

9.1 Making a Table of Values

GOAL

Create a table of values for a given linear relation.

1. Complete the table of values for each equation.

a)

n	1	2	3	4	5	6
$2n + 4$				12		

b)

n	1	2	3	4	5	6
$\frac{n}{2} - 1$						

2. A rectangle is three times wider than it is long.

- Write an equation that you can use to determine the length when you know the width.
- Write an equation that you can use to determine the perimeter when you know the width.
- Complete the table of values for the perimeters of rectangles with the given widths.

Width of rectangle (cm)	9	12	15	18	21	24
Perimeter of rectangle (cm)						

- Determine the perimeter of a rectangle with a width of 45 cm. Explain your steps.

At-Home Help

You can represent a linear situation using an equation and a **table of values**.

For example, lunch for up to 24 people costs \$2 for each person, plus \$4.

- Write an equation to represent this situation. Let n represent the number of people and c represent the total cost. The equation is $c = 2n + 4$.
- Complete the table of values. Substitute values for n into the equation to determine the values for c . The value of n cannot be greater than 24.

Number of people, n	Cost of lunch, c (\$)
4	12
8	20
12	28
16	36
20	44
24	52

9.2 Graphing Linear Relations

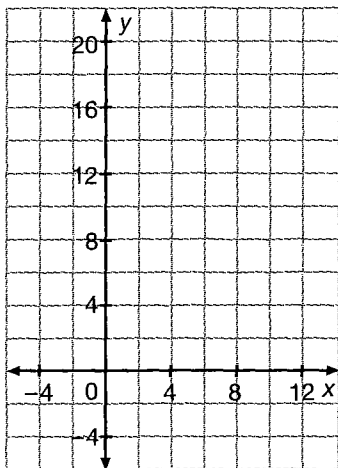
GOAL

Construct a graph from the equation of a given linear relation.

1. a) Complete the table of values.

$y = 4 + 3x$	
x	y
-2	
0	
2	
4	
6	

- b) Graph the points from your table on a Cartesian coordinate system.



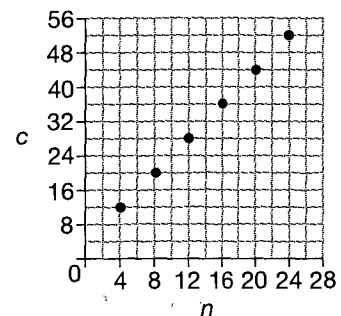
At-Home | Help

You can make a **graph** of a linear equation using a table of values.

For example, the table of values for $c = 2n + 4$ is shown.

n	c
4	12
8	20
12	28
16	36
24	52

- Plot n on the horizontal axis and c on the vertical axis.
- The n -axis will go from 0 to at least 24. The c -axis will go from 0 to at least 52.



9.3 Exploring Possible Values

GOAL

Explore possible values for variables in a given equation.

At her school's math competition, Ann is given the following problem. If she gets it right, her team advances to the finals. Ann may use two or more of the clues to help her solve the problem.

Problem: There is a cat and a dog. How old is each animal?

Clue 1: If you add the age of the cat and the dog together and multiply by 3, the answer is 42.

Clue 2: The sum of 3 times the age of the cat and 4 times the age of the dog is 45.

Clue 3: The sum of 4 times the age of the cat and 3 times the age of the dog is 53.

Clue 4: Half of the difference between the age of the cat and the age of the dog is 4.

1. Write an equation for each clue. Use c to represent the age of the cat. Use d to represent the age of the dog.

Clue 1:

Clue 2:

Clue 3:

Clue 4:

2. Use your equations from question 1 to solve the problem.
3. Choose new ages for the cat and the dog and create four new clues. Include the answers.

9.4 Drawing Diagrams to Represent Equations

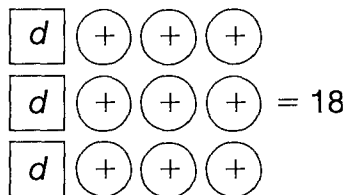
GOAL

Draw a diagram to determine the missing value in an ordered pair.

- Solve the equation using a diagram.

$$t = 2(n + 3), \text{ when } t = 20$$

- The diagram is the beginning of a solution to an equation. Write the equation. Then continue the solution.



- Which of these equations would you solve by drawing a diagram? Explain your choice(s) and show the diagrams that you would use.

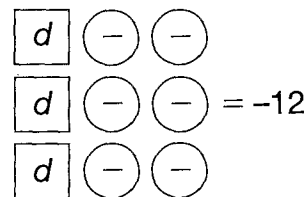
a) $y = 3x$, when $y = 18$

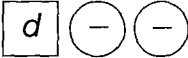
b) $y = 2x + 160$, when $y = 212$

c) $d = n - 10$, when $d = 0$

At-Home Help

You can solve an equation by drawing a **diagram**. For example, solve $t = 3(d + 2)$, when $t = -12$. Draw a picture to represent the equation.



3 groups of  equal -12 .

$3(-4) = -12$, so each group of

 must equal -4 .

If $d + 2 = -4$, then d must be -6 .

Check:

Left side: Right side:

$$3((-6) + 2) \quad -12$$

$$= 3(-4)$$

$$= -12$$

Left side = Right side ✓

9.5 Solving Equations with Counter Models

GOAL

Model and solve linear equations concretely.

You will need counters, cubes, and a balance mat.

1. Model and solve each equation.

a) $3x = -24$

b) $4x + 8 = 20$

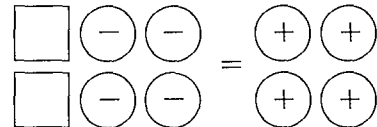
c) $4p + 3 = 15$

d) $3(m - 1) = 21$

At-Home Help

You can model and solve a linear equation, such as $2(c - 2) = 4$, using a **counter model**.

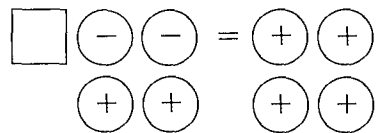
- Use counters to represent the known numbers and cubes to represent the unknown numbers. For example,



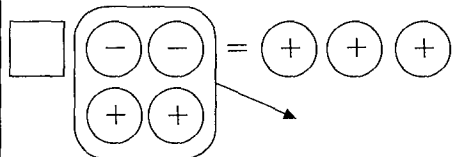
- Remember to do the same thing to each side of the equation to keep it balanced.



Divide by 2.



Add 2 to each side.



$c = 4$

- Substitute to check your answer.
 $2(4 - 2) = 2(2) = 4$

9.6 Solving Equations Symbolically

GOAL

Solve a linear equation symbolically.

1. Solve each equation and record your steps. Verify each solution.

a) $2x - 1 = 11$ Check

b) $-3(b - 8) = 6$ Check

c) $-4m + 7 = 51$ Check

d) $\frac{a}{4} = -5$ Check

2. Solve $5(x + 8) = 50$ in two different ways. Show what you did in each solution.

Solution 1

Solution 2

At-Home Help

You can solve a linear equation, such as $3x + 4 = 10$, symbolically.

- Isolate the unknown variable on one side of the equation by adding, subtracting, multiplying, or dividing.

For example,

$$3x + 4 = 10$$

$$3x + 4 - 4 = 10 - 4$$

$$3x = 6$$

$$\frac{3x}{3} = \frac{6}{3}$$

$$x = 2$$

- Substitute to check your answer.

$$3(2) + 4 = 6 + 4 = 10 \checkmark$$

9.7

Correcting Errors in Solutions

GOAL

Verify solutions to linear equations and identify and correct any errors.

1. Verify each solution. Identify and correct any errors.

a) $3x = 15$
 $3x - 3 = 15 - 3$
 $x = 12$

b) $m + 15 = 20$
 $m + 15 - 15 = 20 + 15$
 $m = 35$

c) $2x + 3 = 9$
 $2x + 3 - 3 = 9 + 3 - 3$
 $2x = 6$
 $\frac{2x}{2} = \frac{6}{2}$
 $x = 3$

d) $\frac{n}{4} + 3 = 10$
 $4\left(\frac{n}{4} + 3\right) = 4(10)$
 $n + 12 = 40$
 $n + 12 - 12 = 40 - 12$
 $n = 28$

At-Home Help

You can verify a solution by substituting it into the original equation. If the left side and right side are equal, the solution is correct.

If the solution is incorrect, carefully work through each line to find the error.

2. Solve each equation and verify your solution.

a) $6x + 4 = 28$

b) $\frac{a}{4} + 3 = -2$

3. When you solve an equation, why is it important to record your solution steps as well as the answer?

9.8 Solve Problems Using Logical Reasoning

GOAL

Solve problems that involve equations using logical reasoning.

Use logical reasoning to solve the following problems.

1. Sally's father is 45. He is 15 years older than twice Sally's age. How old is Sally?
2. Kathy is twice as old as Lisa. Three years from now, the sum of their ages will be 42. How old is Kathy?
3. Each week, Ben deposits the same amount of money into his bank account. Today, he has \$42 in his bank account. Three weeks from now, he will have \$210. How much money does Ben deposit each week?
4. John and his family are planning a trip to Vancouver, British Columbia. They are choosing between three options. Trip A lasts for 5 days. Trip B lasts for 7 days. Trip C costs \$2850 for 9 days. Trip C is twice the cost of Trip B, minus \$1750. Trip B is twice the cost of Trip A, minus \$200. How much does Trip A cost?

At-Home Help

When solving problems using logical reasoning, the following steps will help you:

1. **Understand the Problem**
Search the question for information necessary to solve the problem.
2. **Make a Plan**
Express the information in the form of an equation.
3. **Carry Out the Plan**
Solve the equation.
4. **Look Back**
Check your answer.

Circle the letter of the correct answer.

1. Which equation represents the statement “ k is equal to half of n added to 3 times n ”?

A. $\frac{1}{2}n = k + 3n$ B. $k = \frac{1}{2}n + 3$ C. $k = \frac{1}{2}n + 3n$ D. $k = \frac{1}{2}n + 4n$

2. Renee runs a dog-walking service. She charges a fee of \$5 per walk, plus \$1 for every 10 minutes of the walk. Which equation represents this information? (In each equation, t is the time in minutes and c is the cost in dollars.)

A. $c = \frac{t}{10} + 5$ B. $c = \frac{1}{10} + 5t$ C. $c = \frac{t}{10} + 5t$ D. $c = \frac{t}{10} - 3$

3. Which quadrant will not be included in the graph of $y = 2x + 4$?

A. Quadrant 1 B. Quadrant 2 C. Quadrant 3 D. Quadrant 4

4. What is the solution to $6x + 5 = y$, when $y = 41$?

A. $x = 5$ B. $x = 6$ C. $x = 3$ D. $x = 2$

5. What is the solution to $-2x + 2 = y$, when $y = 16$?

A. $x = 7$ B. $x = -7$ C. $x = 16$ D. $x = 14$

6. A 12-year-old boy is four times older than his brother. How old is his brother?

A. 3 years B. 4 years C. 6 years D. 8 years

7. Bowling costs \$5 per game, plus \$3 for shoe rental. Which equation represents this information?

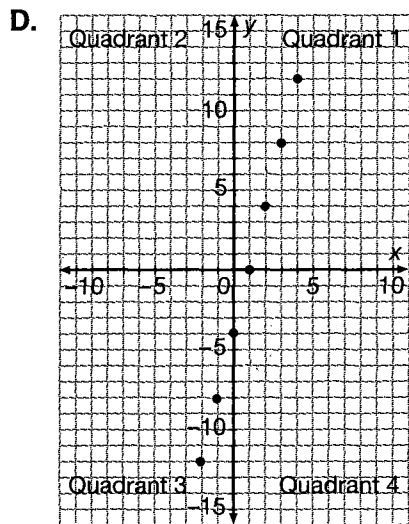
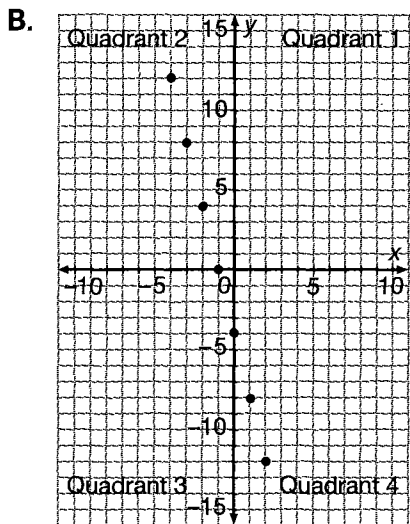
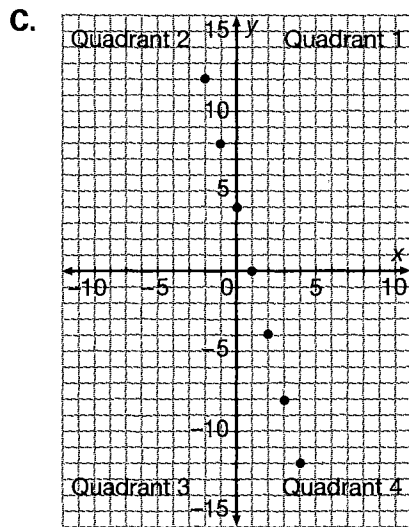
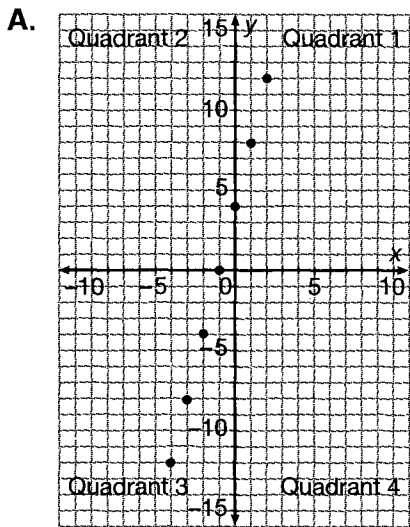
A. $y = 5x + 3$ B. $y = 3x + 5$ C. $5 = 5y + 3$ D. $x = 5 + 3y$

8. The diagram represents which equation?

$$\boxed{x} \boxed{x} \boxed{x} \boxed{x} \boxed{x} \boxed{x} \ominus \ominus = \oplus$$

A. $6x + 2 = 1$ B. $6x - 2 = 1$ C. $6x + 2y = 1$ D. $6x - 2y = 1$

9. Which graph represents the equation $y = -4x - 4$?



- 10.** Which equation represents the statement “four times two more than a number is 32”?
- A.** $4x + 2 = 32$ **B.** $2x + 4 = 32$ **C.** $4(x + 2) = 32$ **D.** $4(2x + 4) = 32$
- 11.** Mark is going to Montreal in 6 weeks. He has \$90 and the return airfare is \$480. How much must he save each week to pay for his trip?
- A.** \$45 **B.** \$40 **C.** \$65 **D.** \$60
- 12.** A Grade 8 class raised \$400 in a bake sale. They gave \$150 to an animal shelter and shared the rest of the money equally among 5 charities. How much money did each charity receive?
- A.** \$250 **B.** \$150 **C.** \$50 **D.** \$100