

2-1 Relations and Functions

Standards

A2.F.BF.A.1 Write a function that describes a relationship between two quantities.

A2.F.BF.A.1a Determine an explicit expression, a recursive process, or steps for calculation from a context.

A2.F.BF.A.1b Combine standard function types using arithmetic operations.

Key Concepts

_____ - a set of pairs of input and output values.

_____ - the set of all inputs (x -coordinates) _____ - the set of all outputs (y -coordinates)

_____ - a relation in which each element in the domain corresponds to exactly one element of the range.

_____ - if any vertical line passes through more than one point on the graph of a relation, then it is *not* a function.

_____ - an equation that represents an output value in terms of an input value. You can write the function rule in function notation.

_____ - x , represents the input value.

_____ - y , represents the output value.

Four Ways to Represent Relations

Ordered Pairs

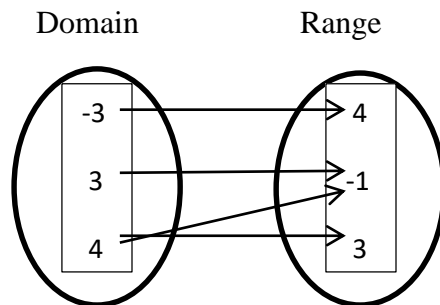
(-3, 4)

(3, -1)

(4, -1)

(4, 3)

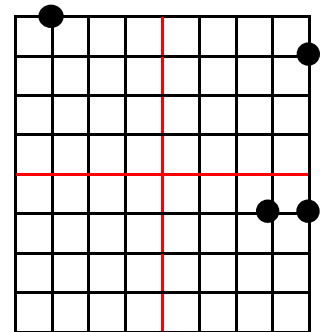
Mapping Diagram



Table

x	y
-3	4
3	-1
4	-1
4	3

Graph



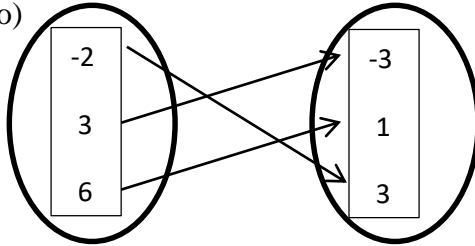
Examples

1. (I do) The water temperature in the Gulf of Mexico for January, February, March and April is as follows 69°F , 70°F , 75°F and 78°F . Represent the relation in four ways. Identify the domain and the range.

2. Is the relation a function?

a. (I do) $\{(4, -1), (8, 6), (1, -1), (6, 6), (4, 1)\}$

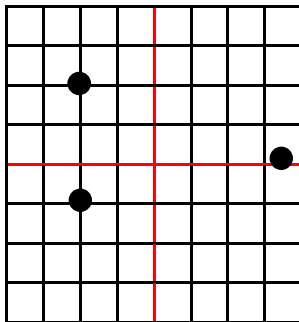
b. (We do)



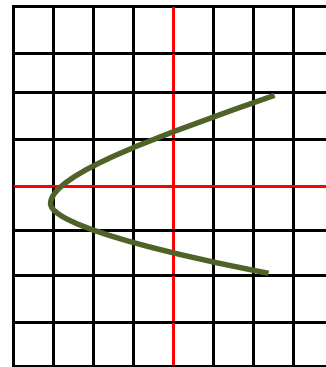
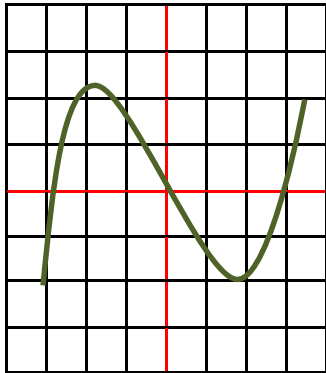
a. (They do)

x	y
-3	4
3	-1
4	-1
4	3

d. (You do)



3. Use the vertical line test to determine if the relation is a function.
- a. (I do) b. (We do)



4. (They do) For $f(x) = -4x + 1$, find the output for the input values of -3, -2, 0, and 1.

5. (They do) Movie tickets can be purchased online in advance for \$8.50 each plus a \$2 convenience fee. The total cost is a function of the number of tickets. Write a function rule for this situation and determine the total cost for 5 tickets.

You do: Practice 2-1: Complete your assignment on a separate sheet of paper. Show work.

Every year the Rock and Roll Hall of Fame and Museum inducts legendary musicians and acts to the Hall. The table shows the number of inductees for each year.

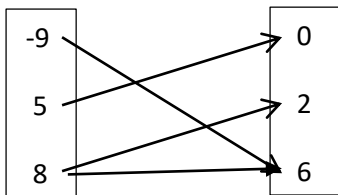
YEAR	2001	2002	2003	2004	2005	2006
# of Inductees	11	8	9	8	7	6

1. Represent the data using each of the following:
 - a. a mapping diagram
 - b. ordered pairs
 - c. graph on the coordinate plane

2. What are the domain and range of this relation?

3. Determine whether the relation is a function.

a.



b. $\{(3, -9), (121, 34), (34, 1), (23, 45)\}$

4. Evaluate $f(x) = 17x + 3$ for $x = 3$
5. Evaluate $f(x) = -9x - 2$ for $x = 7$

6. Write a function rule to model the cost per month of a long-distance cell phone calling plan. Then evaluate the function for given number of minutes.

Monthly service fee: \$4.99, Rate per minute: \$.10, Minutes used: 250 minutes

7. You are considering renting a car from two different rental companies. Proxy car rental company charges \$0.32 per mile plus an \$18 surcharge. YourPal rental company charges \$0.36 per mile plus a \$12 surcharge.
 - a. Write a function that shows the cost of renting from Proxy.
 - b. Write a function that shows the cost of renting from YourPal.
 - c. Which company offers a better deal for an 820 mile trip?

2-3 Linear Functions and Slope-Intercept Form

Standards

A2.F.BF.A.1 Write a function that describes a relationship between two quantities.

A2.F.BF.A.1a Determine an explicit expression, a recursive process, or steps for calculation from a context.

A2.F.BF.A.1b Combine standard function types using arithmetic operations.

Key Concepts

_____ - the rate of change

_____ - a function whose graph is a line

_____ - represents a linear function where a solution is any ordered pair (x, y) that makes the equation true.

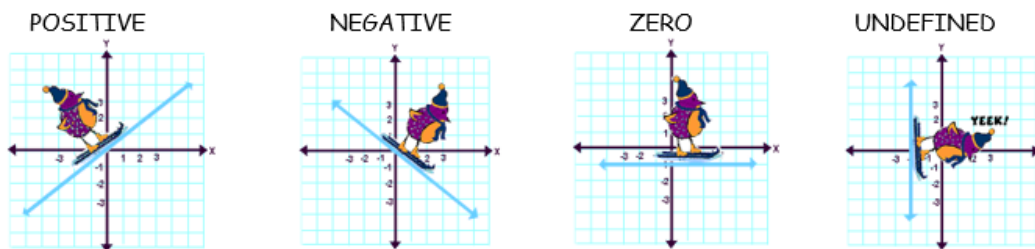
_____ - the point in which a line crosses the y -axis

_____ - the point in which a line crosses the x -axis

Formulas

- slope $m = \frac{y_2 - y_1}{x_2 - x_1}$
- slope-intercept form $y = mx + b$, slope = m and $(0, b)$ is y -intercept

Properties



Examples

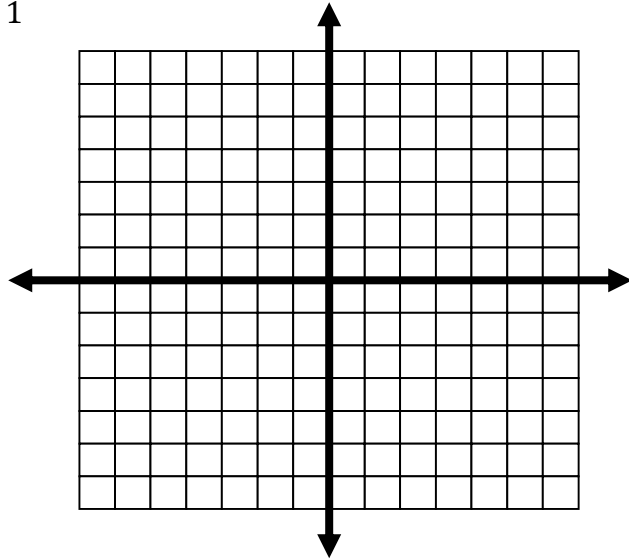
1. What is the slope of the line that passes through the following points?
 - a. (I do) $(-3, 1)$ and $(-2, 1)$.
 - b. (We do) $(-2, 7)$ and $(8, -6)$

2. (They do) What is the equation of the line with slope $\frac{1}{3}$ and y-intercept $(0, -3)$?

3. (I do) Write the equation in slope-intercept form. What is the slope and y-intercept of the equation $5x - 4y = 16$?

4. (We do) Write the equation in slope-intercept form. What is the slope and y-intercept of the equation $-\frac{3}{4}x + \frac{1}{2}y = -1$?

5. (I do) Graph the equation $-2x + y = 1$



You do: Practice 2-3: Complete your assignment on graph paper. Show all work.

1. Find the slope of the line through each pair of points.
 - a. $(-4, -3)$ and $(7, 1)$
 - b. $(-3, 5)$ and $(4, 5)$
2. Write an equation for the line with $m = 3$ and y-intercept $(0, 2)$.
3. Write the equation in slope-intercept form. Then find the slope and y-intercept.
 - a. $5x + y = 4$
 - b. $9x - 2y = 10$
4. Graph
 - a. $y = 2x$
 - b. $y = -3x - 4$
 - c. $y - 3 = -2x$
 - d. $-2x + 5y = -10$
5. Suppose the equation $y = 12 + 10x$ models the amount of money in your wallet, where y is the total in dollars and x is the number of weeks from today.
 - a. Is the equation in slope-intercept form? If not, re-write it.
 - b. Graph this equation, what do the slope and y-intercept represent? Explain
 - c. What units make sense for the slope?

2-4 More Linear Equations

Standards

A2.F.BF.A.1 Write a function that describes a relationship between two quantities.

A2.F.BF.A.1a Determine an explicit expression, a recursive process, or steps for calculation from a context.

A2.F.BF.A.1b Combine standard function types using arithmetic operations.

Key Concepts

_____ - the slopes of these lines are equal.

_____ - the slopes of these lines are negative reciprocals of each other.

Formulas

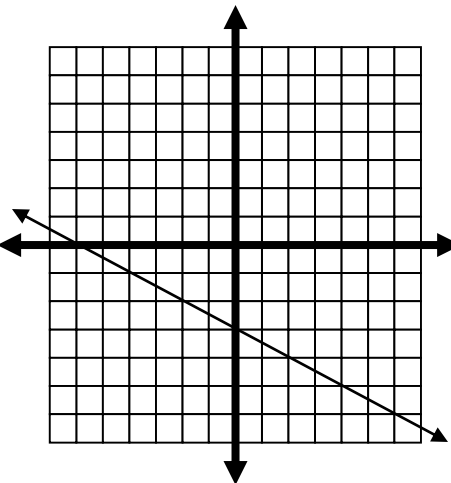
- point-slope form of a line is $y - y_1 = m(x - x_1)$
- standard form of a linear equation is $Ax + By = C$
- $m = -\frac{A}{B}$, y -intercept = $\frac{C}{B}$, x -intercept = $\frac{C}{A}$

Examples

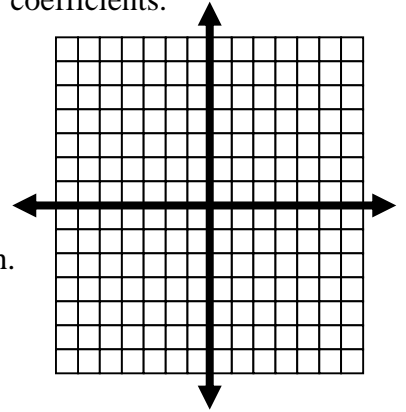
1. (I do) Write the equation of the line in point-slope form through $(-5, 2)$ with a slope of $\frac{2}{3}$.

2. (We do) Write the equation of the line slope-intercept form through $(-3, 2)$ and $(5, 8)$.

3. (They do) What is the equation of the line in point-slope form?



4. (I do) Write the equation $y = \frac{3}{4}x - 5$ in standard form. Use integer coefficients.



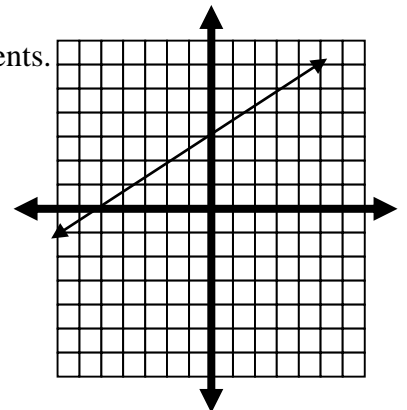
5. (We do) Find the x - and y -intercepts of $2x + 3y = -12$. Then graph.

6. (They do) What is the equation of the line parallel to $y = 2x - 3$ through $(1, -3)$ in slope-intercept form?

7. (They do) What is the equation of the line perpendicular to $y = \frac{2}{3}x - 1$ through $(-2, 4)$ in slope-intercept form?

Practice 2-4: Complete your assignment on a separate sheet of paper. Show all work.

- Write an equation for each line in point-slope form
 - slope = -3, through $(1, -4)$
 - slope = $\frac{1}{2}$, through $(2, 3)$
- What are the intercepts of $3x + y = 6$? Graph the equation.
- If the intercepts of a line are $(a, 0)$ and $(0, b)$, what is the slope of the line?
- Write the equation of the line through $(1, 9)$ and $(6, 2)$ in slope-intercept form?
- Write an equation of each line in standard form with integer coefficients.
 - $y = -7x - 9$
 - $y = -\frac{3}{5}x + 3$
- Write an equation for the line shown in standard form.



2-5 Using Linear Models

Standards

A2.S.ID.B.2 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data.

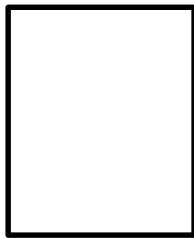
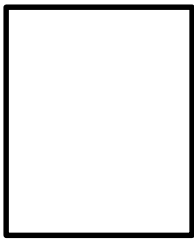
Key Concepts

_____ - a graph that relates two sets of data

_____ - the relationship between two sets of data

_____ - a trend line that gives the most accurate model

_____ - the strength of the correlation (r)

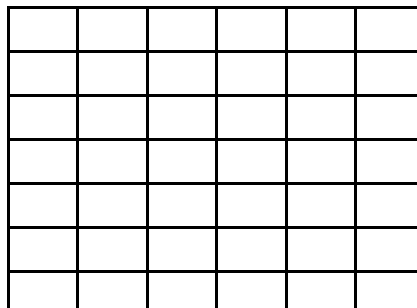


Examples

1. The table shows the number of hours a student spends watching TV the day before the test and their test scores.

Number of hours	0	0	1	1	1.5	1.8	2	2	3	4	4.5	5
Test scores	100	94	98	88	92	89	75	70	78	72	57	60

- a. (I do) Make a scatter plot. How would you describe the correlation? Draw a trend line.



- b. (We do) Using the graph, determine the grade you could expect to make if you watch 5.5 hours of TV the night before the test.
2. (They do) The average cost of whole milk for several recent years is listed in the table. What is the equation for the line of best fit. Based on the model, what would you expect to pay in the year 2020 for a gallon of milk?

Year	1998	2000	2002	2004	2006	2008
Cost of gallon	2.65	2.89	3.00	3.01	3.20	3.77

You do: Practice 2-5: Complete your assignment on a separate sheet of paper. Show work.

- 1. SALARIES** The table below shows the years of experience for eight technicians at Lewis Techomatic and the hourly rate of pay each technician earns.

Experience (years)	9	4	3	1	10	6	12	8
Hourly Rate of Pay	\$17	\$10	\$10	\$7	\$19	\$12	\$20	\$15

- a. Draw a scatter plot to show how years of experience are related to hourly rate of pay. Draw a line of fit and describe the correlation.
- b. Write a prediction equation to show how years of experience (x) are related to hourly rate of pay (y).
- c. Use the function to predict the hourly rate of pay for 15 years of experience.



2. Make a scatter plot and describe the correlation for the points $\{(0, 11), (2, 8), (3, 7), (7, 2), (8, 0)\}$

2-7 Absolute Value Functions and Graphs

Standards

A2.A.REI.D.6 (formerly A.REI.11) Explain why the x -coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the approximate solutions using technology.

Key Concepts

_____ - the simplest form in a set of functions that form a family

_____ - operation that shifts a graph horizontally, vertically, or both.

_____ - moves the graph up or down, represented by k

_____ - moves the graph right or left, represented by h

_____ - flips the graph of a function across a line such as the x - or y -axis

_____ - multiplies all y -values of a function by the same factor $a > 1$

_____ - reduces all y -values of a function by the same factor for $0 < a < 1$

_____ - the line that divides a figure into 2 parts that are mirror images

_____ - a point where the function reaches a maximum or minimum value

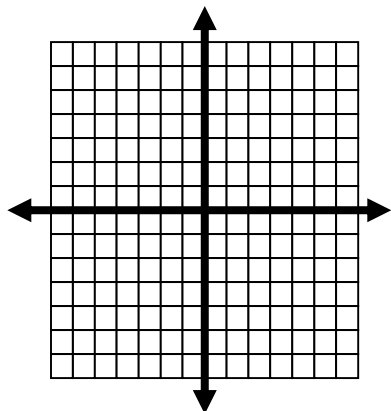
_____ - general form of an abs. value function, $v = (h, k)$ and AOS is $x = h$

Transformations of $f(x)$	
Vertical Translation (k units) <u>Up:</u> $y = f(x) + k$ <u>Down:</u> $y = f(x) - k$	Horizontal Translation (h units) <u>Right:</u> $y = f(x - h)$ <u>Left:</u> $y = f(x + h)$
Vertical Stretch/ Compression <u>Stretch ($a > 1$):</u> $y = af(x)$ <u>Compression ($0 < a < 1$):</u> $y = af(x)$	Reflection <u>x-axis:</u> $y = -f(x)$ <u>y-axis:</u> $y = f(-x)$

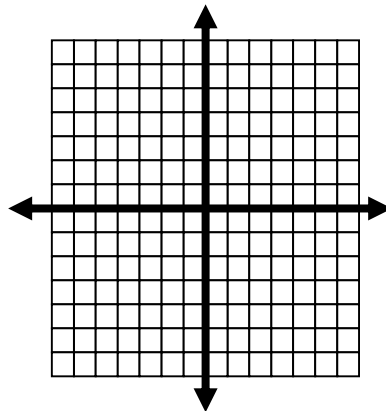
Examples

1. Graph the absolute value function.

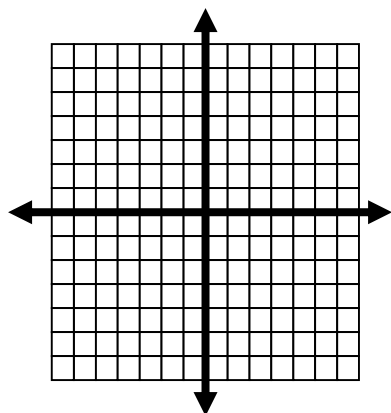
a. (I do) $f(x) = |x|$



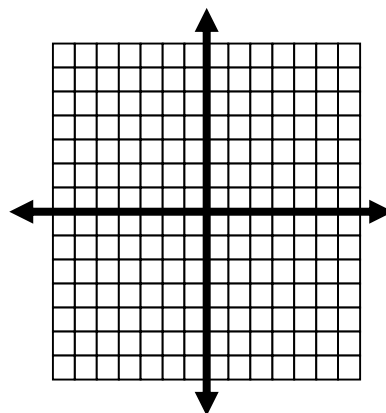
b. (We do) $f(x) = |x| - 4$



c. (They do) $y = |x + 2| + 3$

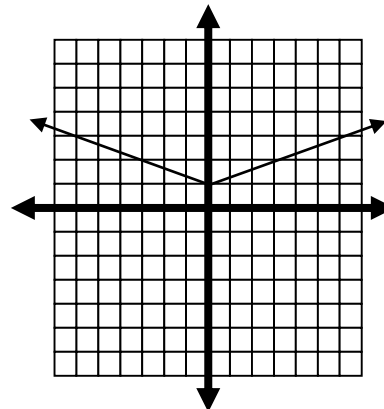


d. (You do) $y = -\frac{1}{2}|x|$



2. (I do) Without graphing, identify the vertex, axis of symmetry and transformations of $f(x) = -3|x - 1| + 4$ from the parent function $f(x) = |x|$.

3. (We do) Write an absolute value function for the graph.



You do: Practice 2-7: Complete your assignment on graph paper. Show your work.

Graph

1. $y = |x| + 4$

2. $y = |x + 2|$

3. $y = -|x + 1| - 3$

Without graphing, identify the vertex, axis of symmetry, and transformations from the parent function $f(x) = |x|$.

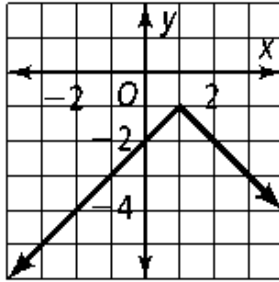
4. $y = 2|x + 1|$

5. $y = |x - 2| + 3$

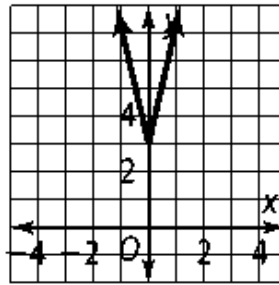
6. $y = -\frac{1}{2}|x| - 2$

Write an absolute value equation for the graph

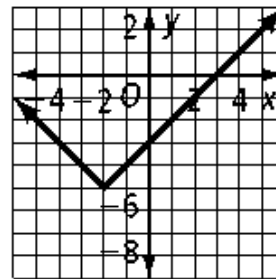
7.



8.



9. **Error Analysis.** For the graph to the right, you said the absolute value equation is $y = |x + 2| - 5$. Your friend said the equation is $y = |x - 2| + 5$. Which one of you is correct? What mistake did the other person make?



2-8 Two Variable Inequalities

Standards

A2.A.REI.D.6 (formerly A.REI.11) Explain why the x -coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the approximate solutions using technology.

Key Concepts

_____ -an inequality in two variables whose graph is a region of the coordinate plane that is bounded by a line.

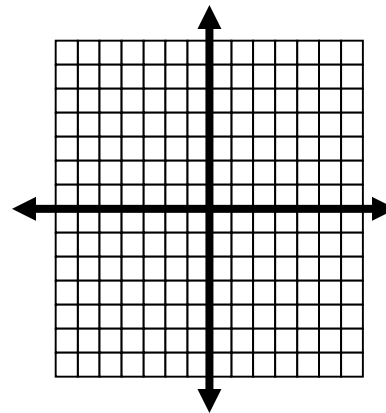
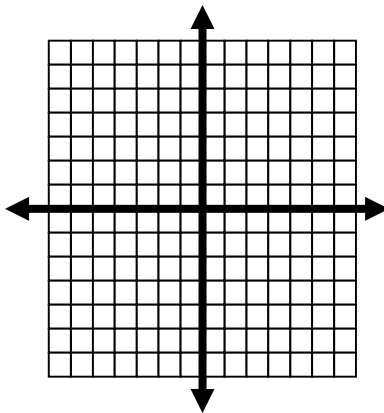
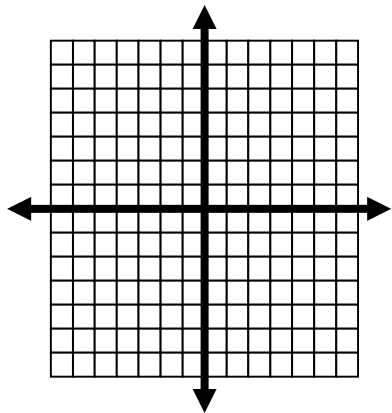
Examples

1. Graph each inequality

a. (I do) $y \leq 3x - 1$

b. (We do) $y > -\frac{1}{2}x + 3$

c. (You do) $1 + y < |x + 2|$



You do: Practice 2-8: Complete your assignment on graph paper Show all work.

Graph each inequality.

1. $y < x + 4$

2. $y \geq -3x - 1$

3. $y - 2 < 5x$

4. You want to buy some CDs that cost \$10 each and some DVDs that cost \$15 each and you have \$45 to spend.

a. Write an inequality to represent the situation, where x is the number of CDs you buy and y is the number of DVDs.

b. Graph the inequality.

c. **Reasoning** Can you buy 3 CDs and 2 DVDs? Explain.