

**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. This sheet is perforated so you may remove it 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 perforated 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.

Part I

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

Use this space for
computations.

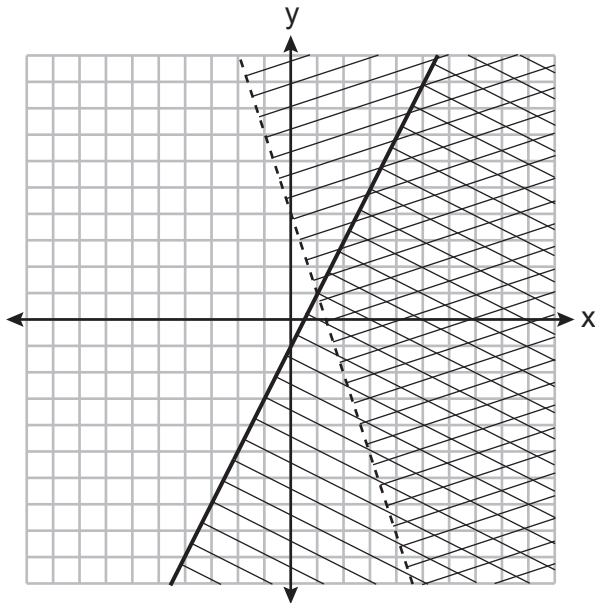
5 A landscaping company charges a set fee for a spring cleanup, plus an hourly labor rate. The total cost is modeled by the function $C(x) = 55x + 80$. In this function, what does the 55 represent?

- (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) $2x^2 + x + 3$
- (2) $2x^2 - 5x + 5$
- (3) $2x^4 + x^2 + 3$
- (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)
- (2) (2,-2)
- (3) (1,8)
- (4) (4,2)

Use this space for
computations.

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) $w = \frac{2l + p}{2}$ (3) $w = \frac{p}{2} + l$
(2) $w = \frac{p - 2l}{2}$ (4) $w = l - \frac{p}{2}$

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% (3) 40%
(2) 30% (4) 50%

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

- (1) $\frac{8}{7}$ (3) $-\frac{16}{21}$
(2) $\frac{10}{11}$ (4) $-\frac{16}{3}$

Use this space for
computations.

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?

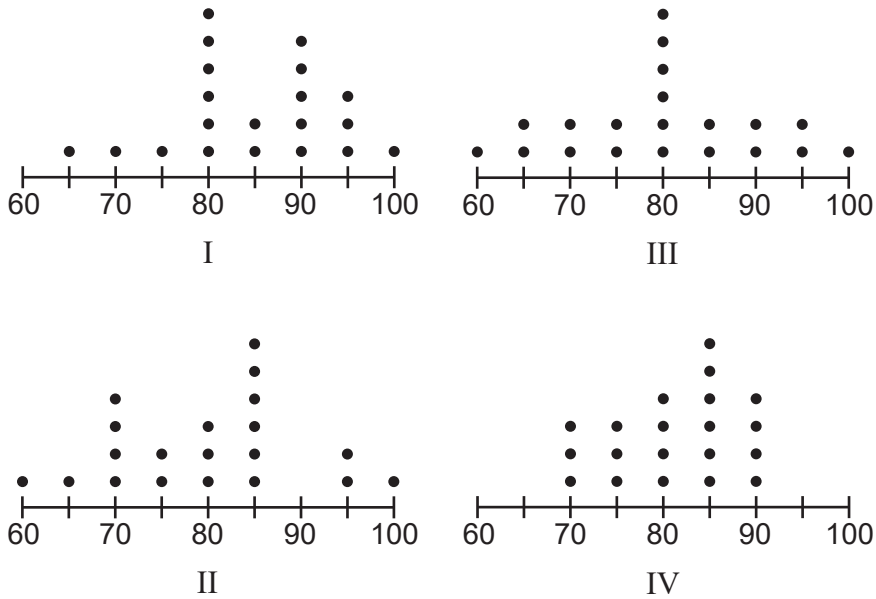
- (1) associative property (3) distributive property
(2) commutative property (4) addition property of equality

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) $9\sqrt{3}$

Use this space for computations.

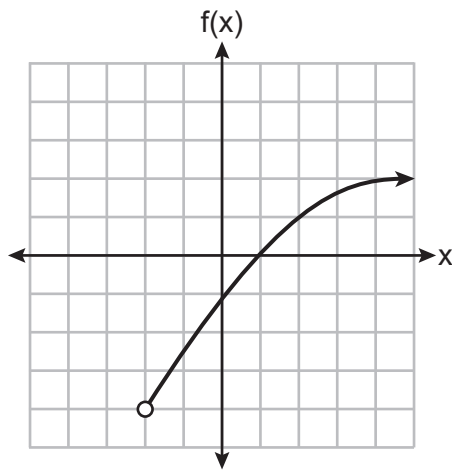
16 The dot plots below represent test scores for 20 students on a math test.



The mode for this math test is 80 and the median is 85. Which dot plot correctly represents this data?

- (1) I
- (2) II
- (3) III
- (4) IV

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



The domain of this function is

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

Use this space for
computations.

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

- (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) $\frac{7 \text{ sec}}{50 \text{ meters}} \cdot \frac{60 \text{ sec}}{1 \text{ min}} \cdot \frac{1 \text{ meter}}{39.37 \text{ in}}$
(2) $\frac{7 \text{ sec}}{50 \text{ meters}} \cdot \frac{1 \text{ min}}{60 \text{ sec}} \cdot \frac{39.37 \text{ in}}{1 \text{ meter}}$
(3) $\frac{50 \text{ meters}}{7 \text{ sec}} \cdot \frac{60 \text{ sec}}{1 \text{ min}} \cdot \frac{1 \text{ meter}}{39.37 \text{ in}}$
(4) $\frac{50 \text{ meters}}{7 \text{ sec}} \cdot \frac{60 \text{ sec}}{1 \text{ min}} \cdot \frac{39.37 \text{ in}}{1 \text{ meter}}$

20 The table below shows the highest temperatures recorded in August for several years in one town.

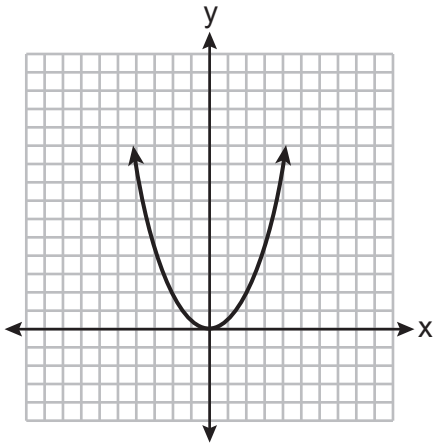
Year	Temperature (°F)
1990	86
1991	78
1992	84
1993	95
1994	81
1995	77
1996	88
1997	93

The interquartile range of these data is

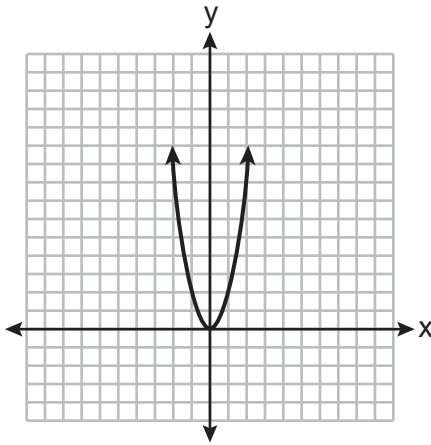
- (1) 7 (3) 11
(2) 10 (4) 18

Use this space for
computations.

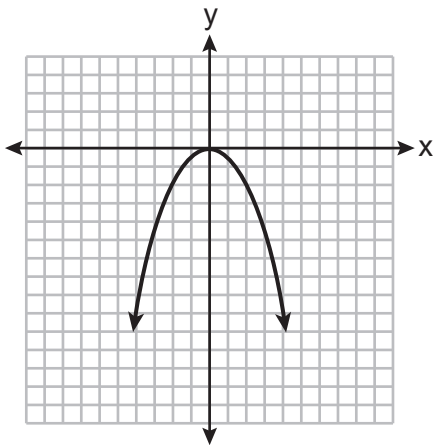
- 21 The function $f(x) = x^2$ is multiplied by k , where $k < -1$. Which graph could represent $g(x) = kf(x)$?



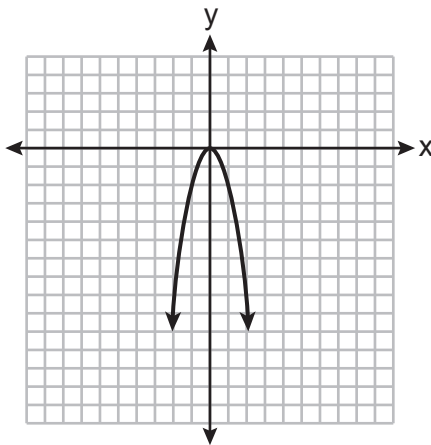
(1)



(3)

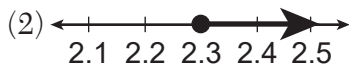
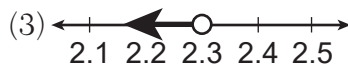
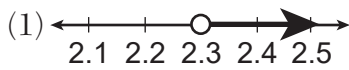


(2)



(4)

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



Use this space for
computations.

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?

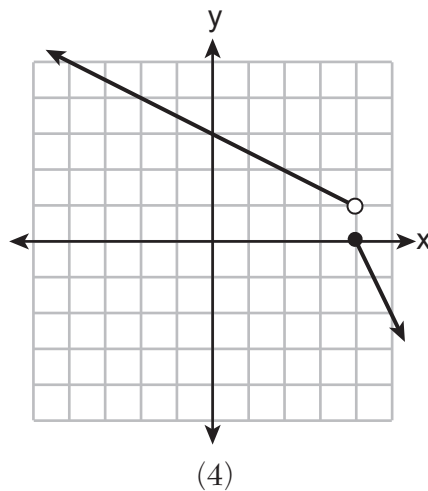
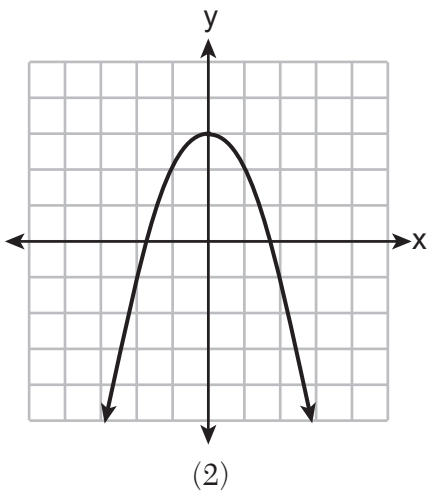
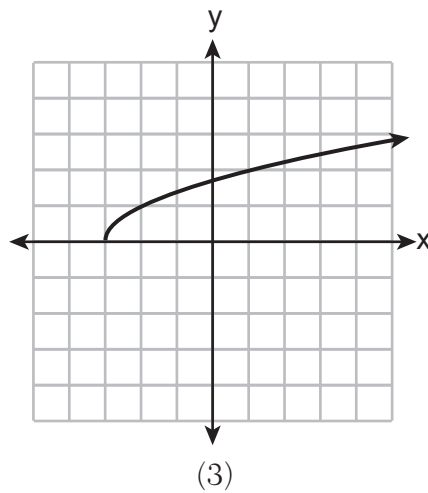
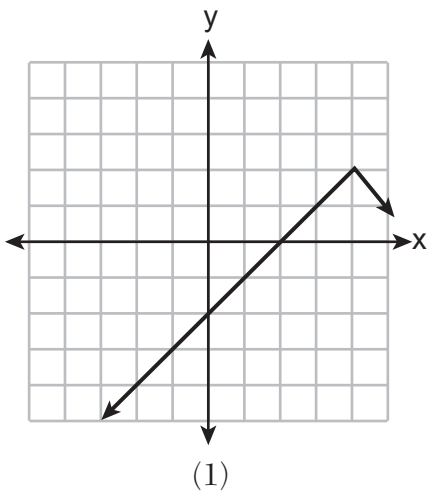
(1) $x + 8x \geq 20$

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

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

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

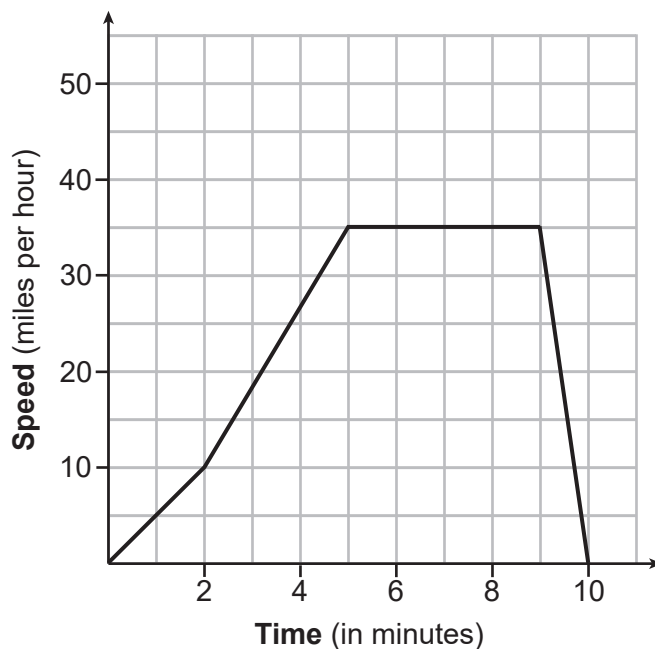
24 Which graph below represents a function that is always *decreasing* over the entire interval $-3 < x < 3$?



Part II

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]

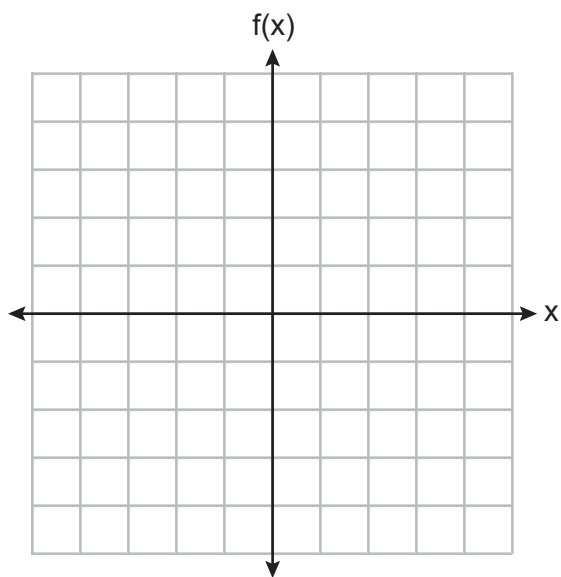
25 The graph below models Sally's drive to the store.



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 $f(x)$.

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.

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

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

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

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

Part III

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.

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*.

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

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

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

Express your solution in simplest radical form.

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

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

$$y = 2x - 6$$

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]

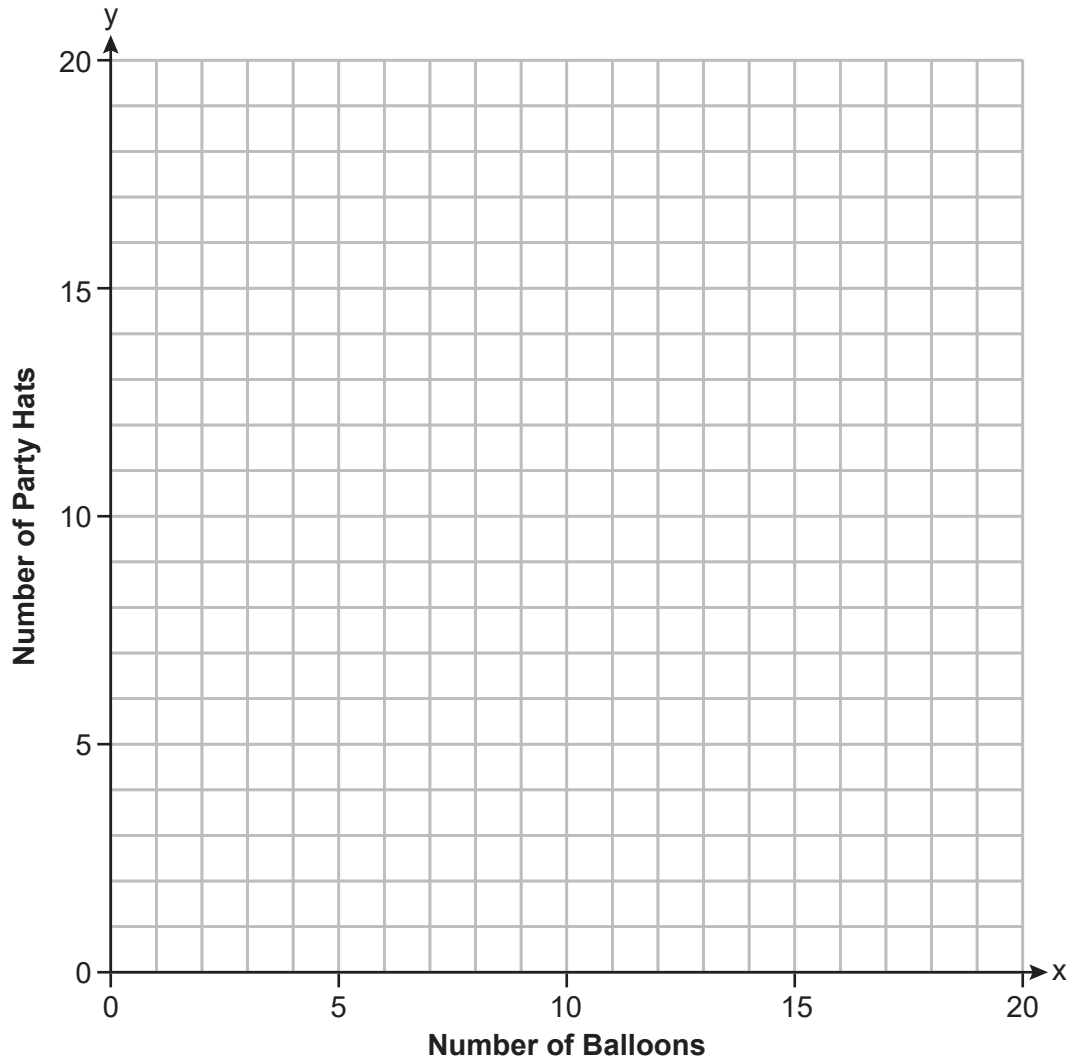
35 Anna plans to spend \$30 on balloons and party hats for her daughter's birthday party. Including tax, balloons cost \$2 each and party hats cost \$1.50 each. The number of party hats Anna needs is twice as many as the number of balloons.

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.

Question 35 is continued on the next page.

Question 35 continued

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



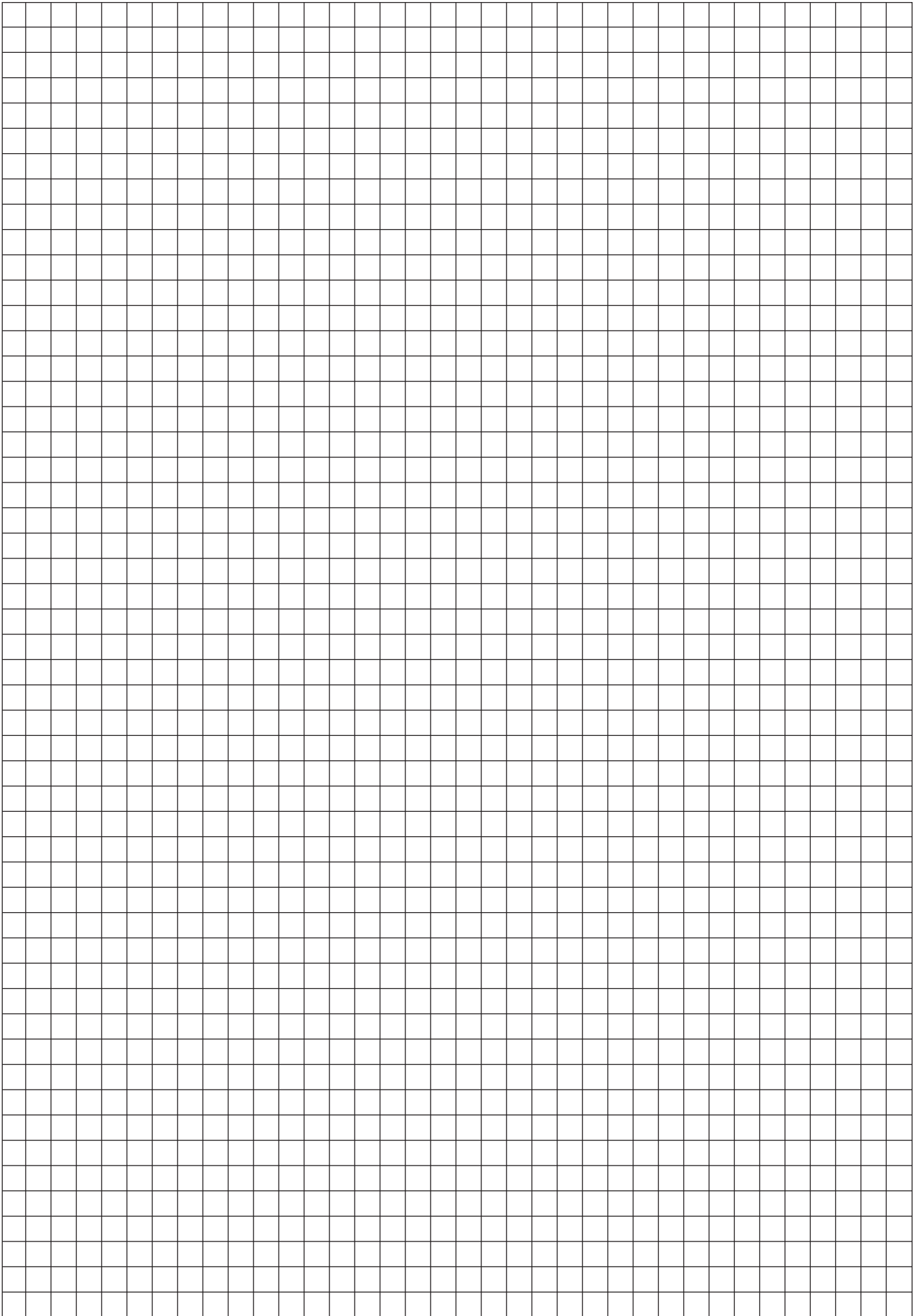
State the coordinates of the point of intersection of your lines.

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

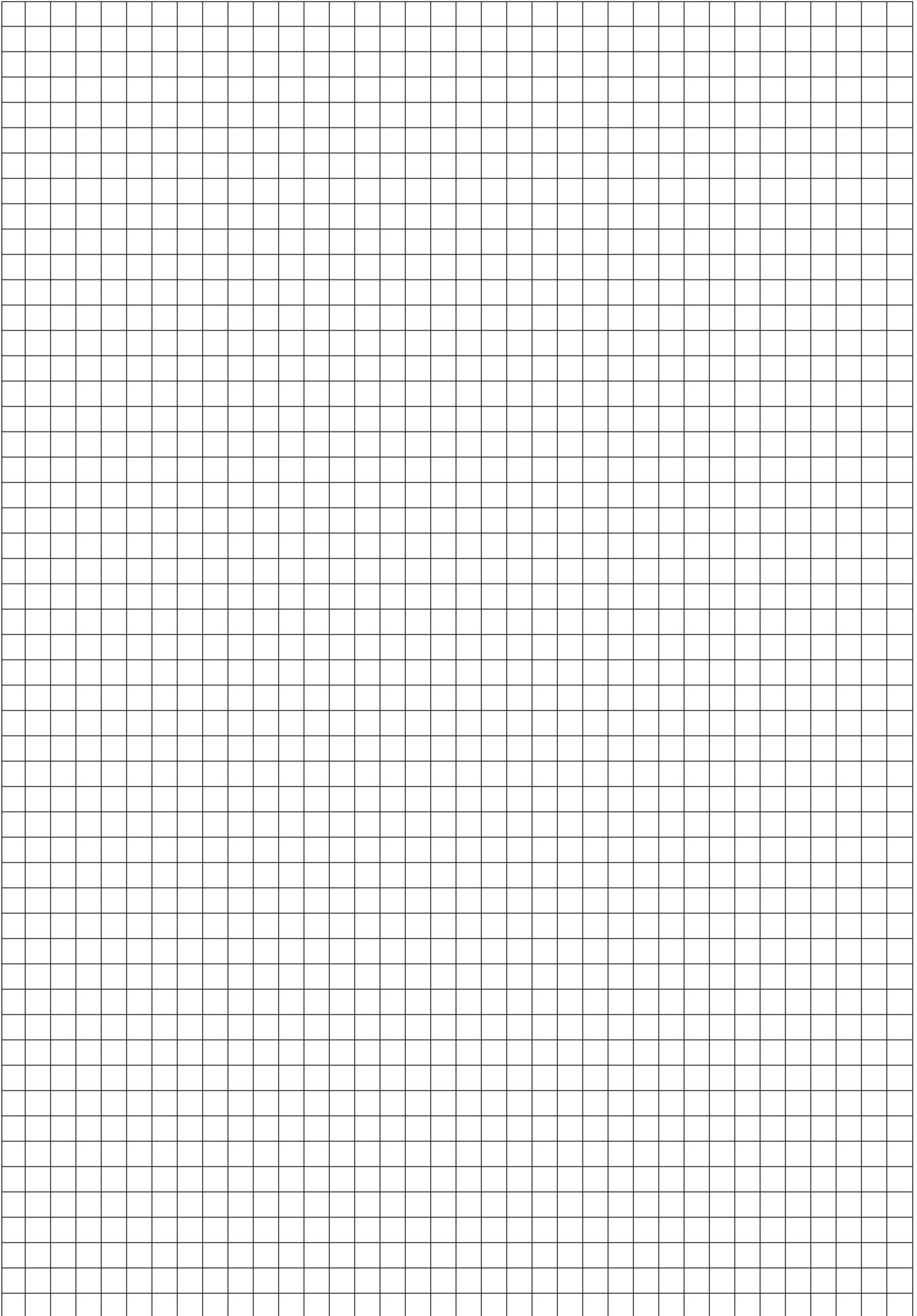
Scrap Graph Paper — this sheet will *not* be scored.

Tear Here

Tear Here



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



Tear Here

Tear Here

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	$y = ax^2 + bx + c$	Exponential Equation	$y = ab^x$
Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	Annual Compound Interest	$A = P(1 + r)^n$
Equation of the Axis of Symmetry	$x = -\frac{b}{2a}$	Arithmetic Sequence	$a_n = a_1 + d(n - 1)$
Slope	$m = \frac{y_2 - y_1}{x_2 - x_1}$	Geometric Sequence	$a_n = a_1 r^{n - 1}$
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 = $Q_3 + 1.5(IQR)$

Tear Here

Tear Here

ALGEBRA I

Tear Here

Tear Here

Printed on Recycled Paper

ALGEBRA I