Review What You Know!

Vocabulary

Choose the best term from the box.

- equality
- operations
- inverse
- variable

1. Addition, subtraction, multiplication, and division are all __?__.

2. When both sides of an equation have the same value, they have __?__.

3. A __?__ is a letter or symbol that is used to represent an unknown value.

4. Operations that undo each other are called __?__ operations.

Multiplication Facts

Find each product.

5. 8×7 **6.** 6×9 **7.** 4×8

8. 3×9 **9.** 7×4 **10.** 5×3

Estimation

Estimate each product, sum, or difference.

11. $13 + 24$ **12.** $81 - 19$ **13.** 37×3

14. $68 - 31$ **15.** 27×2 **16.** $17 + 59$

Problem Solving

Writing to Explain Write an answer for the question.

17. Lin went to the store with $10.00. She bought a toothbrush for $4.59 and a tube of toothpaste for $3.29. Explain what you could do to find out how much change Lin will receive when she checks out.

Lesson
16-1

AF 1.1, Grade 6
Write and solve one-step
linear equations in one
variable.

Solving Addition and Subtraction Equations

How can you use addition and subtraction to solve equations?

In January 2005, there were 83 women in Congress. How many women were serving in the U.S. Senate?

Members of U.S. Congress	
January, 2005	
U.S. Senate	
Men	86
Women	
U.S. House of Representatives	
Men	367
Women	69

Other Examples

Addition Property of Equality:
You can add the same number to both sides of an equation and the sides remain equal.

Example:
$$9 - 4 = 5$$
$$9 - 4 + 2 = 5 + 2$$

Subtraction Property of Equality:
You can subtract the same number from both sides of an equation and the sides remain equal.

Example:
$$8 + 6 = 14$$
$$8 + 6 - 3 = 14 - 3$$

Operations that undo each other are inverse operations. Addition and subtraction have an inverse relationship.

Guided Practice*

Do you know HOW?

In **1** and **2**, what would you do to get each variable by itself on one side of the equation?

1. $x - 45 = 90$ **2.** $n + 23.4 = 36.9$

In **3** through **6**, use inverse operations and a property of equality to solve these equations.

3. $x + 13 = 42$ **4.** $x - 12 = 37$

**5.** $a + 8 = 37$ **6.** $b - 9 = 25$

Do you UNDERSTAND?

7. What could you do to check the answer in the example at the top of the page?

8. When finding the number of women in the Senate, why must 69 be subtracted from both sides of the equation?

9. Write a subtraction equation for the problem in the example at the top of the page.

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*For another example, see Set A on page 382.

Since Congress includes the Senate plus the House, you can write an addition equation. An equation is a number sentence that uses an equal sign to show that two expressions have the same value.

83	
x	69
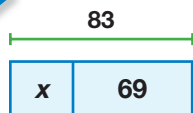
Let x = the number of women in the Senate.

Equation: $x + 69 = 83$.

To solve the equation, get the variable alone.

$$x + 69 = 83$$
$$x + 69 - 69 = 83 - 69$$
$$x = 83 - 69$$
$$x = 14$$

You can subtract 69 from both sides of the equation and the quantities on each side of the equal sign are still equal.

There were 14 women serving in the U.S. Senate in January, 2005.

Independent Practice

Solve each equation.

10. $d - 14 = 13$

11. $p + 31 = 52$

12. $c - 68 = 78$

13. $n + 70 = 265$

14. $y - 28 = 98$

15. $746 + t = 947$

16. $91 = 19 + m$

17. $75 = n - 39$

18. $k + 22.5 = 30$

Problem Solving

19. If there are 57 students in the school band and 29 of them are boys, how many girls are in the band?

20. Writing to Explain Why will the equations $x + 14 = 37$ and $x - 14 = 37$ have different solutions for x?

21. Draw It Draw a diagram to represent the equation $y + 18 = 73$.

22. In 2006, the California Senate had 40 members, of which 29 were men. Solve the equation $29 + x = 40$ to find the number of women in that Senate.

23. Think About the Process Which operation would you use to solve the equation $x - 17 = 23$?

    A Add 17   **C** Multiply by 17

    B Subtract 17   **D** Divide by 1

24. The Johnson family shared a spinach quiche for breakfast. Mom ate $\frac{1}{4}$, Dad ate $\frac{1}{3}$, and Julia ate $\frac{1}{4}$ of the quiche. How much of the quiche was not eaten?

25. The area of Lake Victoria in Africa is 26,828 square miles. The area of Lake Michigan in the U.S. is 22,539 square miles. Solve the equation $22,539 + x = 26,828$ to find how much larger Lake Victoria is than Lake Michigan.

Solving Multiplication and Division Equations

How can you use multiplication and division to solve equations?

Keef's scout troop is participating in a Pinewood Derby. The cars are sold by the case. How many cases should the scoutmaster buy for 32 boys?

4 cars in each case

Other Examples

Multiplication Property of Equality:
You can multiply both sides of an equation by the same nonzero number and the sides remain equal.

Example:

$$\frac{14}{2} = 7$$

$$\frac{14}{2} \times 2 = 7 \times 2$$

Division Property of Equality:
You can divide both sides of an equation by the same nonzero number and the sides remain equal.

Example:

$$6 \times 5 = 30$$

$$\frac{6 \times 5}{5} = \frac{30}{5}$$

Operations that undo each other are inverse operations. Multiplication and division have an inverse relationship.

Guided Practice*

Do you know HOW?

In **1** and **2**, what would you do to get each variable alone on one side of the equation?

1. $24n = 120$ **2.** $\frac{b}{7} = 42$

In **3** through **6**, use inverse operations and a property of equality to solve these equations.

3. $y \div 9 = 12$ **4.** $3m = 63$

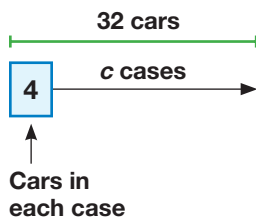**5.** $85 = 17r$ **6.** $24 = \frac{c}{3}$

Do you UNDERSTAND?

7. What could you do to check the answer in the example at the top of the page?

8. Write a division equation for the problem at the top.

9. In the example above, if there were 6 cars in a case, how many cases would the scoutmaster need to buy to be sure every scout had a car?

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For another example, see Set A on page 382.

Let c = the number of cases needed.

32 cars

4 → **c cases**

↑
**Cars in
each case**

Since each case contains 4 cars,
you can write the equation

$4c = 32$

To solve the equation, get the
variable alone.

$$4c = 32$$
$$\frac{4c}{4} = \frac{32}{4}$$
$$c = 8$$

You can divide both sides
of the equation by 4 and
the quantities on each
side of the equal sign are
still equal.

Tip *Remember that $\frac{4c}{4}$ is the same as
$4 \times c \div 4$.*

The scoutmaster should buy 8 cases of cars.

Independent Practice

Solve each equation.

10. $14d = 56$

11. $\frac{c}{8} = 64$

12. $45y = 135$

13. $184 = 23p$

14. $\frac{m}{5} = 12$

15. $8 = \frac{k}{30}$

16. $72 = 12t$

17. $14 = \frac{w}{7}$

Problem Solving

18. Geometry The sides of a pentagon
are 11 inches in length. What is the
perimeter of the pentagon?

19. Reasoning Randy divides 48 by 6 to
solve an equation for y. One side of the
equation is 48. Write the equation.

20. Martin is going on a 216-mile trip. If his
car gets 24 miles per gallon, how many
gallons of gas will he need for his trip?

21. Writing to Explain How could you use
mental math to find m in the equation
$279\left(\frac{m}{279}\right) = 72$?

22. Daria measured the length of three ants
in science class. They were $\frac{2}{3}$ inch, $\frac{3}{5}$ inch,
and $\frac{1}{4}$ inch. Which ant is the longest?

23. **Think About the Process** Which operation
would you use to solve the equation
$17x = 255$?

    A Add 17   **C** Multiply by 17

    B Subtract 17   **D** Divide by 17

24. Giraffes can grow to about 20 feet tall.
Some fifth-grade students can be about
5 feet tall. Solve the equation $5x = 20$ to
find how many times as tall a giraffe can
be as a fifth-grade student.

25. General Grant, a sequoia tree, is
273 feet tall. A typical Red Oak tree is
about 70 feet tall. Solve the equation
$70x = 280$ to find about how many
times as tall the General Grant is as a
typical Red Oak.
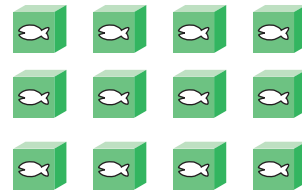
Problem Solving

Use Reasoning

Hands-On
unit cubes

Laurie has 12 fish in her aquarium. Half of the fish are yellow, $\frac{1}{3}$ of the fish are black, and the rest are orange. How many fish of each color does Laurie have?

Unit cubes can be used to represent the fish and solve the problem.

Guided Practice*

Do you know HOW?

1. The Lions soccer team scored 8 goals. Joe scored $\frac{1}{2}$ of the goals, and Carlos scored two fewer goals than Joe. How many goals did Joe score? How many did Carlos score?

2. Percy buys two items that cost a total of $90. One of the items cost $\frac{1}{3}$ of the total. What is the cost of each item?

Do you UNDERSTAND?

3. In the example above, how can you reason that there are 4 black fish?

4. How many of each color of fish would Laurie have if she had a total of 36 fish?

5. **Write a Problem** Write a real-life problem that involves fractions and can be solved by using reasoning.

Independent Practice

For **6** through **10**, use reasoning to solve.

6. Freemont School tried a new lunch menu for 15 days. For $\frac{1}{3}$ of the days, sandwiches were served. For $\frac{2}{5}$ of the days, hot entrees were served. The rest of the days pizzas were served. How many days for each kind of lunch was served?

7. Mr. Reyes has 24 books. Science fiction makes up $\frac{1}{4}$ of the books, and he has twice as many mystery books as science fiction. The rest are fiction. How many books are science fiction? How many are mystery?

Stuck? Try this....

- What do I know?
- What am I asked to find?
- What diagram can I use to help understand the problem?
- Can I use addition, subtraction, multiplication, or division?
- Is all of my work correct?
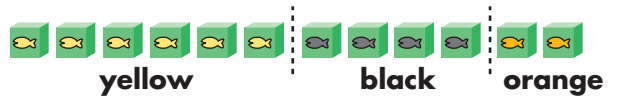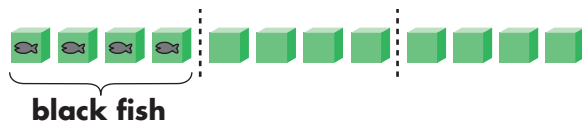- Did I answer the right question?
- Is my answer reasonable?

For another example, see Set B on page 382.

Use reasoning to make conclusions.

Half of the fish are yellow. Half of 12 is 6, so there are 6 yellow fish.
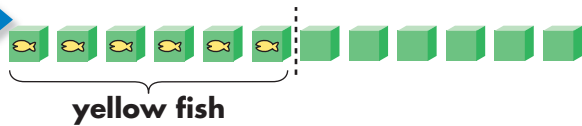
yellow fish

One third of the fish are black. One third of 12 is 4, so there are 4 black fish.

black fish

yellow   black   orange

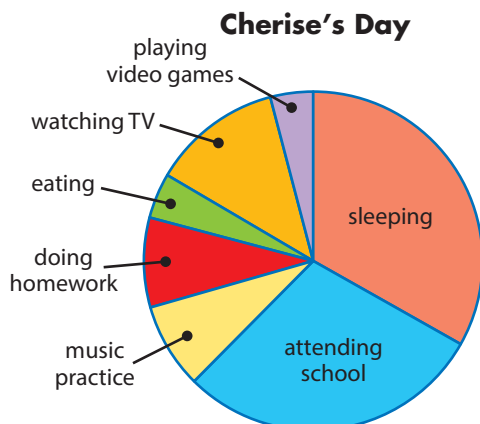Since $6 + 4 = 10$ and $12 - 10 = 2$, the other two fish are orange.

There are 6 yellow fish, 4 black fish, and 2 orange fish.

Look back and check your answer. Since $6 + 4 + 2 = 12$, the answer is reasonable.

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8. Ms. Clark has a box of minerals. In the box there are 4 diamonds. There are also 3 times as many rubies as there are sapphires. The box has 12 minerals in all. How many of each type of mineral are in the box?

10. Kathy, Paul, Sean, and Kelly each play a different instrument. The instruments they play are drums, guitar, bass, and keyboard. Kelly plays the drums, and Paul is not playing the keyboard. If Sean plays the bass, what instrument does each play?

11. Writing to Explain Why is the amount of time Cherise spends sleeping more than $\frac{1}{4}$ of her day? What benchmark fraction is this amount closer to?

Cherise's Day

playing video games
watching TV
eating
doing homework
music practice
sleeping
attending school

9. Rosie said she did not know how to respond to the following survey question. Explain why.

How old are you?
Circle one.

A   Under 10

B   10–12

C   12–15

D   Over 15

12. The blue whale is the world's largest animal. An average-sized adult is 80 feet long and weighs about 120 tons. How many pounds does the blue whale weigh? Hint: 1 ton = 2,000 pounds.

13. If a human heart beats 70 times per minute, how many times will it beat in one hour?

14. Two drinking glasses hold the same amount of water. If these two glasses hold a total of 500 milliliters, how many milliliters will three of these hold?

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Patterns and Equations

How can you find a rule for a pattern and complete a table?

Dots were used to draw the figures below.

How many dots would be in the 20th figure?

Which figure would have 100 dots?

| Figure 1 | Figure 2 | Figure 3 | Figure 4 |

Another Example **How can you find a rule?**

Which equation gives a rule that states the relationship between each pair of values in the table below?

x	22	34	35	40	▨
y	11	23	24	▨	47

A $y = \frac{x}{2}$ **B** $y = x + 11$ **C** $y = x - 11$ **D** $y = 2x$

Step 1 State the relationship between the first pair of numbers.
y is half of *x* or *y* is 11 less than *x*.

Step 2 Which relationship is also true for the second pair of numbers?
y is 11 less than *x*.

Step 3 Check that the relationship is also true for other pairs of numbers.

Step 4 The equation for Choice **C** gives a rule for the relationship between *x* and *y* in the table.
$y = x - 11$

Explain It

1. If a rule describes the relationship for one pair of numbers in a table, does it always describe every pair in the same table? Explain your answer.

2. If you know the rule for a table, how can you add pairs of numbers to the table?

Make a table.

Figure number (n)	Total number of dots (d)
1	4
2	8
3	12
4	16
20	⬜
⬜	100

Look for a pattern in the relationship between the figure number and the total number of dots in the figure.

Express the pattern as a rule.

Multiply the figure number by 4

Express the pattern as an equation.

$d = 4n$

Tip *4n means 4 × n.*

Use the equation to find the missing numbers in the table.

$d = 4 \times 20$

$d = 80$

Figure 20 has 80 dots.

$100 = 4 \times n$

$\dfrac{100}{4} = \dfrac{4 \times n}{4}$

$25 = n$

Figure 25 has 100 dots.

Guided Practice*

Do you know HOW?

x	2	4	6	8	⬜
y	14	28	42	⬜	70

1. Write a rule for this table in words.

2. Write an equation for the rule.

3. What is a missing *y*-value?

4. What is a missing *x*-value?

Do you UNDERSTAND?

5. In the example above, how do you know the table of values is represented by the equation $d = 4n$?

6. If the *n*-value is 36, what is a *d*-value?

7. Write and solve equations to find the missing numbers in the table in Another Example.

Independent Practice

In exercises **8** through **11**, find a rule for each table. Write an equation for each rule.

8.

x	y
0	16
20	36
36	52
42	58

9.

x	y
25	17
32	24
46	38
59	51

10.

x	y
6	2
12	4
24	8
33	11

11.

x	y
5	30
3	18
9	54
7	42

In **12** through **15**, write an equation for each table and find the missing values for *x* and *y*.

12.

x	y
12	6
10	4
8	▢
13	7
▢	13

13.

x	y
48	96
30	60
25	50
▢	64
14	▢

14.

x	y
30	3
80	8
170	17
▢	25
320	▢

15.

x	y
3	17
7	21
6	▢
9	23
▢	26

Problem Solving

16. Number Sense In the equation $y = 12x$, if *y* is to equal 0, what is the value of *x*?

17. Write an equation that will give the answer $y = 3$ when $x = 7$.

18. The Autobahn in Germany is known around the world. Along most of the Autobahn, there is an advised speed limit of 130 km/h. How many hours would a car need to travel at the advised speed limit to go 520 km?

19. Geometry The triangle below is an isosceles triangle. What is the perimeter of the triangle?
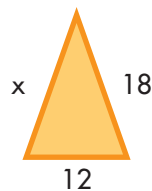
For **20** through **22**, use the table at the right.

20. During which month was the electric bill the highest?

21. During which month was the electric bill the lowest?

22. What was the total cost of electricity for the 12 months?

Month	Electric Bill ($)	Month	Electric Bill ($)
January	58	July	89
February	52	August	88
March	46	September	74
April	47	October	63
May	44	November	63
June	75	December	57

23. Number Sense In the equation $y = x - 6$, which positive numbers would you use for *x* if you wanted $y < 0$?

24. Which pair of values could appear in a table of values for the equation $y = 2x$?

A $x = 2, y = 5$ **C** $x = 5, y = 10$

B $x = 4, y = 6$ **D** $x = 0, y = 2$

Find each difference.

1. $^-5 - {}^+3$

2. $^+2 - {}^+9$

3. $^-6 - {}^+5$

4. $^-2 - {}^+4$

5. $^-10 - {}^+8$

6. $^-25 - {}^+5$

Solve each equation for z.

7. $25 = z - 22$

8. $z - 192 = 24$

9. $z - 4 = 312$

10. $z - 19 = 4$

11. $150 = z - 225$

12. $z - 22 = 222$

13. $15 = z - 342$

Solve each equation for c.

14. $12c = 96$

15. $10c = 90$

16. $8c = 64$

17. $5c = 35$

18. $3c = 27$

19. $16c = 32$

20. $7c = 28$

21. $25c = 100$

Error Search Find each value of v that is not correct. Write it correctly and explain the error.

22. $55 + v = 132$
$v = 187$

23. $v - 12 = 111$
$v = 123$

24. $48 = 8v$
$v = 7$

25. $55 = 22 + v$
$v = 33$

Number Sense

Estimating and Reasoning Write whether each statement is true or false. Explain your reasoning.

26. The g in the equation $14 + g = 19$ is equal to 13.

27. The quotient of $45,876 \div 32$ is closer to 2,000 than 1,000.

28. The sum of 8,143 and 25,709 is between 33,000 and 35,000.

29. The difference $^-3 - {}^+8$ is positive.

30. The expression $12 - 8 \div 4 + 6$ equals 16.

31. The product of $4\frac{7}{8} \times 3$ is closer to 15 than 12.

More Patterns and Equations

How can you extend patterns given by an equation involving two operations?

How much will a family of four pay for tickets and parking when they go to the Medieval Fair?

Medieval Fair

Ticket
$8⁵⁰
All Ages

Parking $5.00

Guided Practice*

Do you know HOW?

1. Choose the equation that matches the table.

x	y
0	4(0) + 6
1	4(1) + 6
2	4(2) + 6
3	4(3) + 6

A $y = x + 6$

B $x = 4y + 6$

C $x = 4 + 6y$

D $y = 4x + 6$

2. Write a rule for the table above using words.

Do you UNDERSTAND?

3. In the example above, why is the equation $8.50n + 5 = c$ instead of $8.50n = c$?

4. Writing to Explain Tell two ways that you could find the cost for the family of four to go to the fair.

5. A group of 8 people went to the fair in a mini-van. How much did they pay for tickets and parking?

Independent Practice

In **6** and **7**, choose the equation that best matches each table.

6.

x	y
5	6(5 + 4)
6	6(6 + 4)
7	6(7 + 4)
8	6(8 + 4)

A $y = 6x + 4$

B $y = 6(x + 4)$

C $x = 6y + 4$

D $x = 6(y + 4)$

7.

x	y
3	2(3) − 5
5	2(5) − 5
7	2(7) − 5
9	2(9) − 5

A $y = 2x − 5$

B $y = 5x − 2$

C $x = 2y − 5$

D $x = y − 5$

For another example, see Set C on page 383.

Step 1

State a rule to find how much a family would pay to go to the Fair.

Multiply $8.50 by the number of people, and then add $5.00.

Step 2

Make a table and find a pattern.

Number of people (n)	Cost (c)
1	$8.50 \times 1 + 5.00$
2	$8.50 \times 2 + 5.00$
3	$8.50 \times 3 + 5.00$

Step 3

Write an equation.

$c = 8.50n + 5.00$

For a family of four:

$c = 8.50(4) + 5.00$

$c = 39$

A family of four would pay $39.00 to go to the Fair.

Independent Practice

In **8** through **10**, choose the equation that matches each table.

8.

x	y
2	12
4	16
6	20
8	24

A $x + 10 = y$
B $6x = y$
C $2x + 8 = y$
D $2x + 10 = y$

9.

x	y
1	9
4	21
7	33
10	45

A $y = 9x$
B $y = 4x + 5$
C $y = 5x + 1$
D $y = x + 9$

10.

x	y
5	11
6	14
7	17
8	20

A $x + 6 = y$
B $2x + 1 = y$
C $3x - 5 = y$
D $3x - 4 = y$

Problem Solving

11. Estimation Admission to the skating rink is $4.75 for adults and $2.75 for children. About how much money should Marcy bring to make sure she and her 2 children can get in to skate?

12. Geometry Anji's room is 12 feet by 9 feet. She purchased 95 square feet of carpet for her room. Does she have enough carpet to cover the entire floor in her room? Explain your answer.

For **13** and **14**, use the table at the right.

13. Mario purchased 3 adult tickets and 1 senior ticket. How much did he pay?

14. Joe took his four grandchildren to the movies. Write an equation to find the total cost of the children's tickets plus his senior ticket. How much did he pay?

Cinema Ticket Prices

|	
Adult Admission	$6.50
Children (under 12)	$4.75
Seniors	$3.75

Lesson
16-6

AF 1.1, Grade 6
Write and solve one-step
linear equations in one
variable.
Also **MR 2.3, 3.0**

Problem Solving

Draw a Picture and Write an Equation

At an art fair, Dean sold different types of paintings. The price of a portrait is $125 more than the price of a still-life painting. What is the price of a still-life painting?
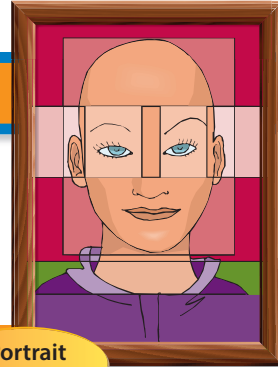
Still Life
$?

Portrait
$210.00

Landscape
$135.00

Another Example

Dean also sold 8 pen-and-ink sketches at the art fair. All the sketches were the same price. He made $196 on the sale of the sketches. What was the price for each sketch?

Read and Understand

What do you know?   Dean sold 8 sketches and made $196.

What are you trying to find?   The price of one sketch

Plan

What strategy will you use?   Write an equation. A diagram can help to picture how the information is related.

Let n = the price of one sketch.

$196

| n | n | n | n | n | n | n | n |

$8 \times n = 196$
$(8 \times n) \div 8 = 196 \div 8$
$n = 24.50$

Divide both sides of the equation by 8 to get n alone on one side of the equation.

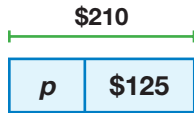Each sketch was sold for $24.50.

Explain It

1. **Reasonableness** Is $24.50 a reasonable answer?

2. How does the diagram above show the information in the problem?

Plan

Choose a variable for the unknown quantity.

Let p = price of a still-life painting.

Use a diagram to picture the relationship between the prices.

	$210	
p	$125	

Write an equation.

$p + 125 = 210$

Solve

Solve the equation.

$$p + 125 = 210$$
$$p + 125 - 125 = 210 - 125$$
$$p = 85$$

Subtract 125 from both sides to get the variable alone.

The price of a still-life painting is $85.

Look Back

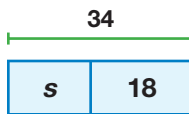Estimate to see if the answer makes sense.

Round 85 to 100.

$100 + 125 = 225$, which is close to 210.

The price of $85 is reasonable.

Guided Practice*

Do you know HOW?

1. Use the picture to write and solve an equation.

	34	
s	18	

Do you UNDERSTAND?

2. **Write a Problem** Write a real-world problem that you can solve by drawing a picture and writing an addition or subtraction equation.
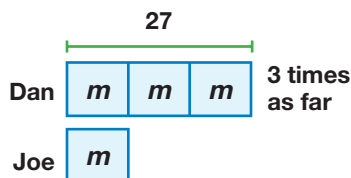

Independent Practice

In **3** through **5**, use each picture to write and solve each equation.

3. Allen read 5 more pages today than he did yesterday. Today he read 42 pages. How many pages did Allen read yesterday?

42 pages

p	5
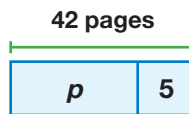
4. Dan biked 27 miles yesterday. If he biked 3 times as far as Joe, how far did Joe bike?

27

Dan | m | m | m | 3 times as far

Joe | m |

5. Max is saving $15 per month to buy a desk that costs $285. How many months will he need to save?
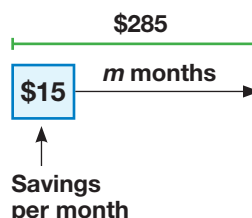
$285

$15 — m months

Savings per month

Stuck? Try this....

- What do I know?
- What am I asked to find?
- What diagram can I use to help understand the problem?
- Can I use addition, subtraction, multiplication, or division?
- Is all of my work correct?
- Did I answer the right question?
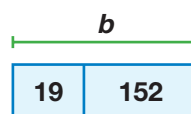- Is my answer reasonable?

For **6** through **8**, draw a picture, write and solve an equation to answer the question.

6. Kieko and Linda sold a total of 124 calendars. Kieko sold 57 of them. How many calendars did Linda sell?

7. Carmen has saved $13 to buy a DVD that costs $29. How much more money does Carmen need to save?

8. Jonathan loaned his brother $22 and had $126 left. How much money did Jonathan have before he loaned the money?

9. Writing to Explain Caryn drew this picture and wrote this equation to represent the problem below.

A zoo has 19 more species of fish than birds. There are 152 species of fish. How many species of birds does the zoo have?

$b - 19 = 152$

Is Caryn correct? Explain your answer.

10. Camille used a coupon to pay for a movie ticket. The original cost of the ticket was $6.50, but Camille only paid $4. Write an equation and solve it to find how much the coupon was worth.

11. Orlando saved $520 in 1 year. He saved $330 in the last 4 months. Write and solve an equation to find how much Orlando saved in the first 8 months.

12. Dean also does abstract paintings. He charges $85 less than the price of a portrait. He charges $210 for a portrait. Write and solve an equation to find the price of one of Dean's abstract paintings.

13. Forests once covered about $\frac{1}{2}$ of Earth's land surface. Today, about $\frac{2}{5}$ of Earth's original forest areas remain untouched and undisturbed. What fraction of Earth's land surface is covered by forests today?

Think About the Process

14. A total of 44 adults are going on a field trip with the class. If 14 of the adults are men, how many are women? Which of the following equations gives the number of women?

A $14 + 44 = w$

B $w - 14 = 44$

C $14 + w = 44$

D $w - 44 = 14$

15. Tony is running a 10-kilometer race. He just reached the 4-kilometer marker. Which of the following equations can you use to find out how many more kilometers he needs to run?

A $k - 4 = 10$

B $4 + k = 10$

C $4 - k = 10$

D $10 + 4 = k$

Algebra Connections

Solution Pairs

Remember that an equation is a number sentence that uses an equal sign to show that two expressions have the same value.

When two variables occur in an equation, each variable can be replaced with a different number. When the two replacements make a true equation, the two replacements form a **solution pair**.

> **Example**: Do $x = 12$ and $y = 8$ form a solution pair for $x = y + 4$?
>
> Substitute the given values for x and y into the equation.
>
> Replacing x with 12 and y with 8 gives $12 = 8 + 4$, or $12 = 12$. The equation is true.
>
> So, $x = 12$ and $y = 8$ form a solution pair for $x = y + 4$.

For **1** through **15**, use the table of values at the right. For each equation, determine if the given replacements form a solution pair. Write yes or no.

1. $y + z = 10$
2. $b = x + 15$
3. $b = a + 15$
4. $a + x = 40$
5. $40 - c = x$
6. $c - x = 6$
7. $b - y = 43$
8. $b = 99 - z$
9. $60 - y = b$
10. $63 = b - c$
11. $20 + z = c$
12. $10 - y = z$
13. $20 = x + y$
14. $b + c = 58$
15. $a + b = 85$

Table of Values
$a = 30$
$b = 45$
$c = 18$
$x = 12$
$y = 8$
$z = 2$

For **16** through **17**, refer to the table at the right.

16. The cost of an adult ticket is equal to twice the cost of a child's ticket.
    So, $a = 2 \times c$. Find two different pairs of values for a and c to make the equation true.

17. An adult ticket costs \$3 more than a student ticket. So $a = s + 3$. Find two different pairs of values for a and s to make the equation true.

Cost of Museum Tickets

Ticket	Price
Child	c
Adult	a
Student	s
Early Bird	e

1. On average, residents of the United Kingdom have 28 vacation days each year, 14 fewer than the average in Italy. Solve the equation $n - 14 = 28$ to find n, the average number of vacation days in Italy. (16-1)

A $n = 2$

B $n = 14$

C $n = 42$

D $n = 49$

2. Which equation could be used to represent the table shown? (16-4)

n	m
10	0
12	2
15	5
19	9

A $m = \frac{n}{10}$

B $m = 10 - n$

C $m = n + 10$

D $m = n - 10$

3. An African elephant can eat up to 4,200 pounds of food in a week. Solve the equation $7n = 4,200$ to find n, the pounds of food it can eat in a day. (16-2)

A $n = 60$

B $n = 600$

C $n = 700$

D $n = 29,400$

4. Which equation could be used to represent the table shown? (16-4)

x	y
20	40
13	26
12	24
5	10

A $y = 2x$

B $y = x + 20$

C $y = \frac{x}{2}$

D $y = 3x$

5. Which equation could be used to represent the table shown? (16-5)

p	q
4	8
6	14
8	20

A $q = 2p$

B $q = 3p - 4$

C $q = 3p + 4$

D $q = 2p + 4$

6. On a trip to the United Kingdom, Kameko exchanged currency as shown in the table. How many British pounds could Kameko get for 38 U.S. dollars? (16-4)

U.S. Dollars	British Pounds
8	4
14	7
20	10

A 19

B 28

C 34

D 76

7. The United Kingdom, Denmark, and Norway have a total of 20 territories. Norway has $\frac{1}{5}$ as many territories as the United Kingdom. Denmark has 2 territories. How many territories does Norway have? (16-3)

A 2

B 3

C 5

D 6

8. What step can be taken to get the *x* by itself on one side in the equation $x - 13 = 102$? (16-1)

   A Add 13 to both sides of the equation.

   B Subtract 13 from both sides of the equation.

   C Multiply both sides of the equation by 13.

   D Divide both sides of the equation by 13.

9. What step can be taken to get the variable *m* alone on one side of the equation $\frac{m}{5} = 25$? (16-2)

   A Add 5 to both sides of the equation.

   B Subtract 5 from both sides of the equation.

   C Multiply both sides of the equation by 5.

   D Divide both sides of the equation by 5.

10. What value will complete the table shown? (16-5)

x	y = 4x − 23	y
7	y = 4(7) − 23	5
9	y = 4(9) − 23	▢

   A 13

   B 28

   C 36

   D 56

11. For his recital, Alberto chose a song with 112 measures. The song was divided into 7 movements, or parts, each with the same number of measures. Which of the following can be used to find, *m*, the number of measures in each movement? (16-6)

112 measures

m	*m*	*m*	*m*	*m*	*m*	*m*

↑
**Measures in
each movement**
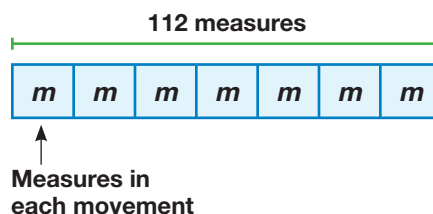
   A $m + 7 = 112$

   B $m - 7 = 112$

   C $7m = 112$

   D $\frac{m}{7} = 112$

12. The table shows the total number of lawns, *L*, that Saul has mowed after *w* weeks. Which equation could be used to represent the relationship in the table? (16-4)

Number of weeks, *w*	Number mowed, *L*
1	14
2	28
3	42

   A $L = \frac{14}{w}$

   B $L = \frac{w}{14}$

   C $L = w + 13$

   D $L = 14w$

Reteaching

Set A, pages 364–367

To solve an equation, get the variable alone on one side of the equation.

Solve: $x + 15 = 32$

To get a variable alone, undo what was done to it.

Since 15 is added to x, *subtract 15*.

Solve the equation.

$$x + 15 = 32$$
$$x + 15 - 15 = 32 - 15$$
$$x = 32 - 15$$
$$x = 17$$

To keep the sides of the equation equal, subtract 15 from both sides.

Remember that addition and subtraction, and multiplication and division, undo each other. What operation will get the variable alone on one side of each equation?

1. $a - 17 = 9$ **2.** $3n = 36$

3. $57 + c = 93$ **4.** $\frac{x}{4} = 19$

5. $18b = 108$ **6.** $27 = m - 65$

Solve each equation.

7. $d + 32 = 97$ **8.** $r - 14 = 49$

9. $72 = h - 25$ **10.** $n + 31 = 57$

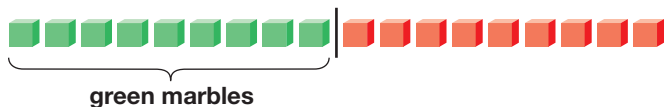**11.** $12b = 144$ **12.** $\frac{m}{10} = 12$

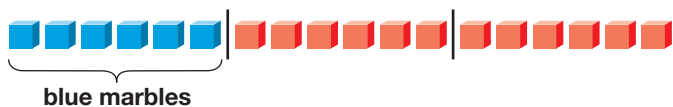**13.** $250 = 25x$ **14.** $30 = \frac{w}{6}$

Set B, pages 368–369

Use reasoning to solve problems.

Carlos has 18 marbles. $\frac{1}{2}$ of them are green, $\frac{1}{3}$ of them are blue, and the rest are red. How many marbles of each color does he have?

Unit cubes can be used to show the marbles and solve the problem.

green marbles

$\frac{1}{2}$ of 18 is 9.

blue marbles

$\frac{1}{3}$ of 18 is 6.

Since 9 marbles are green and 6 marbles are blue, the 3 remaining marbles are red.

Remember that using objects or making a table can help you reason through a problem.

1. Alvin has an insect collection. He has 10 insects in all. $\frac{1}{2}$ of the insects are ladybugs and $\frac{1}{5}$ of the insects are grasshoppers. The rest are crickets. How many of each insect are in his collection?

2. Allie, Tia, and Carla each live in a different city: Los Angeles, Chicago, or Dallas. Tia does not live in Texas. Carla does not live in California. Allie lives in Illinois. In which city does each girl live?

Set C, pages 370–372, 374–375

Write an equation for the table.

x	y	What can be done to x to get y?
4	12	$x + 8 = y$, or $3x = y$
8	16	$x + 8 = y$, or $2x = y$
12	20	$x + 8 = y$
16	24	$x + 8 = y$

The equation $x + 8 = y$ is true for all of the pairs in the table.

Choose the equation that matches the table.

x	y		
2	2	**A** $3y - 4 = x$	Replace x with the given values to see which equation gives the correct y-values.
3	5	**B** $3x - 4 = y$	
4	8	**C** $3(x - 4) = y$	
5	11	**D** $3(y - 4) = x$	

The equation $3x - 4 = y$ matches the table.

Remember that the same equation must be true for each pair of numbers in the table.

Write an equation for each table.

1.

x	y
16	4
20	8
24	12
36	24

2.

x	y
8	1
16	2
24	3
32	4

3. Choose the equation that matches the table.

x	y		
2	9	**A** $2(y + 5) = x$	
4	13	**B** $2(x + 5) = y$	
6	17	**C** $2x + 5 = y$	
8	21	**D** $2y + 5 = x$	

Set D, pages 376–378

A flower shop has 98 roses arranged in 7 vases. How many roses are in each vase?

Draw a diagram.

Let r = roses in each vase.

98 roses

r	r	r	r	r	r	r

↑
Roses in each vase
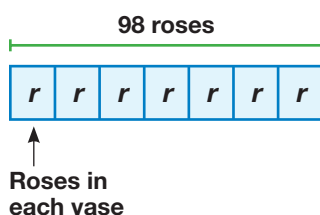
Write and solve an equation.

$$7r = 98$$
$$(7 \times r) \div 7 = 98 \div 7$$
$$r = 14$$

There are 14 roses in each vase.

Remember that a diagram or equation can help you.

1. The 5 members of the Wyler family paid $112.50 for admission to a water park. What was the price of each ticket?

2. Tom gave his sister $25 and had $45 left. How much did he have before he gave her the money?