

6th Grade Math

Monday, April 20 – Lesson 8-3, Solving Percent Problems

Tuesday, April 21 – Lesson 9-3, Order of Operations

Wednesday, April 22 – Lesson 10-2, Evaluating Expressions

Thursday, April 23 – Lesson 11-1, Writing Equations to Represent Situations

Friday, April 24 – Lesson 11-2, Addition and Subtraction Equations

LESSON
8-3

Solving Percent Problems

Reteach

You can use this proportion to solve percent problems.

$$\frac{\text{part}}{\text{total}} = \frac{\text{percent}}{100}$$

percent is always out of 100!
is
of

9 is what percent of 12?
Think: part unknown total

The number following "of" is the total.

30% of what number is 24?
Think: percent unknown part

$$\frac{9}{12} = \frac{x}{100}$$

$$12 \cdot x = 9 \cdot 100$$

$$12x = 900$$

$$\frac{12x}{12} = \frac{900}{12}$$

$$x = 75$$

So, 9 is 75% of 12.

$$\frac{24}{x} = \frac{30}{100}$$

$$30 \cdot x = 24 \cdot 100$$

$$30x = 2,400$$

$$\frac{30x}{30} = \frac{2,400}{30}$$

$$x = 80$$

So, 30% of 80 is 24.

Solve.

1. What percent of 25 is 14?

is a. part = 14

of b. total = 25

c. percent = X or we do not know yet.

d. Write and solve the proportion.

$$\frac{14}{25} = \frac{x}{100}$$

$$14 \cdot 4 = 56$$

56%

Answer: 56% of 25 is 14.

2. 80% of what number is 16?

is a. part = 16

of b. total = X

c. percent = 80

d. Write and solve the proportion.

$$\frac{16}{x} = \frac{80}{100}$$

$$100 \div 5 = 20$$

Answer: 80% of 20 is 16.

~~3. What percent of 20 is 11?~~

~~4. 18 is 45% of what number?~~

5. 15 is what percent of 5?

Cross mult. & divide
examples:
 $1500 \div 5 = 300$
300%

~~$$\frac{15}{5} = \frac{x}{100}$$~~

$$x \cdot 5 = 15 \cdot 100$$

$$x \cdot 5 = 1500$$

$$\div 5 \quad \div 5$$

6. 75% of what number is 105?

$$\frac{105}{x} = \frac{75}{100}$$

$$x \cdot 75$$

$$x \cdot 75 = 105 \cdot 100$$

$$x \cdot 75 = 10500$$

$$\div 75 \quad \div 75$$

$$x = 140$$

LESSON
8-3

Solving Percent Problems

Practice and Problem Solving: A/B

Solve.

1. 22 students is ____% of 55.
2. 24 red marbles is 40% of ____ marbles.
3. 15% of \$9 is \$_____.
4. 12 is ____ % of 200.
5. Yesterday, Bethany sent 60 text messages. She said that 15% of those messages were to her best friend. How many text messages did Bethany send to her friend yesterday?

6. In a survey, 27% of the people chose salads over a meat dish. In all, 81 people chose salads. How many people were in the survey?

7. The sales tax on a \$350 computer is \$22.75. Find the sales tax rate.

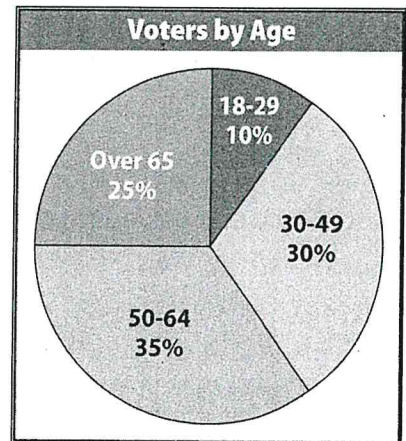
Use the circle graph to complete Exercises 8–11.

8. If 6,000 people voted in the election, how many were from 18 to 29 years old?

9. If 12,000 people voted in the election, how many were from 50 to 64 years old?

10. If 596 people voted in the election, how many were over 65 years old?

11. Suppose that Sahil knows that 45 people with ages of 18 to 29 voted. Without using a calculator, he quickly says then 135 people with ages of 30 to 49 voted. Is he correct? How might Sahil have come up with his answer so quickly?



LESSON
8-3

Solving Percent Problems

Practice and Problem Solving: A/B

Solved on next page!

Solve.

- 22 students is 40% of 55.
- 24 red marbles is 40% of 60 marbles.
- 15% of \$9 is \$ 1.35.
- 12 is 6 % of 200.
- Yesterday, Bethany sent 60 text messages. She said that 15% of those messages were to her best friend. How many text messages did Bethany send to her friend yesterday?

9 text messages

- In a survey, 27% of the people chose salads over a meat dish. In all, 81 people chose salads. How many people were in the survey?

300 people

- The sales tax on a \$350 computer is \$22.75. Find the sales tax rate.

6.5%

Use the circle graph to complete Exercises 8–11.

- If 6,000 people voted in the election, how many were from 18 to 29 years old?

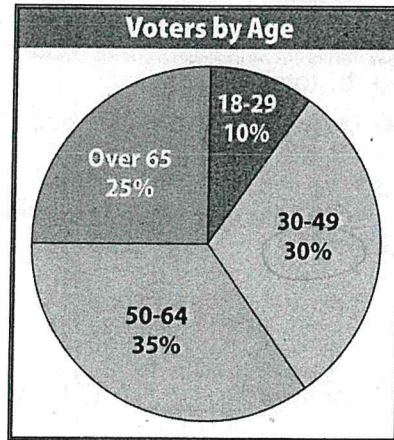
600

- If 12,000 people voted in the election, how many were from 50 to 64 years old?

4,200

- If 596 people voted in the election, how many were over 65 years old?

149



- Suppose that Sahil knows that 45 people with ages of 18 to 29 voted. Without using a calculator, he quickly says then 135 people with ages of 30 to 49 voted. Is he correct? How might Sahil have come up with his answer so quickly?

18-29 age is 10% and we know 45 people
30-49 age is 30%, so we can multiply
45 and 3 to get a quick answer.

8-3 Key #1-10 pg. 53

is
of

1.) ~~$\frac{22}{55} = \frac{x}{100}$~~

2.) $\frac{24}{x} = \frac{40}{100}$

3.) $\frac{15}{100} = \frac{x}{9}$

$22 \cdot 100 = x \cdot 55$

$100 \cdot 24 = x \cdot 40$

$15 \cdot 9 = x \cdot 100$

$\frac{2200}{\div 55} = \frac{x \cdot 55}{\div 55}$

$\frac{\quad}{\div 40} \quad \frac{\quad}{\div 40}$

$\frac{135}{\div 100} = \frac{x \cdot 100}{\div 100}$

$\div 55 \quad \div 55$

$60 = x$

$\div 100 \quad \div 100$

$40 = x$

$1.35 = x$

4.) $\frac{12}{200} = \frac{x}{100}$
 $\xrightarrow{\div 2}$
 $\div 2$

5.) best friend
total

$\frac{x}{60} = \frac{15}{100}$

6.) $\frac{27}{100} = \frac{81}{x}$
 $\xrightarrow{\cdot 3}$
 $\cdot 3$

$12 \div 2 = 6$

$x \cdot 100 = 60 \cdot 15$

$100 \cdot 3 = x$

$x = 6$

$x \cdot 100 = 900$
 $\div 100 \quad \div 100$

$x = 300$

$x = 9$

(Salad
total in
survey)

7.) Sales tax
total

8.) age
total
 $\frac{x}{6,000} = \frac{10}{100}$
 $\xrightarrow{\cdot 60}$
 $\cdot 60$

9.) age
total

$\frac{x}{12,000} = \frac{35}{100}$
 $\xrightarrow{\cdot 120}$
 $\cdot 120$

$\frac{22.75}{350} = \frac{x}{100}$
 $\xrightarrow{\div 3.5}$
 $\div 3.5$

$10 \cdot 60 = x$

$x = 600$

$35 \cdot 120 = x$
 $x = 4200$

$22.75 \div 3.5 = x$

$x = 6.5$

$x \cdot 100 = 25 \cdot 596$

10.) age
total

$\frac{x}{596} = \frac{25}{100}$

$x \cdot 100 = 14,900$
 $\div 100 \quad \div 100$

x.

$x = 149$

LESSON
9-3

Order of Operations
Reteach

A mathematical phrase that includes only numbers and operations is called a *numerical expression*.

$9 + 8 \times 3 \div 6$ is a numerical expression.

When you evaluate a numerical expression, you find its value.

You can use the order of operations to evaluate a numerical expression.

Order of operations:

1. Do all operations within *parentheses*.
2. Find the values of numbers with *exponents*.
3. *Multiply* and *divide* in order from left to right.
4. *Add* and *subtract* in order from left to right.

Evaluate the expression.

$60 \div (7 + 3) + 3^2$

$60 \div 10 + 3^2$

Do all operations within parentheses.

$60 \div 10 + 9$

Find the values of numbers with exponents.

$6 + 9$

Multiply and divide in order from left to right.

15

Add and subtract in order from left to right.

Evaluate each numerical expression.

1. $7 \times (12 + 8) - 6$

$7 \times \underline{20} - 6$

$\underline{140} - 6$

$\underline{134}$

2. $10 \times (12 + 34) + 3$

$10 \times \underline{46} + 3$

$\underline{460} + 3$

$\underline{463}$

3. $10 + (6 \times 5) - 7$

$10 + \underline{\hspace{2cm}} - 7$

$\underline{\hspace{2cm}} - 7$

$\underline{\hspace{2cm}}$

4. $2^3 + (10 - 4)$

$\begin{matrix} 2 & 2^3 + 6 \\ 2 & 8 + 6 = \end{matrix} \underline{14}$

5. $7 + 3 \times (8 + 5)$

$\underline{\hspace{2cm}}$

6. $36 \div 4 + 11 \times 8$

$\underline{\hspace{2cm}}$

7. $5^2 - (2 \times 8) + 9$

$\underline{\hspace{2cm}}$

8. $3 \times (12 \div 4) - 2^2$

$\underline{\hspace{2cm}}$

9. $(3^3 + 10) - 2$

$\begin{matrix} 3 \cdot 3 \cdot 3 \\ 9 \cdot 3 \\ 27 \end{matrix} \underline{(27 + 10) - 2}$

$\begin{matrix} 37 - 2 \\ \underline{35} \end{matrix}$

Solve.

10. Write and evaluate your own numerical expression. Use parentheses, exponents, and at least two operations.

LESSON
9-3**Order of Operations****Practice and Problem Solving: A/B**

Name the operation you should perform first.

1. $4 \times 6 - 3$

2. $1 + 8 \div 2$

3. $(2 + 5) - 4^2$

4. $7 \div 7^3 \times 7$

5. $8^2 \div (8 - 4)^2$

6. $-4 + 3^3 \div 5$

Match each expression to its value.

Expression**Value**

7. $7 + 8 - 2$

A. 9

8. $9 + (12 - 10)$

B. 40

9. $(20 - 15) \times 2$

C. 12

10. $10 \div 5 + 7$

D. 14

11. $6 + 2 \times 3$

E. 16

12. $(2 \times 4) + 8$

F. 11

13. $14 + 2 \times 0$

G. 13

14. $(5 - 1) \times 10$

H. 10

15. A sixth-grade student bought three cans of tennis balls for \$4 each. Sales tax for all three cans was \$.95. Write an expression to show the total amount the student paid.

16. The middle-school camera club sold 240 tulip bulbs and 360 daffodil bulbs. Students divided the bulbs into 100 bags to sell at the school fair. Write an expression to show how many bulbs went into each of the 100 bags if students put the same number of each kind of bulb in each bag.

LESSON
9-3

Order of Operations
Practice and Problem Solving: A/B

Name the operation you should perform first.

- | | | |
|--|---|--|
| 1. $4 \times 6 - 3$
<u>multiplication</u> | 2. $1 + 8 \div 2$
<u>division</u> | 3. $(2 + 5) - 4^2$
<u>parentheses</u> |
| 4. $7 \div 7^3 \times 7$
<u>exponents</u> | 5. $8^2 \div (8 - 4)^2$
<u>parentheses</u> | 6. $-4 + 3^3 \div 5$
<u>exponents</u> |

Match each expression to its value.

Expression	Value
7. $7 + 8 - 2$ <u>G</u>	A. 9
8. $9 + (12 - 10)$ <u>F</u>	B. 40
9. $(20 - 15) \times 2$ <u>H</u>	C. 12
10. $10 \div 5 + 7$ <u>A</u>	D. 14
11. $6 + 2 \times 3$ <u>C</u>	E. 16
12. $(2 \times 4) + 8$ <u>E</u>	F. 11
13. $14 + 2 \times 0$ <u>D</u>	G. 13
14. $(5 - 1) \times 10$ <u>B</u>	H. 10

Solved on
next page!

15. A sixth-grade student bought three cans of tennis balls for \$4 each. Sales tax for all three cans was \$.95. Write an expression to show the total amount the student paid.

$3 \cdot 4 + 0.95$

16. The middle-school camera club sold 240 tulip bulbs and 360 daffodil bulbs. Students divided the bulbs into 100 bags to sell at the school fair. Write an expression to show how many bulbs went into each of the 100 bags if students put the same number of each kind of bulb in each bag.

$(240 + 360) \div 100$

$$7.) \frac{7+8-2}{15-2}$$

(13)

$$8.) \frac{9+(12-10)}{9+2}$$

(11)

$$9.) \frac{(20-15) \cdot 2}{5 \cdot 2}$$

(10)

$$10.) \frac{10 \div 5 + 7}{2+7}$$

(19)

$$11.) \frac{6+2 \cdot 3}{6+6}$$

(12)

$$12.) \frac{(2 \cdot 4) + 8}{8+8}$$

(16)

$$13.) \frac{14+2 \cdot 0}{14+0}$$

(14)

$$14.) \frac{(5-1) \cdot 10}{4 \cdot 10}$$

(40)

LESSON
10-2

Evaluating Expressions

Reteach

A **variable** is a letter that represents a number that can change in an expression. When you **evaluate** an algebraic expression, you substitute the value given for the variable in the expression.

- Algebraic expression: $x - 3$

The value of the expression depends on the value of the variable x .

$$\text{If } x = 7 \rightarrow 7 - 3 = 4$$

$$\text{If } x = 11 \rightarrow 11 - 3 = 8$$

$$\text{If } x = 25 \rightarrow 25 - 3 = 22$$

- Evaluate $4n + 5$ for $n = 7$.

Replace the variable n with 7. $\rightarrow 4(7) + 5$

Evaluate, following the order of operations. $\rightarrow 4(7) + 5 = 28 + 5 = 33$

Evaluate each expression for the given value. Show your work.

1. $a + 7$ when $a = 3$

$$a + 7 = 3 + 7 = \underline{10}$$

2. $y \div 3$ when $y = 6$

$$y \div 3 = \underline{6} \div 3 = \underline{2}$$

3. $n - 5$ when $n = 15$

$$n - 5 = \underline{15} - 5 = \underline{10}$$

4. $(6 + d) \cdot 2$ when $d = 3$

$$\begin{aligned} (6 + d) \cdot 2 &= (6 + \underline{3}) \cdot 2 \\ &= \underline{9} \cdot 2 = \underline{18} \end{aligned}$$

5. $3n - 2$ when $n = 5$

$$3n - 2 = 3(\underline{5}) - 2 = \underline{15} - 2 = \underline{13}$$

6. $6b$ when $b = 7$

$$\underline{6(7) = 42}$$

7. $12 - f$ when $f = 3$

$$\underline{12 - 3 = \underline{9}}$$

8. $\frac{m}{5}$ when $m = 35$

$$\underline{\frac{35}{5} = 35 \div 5 = \underline{7}}$$

9. $2k + 5$ when $k = 8$

$$\underline{2(8) + 5 = 16 + 5 = \underline{21}}$$

10. $10 - (p + 3)$ when $p = 7$

$$\begin{aligned} \underline{10 - (7 + 3)} &= \\ 10 - 10 &= \underline{0} \end{aligned}$$

LESSON
10-2

Evaluating Expressions

Practice and Problem Solving: A/B

Evaluate each expression for the given value(s) of the variable(s).

1. $a - 4$ when $a = 16$

2. $2b + 9$ when $b = 3$

3. $c \div 2$ when $c = 26$

4. $5(9 + d) - 6$ when $d = 3$

5. $g^2 + 23$ when $g = 6$

6. $3h - j$ when $h = 8$ and $j = 11$

7. $(n - 2) \cdot m$ when $n = 5$ and $m = 9$

8. $r(s^2)(t)$ when $r = 2$, $s = 3$, and $t = 5$

Use the given values to complete each table.

9.

p	$2(13 - p)$
2	
3	
4	

10.

v	w	$3v + w$
4	2	
6	3	
8	4	

11.

x	y	$x^2 \div y$
2	1	
6	2	
8	4	

Solve.

12. The sales tax in one town is 8%. So, the total cost of an item can be written as $c + 0.08c$. What is the total cost of an item that sells for \$12?

13. To change knots per hour to miles per hour, use the expression $1.15k$, where k is the speed in knots per hour. A plane is flying at 300 knots per hour. How fast is that plane flying in miles per hour?

14. Lurinda ordered some boxes of greeting cards online. The cost of the cards is $\$6.50n + \3 where n is the number of boxes ordered and \$3 is the shipping and handling charge. How much will Lurinda pay if she orders 8 boxes of cards?

LESSON
10-2 **Evaluating Expressions**

Practice and Problem Solving: A/B

Evaluate each expression for the given value(s) of the variable(s).

1. $a - 4$ when $a = 16$

$16 - 4 = 12$

2. $2b + 9$ when $b = 3$

$2(3) + 9 = 6 + 9 = 15$

3. $c \div 2$ when $c = 26$

$26 \div 2 = 13$

4. $5(9 + d) - 6$ when $d = 3$

$5(9 + 3) - 6 = 5(12) - 6 = 60 - 6 = 54$

5. $g^2 + 23$ when $g = 6$

$6^2 + 23 = 36 + 23 = 59$

6. $3h - j$ when $h = 8$ and $j = 11$

$3(8) - 11 = 24 - 11 = 13$

7. $(n - 2) \cdot m$ when $n = 5$ and $m = 9$

$(5 - 2) \cdot 9 = 3 \cdot 9 = 27$

8. $r(s^2)(t)$ when $r = 2$, $s = 3$, and $t = 5$

$2(3^2)(5) = 2(9)(5) = 18(5)$

$= 90$

Use the given values to complete each table.

9.

p	$2(13 - p)$
2	22
3	20
4	18

10.

v	w	$3v + w$
4	2	14
6	3	21
8	4	28

11.

x	y	$x^2 \div y$
2	1	4
6	2	18
8	4	16

$6^2 \div 2 = 18$
 $6 \cdot 6 \div 2 = 18$
 $36 \div 2 = 18$

Solve. (Subtract, then multiply)

(multiply, then add)

(square then divide)

12. The sales tax in one town is 8%. So, the total cost of an item can be written as $c + 0.08c$. What is the total cost of an item that sells for \$12?

$12 + 0.08(12) = 12 + 0.96 = \12.96

$C = 12$

13. To change knots per hour to miles per hour, use the expression $1.15k$, where k is the speed in knots per hour. A plane is flying at 300 knots per hour. How fast is that plane flying in miles per hour?

$1.15(300) = 345$ miles per hour

$k = 300$

14. Lurinda ordered some boxes of greeting cards online. The cost of the cards is $\$6.50n + \3 where n is the number of boxes ordered and \$3 is the shipping and handling charge. How much will Lurinda pay if she orders 8 boxes of cards?

$6.50(8) + 3 = 52.00 + 3 = \55.00

$n = 8$

LESSON
11-1

Writing Equations to Represent Situations

Reteach

An **equation** is a mathematical sentence that says that two quantities are equal.

Some equations contain variables. A **solution** for an equation is a value for a variable that makes the statement true.

You can write related facts using addition and subtraction.

$$7 + 6 = 13 \quad 13 - 6 = 7$$

You can write related facts using multiplication and division.

$$3 \cdot 4 = 12 \quad \frac{12}{4} = 3$$

You can use related facts to find solutions for equations. If the related fact matches the value for the variable, then that value is a solution.

A. $x + 5 = 9$; $x = 3$

Think: $9 - 5 = x$
 $4 = x$
 $4 \neq 3$

3 is **not** a solution of $x + 5 = 9$.

B. $x - 7 = 5$; $x = 12$

Think: $5 + 7 = x$
 $12 = x$
 $12 = 12$

12 is a solution of $x - 7 = 5$.

C. $2x = 14$; $x = 9$

Think: $14 \div 2 = x$
 $7 = x$
 $7 \neq 9$

9 is **not** a solution of $2x = 14$.

D. $\frac{x}{5} = 3$; $x = 15$

Think: $3 \cdot 5 = x$
 $15 = x$
 $15 = 15$

15 is a solution of $x \div 5 = 3$.

Substitute and solve.

If answers on both sides of the = are the same then the solution is correct.

Use related facts to determine whether the given value is a solution for each equation.

1. $x + 6 = 14$; $x = 8$

$8 + 6 = 14$ yes
 $14 = 14$ true

2. $\frac{s}{4} = 5$; $s = 24$ no

$\frac{24}{4} = 5$ $6 \neq 5$ false

$24 \div 4 = 5$

3. $g - 3 = 7$; $g = 11$

$11 - 3 = 7$ no
 $8 \neq 7$ false

4. $3a = 18$; $a = 6$

$3(6) = 18$ yes
 $18 = 18$ true

5. $26 = y - 9$; $y = 35$

$26 = 35 - 9$ yes
 $26 = 26$ true

6. $b \cdot 5 = 20$; $b = 3$ no

$3 \cdot 5 = 20$ false
 $15 \neq 20$

7. $15 = \frac{v}{3}$; $v = 45$

$15 = \frac{45}{3}$ yes
true

8. $11 = p + 6$; $p = 5$

$11 = 5 + 6$ yes
 $11 = 11$ true

9. $6k = 78$; $k = 12$

$6(12) = 78$ no
 $72 \neq 78$ false

$15 = 45 \div 3$
 $15 = 15$

LESSON
11-1

Writing Equations to Represent Situations

Practice and Problem Solving: A/B

Determine whether the given value is a solution of the equation. Write *yes* or *no*.

1. $x + 11 = 15$; $x = 4$ _____

2. $36 - w = 10$; $w = 20$ _____

3. $0.2v = 1.2$; $v = 10$ _____

4. $15 = 6 + d$; $d = 8$ _____

5. $28 - w = 25$; $w = 3$ _____

6. $4t = 32$; $t = 8$ _____

7. $\frac{12}{s} = 4$; $s = 3$ _____

8. $\frac{33}{p} = 3$; $p = 11$ _____

Circle the letter of the equation that each given solution makes true.

9. $m = 19$

A $10 + m = 20$

C $7m = 26$

B $m - 4 = 15$

D $\frac{18}{m} = 2$

10. $a = 16$

A $2a = 18$

C $24 - a = 6$

B $a + 12 = 24$

D $\frac{a}{4} = 4$

Write an equation to represent each situation.

11. Seventy-two people signed up for the soccer league. After the players were evenly divided into teams, there were 6 teams in the league and x people on each team.

12. Mary covered her kitchen floor with 10 tiles. The floor measures 6 feet long by 5 feet wide. The tiles are each 3 feet long and w feet wide.

Solve.

13. The low temperature was 35°F . This was 13°F lower than the daytime high temperature. Write an equation to determine whether the high temperature was 48°F or 42°F .

14. Kayla bought 16 bagels. She paid a total of \$20. Write an equation to determine whether each bagel cost \$1.50 or \$1.25.

15. Write a real-world situation that could be modeled by the equation

$\frac{24}{y} = 3$. Then solve the problem.

LESSON
11-1

Writing Equations to Represent Situations

Practice and Problem Solving: A/B

Determine whether the given value is a solution of the equation. Write *yes* or *no*.

1. $x + 11 = 15$; $x = 4$ yes

2. $36 - w = 10$; $w = 20$ no

3. $0.2v = 1.2$; $v = 10$ no

4. $15 = 6 + d$; $d = 8$ no

5. $28 - w = 25$; $w = 3$ yes

6. $4t = 32$; $t = 8$ yes

7. $\frac{12}{s} = 4$; $s = 3$ yes

8. $\frac{33}{p} = 3$; $p = 11$ yes

Circle the letter of the equation that each given solution makes true.

9. $m = 19$

A $10 + m = 20$

C $7m = 26$

B $m - 4 = 15$

D $\frac{18}{m} = 2$

10. $a = 16$

A $2a = 18$

C $24 - a = 6$

B $a + 12 = 24$

D $\frac{a}{4} = 4$

Write an equation to represent each situation.

11. Seventy-two people signed up for the soccer league. After the players were evenly divided into teams, there were 6 teams in the league and x people on each team.

$6x = 72$; $72 \div 6 = x$

12. Mary covered her kitchen floor with 10 tiles. The floor measures 6 feet long by 5 feet wide. The tiles are each 3 feet long and w feet wide.

floor = tiles
 $(6)(5) = (10)(3)(w)$

Solve.

13. The low temperature was 35°F . This was 13°F lower than the daytime high temperature. Write an equation to determine whether the high temperature was 48°F or 42°F .

$x - 13 = 35$; $35 + 13 = x$ $x = 48^\circ\text{F}$

14. Kayla bought 16 bagels. She paid a total of \$20. Write an equation to determine whether each bagel cost \$1.50 or \$1.25.

$16b = 20.00$; $20 \div 16 = b$ $b = 1.25$

15. Write a real-world situation that could be modeled by the equation

$\frac{24}{y} = 3$. Then solve the problem.

Sample: 24 people were divided evenly into y teams. There are three people on each team. How many teams are there?

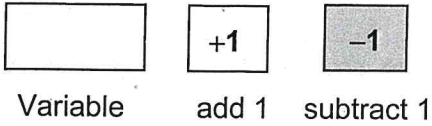
LESSON
11-2

Addition and Subtraction Equations

Reteach

To solve an equation, you need to get the variable alone on one side of the equal sign.

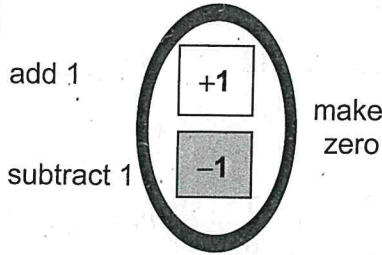
You can use tiles to help you solve subtraction equations.



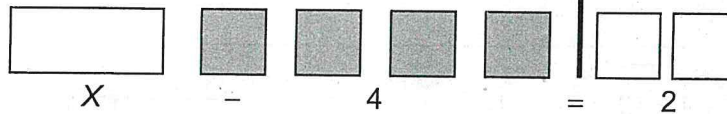
Addition undoes subtraction, so you can use addition to solve subtraction equations.

One positive tile and one negative tile make a **zero pair**.

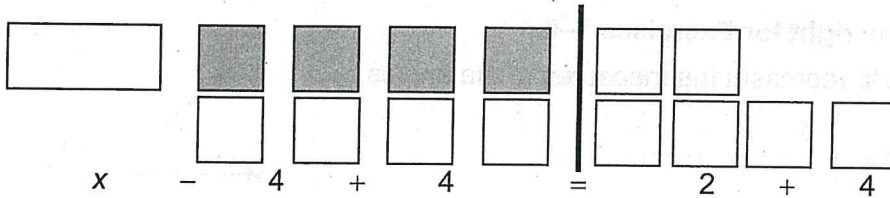
Zero pair: $+1 + (-1) = 0$



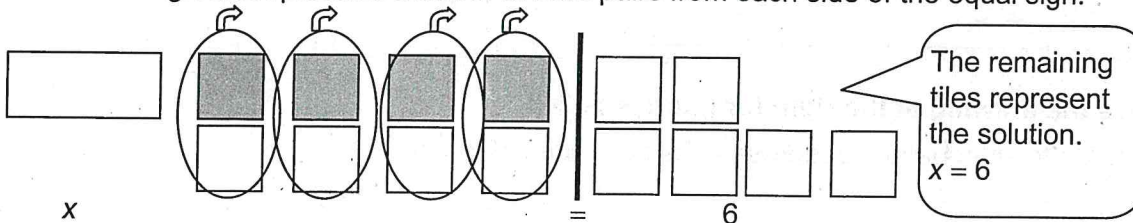
To solve $x - 4 = 2$, first use tiles to model the equation.



To get the variable alone, you have to add positive tiles. Remember to add the same number of positive tiles to each side of the equation.



Then remove the greatest possible number of zero pairs from each side of the equal sign.



Use tiles to solve each equation.

1. $x - 5 = 3$
 $+5 \quad +5$
 $x = 8$

2. $x - 2 = 7$
 $+2 \quad +2$
 $x = 9$

3. $x - 1 = 4$
 $+1 \quad +1$
 $x = 5$

4. $x - 8 = 1$
 $+8 \quad +8$
 $x = \underline{\quad}$

5. $x - 3 = 3$
 $+3 \quad +3$
 $x = \underline{\quad}$

6. $x - 6 = 2$
 $+6 \quad +6$
 $x = \underline{\quad}$

Goal: get "x" by itself.

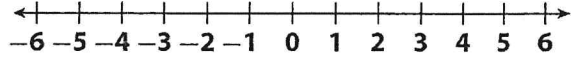
LESSON
11-2

Addition and Subtraction Equations

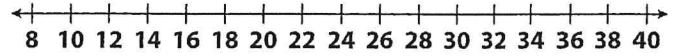
Practice and Problem Solving: A/B

Solve each equation. Graph the solution on the number line.

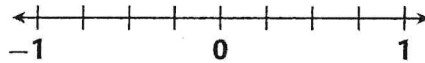
1. $6 = r + 2$ $r = \underline{\hspace{2cm}}$



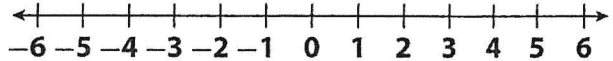
2. $26 = w - 12$ $w = \underline{\hspace{2cm}}$



3. $\frac{1}{2} = m - \frac{1}{8}$ $m = \underline{\hspace{2cm}}$



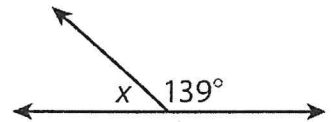
4. $t + 1 = -3$ $t = \underline{\hspace{2cm}}$



Use the drawing at the right for Exercises 5–6.

5. Write an equation to represent the measures of the angles.

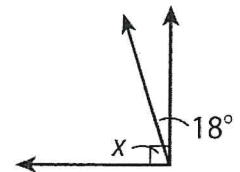
6. Solve the equation to find the measure of the unknown angle.



Use the drawing at the right for Exercises 7–8.

7. Write an equation to represent the measures of the angles.

8. Solve the equation to find the measure of the unknown angle.



Write a problem for the equation $3 + x = 8$. Then solve the equation and write the answer to your problem.

9. _____

LESSON

11-2

Addition and Subtraction Equations

Practice and Problem Solving: A/B

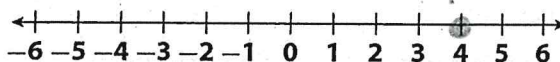
Solve each equation. Graph the solution on the number line.

1. $6 = r + 2$

$r = 4$

$-2 \quad -2$

$4 = r$

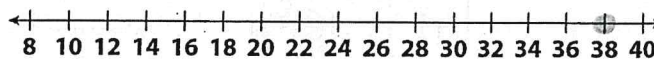


2. $26 = w - 12$

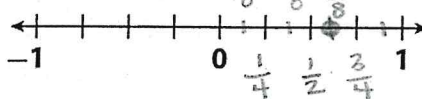
$w = 38$

$+12 \quad +12$

$38 = w$



3. $\frac{1}{8} + \frac{1}{2} = m - \frac{1}{8} + \frac{1}{8}$ $m = \frac{5}{8}$



$\frac{1}{8} + \frac{1}{2} = \frac{1}{8} + \frac{4}{8}$

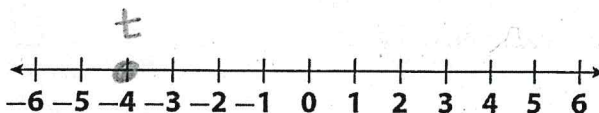
$\frac{5}{8} = m$

4. $t + 1 = -3$

$t = -4$

$-1 \quad -1$

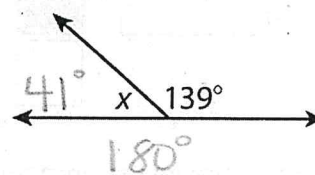
$t = -4$



Use the drawing at the right for Exercises 5–6.

5. Write an equation to represent the measures of the angles.

$180 = x + 139$; $x + 139 = 180$; $x = 180 - 139$



6. Solve the equation to find the measure of the unknown angle.

$180 = x + 139$
 $-139 \quad -139$
 $x = 180 - 139 = 41^\circ$

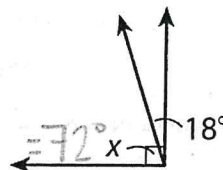
Use the drawing at the right for Exercises 7–8.

7. Write an equation to represent the measures of the angles.

$90 = x + 18$; $x + 18 = 90$; $x = 90 - 18$

8. Solve the equation to find the measure of the unknown angle.

$90 = x + 18$
 $-18 \quad -18$
 $x = 90 - 18$ $x = 72^\circ$

Write a problem for the equation $3 + x = 8$. Then solve the equation and write the answer to your problem.9. Just an idea for your problem.

John has some books. If he adds three more, he will have 8 total. How many books did he start with?