Answer all **24** questions in this part. **Each correct answer will receive 2 credits. No partial credit will be allowed. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Record your answers on your separate answer sheet.** [48]

Use this space for computations.

1 When factored, the expression $x^3 - 36x$ is equivalent to

(1) $(x + 6)(x - 6)$

(3) $x(x + 6)(x - 6)$

(2) $(x + 18)(x - 18)$

(4) $x(x + 18)(x - 18)$

2 Which equation represents the line that passes through the points $(-1,8)$ and $(4,-2)$?

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

(3) $y = -0.5x + 7.5$

(2) $y = -2x + 10$

(4) $y = -0.5x + 8.5$

3 A geometric sequence is shown below.

$$\frac{1}{2}, 2, 8, 32, \dots$$

What is the common ratio?

(1) $\frac{1}{4}$ (3) $\frac{1}{2}$

(2) 2 (4) 4

4 What is the constant term of the polynomial $2x^3 - x + 5 + 4x^2$?

(1) 5 (3) 3

(2) 2 (4) 4

5 A landscaping company charges a set fee for a spring cleanup, plus an hourly labor rate. The total cost is modeled by the function $C(x) = 55x + 80$. In this function, what does the 55 represent?
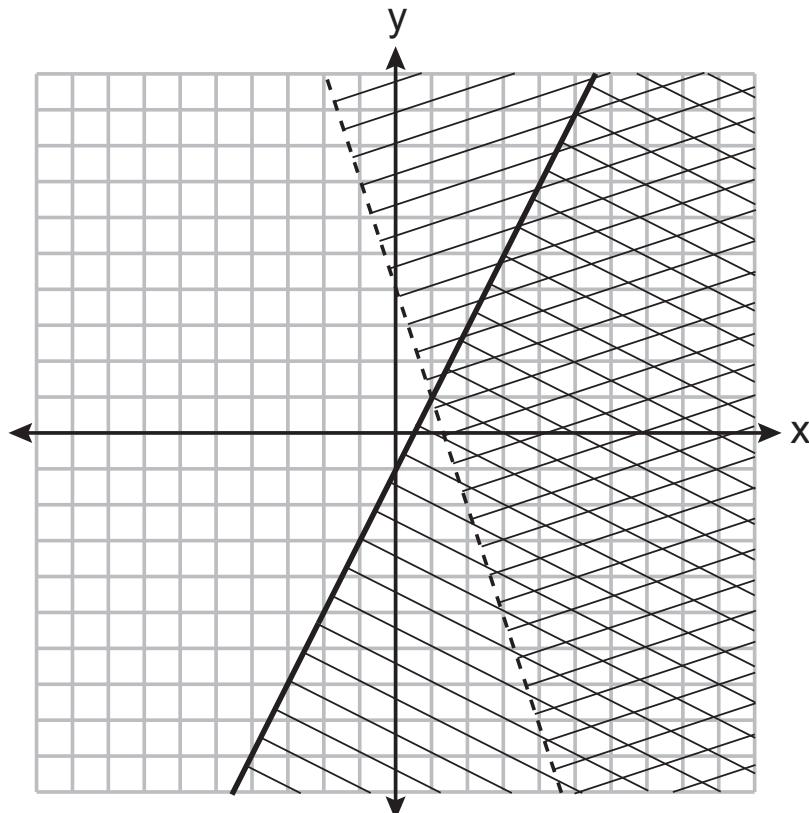
(1) the set fee for the cleanup

(2) the hourly labor rate for a cleanup

(3) the profit earned by the company for one cleanup

(4) the number of hours of labor required for one cleanup

6 Which expression is equivalent to $(5x^2 - 2x + 4) - (3x^2 + 3x - 1)$?

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

(3) $2x^4 + x^2 + 3$

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

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

7 A system of inequalities is graphed on the set of axes below.

Which point is a solution to this system?

(1) $(1,1)$

(3) $(1,8)$

(2) $(2,-2)$

(4) $(4,2)$

8 In an arithmetic sequence, the first term is 25 and the third term is 15. What is the tenth term in this sequence?

(1) -20 (3) 70

(2) -25 (4) 75

9 When the formula $p = 2l + 2w$ is solved for w, the result is

(1) $w = \dfrac{2l + p}{2}$ (3) $w = \dfrac{p}{2} + l$

(2) $w = \dfrac{p - 2l}{2}$ (4) $w = l - \dfrac{p}{2}$

10 Market Street Pizza kept a record of pizza sales for the month of February. The results are shown in the table below.

Type	Plain	Veggie	Meat Only	The Works
Thin Crust	300	80	120	100
Deep-dish	200	25	105	70

Of all the pizzas sold in February, what percent were plain, deep-dish pizzas?

(1) 20%

(2) 30%

(3) 40%

(4) 50%

11 When solving $-2(3x - 5) = \dfrac{9}{2}x - 2$ for x, the solution is

(1) $\dfrac{8}{7}$

(2) $\dfrac{10}{11}$

(3) $-\dfrac{16}{21}$

(4) $-\dfrac{16}{3}$

12 The expression $x^{2a + b}$ is equivalent to

(1) $x^{2a} + x^b$

(3) $x^a \cdot x^{a + b}$

(2) $x^a + x^{a + b}$

(4) $x^{a + b} \cdot x^{a + b}$

13 The inputs and outputs of a function are shown in the table below.

x	f(x)
0	0.0625
1	0.125
2	0.25
3	0.5
4	1
5	2

This function can best be described as

(1) linear

(3) exponential

(2) quadratic

(4) absolute value

14 Stephanie is solving the equation $x^2 - 12 = 7x - 8$. Her first step is shown below.

$$\text{Given: } x^2 - 12 = 7x - 8$$
$$\text{Step 1: } x^2 - 4 = 7x$$

Which property justifies her first step?
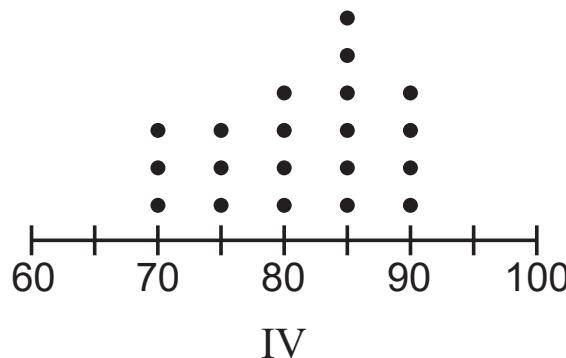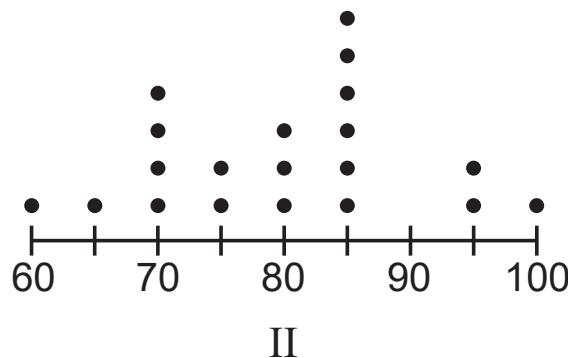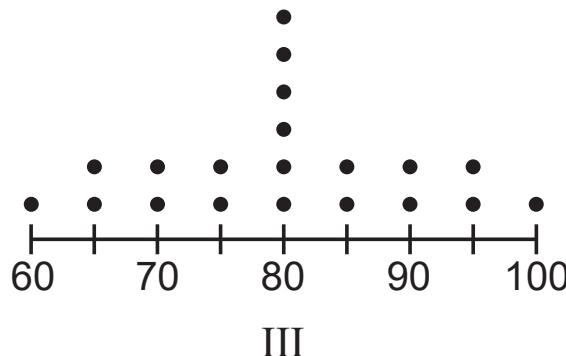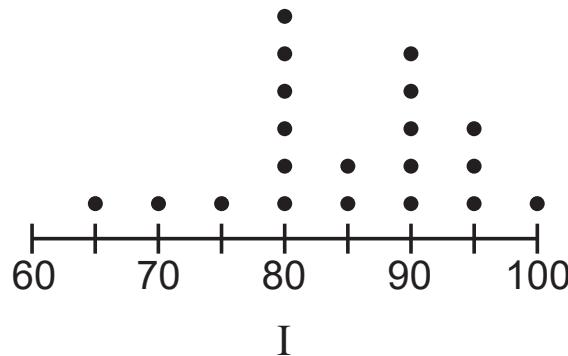
(1) associative property

(3) distributive property

(2) commutative property

(4) addition property of equality

15 What is the sum of $8\sqrt{3}$ and $\sqrt{3}$?

(1) $8\sqrt{6}$

(3) $7\sqrt{3}$

(2) $9\sqrt{6}$

(4) $9\sqrt{3}$

16 The dot plots below represent test scores for 20 students on a math test.
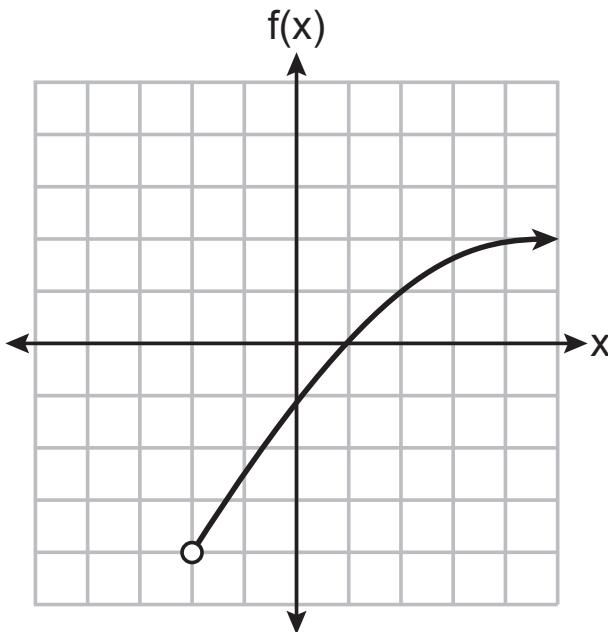
The mode for this math test is 80 and the median is 85. Which dot plot correctly represents this data?

(1) I   (3) III

(2) II   (4) IV

17 A function is graphed on the set of axes below.

The domain of this function is

(1) $\{x|x > -2\}$ (3) $\{x|x > -4\}$

(2) $\{x|x \geq -2\}$ (4) $\{x|x \geq -4\}$

18 Which ordered pair is a solution to the equation $y - 1 = 2\left(x + \dfrac{1}{4}\right)$?

(1) $(0.75, 0)$ (3) $(2.5, -6.5)$

(2) $(1.25, 4)$ (4) $(4, -9.5)$

19 Elena's fastest time for the 50-meter dash is 7 seconds. She wants to know how fast this is in inches per minute. Which expression can Elena use for a correct conversion?

(1) $\dfrac{7 \text{ sec}}{50 \text{ meters}} \cdot \dfrac{60 \text{ sec}}{1 \text{ min}} \cdot \dfrac{1 \text{ meter}}{39.37 \text{ in}}$

(2) $\dfrac{7 \text{ sec}}{50 \text{ meters}} \cdot \dfrac{1 \text{ min}}{60 \text{ sec}} \cdot \dfrac{39.37 \text{ in}}{1 \text{ meter}}$

(3) $\dfrac{50 \text{ meters}}{7 \text{ sec}} \cdot \dfrac{60 \text{ sec}}{1 \text{ min}} \cdot \dfrac{1 \text{ meter}}{39.37 \text{ in}}$

(4) $\dfrac{50 \text{ meters}}{7 \text{ sec}} \cdot \dfrac{60 \text{ sec}}{1 \text{ min}} \cdot \dfrac{39.37 \text{ in}}{1 \text{ meter}}$

20 The table below shows the highest temperatures recorded in August for several years in one town.
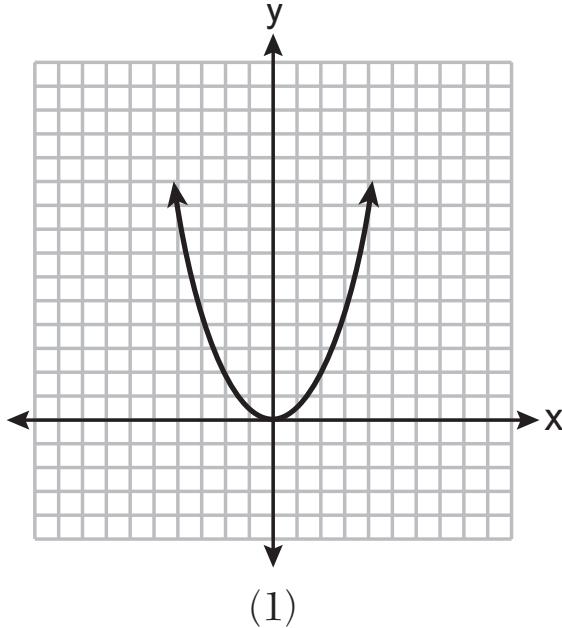
Year	Temperature (°F)
1990	86
1991	78
1992	84
1993	95
1994	81
1995	77
1996	88
1997	93
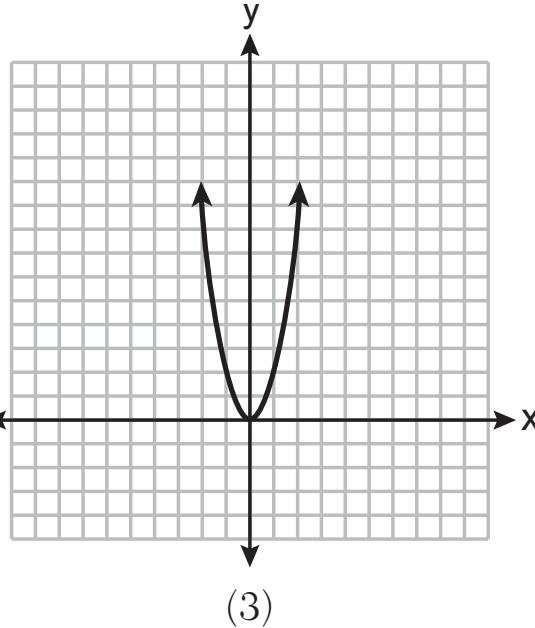
The interquartile range of these data is

(1) 7   (3) 11

(2) 10   (4) 18

21 The function $f(x) = x^2$ is multiplied by k, where $k < -1$. Which graph could represent $g(x) = kf(x)$?
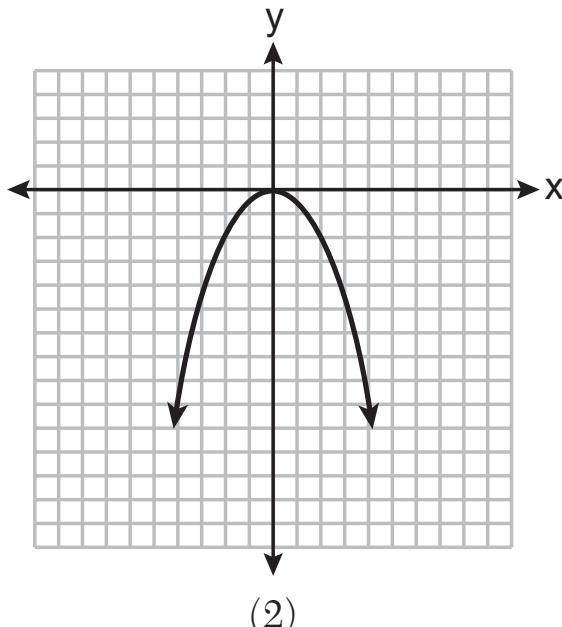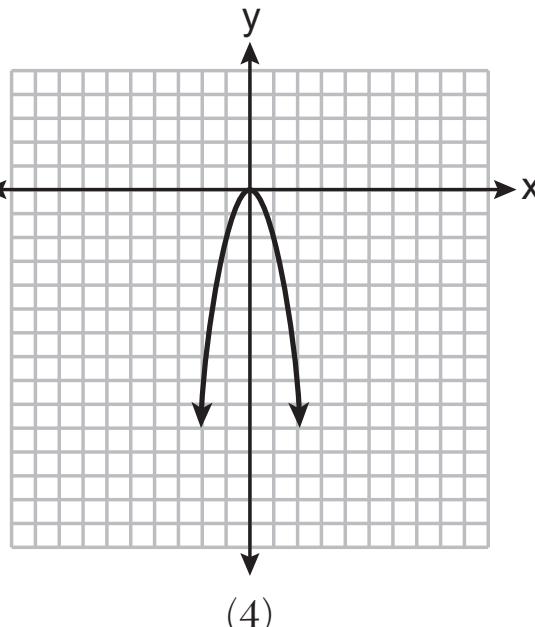
(1)

(3)
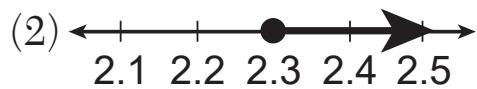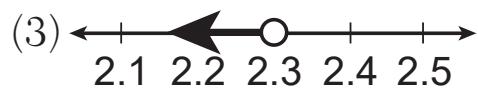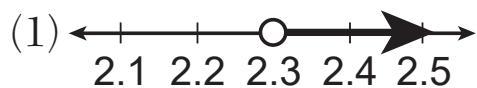
(2)

(4)

22 Which graph is the solution to the inequality $6.4 - 4x \geq -2.8$?

(1)

2.1 2.2 2.3 2.4 2.5

(3)

2.1 2.2 2.3 2.4 2.5

(2)

2.1 2.2 2.3 2.4 2.5

(4)

2.1 2.2 2.3 2.4 2.5

23 The number of fish in a pond is eight more than the number of frogs. The total number of fish and frogs in the pond is at least 20. If x represents the number of frogs, which inequality can be used to represent this situation?

(1) $x + 8x \geq 20$
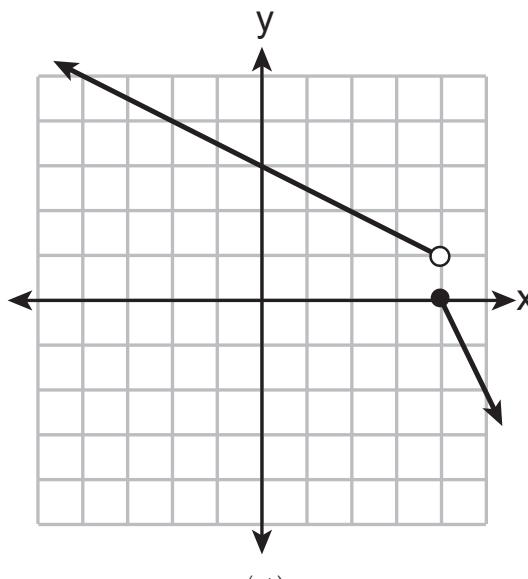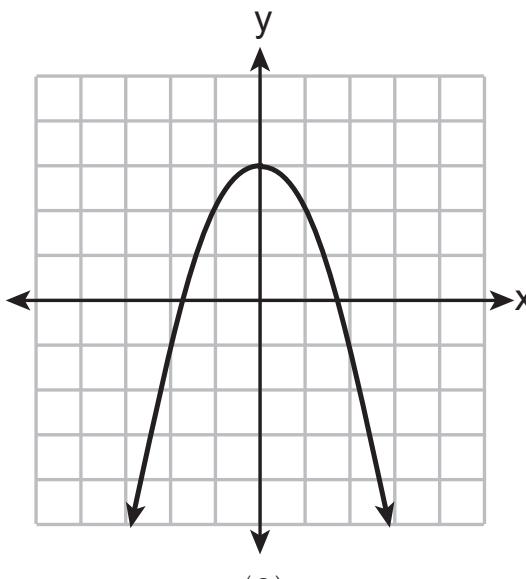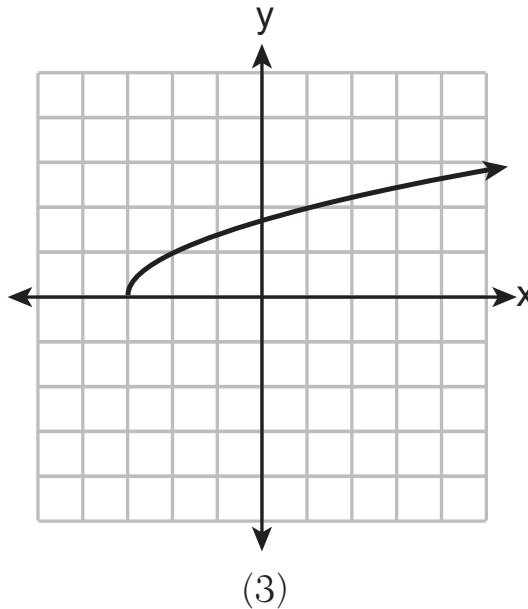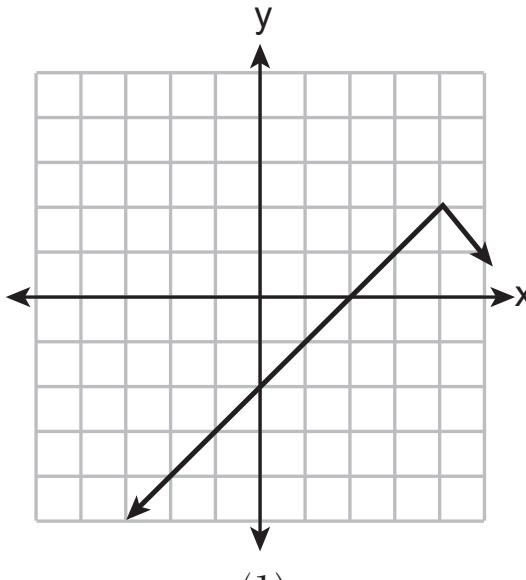
(3) $x + 8x \leq 20$

(2) $2x + 8 \geq 20$

(4) $2x + 8 \leq 20$

24 Which graph below represents a function that is always *decreasing* over the entire interval $-3 < x < 3$?

(1)

(3)

(2)

(4)
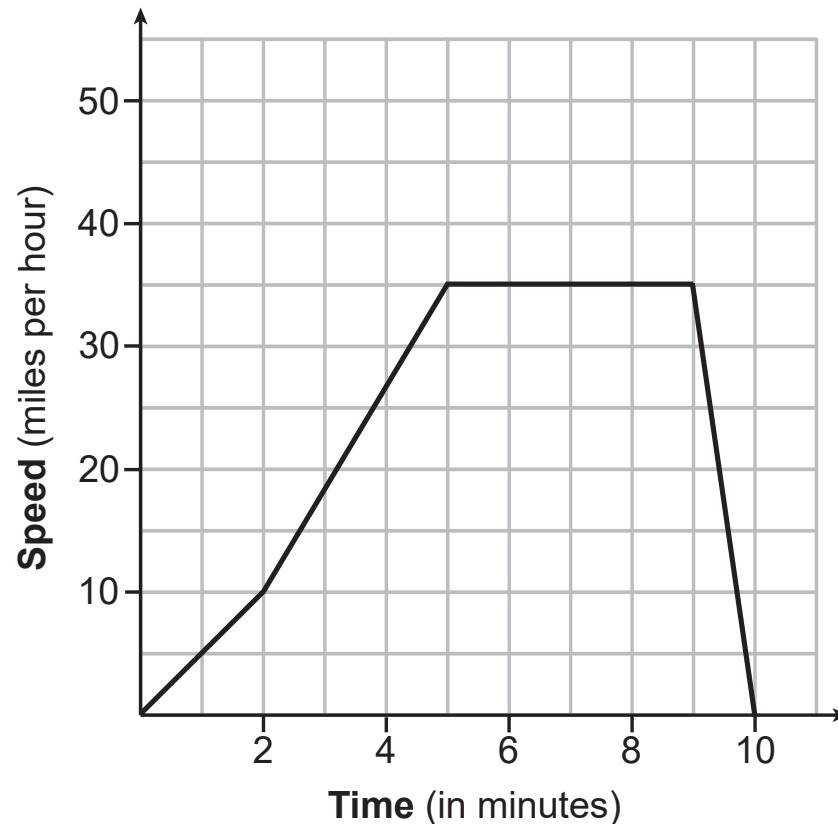
Answer all 6 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [12]

**25** The graph below models Sally's drive to the store.
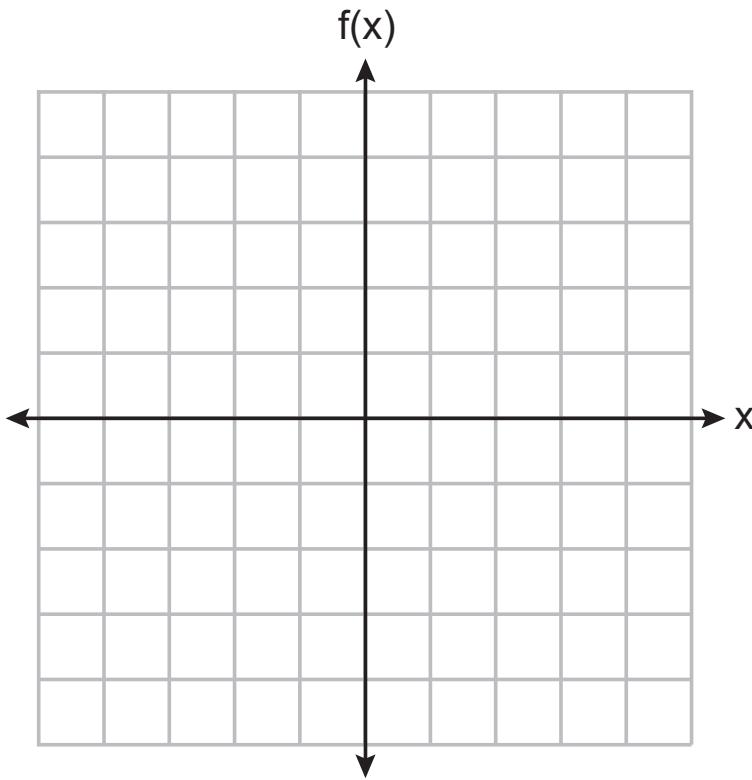
Question 25 continued

State an interval when Sally is traveling at a constant speed.

Explain your reasoning.

26 Graph the function $f(x) = x^2 + 4x + 3$.

State the equation of the axis of symmetry of $f(x)$.

Question 26 continued

27 The function $f(x)$ is shown in the table below.

x	0	3	2	6	1	5	4	m
f(x)	6	2	7	5	8	4	3	9

State an appropriate value for m in the table, so that $f(x)$ remains a function.

Explain your reasoning.

e.

Question 27 continued

28 Solve $x^2 + 8x = 33$ for x by completing the square.

Question 28 continued

29 If $f(x) = \dfrac{-3x - 5}{2}$, algebraically determine the value of x when $f(x) = -22$.

Question 29 continued

30 Rationalize the denominator of the fraction below. Express the solution in simplest form.

$$\frac{4}{\sqrt{2}}$$

Question 30 continued

Answer all 4 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

31 Alex had $1.70 in nickels and dimes on his desk. There were 25 coins in all.

Write a system of equations that could be used to determine both the number of nickels, n, and the number of dimes, d, that Alex had.

Question 31 continued

Use your system of equations to algebraically determine both the number of nickels and the number of dimes that he had.

32 The table below shows the average heart rate, x, and Calories burned, y, for seven men on an Olympic rowing team during a one-hour workout class.

Average Heart Rate (x)	135	147	150	144	146	153	143
Calories Burned (y)	725	812	866	761	825	863	737

Write the linear regression equation that models these data, rounding all values to the *nearest tenth*.

Question 32 continued

State the correlation coefficient, rounded to the *nearest tenth*.

State what the correlation coefficient suggests about the linear fit of these data.

33

33 Using the quadratic formula, solve $x^2 + 4x - 3 = 0$.

Express your solution in simplest radical form.

Question 33 continued

34 Solve the following system of equations algebraically for all values of x and y.

$$y = x^2 - 7x + 12$$

$$y = 2x - 6$$

Question 34 continued

Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided to determine your answer. Note that diagrams are not necessarily drawn to scale. A correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [6]
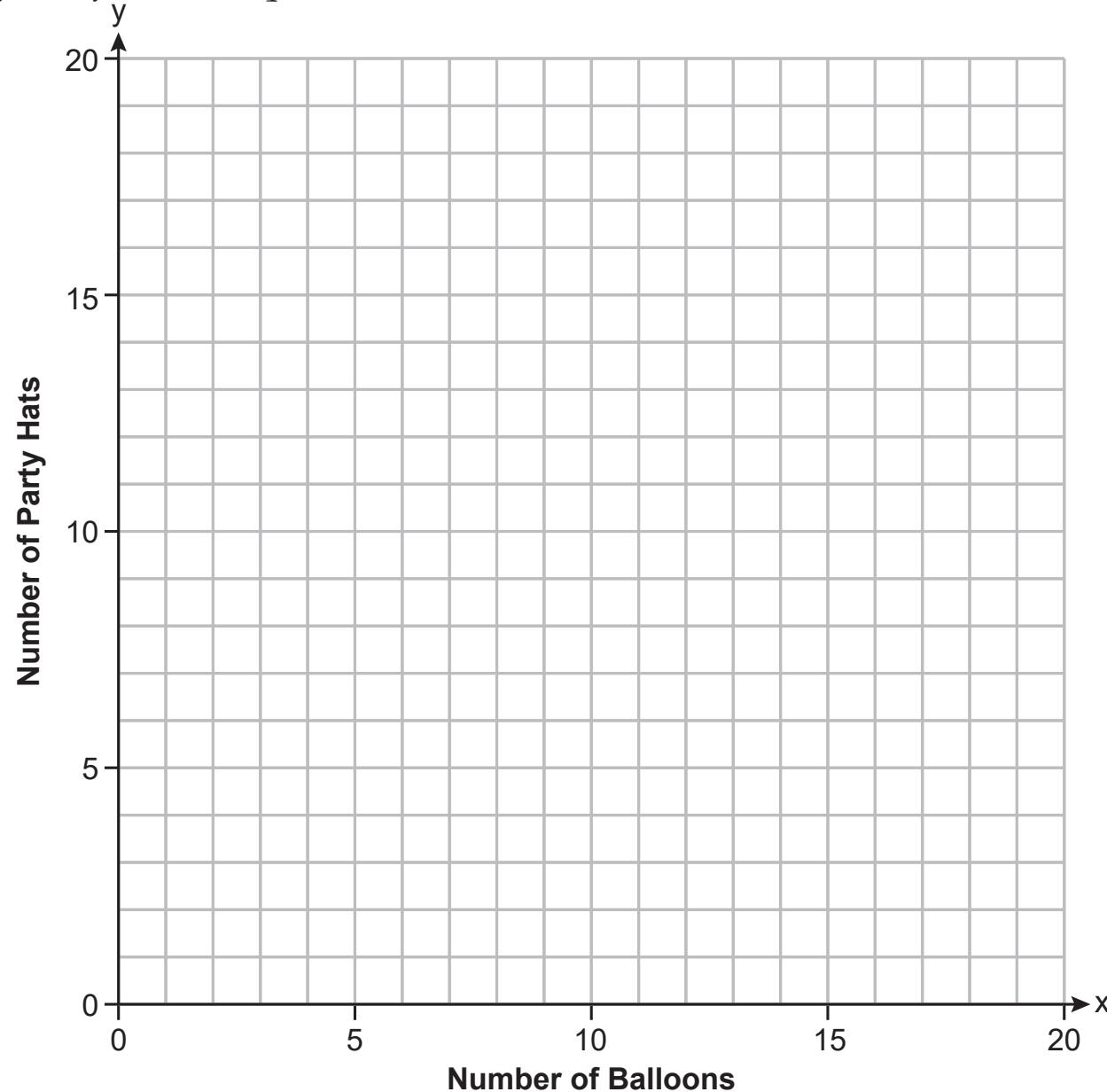
35 Anna plans to spend $30 on balloons and party hats for her daughter's birthday party. Including tax, balloons cost $2 each and party hats cost $1.50 each. The number of party hats Anna needs is twice as many as the number of balloons.

If x represents the number of balloons and y represents the number of party hats, write a system of equations that can be used to represent this situation.

Graph your system of equations on the set of axes below.

Number of Party Hats (y-axis)

Number of Balloons (x-axis)

State the coordinates of the point of intersection of your lines.

Explain what each coordinate means in the context of the problem.

Scrap Graph Paper — this sheet will *not* be scored.

Reference Sheet for Algebra I

Conversions

1 mile = 5280 feet
1 mile = 1760 yards
1 pound = 16 ounces
1 ton = 2000 pounds

Conversions Across Measurement Systems

1 inch = 2.54 centimeters
1 meter = 39.37 inches
1 mile = 1.609 kilometers
1 kilometer = 0.6214 mile
1 pound = 0.454 kilogram
1 kilogram = 2.2 pounds

Quadratic Equation	$y = ax^2 + bx + c$
Quadratic Formula	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Equation of the Axis of Symmetry	$x = -\dfrac{b}{2a}$
Slope	$m = \dfrac{y_2 - y_1}{x_2 - x_1}$

Exponential Equation	$y = ab^x$
Annual Compound Interest	$A = P(1 + r)^n$
Arithmetic Sequence	$a_n = a_1 + d(n - 1)$
Geometric Sequence	$a_n = a_1 r^{n-1}$

The Reference Sheet is continued on the next page.

Reference Sheet — concluded

Linear Equation Slope Intercept	$y = mx + b$	Interquartile Range (IQR)	$IQR = Q_3 - Q_1$
Linear Equation Point Slope	$y - y_1 = m(x - x_1)$	Outlier	Lower Outlier Boundary $= Q_1 - 1.5(IQR)$
			Upper Outlier Boundary $= Q_3 + 1.5(IQR)$