



## Vocabulary

### ● Review

Write the correct word to continue each *pattern*.

- Monday, Wednesday, Friday, Sunday, Tuesday, . . .
- January, April, July, October, January, . . .
- red, blue, red, yellow, red, blue, . . .
- circle, square, triangle, circle, square, . . .

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Write the next number in each *pattern*.

- 2, 4, 6, 8,
- 6, 3, 0, -3,
- 2, 8, 32, 128,

### ● Vocabulary Builder

**variable** (noun) VERH ee uh bul

Related Words: vary

Main Idea: A variable is usually a letter that can change or vary.

Definition: A variable is a symbol that can represent one or more numbers.

Math Usage: A variable represents an unknown number in equations and inequalities.

**x** and **y**  
are often used as  
**variables**

### ● Use Your Vocabulary

- Write **N** if the expression is a *numerical expression*. Write **A** if the expression is an *algebraic expression*.

$$5x \quad 3 + \frac{5}{2} \quad 9 - z \cdot 5 \quad \frac{6}{r} + 7$$

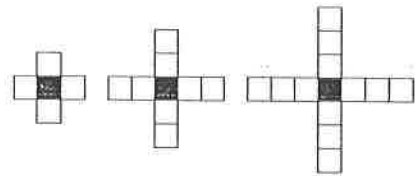
- Circle the *variables* in each algebraic expression below.

$$3 - x \quad 4w + d \quad 8 \cdot v \quad k + 2q - 7$$



### Problem 1 Identifying a Pattern

**Got It?** Look at the figures from left to right. What is the pattern?  
Draw the next figure in the pattern.



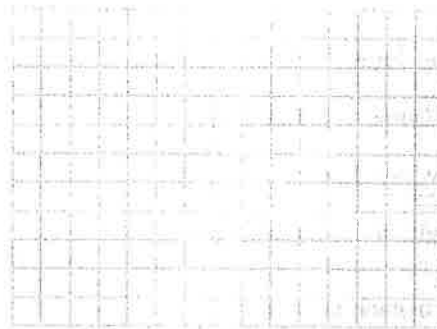
- There are      white squares in the first figure.
- There are      more white squares in the second figure.
- Describe the pattern.

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- Draw the next figure in the pattern.



### Problem 2 Expressing a Pattern with Algebra

**Got It?** How many tiles are in the 25th figure in this pattern?  
Use a table of values with a process column.



- Complete the table of values.

Figure Number (Input)	Process Column	Number of Tiles (Output)
1	$1 + (2 \cdot 1 + 1)$	4
2	$1 + (2 \cdot \quad + 1)$	
3	$1 + (2 \cdot \quad + 1)$	
4	$1 + (2 \cdot \quad + 1)$	10
⋮	⋮	⋮
$n$		

- There are  $25(\quad) + 2$ , or  $\quad$ , tiles in the 25th figure of this pattern.

16. Explain how the table of values helps you find the number of tiles in the 25th figure.

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### Problem 3 Using a Graph

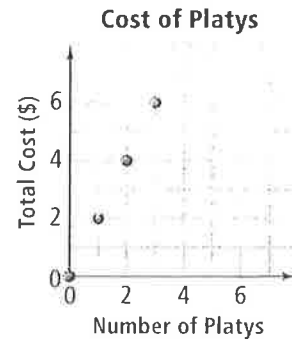
**Got It?** The graph shows the total cost of platys at the aquarium shop. Use a table to find the cost of six platys.

17. Circle the description of the input value. Underline the description of the output value.

cost of platys    number of platys    process    total cost

18. Complete the table of values.

(Input)	Process Column	(Output)
1	$1 \cdot 2$	
2	$\cdot 2$	4
	$3 \cdot$	6
6	$\cdot$	
$\vdots$	$\vdots$	$\vdots$
$n$	$\cdot$	2



Underline a number or expression to complete each sentence.

19. In the table, when the input value is 6, the output value is  $2 / 6 / 12$ .

20. The expression  $n / 2n / 3n$  describes the cost of  $1 / 2 / n$  platys.

21. At the aquarium shop, six platys cost \$ \_\_\_\_\_.



### Lesson Check Do you know HOW?

Make a table to represent each pattern. Use a process column.

22. 2, 4, 6, 8

23. ||| |||| ||||| ||||||



### Lesson Check Do you UNDERSTAND?

**Error Analysis** Your friend looks for a pattern in the table at the right and claims that the output equals the input divided by 2. Is your friend correct? Explain.

Input	3	6.8	8	10	25
Output	2	3.4	4	5	12.5

24. Circle the rule that applies to most of the input and output values.

Output = Input  $\div$  3

Output = Input  $\cdot$  2

Output = Input  $\div$  2

25. Does the input value of 3 follow this rule?

Yes / No

26. Does the table represent a pattern? Explain.

\_\_\_\_\_  
\_\_\_\_\_



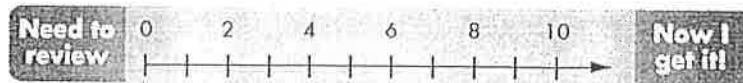
### Math Success

Check off the vocabulary words that you understand.

variable

algebraic expression

Rate how well you can *determine patterns*.



# 1-2

## Properties of Real Numbers



### Vocabulary

#### ● Review

1. Circle the pairs of numbers that are *opposites*.

7 and  $\frac{1}{7}$     -4 and 4    1.2 and 2.1    5 and -5    4 and  $|4|$

2. Write the opposite of each number.

$|-3|$     1    -17     $\frac{1}{2}$      $\sqrt{16}$     0

#### ● Vocabulary Builder

**real numbers** (noun) reel NUM burz

**Definition:** The set of real numbers includes all rational and irrational numbers.

**Related Words:** natural numbers, whole numbers, integers, rational numbers, irrational numbers

#### Real Numbers

$-5, \frac{1}{3}, \sqrt{8}, 0,$   
 $1.55,$  and  $4$

#### ● Use Your Vocabulary

3. Circle the *real numbers*.

-3     $\sqrt{5}$      $\sqrt{-1}$     0     $\frac{7}{8}$

4. Circle the *real numbers* that are integers.

-3     $\sqrt{5}$      $\sqrt{-1}$     0     $\frac{7}{8}$

5. How does the set of *real numbers* differ from the set of integers?

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### Problem 1 Classifying a Variable

**Got It?** Your school is sponsoring a charity race. If each participant made a donation  $d$  of \$15.50 to a local charity, which subset of real numbers best describes the amount of money raised?

6. Circle the values below that could represent the number of participants making a donation.

$\sqrt{5}$       0       $\frac{3}{8}$       2.7      10      150

7. Circle the set of numbers that best describes the numbers you chose in Exercise 6.

counting numbers      rational numbers      real numbers      whole numbers



### Problem 2 Graphing Numbers on the Number Line

**Got It?** What is the graph of the numbers  $\sqrt{3}$ ,  $-1.\bar{4}$ , and  $\frac{1}{3}$ ?

8. Find the integers each number is between.

Use a calculator and round to one decimal place:

Because  $\sqrt{3} \approx$       ,  $\sqrt{3}$  is between 1 and 2.

Think of the fraction form:  $-1.\bar{4} \approx -1.4 \approx$       ,

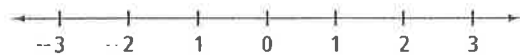
so  $-1.\bar{4}$  is between      and      .

Think:  $\frac{1}{3}$  is between      and      .

9. How can you estimate  $\sqrt{3}$  without using a calculator?

\_\_\_\_\_

10. Graph the numbers  $\sqrt{3}$ ,  $-1.\bar{4}$ , and  $\frac{1}{3}$  on the number line.



### Problem 3 Ordering Real Numbers

**Got It?** How do  $\sqrt{26}$  and 6.25 compare? Use  $>$  or  $<$ .

11. Find a perfect square close to 26.

$2 =$

12. Find a square root of a perfect square close to 6.25.

$\sqrt{\quad} =$

13. Use  $<$  or  $>$  twice to compare your answers to Exercises 11 and 12.

$$\sqrt{\quad} \quad \sqrt{\quad} \quad 6.25$$

14. Now write  $>$  or  $<$  to compare  $\sqrt{26}$  and 6.25.

$$\sqrt{26} \quad 6.25$$

Take note

### Key Concept Properties of Real Numbers

Let  $a$ ,  $b$ , and  $c$  represent real numbers.

Property	Addition	Multiplication
Closure	$a + b$ is a real number.	$ab$ is a real number.
Commutative	$a + b = b + a$	$ab = ba$
Associative	$(a + b) + c = a + (b + c)$	$(ab)c = a(bc)$
Identity	$a + 0 = a$ , $0 + a = a$ 0 is the additive identity	$a \cdot 1 = a$ , $1 \cdot a = a$ 1 is the multiplicative identity
Inverse	$a + (-a) = 0$	$a \cdot \frac{1}{a} = 1$ , $a \neq 0$
Distributive	$a(b + c) = ab + bc$	

15. Draw a line from the expression in Column A to the property that it illustrates in Column B.

#### Column A

$$2(3x + 7) = (3x + 7)(2)$$

$$(x + y) + 5 = x + (y + 5)$$

$$x + 0 = x$$

$$x \cdot 1 = x$$

$$8 + (-8) = 0$$

$$5(2x + 1) = 5 \cdot 2x + 5 \cdot 1$$

#### Column B

Inverse Property of Addition

Commutative Property of Multiplication

Associative Property of Addition

Distributive Property

Identity Property of Multiplication

Identity Property of Addition

### Problem 4 Identifying Properties of Real Numbers

**Got It?** Which property does the equation  $3(g + h) + 2g = (3g + 3h) + 2g$  illustrate?

16. Circle the operations used in the equation.

division

addition

multiplication

subtraction

17. Circle the algebraic equation that models  $3(g + h) = 3g + 3h$ .

$$hg = gh$$

$$h + g = g + h$$

$$a(g + h) = ag + ah$$

$$a + (g - h) = (g - h) + a$$

18. The equation  $3(g - h) + 2g = 3g - 3h + 2g$  illustrates the ? Property.



## Lesson Check Do you UNDERSTAND?

Reasoning There are grouping symbols in the equation  $(5 + w) + 8 = (w + 5) + 8$ , but it does not illustrate the Associative Property of Addition. Explain.

19. Circle the equation below that illustrates the Associative Property of Addition.

$$a + b + c = b + a + c \quad a + (b + c) = ab + ac \quad (a + b) + c = a + (b + c)$$

20. The Associative Property of Addition is a rule about the order / grouping of the terms of an addition statement.

21. Write the terms grouped on each side of the equation.

Left side:      and                      Right side:      and

22. Now explain why  $(5 + w) + 8 = (w + 5) + 8$  does NOT illustrate the Associative Property of Addition.

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23. Circle the property that the equation illustrates.

Closure Property of Addition      Commutative Property of Addition  
Inverse Property of Addition      Distributive Property



## Math Success

Check off the vocabulary words that you understand.

additive inverse     multiplicative inverse     opposite     reciprocal     squares

Rate how well you *understand the properties of real numbers*.







## Vocabulary

### Review

Simplify each numerical expression.

1.  $6(5 - 2) + 7 =$

2.  $\frac{7 + 5 \cdot (-3)}{4} =$

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

### Vocabulary Builder

**evaluate** (noun) ee VAL you ayt

**Definition:** To **evaluate** an expression means to substitute a number for each variable and then simplify to get a value.

**Example:** To **evaluate**  $xy$  for  $x = 2$  and  $y = 3$ , substitute 2 for  $x$  and 3 for  $y$ ;  
 $xy = (2)(3) = 6$ .

### Use Your Vocabulary

Evaluate each expression for the given values of the variables.

4.  $a + \frac{b}{4}$  for  $a = -2$  and  $b = 8$

5.  $x - x^2y$  for  $x = 3$  and  $y = -4$

### Take note

#### Key Concept Properties for Simplifying Algebraic Expressions

6. Draw a line from each property in Column A to an algebraic example of the property in Column B. Let  $a$ ,  $b$ , and  $c$  represent real numbers.

##### Column A

Distributive Property for Subtraction

Multiplication by 0

Multiplication by  $-1$

Opposite of a Sum

Opposite of a Difference

Opposite of an Opposite

##### Column B

$$-(a + b) = -a + (-b) = -a - b$$

$$-(-a) = a$$

$$-1 \cdot a = -a$$

$$a(b - c) = ab - ac$$

$$0 \cdot a = 0$$

$$-(a - b) = -a + b = b - a$$



### Problem 1 Modeling Words With Algebraic Expressions

**Got It?** Which algebraic expression models the word phrase *two times the sum of a and b*?

- The word "times" means you should use multiplication / addition / division .
- The word "sum" means you should use multiplication / addition / division .
- Now write the expression.

Complete each numerical or algebraic expression by writing a letter, number or operation sign in each box.

- The difference of 7 and 4. 7    4
- The product of 3 and  $x$ . 3     $x$
- The number  $y$  increased by 2.  $y$
- The quotient of 48 and 3. 48    3
- The number  $t$  is doubled then decreased by 1.  $t$     1
- Five taken away from  $q$ . —



### Problem 2 Modeling a Situation

**Got It?** You had \$150, but you are spending \$2 each day. What algebraic expression models this situation?

- Define the variable. Let  $d =$  \_\_\_\_\_.
- Complete the model to write the algebraic expression.

Relate      Starting amount    —    the amount spent per day    the number of days

Write

—

- Now write the expression.



### Problem 3 Evaluating Algebraic Expressions

**Got It?** What is the value of the expression  $\frac{2(x^2 - y^2)}{3}$  for  $x = 6$  and  $y = -3$ ?

- Substitute the given values for each variable into the expression.

$$\frac{2(x^2 - y^2)}{3} = \frac{2(\quad^2 - \quad^2)}{3}$$

20. Now simplify the numerical expression.



### Problem 4 Writing and Evaluating an Expression

**Got It?** In basketball, teams can score by making two-point shots, three-point shots, and one-point free throws. What algebraic expression models the total number of points that a basketball team scores in a game? If a team makes 10 two-point shots, 5 three-point shots, and 7 free throws, how many points does it score in all?

21. Define the variables.

Let  $t$  = the number of two-point shots,

Let  $h$  = \_\_\_\_\_, and

Let  $f$  = \_\_\_\_\_.

22. Complete the expression for the total number of points a team can score in one game.

2     + 3     +

23. Evaluate the expression for  $t = 10$ ,  $h = 5$ , and  $f = 7$ .

24. The team scored \_\_\_\_\_ points.

The expression  $5ax + 6y - 7$  has three *terms*:  $5ax$ ,  $6y$ , and  $-7$ .

The *coefficient* is the numerical factor of a term: 5, 6

The *constant term* is the term with no variables:  $-7$ .

Identify the *coefficients* and the *constant term* in each expression.

25.  $2x^2 - 3x + 5$

Coefficients:     and

Constant:

26.  $-4yx + 8x - 3$

Coefficients:     and

Constant:



### Problem 5 Simplifying Algebraic Expressions

**Got It?** Combine like terms. What is a simpler form of the expression  $-4j^2 - 7k + 5j + j^2$ ?

At the right is one student's solution.

Rose's Solution

$$\begin{aligned} -4j^2 - 7k + 5j + j^2 &= -3j^2 - 7k + 5j \\ &= -3j^2 - 2kj \end{aligned}$$

27. What error did Rose make?

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28. Simplify the expression correctly.



### Lesson Check • Do you UNDERSTAND?

**Compare and Contrast** How are algebraic expressions and numerical expressions alike? How are they different? Include examples to justify your reasoning.

29. How is an algebraic expression different from a numerical expression?

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30. Put an **N** next to each *numerical expression*. Put an **A** next to each *algebraic expression*.

$3x + 2$  \_\_\_    
  $6 \cdot 4$  \_\_\_    
  $a - 7$  \_\_\_    
  $4 \cdot 1 + 10$  \_\_\_    
  $\frac{5g}{3} + h$  \_\_\_



### Math Success

Check off the vocabulary words that you understand.

term    
 evaluate    
 coefficient    
 constant    
 terms    
 like terms

Rate how well you can *write and evaluate algebraic expressions*.



# 1-4

## Solving Equations



### Vocabulary

#### ● Review

Circle the equations.

$2(3x + 7) = 10$

$3x + 14$

$3x + 2y = 6$

$4x + (y + 5)$

#### ● Vocabulary Builder

**inverse operations** (noun) IN vurs ahp uh RAY shunz

**Related Words:** opposite, reverse

**Main Idea:** Inverse operations undo each other.

**Example:** Addition and subtraction are **inverse operations**.

$$x - 2 + 2 = x$$

#### ● Use Your Vocabulary

1. Write each *inverse operation*.

Add 7.

Subtract 4.

Divide by 5.

Multiply by 3.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Take note

### Key Concepts Properties of Equality

Assume  $a$ ,  $b$ , and  $c$  represent real numbers.

Property	Definition	Example
Reflexive	$a = a$	$5 = 5$
Symmetric	If $a = b$ , then $b = a$ .	$(4)(2) = 8$ , so $8 = (4)(2)$
Transitive	If $a = b$ and $b = c$ , then $a = c$ .	$6 = (2)(3)$ and $(2)(3) = (3)(2)$ , so $6 = (3)(2)$
Substitution	If $a = b$ , then you can replace $a$ with $b$ and vice versa.	If $a = b$ and $9 + a = 15$ , then $9 + b = 15$

Draw a line from each example in Column A to the property that it illustrates in Column B.

**Column A**

2.  $a = 4$  and  $a + b = 5$ , so  $4 + b = 5$
3.  $2 + (x + 8) = 2 + (x + 8)$
4.  $x + y = z$  and  $z = 4$ , so  $x + y = 4$
5.  $y + 12 = 9$ , so  $9 = y + 12$

**Column B**

- Reflexive Property
- Symmetric Property
- Transitive Property
- Substitution Property

Take note

**Key Concepts Properties of Equality, Continued**

Assume  $a$ ,  $b$ , and  $c$  represent real numbers.

Property	Definition	Example
Addition	If $a = b$ , then $a + c = b + c$ .	If $x = 12$ , then $x + 3 = 12 + 3$ .
Subtraction	If $a = b$ , then $a - c = b - c$ .	If $x = 12$ , then $x - 3 = 12 - 3$ .
Multiplication	If $a = b$ , then $a \cdot c = b \cdot c$ .	If $x = 12$ , then $x \cdot 3 = 12 \cdot 3$ .
Division	If $a = b$ , then $a \div c = b \div c$ (with $c \neq 0$ ).	If $x = 12$ , then $x \div 3 = 12 \div 3$ .

Write the Property of Equality that justifies each statement.

6. If  $x + 2 = 5$ , then  $x + 2 - 2 = 5 - 2$ . \_\_\_\_\_ Property of Equality
7. If  $4x = 12$ , then  $\frac{4x}{4} = \frac{12}{4}$ . \_\_\_\_\_ Property of Equality
8. If  $-20 = \frac{x}{5}$ , then  $-20 \cdot 5 = \frac{x}{5} \cdot 5$ . \_\_\_\_\_ Property of Equality
9. If  $y - 3 = -12$  then  $y - 3 + 3 = -12 + 3$ . \_\_\_\_\_ Property of Equality



**Problem 1 Solving a One-Step Equation**

**Got It?** What is the solution of  $12b = 18$ ?

10. Circle the multiplicative inverse of 12.

$\frac{1}{12}$

$-12$

$-\frac{1}{12}$

1

11. Use the multiplicative inverse to solve the equation and check your solution.



### Problem 2 Solving a Multi-Step Equation

**Got It?** What is the solution of  $3(2x - 1) - 2(3x + 4) = 11x$ ?

12. The equation has been solved below. Use one of the reasons in the box to justify each step.

$$3(2x - 1) - 2(3x + 4) = 11x$$

$$6x - 3 - 6x - 8 = 11x$$

$$-11 = 11x$$

$$\frac{-11}{11} = \frac{11x}{11}$$

$$-1 = x$$

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Division Property of Equality

Combine like terms.

Simplify.

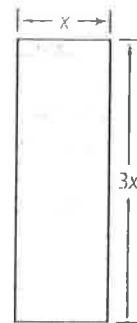
Distributive Property



### Problem 3 Using Properties of Equations to Solve Problems

**Got It?** The carpet at the right has perimeter 320 feet. What are the dimensions of the carpet?

13. Let  $x$  = the width of the carpet. Then \_\_\_\_\_ = length of the carpet.
14. Use the formula for perimeter of a rectangle,  $P = 2w + 2l$ . Write an equation for the perimeter of the carpet.
15. Solve for  $x$ .



16. The width of the carpet is \_\_\_\_\_ ft, and the length of the carpet is \_\_\_\_\_ ft.



### Problem 4 Equations With No Solutions and Identities

**Got It?** Is the equation  $7x + 6 - 4x = 12 + 3x - 8$  *always*, *sometimes*, or *never* true?

17. Combine like terms on each side of the equation.

$$+ 6 = 3x +$$

18. Now solve the equation.

19. The equation is *always* / *sometimes* / *never* true.



### Problem 5 Solving a Literal Equation

**Got It?** The equation  $S = 3F - 24$  relates shoe size  $S$  and length of a foot in inches  $F$ . What is  $F$  in terms of  $S$ ?

20. What two operations will you undo?

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21. Now solve the equation for  $F$ .



### Lesson Check \* Do you UNDERSTAND?

**Reasoning** Suppose you solve an equation and find that your school needs 4.3 buses for a class trip. Explain how to interpret this solution.

22. Why does the solution 4.3 not make sense as a solution to this problem?

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23. What is the minimum number of buses that are needed for the trip? Explain.

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### Math Success

Check off the vocabulary words that you understand.

equation

solution

inverse operations

Rate how well you can *solve equations*.





## 1-5

## Solving Inequalities



## Vocabulary

## ● Review

1. Write I if the math sentence is an *inequality*. Write E if it is an *equation*.

$15 > 32x$

$45 < 46$

$-27 \neq 3x$

$17x = 34$

Complete each statement with  $<$ ,  $>$ , or  $=$ .

2.  $\frac{9}{2} > 4$

3.  $5(2 + 3) < 27$

4.  $0.\bar{6} > \frac{2}{3}$

5.  $-6 < 4$

## ● Vocabulary Builder

**compound** (noun) KAHM pond

**compound inequality**

$$x \leq 7 \text{ or } x \geq 5$$

**Related Words:** compound inequality, less than, greater than

**Definition:** A compound is made up of separate parts.

**Example:** A compound inequality is made up of two or more simple inequalities joined by *and* or *or*.

## ● Use Your Vocabulary

6. A student uses the word *compound* in three different sentences. Place a  $\checkmark$  next to the sentences that use the word correctly. Place an  $\times$  next to those that do not.

In chemistry class we learn about various chemical *compounds*.

*Compound* inequalities contain more than one inequality symbol.

To simplify an expression, you can *compound* like terms.

Write an *inequality* for each verbal description.

7.  $x$  is at most 25

8.  $x$  is not equal to 25

9.  $x$  is greater than 25

10.  $x$  is less than 25



### Problem 1 Writing an Inequality From a Sentence

**Got It?** What inequality represents the sentence *The quotient of a number and 3 is no more than 15*?

11. Circle the expression that represents the phrase "the quotient of a number and 3."

$n - 3$                        $\frac{n}{3}$                        $\frac{3}{n}$                        $3n$

12. The symbol  $<$  /  $>$  /  $\geq$  /  $\leq$  represents the phrase "no more than".

13. Now write the inequality.



### Problem 2 Solving and Graphing an Inequality

**Got It?** What is the solution of  $-2(x + 9) + 5 \geq 3$ ? Graph the solution.

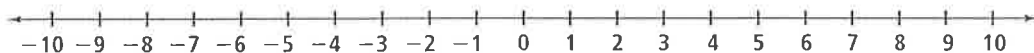
14. Solve the inequality for  $x$ .

15. Underline the correct word or number to complete each sentence.

The graph includes all numbers less / greater than  $-8$  /  $-2$  /  $3$  /  $5$  /  $9$  /  $10$ .

The graph will include a closed / an open circle at  $-8$  /  $-2$  /  $3$  /  $5$  /  $9$  /  $10$ .

16. Graph the solution.



### Problem 3 Using an Inequality

**Got It?** A digital music service offers two subscription plans. The first has a \$9 membership fee and charges \$1 per download. The second has a \$25 membership fee and charges \$.50 per download. How many songs must you download for the second plan to cost less than the first plan?

17. Define the variables.

Let \_\_\_\_\_ = the number of songs downloaded.

Let  $C_1$  = cost of the first plan.

Let  $C_2$  = \_\_\_\_\_.

Write an algebraic expression to describe the cost of the first plan and the cost of the second plan.

18.  $C_1 = \quad + 1$

19.  $C_2 = \quad + 0.5$

20. Write an inequality to represent the situation. Then solve.

21. You must download  $\quad$  songs for the second plan to cost less than the first plan.



### Problem 4 No Solution or All Real Numbers as Solution

**Got It?** Is  $4(2x - 3) < 8(x + 1)$  *always, sometimes, or never* true?

22. Complete the solution.

$$4(2x - 3) < 8(x + 1)$$

Write the original inequality.

Distributive Property

Subtract 8 from each side.

Subtract  $8x$  from each side.

23. The inequality is *always / sometimes / never* true.

24. Describe the solution set of the inequality.

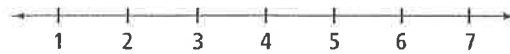
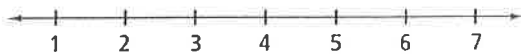


### Problem 5 Solving an And Inequality

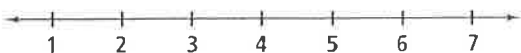
**Got It?** What is the solution of  $8 \leq 3x - 1$  and  $2x < 12$ ? Graph the solution.

25. Solve each inequality.

26. Graph each inequality.



27. Graph the solution set. Then write the solution as a compound inequality.





### Problem 6 Solving an Or Inequality

**Got It?** What is the solution of  $7w + 3 > 11$  or  $4w - 1 < -13$ ? Graph the solution.

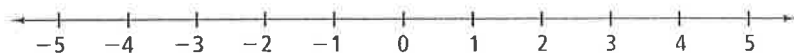
28. Cross out the inequality that is NOT a solution to either  $7w + 3 > 11$  or  $4w - 1 < -13$ .

$w < -3$

$w > 1\frac{1}{7}$

$w > 1$

29. Graph the solution.



30. The solution to  $7w + 3 > 11$  or  $4w - 1 < -13$  is all real numbers

less than      or greater than      .



### Lesson Check \* Do you UNDERSTAND?

**Reasoning** Make up an example to help explain why you must reverse the inequality symbol when you multiply or divide by a negative number.

Write T for *true* or F for *false*.

\_\_\_ 31.  $5 > -4$

\_\_\_ 32.  $(-1)5 > (-1)(-4)$

\_\_\_ 33.  $\frac{5}{-1} < \frac{-4}{-1}$

34. Explain what to do to multiply or divide an inequality by a negative number.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



### Math Success

Check off the vocabulary words that you understand.

compound inequality

"and" inequality

"or" inequality

Rate how well you can *solve and graph inequalities*.



# 1-6

## Absolute Value Equations and Inequalities



### Vocabulary

#### ● Review

1. Circle the *solution* of  $3x + 8 = -4$ .

$x = -9$

$x = -4$

$x = 4$

$x = \frac{4}{3}$

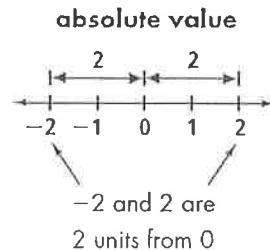
#### ● Vocabulary Builder

**absolute value** (noun) AB.suh loot VAL yoo

**Definition:** The absolute value of a real number  $x$  is its distance from zero on the number line.

**Main Idea:** If  $x$  is positive, then  $|x| = x$ . If  $x$  is negative, then  $|x| = -x$ .

**Examples:**  $|5| = 5$ ,  $|-5| = 5$



#### ● Use Your Vocabulary

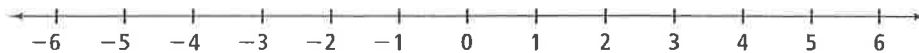
Graph each absolute value on the number line.

2.  $|3|$

3.  $|-2|$

4.  $-|1|$

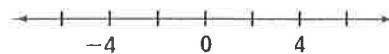
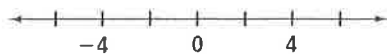
5.  $2|-2|$



Complete each graph.

6.  $|x| = 4$

7.  $|x| = 5$





### Problem 1 Solving an Absolute Value Equation

**Got It?** What is the solution of  $|3x + 2| = 4$ ? Graph the solution.

8. Write as two equations.

or

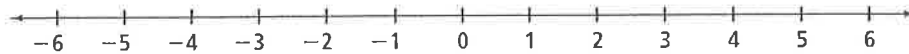
9. Complete the steps to find  $x$ .

Write the two equations from Exercise 8.

Subtract 2 from each side.

Divide each side by 3.

10. Graph the solution.



### Problem 2 Solving a Multi-Step Absolute Value Equation

**Got It?** What is the solution of  $2|x + 9| + 3 = 7$ ? Graph the solution.

11. Complete the steps to find  $x$ .

$$2|x + 9| + 3 = 7$$

Write the original equation.

$$2|x + 9| =$$

Subtract 3 from each side.

$$|x + 9| =$$

Divide each side by 2.

12. Write as two equations.

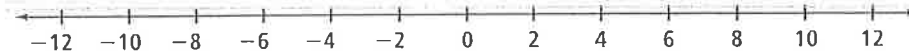
or

13. Solve for  $x$ .

Write the two equations from Exercise 12.

Subtract 9 from each side.

14. Graph the solution.





### Problem 3 Solving for Extraneous Solutions

**Got It?** What is the solution of  $|5x - 2| = 7x + 14$ ? Check for extraneous solutions.

15. Solving the equation yields  $x = -1$  and  $x = -8$ . Substitute each value into the original equation.

$$|5 \cdot \quad - 2| = 7 \cdot \quad + 14 \qquad |5 \cdot \quad - 2| = 7 \cdot \quad + 14$$

$$| \quad | = \qquad | \quad | =$$

16. Which, if any, solutions are extraneous? Explain.



### Problem 4 Solving the Absolute Value Inequality $|A| < b$

**Got It?** What is the solution of  $|3x - 4| \leq 8$ ? Graph the solution.

17. The inequality is solved below. Use the justifications to complete each step.

$$-8 \leq \quad \leq 8 \qquad \text{Write the compound inequality.}$$

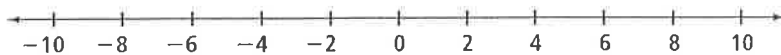
$$\leq \quad \leq \qquad \text{Add 4 to each part.}$$

$$\leq \quad \leq \qquad \text{Divide each part by 3.}$$

18. The endpoints of the graph are  $\quad$  and  $\quad$ .

The endpoints are indicated on the graph with open / closed dots.

19. Now graph the solution.



### Problem 5 Solving the Absolute Value Inequality $|A| \geq b$

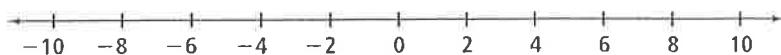
**Got It?** What is the solution of  $|5x + 10| > 15$ ? Graph the solution.

20. Write the absolute value inequality as a compound inequality.

$$5x + 10 < -15 \quad \text{or}$$

21. Solve each inequality for  $x$ .

22. Now graph the solution.





### Problem 6 Using an Absolute Value Inequality

**Got It?** Suppose the smallest allowable height of a racecar is 52 in. and the desirable height is 52.5 in. What absolute value inequality describes heights of a racecar within an indicated tolerance?

23. Find the difference between the desirable height and the smallest allowable height.

$$52.5 - \quad =$$

24. Circle the expression that models the difference between the desirable height and the actual height  $h$ .

$$52.0 - h \qquad 52.5 - h$$

25. Write a compound inequality.

$$-0.5 \leq \qquad \leq 0.5$$

26. Rewrite the compound inequality as an absolute value inequality.

$$| \qquad | \leq$$



### Lesson Check Do you UNDERSTAND?

**Reasoning** When is the absolute value of a number equal to itself?

27. The absolute value of 0 is equal to   ?  . \_\_\_\_\_

28. When a number is negative, its absolute value is equal to   ?  . \_\_\_\_\_

29. When a number is positive, its absolute value is equal to   ?  . \_\_\_\_\_

30. Now answer the question.  
\_\_\_\_\_  
\_\_\_\_\_



### Math Success

Check off the vocabulary words that you understand.

absolute value     graph     inequality     equation

Rate how well you can use *absolute value to solve equations and inequalities*.





# 1-6

## Absolute Value Equations and Inequalities



### Vocabulary

#### Review

1. Circle the *solution* of  $3x + 8 = -4$ .

$x = -9$

$x = -4$

$x = 4$

$x = \frac{4}{3}$

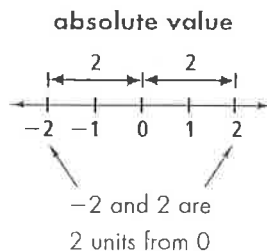
#### Vocabulary Builder

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#### Use Your Vocabulary

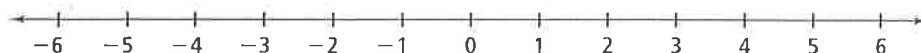
Graph each absolute value on the number line.

2.  $|3|$

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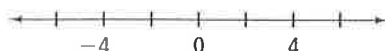
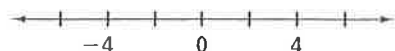
5.  $2|-2|$



Complete each graph.

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### Problem 1 Solving an Absolute Value Equation

**Got It?** What is the solution of  $|3x + 2| = 4$ ? Graph the solution.

8. Write as two equations.

or

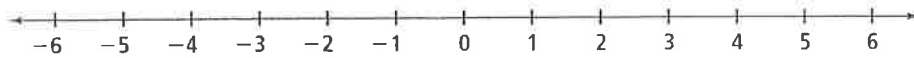
9. Complete the steps to find  $x$ .

Write the two equations from Exercise 8.

Subtract 2 from each side.

Divide each side by 3.

10. Graph the solution.



### Problem 2 Solving a Multi-Step Absolute Value Equation

**Got It?** What is the solution of  $2|x + 9| + 3 = 7$ ? Graph the solution.

11. Complete the steps to find  $x$ .

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Write the original equation.

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Subtract 3 from each side.

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Divide each side by 2.

12. Write as two equations.

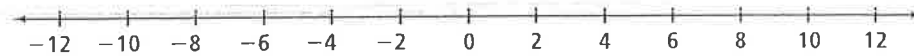
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**Got It?** What is the solution of  $|5x - 2| = 7x + 14$ ? Check for extraneous solutions.

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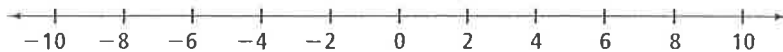
$$\leq \qquad \leq \qquad \text{Add 4 to each part.}$$

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18. The endpoints of the graph are  $\quad$  and  $\quad$ .

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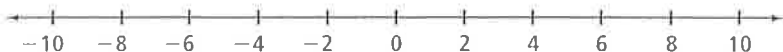
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$$| \quad | \leq$$



### Lesson Check \* Do you UNDERSTAND?

**Reasoning** When is the absolute value of a number equal to itself?

27. The absolute value of 0 is equal to ? .

\_\_\_\_\_

28. When a number is negative, its absolute value is equal to ? .

\_\_\_\_\_

29. When a number is positive, its absolute value is equal to ? .

\_\_\_\_\_

30. Now answer the question.

\_\_\_\_\_  
\_\_\_\_\_



### Math Success

Check off the vocabulary words that you understand.

absolute value

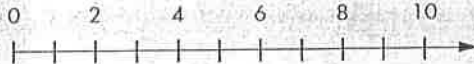
graph

inequality

equation

Rate how well you can use *absolute value to solve equations and inequalities*.

Need to review



Now I get it!

# 1-6

## Absolute Value Equations and Inequalities



### Vocabulary

#### Review

1. Circle the *solution* of  $3x + 8 = -4$ .

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$x = -4$

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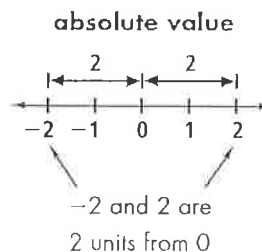
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#### Use Your Vocabulary

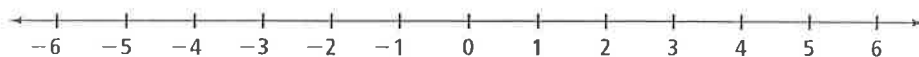
Graph each absolute value on the number line.

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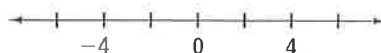
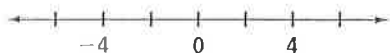
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### Problem 1 Solving an Absolute Value Equation

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or

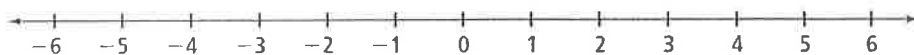
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$$2|x + 9| =$$

Subtract 3 from each side.

$$|x + 9| =$$

Divide each side by 2.

12. Write as two equations.

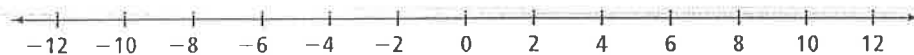
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**Got It?** What is the solution of  $|5x - 2| = 7x + 14$ ? Check for extraneous solutions.

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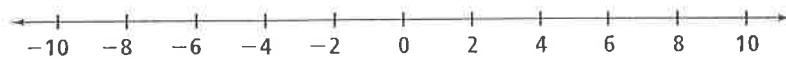
$$\leq \qquad \leq \qquad \text{Add 4 to each part.}$$

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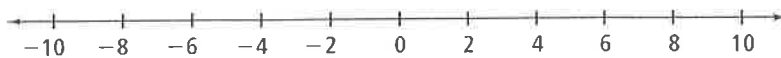
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25. Write a compound inequality.

$$-0.5 \leq \quad \leq 0.5$$

26. Rewrite the compound inequality as an absolute value inequality.

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\_\_\_\_\_

30. Now answer the question.

\_\_\_\_\_  
\_\_\_\_\_

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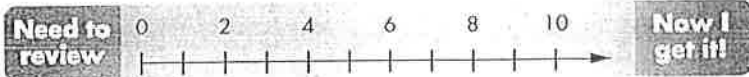


### Math Success

Check off the vocabulary words that you understand.

absolute value     graph     inequality     equation

Rate how well you can use *absolute value to solve equations and inequalities*.





# 1-6

## Absolute Value Equations and Inequalities



### Vocabulary

#### ● Review

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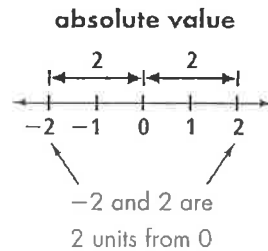
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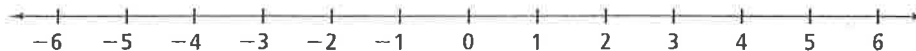
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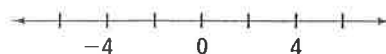
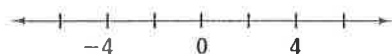
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Complete each graph.

6.  $|x| = 4$

7.  $|x| = 5$





### Problem 1 Solving an Absolute Value Equation

**Got It?** What is the solution of  $|3x + 2| = 4$ ? Graph the solution.

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or

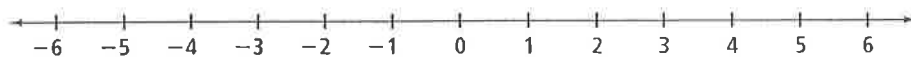
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Write the two equations from Exercise 8.

Subtract 2 from each side.

Divide each side by 3.

10. Graph the solution.



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**Got It?** What is the solution of  $2|x + 9| + 3 = 7$ ? Graph the solution.

11. Complete the steps to find  $x$ .

$$2|x + 9| + 3 = 7$$

Write the original equation.

$$2|x + 9| =$$

Subtract 3 from each side.

$$|x + 9| =$$

Divide each side by 2.

12. Write as two equations.

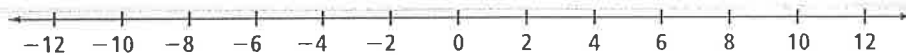
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**Got It?** What is the solution of  $|5x - 2| = 7x + 14$ ? Check for extraneous solutions.

15. Solving the equation yields  $x = -1$  and  $x = -8$ . Substitute each value into the original equation.

$$|5 \cdot \quad - 2| = 7 \cdot \quad + 14 \qquad |5 \cdot \quad - 2| = 7 \cdot \quad + 14$$

$$| \quad | = \qquad | \quad | =$$

16. Which, if any, solutions are extraneous? Explain.



### Problem 4 Solving the Absolute Value Inequality $|A| < b$

**Got It?** What is the solution of  $|3x - 4| \leq 8$ ? Graph the solution.

17. The inequality is solved below. Use the justifications to complete each step.

$$-8 \leq \qquad \leq 8 \qquad \text{Write the compound inequality.}$$

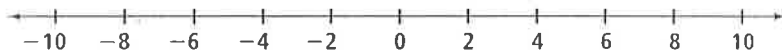
$$\leq \qquad \leq \qquad \text{Add 4 to each part.}$$

$$\leq \qquad \leq \qquad \text{Divide each part by 3.}$$

18. The endpoints of the graph are  $\quad$  and  $\quad$ .

The endpoints are indicated on the graph with open / closed dots.

19. Now graph the solution.



### Problem 5 Solving the Absolute Value Inequality $|A| \geq b$

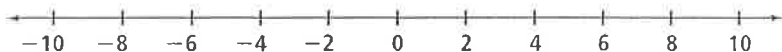
**Got It?** What is the solution of  $|5x + 10| > 15$ ? Graph the solution.

20. Write the absolute value inequality as a compound inequality.

$$5x + 10 < -15 \qquad \text{or}$$

21. Solve each inequality for  $x$ .

22. Now graph the solution.





### Problem 6 Using an Absolute Value Inequality

**Got It?** Suppose the smallest allowable height of a racecar is 52 in. and the desirable height is 52.5 in. What absolute value inequality describes heights of a racecar within an indicated tolerance?

23. Find the difference between the desirable height and the smallest allowable height.

$$52.5 - \quad =$$

24. Circle the expression that models the difference between the desirable height and the actual height  $h$ .

$$52.0 - h \qquad 52.5 - h$$

25. Write a compound inequality.

$$-0.5 \leq \quad \leq 0.5$$

26. Rewrite the compound inequality as an absolute value inequality.

$$| \quad | \leq \quad$$



### Lesson Check Do you UNDERSTAND?

Reasoning When is the absolute value of a number equal to itself?

27. The absolute value of 0 is equal to   ?  . \_\_\_\_\_

28. When a number is negative, its absolute value is equal to   ?  . \_\_\_\_\_

29. When a number is positive, its absolute value is equal to   ?  . \_\_\_\_\_

30. Now answer the question.  
\_\_\_\_\_  
\_\_\_\_\_

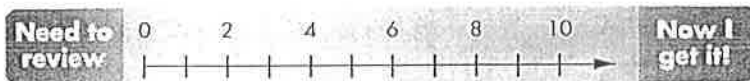


### Math Success

Check off the vocabulary words that you understand.

absolute value     graph     inequality     equation

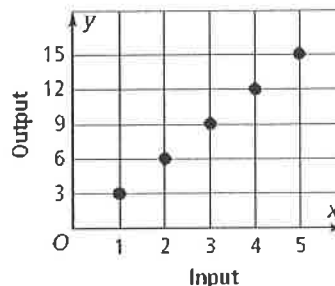
Rate how well you can use *absolute value to solve equations and inequalities*.



# 1-1 Think About a Plan

## Patterns and Expressions

Use the graph shown.



- a. Identify a pattern of the graph by making a table of the inputs and outputs.
  - b. What are the outputs for inputs 6, 7, and 8?
1. What are the ordered pairs of the points in the graph?

2. Complete the table of the input and output values shown in the ordered pairs.

Input	Output
1	
2	
3	
4	
5	

3. Complete the process column with the process that takes each input value and gives the corresponding output value.

Input	Process Column	Output
1	1( )	
2	2( )	
3	3( )	
4	4( )	
5	5( )	

4. output = \_\_\_\_\_

5. Complete the process column for inputs 6, 7, and 8. Then find the outputs for inputs 6, 7, and 8.

Input	Process Column	Output
6	6( )	
7	7( )	
8	8( )	

6. The outputs for inputs 6, 7, and 8 are \_\_\_\_\_





## Problem 6 Using an Absolute Value Inequality

**Got It?** Suppose the smallest allowable height of a racecar is 52 in. and the desirable height is 52.5 in. What absolute value inequality describes heights of a racecar within an indicated tolerance?

23. Find the difference between the desirable height and the smallest allowable height.

$$52.5 - \quad =$$

24. Circle the expression that models the difference between the desirable height and the actual height  $h$ .

$$52.0 - h$$

$$52.5 - h$$

25. Write a compound inequality.

$$-0.5 \leq \quad \leq 0.5$$

26. Rewrite the compound inequality as an absolute value inequality.

$$| \quad | \leq$$



## Lesson Check \* Do you UNDERSTAND?

**Reasoning** When is the absolute value of a number equal to itself?

27. The absolute value of 0 is equal to ?.

\_\_\_\_\_

28. When a number is negative, its absolute value is equal to ?.

\_\_\_\_\_

29. When a number is positive, its absolute value is equal to ?.

\_\_\_\_\_

30. Now answer the question.

\_\_\_\_\_  
\_\_\_\_\_



## Math Success

Check off the vocabulary words that you understand.

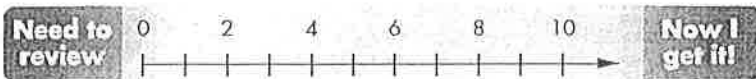
absolute value

graph

inequality

equation

Rate how well you can use *absolute value to solve equations and inequalities*.





### Problem 3 Solving for Extraneous Solutions

**Got It?** What is the solution of  $|5x - 2| = 7x + 14$ ? Check for extraneous solutions.

15. Solving the equation yields  $x = -1$  and  $x = -8$ . Substitute each value into the original equation.

$ 5 \cdot$	$- 2  = 7 \cdot$	$+ 14$	$ 5 \cdot$	$- 2  = 7 \cdot$	$+ 14$
$ $	$  =$		$ $	$  =$	

16. Which, if any, solutions are extraneous? Explain.



### Problem 4 Solving the Absolute Value Inequality $|A| < b$

**Got It?** What is the solution of  $|3x - 4| \leq 8$ ? Graph the solution.

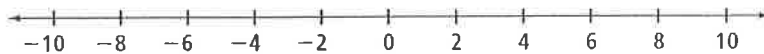
17. The inequality is solved below. Use the justifications to complete each step.

$-8 \leq$	$\leq 8$	Write the compound inequality.
$\leq$	$\leq$	Add 4 to each part.
$\leq$	$\leq$	Divide each part by 3.

18. The endpoints of the graph are \_\_\_\_\_ and \_\_\_\_\_.

The endpoints are indicated on the graph with open / closed dots.

19. Now graph the solution.



### Problem 5 Solving the Absolute Value Inequality $|A| \geq b$

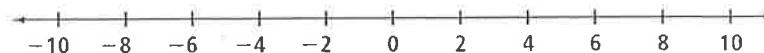
**Got It?** What is the solution of  $|5x + 10| > 15$ ? Graph the solution.

20. Write the absolute value inequality as a compound inequality.

$5x + 10 < -15$  or \_\_\_\_\_

21. Solve each inequality for  $x$ .

22. Now graph the solution.





# 1-2 **Think About a Plan**

---

## Properties of Real Numbers

Five friends each ordered a sandwich and a drink at a restaurant. Each sandwich costs the same amount, and each drink costs the same amount. What are two ways to compute the bill? What property of real numbers is illustrated by the two methods?

### Understanding the Problem

1. There are  sandwiches and  drinks on the bill.
2. What is the problem asking you to determine?

---

---

### Planning the Solution

3. How can you represent the cost of five sandwiches?  

---
4. How can you represent the cost of five drinks?  

---
5. How can you represent the cost of the items ordered by one friend?  

---

### Getting an Answer

6. Write an expression that represents the cost of five drinks and the cost of five sandwiches.  

---
7. Write an expression that represents the cost of the items ordered by five friends.  

---
8. What property of real numbers tells you that these two expressions are equal? Explain.  

---



# 1-3 Think About a Plan

## Algebraic Expressions

**Write an algebraic expression to model the situation.**

The freshman class will be selling carnations as a class project. What is the class's income after it pays the florist a flat fee of \$200 and sells  $x$  carnations for \$2 each?

1. What does the variable represent?

\_\_\_\_\_

2. How will the class's income change for each carnation sold?

\_\_\_\_\_

3. Will paying the florist increase or decrease their income? By how much?

\_\_\_\_\_

4. Will the expression include both the income for each carnation and the florist's fee? Explain.

\_\_\_\_\_

\_\_\_\_\_

5. Write the expression in words.

The income is  and  times .

6. Write the expression using symbols.

income =

7. Check your expression by substituting 300 for the number of carnations. Does your answer make sense? Explain.

\_\_\_\_\_

\_\_\_\_\_

8. The algebraic expression  models the freshman class income.



# 1-4 Think About a Plan

## Solving Equations

**Geometry** The measure of the supplement of an angle is  $20^\circ$  more than three times the measure of the original angle. Find the measures of the angles.

### Know

1. The sum of the measures of the two angles is .

2. What do you know about the supplemental angle?

\_\_\_\_\_

### Need

3. To solve the problem, I need to define:

\_\_\_\_\_  
\_\_\_\_\_

### Plan

4. What equation can you use to find the measure of the original angle?

5. Solve the equation.

6. What are the measures of the angles?

7. Are the solutions reasonable? Explain.

\_\_\_\_\_  
\_\_\_\_\_



# 1-5 Think About a Plan

---

## Solving Inequalities

Your math test scores are 68, 78, 90, and 91. What is the lowest score you can earn on the next test and still achieve an average of at least 85?

### Understanding the Problem

1. What information do you need to find an average of scores? How do you find an average?

---

---

2. How many scores should you include in the average? \_\_\_\_\_

3. You want to achieve an average that is  or  what score?

---

### Planning the Solution

4. Assign a variable,  $x$ .

---

5. Write an expression for the sum of all of the scores, including the next test.

---

6. Write an expression for the average of all of the scores.

---

7. Write an inequality that can be used to determine the lowest score you can earn on the next test and still achieve an average of at least 85.

---

### Getting an Answer

8. Solve your inequality to find the lowest score you can earn on the next test and still achieve an average of at least 85. What score do you need to earn?





# 1-6 Think About a Plan

## Absolute Value Equations and Inequalities

Write an absolute value inequality to represent the situation.

**Cooking** Suppose you used an oven thermometer while baking and discovered that the oven temperature varied between +5 and -5 degrees from the setting. If your oven is set to  $350^\circ$ , let  $t$  be the actual temperature.

1. How do you have to think to solve this problem?

---

---

---

2. Write a compound inequality that represents the actual oven temperature  $t$ .

3. It often helps to draw a picture. Graph this compound inequality on a number line.

4. What is the definition of tolerance?

---

---

---

5. What is the tolerance of the oven? \_\_\_\_\_

6. Use the tolerance to write an inequality without absolute values.

7. Rewrite the inequality as an absolute value inequality.



# 1-1 Additional Vocabulary Support

## Patterns and Expressions

Choose the word from the list that best matches each sentence.

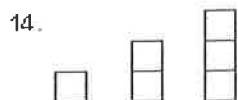
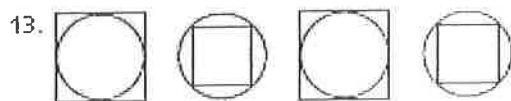
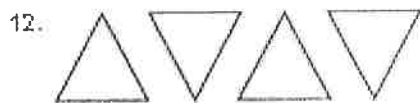
algebraic expression    consecutive    diagram    pattern    variable

1. Following one another in order. \_\_\_\_\_
2. A symbol, usually a letter, that represents one or more numbers. \_\_\_\_\_
3. A drawing that is included with a math problem. \_\_\_\_\_
4. An expression that contains one or more variables. \_\_\_\_\_
5. The same type of change between any two shapes or numbers. \_\_\_\_\_

Use a word from the list above to complete each sentence.

6. The numbers 21 and 22 are \_\_\_\_\_ numbers.
7. In the algebraic expression  $5x^2 - 2x + 9$ ,  $x$  is called the \_\_\_\_\_.
8. The picture included with a problem is called a \_\_\_\_\_.
9.  $2x - 10$  is called an \_\_\_\_\_.
10. The \_\_\_\_\_ in a list of numbers is that each one is 5 more than the last one.

Describe the pattern for each group of figures. What would the next consecutive figure in the pattern look like?





# 1-2 Additional Vocabulary Support

## Properties of Real Numbers

Choose the word from the list that best matches each description.

integers   irrational numbers   natural numbers   rational numbers   whole numbers

1. the natural numbers and zero \_\_\_\_\_
2. the natural numbers, their opposites, and zero \_\_\_\_\_
3. the numbers that can be written as a quotient of integers \_\_\_\_\_
4. the numbers used for counting \_\_\_\_\_
5. the numbers that cannot be written as quotients of integers \_\_\_\_\_

Write all of the numbers from the list that are examples of each subset.

27   -12    $\sqrt{81}$    0    $\frac{5}{7}$    -105    $\sqrt{44}$    93

6. whole numbers \_\_\_\_\_
7. natural numbers \_\_\_\_\_
8. rational numbers \_\_\_\_\_
9. irrational numbers \_\_\_\_\_
10. integers \_\_\_\_\_
11. Draw a diagram showing the relationship of whole numbers, natural numbers, rational numbers, integers, irrational numbers, and real numbers.



# 1-3 Additional Vocabulary Support

## Algebraic Expressions

Use the chart below to review vocabulary. These vocabulary words will help you complete this page.

Addition (+)	Subtraction (-)	Multiplication ( $\times$ )	Division ( $\div$ )
sum	difference	product	quotient
more than	less than	times	divided by
increased by	fewer than		
total	subtracted from		
added to			

Circle the word or words in each word phrase that tell you what operations to use. Write the operation symbol word (+, -,  $\times$ ,  $\div$ ) next to the algebraic expression.

- the sum of a number  $m$  and  $-12$
- the product of  $b$  and  $c$
- 14 less than  $p$
- the total of  $-75$  and  $t$
- the quotient of  $d$  and 28

Match each word phrase in Column A with the matching algebraic expression in Column B.

- | Column A                                 | Column B    |
|--|-------------|
| 6. the difference of a number $p$ and 36 | A. $y + 9$  |
| 7. 15 more than the number $q$           | B. $10(r)$  |
| 8. the product of 10 and a number $r$    | C. $q + 15$ |
| 9. the total of a number $y$ and 9       | D. $p - 36$ |

Match each algebraic expression in Column A with the matching word phrase in Column B.

- | Column A           | Column B                                  |
|--------------------|---|
| 10. $m + 45$       | A. 45 less than a number $m$              |
| 11. $\frac{m}{45}$ | B. 45 times the sum of a number $m$ and 1 |
| 12. $m - 45$       | C. a number $m$ increased by 45           |
| 13. $45(m + 1)$    | D. a number $m$ divided by 45             |





# 1-4 Additional Vocabulary Support

## Solving Equations

The column on the left shows the steps used to solve a problem with an equation. Use the column on the left to answer each question in the column on the right.

<b>Problem</b> <b>Solve by Setting up and Solving an Equation</b>	<b>1.</b> Read the title of the Problem. What process are you going to use to solve the problem?
Two planes leave San Antonio at the same time. The northbound plane travels 70 mi/h faster than the southbound plane. The planes are 1940 mi apart in 2 h. How fast is the southbound plane flying?	_____ _____
<b>Relate</b>  distance the southbound plane travels in 2 h + distance the northbound plane travels in 2 h = <sup>total</sup> distance between the planes after 2h	<b>2.</b> What is the formula that relates distance, rate, and time?  _____
<b>Define</b> Let $x$ = the rate of the southbound plane. Let $x + 70$ = the rate of the northbound plane.	<b>3.</b> Why can you represent the rate of the northbound plane with the algebraic expression $x + 70$ ?  _____ _____
<b>Write</b> $2x + 2(x + 70) = 1940$ $2x + 2x + 140 = 1940$ $4x + 140 = 1940$ $4x + 140 - 140 = 1940 - 140$ $4x = 1800$  Dist. Property Combine like terms. Subtract. Simplify.	<b>4.</b> What does the expression $2x$ represent? _____ _____  <b>5.</b> Why do you divide both sides by 4?  _____
<b>Calculate</b>  $\frac{4x}{4} = \frac{1800}{4}$  $x = 450$  Divide.	<b>6.</b> What does $x$ represent?  _____
<b>Answer the question asked.</b>  The southbound plane is flying at 450 mi/h.	<b>7.</b> How can you find the speed of the northbound plane?  _____ _____



# 1-5 Additional Vocabulary Support

## Solving Inequalities

is greater than	is greater than or equal to	is less than	is less than or equal to
>	≥	<	≤

To write an inequality from a sentence, first identify the operation and then identify the inequality.

**Example** What inequality represents the sentence “6 more than a number is at least 20”?

“more than” means addition

“is at least” means is greater than or equal to

6 more than a number is at least 20  
 $6 + x \geq 20$

Underline the word or words that indicate an operation.

- |   |                              |
|---|------------------------------|
| 1. the product of 12 and a number         | 2. 8 less than a number      |
| 3. the difference between a number and 24 | 4. the sum of a number and 7 |

Circle the word phrase that identifies the inequality to use. Then write the inequality that represents the sentence.

5. The product of 12 and a number is more than 190. \_\_\_\_\_
6. 8 less than a number is at least 34. \_\_\_\_\_
7. The difference between a number and 24 is no more than 4. \_\_\_\_\_
8. The sum of twice a number and 7 is less than 25. \_\_\_\_\_

Some word phrases are very similar, but have different meanings.

**Example** Does the sentence indicate an operation or an inequality?

A number is four greater than 15.

$$x = 4 + 15$$

operation

Four is greater than a number.

$$4 > x$$

inequality

Does the sentence indicate an *operation* or an *inequality*?

- |  |   |
|--|---|
| 9. 22 is 7 greater than a number.<br>_____           | 10. A number is greater than 99.<br>_____ |
| 11. A number is 8 less than another number.<br>_____ | 12. 50 is less than a number<br>_____     |



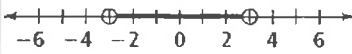
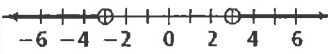
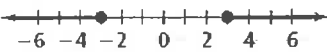
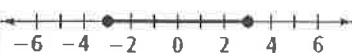
# 1-6 Additional Vocabulary Support

## Absolute Value Equations and Inequalities

### Concept List

$|x| < 3$      
  $|x| > 3$      
  $|x| \leq 3$      
  $|x| \geq 3$      
  $|x| = 3$

Choose the concept from the list below that best represents the item in each box.

<p>1. numbers more than 3 units away from zero</p>	<p>2. numbers three units away from zero or more than three units away from 0</p>	<p>3.</p> 
<p>4. numbers less than 3 units away from zero</p>	<p>5.</p> 	<p>6. numbers 3 units away from zero</p>
<p>7.</p> 	<p>8. numbers three units away from zero or less than three units away from 0</p>	<p>9.</p> 

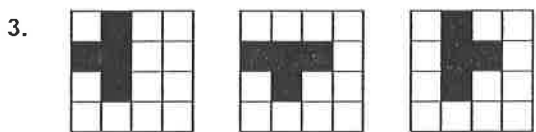
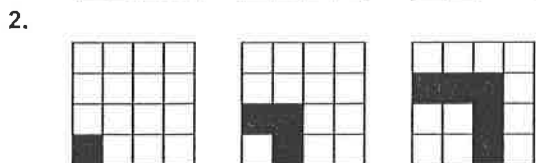
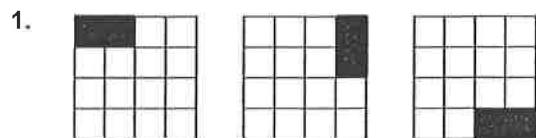


# 1-1 Practice

## Patterns and Expressions

Form G

Describe each pattern using words. Draw the next figure in each pattern.



Copy and complete each table. Include a process column.

4.

Input	Output
1	4
2	9
3	14
4	19
5	
6	
⋮	
n	

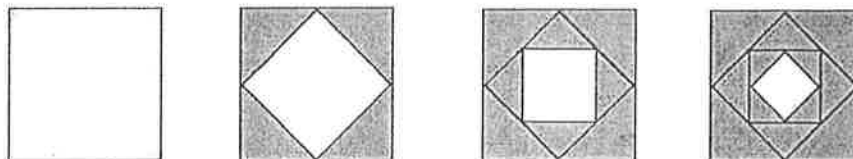
5.

Input	Output
1	-2
2	-4
3	-6
4	-8
5	
6	
⋮	
n	

6.

Input	Output
1	0.5
2	1.0
3	1.5
4	2.0
5	
6	
⋮	
n	

7. Describe the pattern using words.



# 1-1

## Practice (continued)

Form G

### Patterns and Expressions

A gardener plants a flower garden between his house and a brick pathway parallel to the house. The table at the right shows the area of the garden, in square feet, depending on the width of the garden, in feet.

Width	Area
1	3.5
2	7
3	10.5
4	14

8. What is the area of the garden if the width is 8 feet?

9. What is the area of the garden if the width is 15 feet?

**Identify a pattern and find the next three numbers in the pattern.**

10.  $-5, -10, -20, -40, \dots$

11.  $5, 8, 11, 14, \dots$

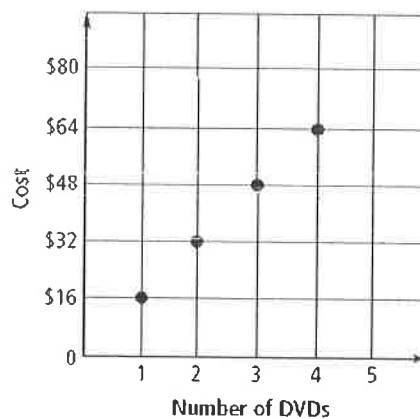
12.  $3, 1, -1, -3, \dots$

13.  $1, 3, 6, 10, 15, \dots$

14.  $\frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \dots$

15.  $10, 9, 6, 1, -6, \dots$

The graph shows the cost depending on the number of DVDs that you purchase.



16. What is the cost of purchasing 5 DVDs?

17. What is the cost of purchasing 10 DVDs?

18. What is the cost of purchasing  $n$  DVDs?

Keesha earns \$320 a week working in a clothing store. As a bonus, her employer pays her \$15 more than she earned the previous week, so that at the end of the second week she earns \$335, and after 3 weeks, she earns \$350.

19. How much will Keesha earn at the end of the fifth week?

20. How much will Keesha earn at the end of the tenth week?



# 1-2 Practice

Form G

## Properties of Real Numbers

Classify each variable according to the set of numbers that best describes its values.

1. the area of the circle  $A$  found by using the formula  $\pi r^2$
2. the number  $n$  of equal slices in a pizza; the portion  $p$  of the pizza in one slice
3. the air temperature  $t$  in Saint Paul, MN, measured to the nearest degree Fahrenheit
4. the last four digits  $s$  of a Social Security number

Graph each number on a number line.

5.  $-1$                       6.  $\sqrt{3}$                       7.  $2.8$                       8.  $-2\frac{1}{2}$

Compare the two numbers. Use  $>$  or  $<$ .

9.  $-\sqrt{2}, -2$                       10.  $4, \sqrt{17}$   
11.  $\sqrt{29}, 5$                       12.  $\sqrt{50}, 6.8$   
13.  $11, \sqrt{130}$                       14.  $-6, -\sqrt{30}$   
15.  $7\frac{1}{2}, \sqrt{67}$                       16.  $-\sqrt{10}, -\sqrt{12}$

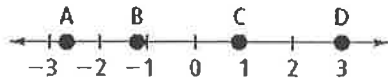
Name the property of real numbers illustrated by each equation.

17.  $2(3 + \sqrt{5}) = 2 \cdot 3 + 2 \cdot \sqrt{5}$                       18.  $16 + (-13) = -13 + 16$   
19.  $-7, \frac{1}{-7} = 1$                       20.  $5(0.2 \cdot 7) = (5 \cdot 0.2) \cdot 7$

**1-2 Practice** (continued)

## Properties of Real Numbers

Estimate the numbers graphed at the labeled points.



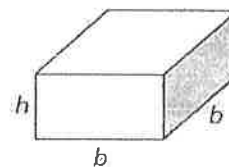
21. point A

22. point B

23. point C

24. point D

**Geometry** To find the length of side  $b$  of a rectangular prism with a square base, use the formula  $b = \sqrt{\frac{V}{h}}$  where  $V$  is the volume of the prism and  $h$  is the height. Which set of numbers best describes the value of  $b$  for the given values of  $V$  and  $h$ ?



25.  $V = 100, h = 5$

26.  $V = 100, h = 25$

27.  $V = 100, h = 20$

28.  $V = 5, h = 20$

Write the numbers in increasing order.

29.  $2\sqrt{2}, \frac{4}{5}, -\frac{5}{4}, 0.9, -1$

30.  $\frac{5}{8}, -6, \frac{2}{3}, -\pi, -0.5$

Justify the equation by stating one of the properties of real numbers.

31.  $(x + 37) + (-37) = x + (37 + (-37))$

32.  $x \cdot 1 = x$

33.  $x + (37 + (-37)) = x + 0$

34.  $x + 0 = x$

# 1-3 Practice

## Algebraic Expressions

Form G

Write an algebraic expression that models each word phrase.

1. seven less than the number  $t$
2. the sum of 11 and the product of 2 and a number  $r$

Write an algebraic expression that models each situation.

3. Arin has \$520 and is earning \$75 each week babysitting.
4. You have 50 boxes of raisins and are eating 12 boxes each month.

Evaluate each expression for the given values of the variables.

5.  $-4v + 3(w + 2v) - 5w$ ;  $v = -2$  and  $w = 4$
6.  $c(3 - a) - c^2$ ;  $a = 4$  and  $c = -1$
7.  $2(3e - 5f) + 3(e^2 + 4f)$ ;  $e = 3$  and  $f = -5$

**Surface Area** The expression  $6s^2$  represents the surface area of a cube with edges of length  $s$ . What is the surface area of a cube with each edge length?

8. 3 inches
9. 1.5 meters

The expression  $4.95 + 0.07x$  models a household's monthly long-distance charges, where  $x$  represents the number of minutes of long-distance calls during the month. What are the monthly charges for each number of long-distance minutes?

10. 73 minutes
11. 29 minutes

Simplify by combining like terms.

12.  $5x - 3x^2 + 16x^2$
13.  $\frac{3(a-b)}{9} + \frac{4}{9}b$
14.  $t + \frac{t^2}{2} + t^2 + t$
15.  $4a - 5(a + 1)$
16.  $-2(j^2 - k) - 6(j^2 + 3k)$
17.  $x(x - y) + y(y - x)$

# 1-3 Practice (continued)

## Algebraic Expressions

Form G

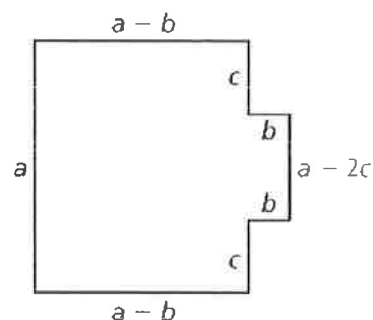
18. In a soccer tournament, teams receive 6 points for winning a game, 3 points for tying a game, and 1 point for each goal they score. What algebraic expression models the total number of points that a soccer team receives in a tournament? Suppose one team wins two games and ties one game, scoring a total of five goals. How many points does the team receive?

Evaluate each expression for the given value of the variable.

19.  $-t^2 - (3t + 2)$ ;  $t = 5$

20.  $i^2 - 5(i^3 - i^2)$ ;  $i = 4$

21. **Perimeter** Write an expression for the perimeter of the figure at the right as the sum of the lengths of its sides. What is the simplified form of this expression?



22. Simplify  $-(2x - 5y) + 3(4x + 2y)$  and justify each step in your simplification.

23. **Error Analysis** Alana simplified the expression as shown. Do you agree with her work? Explain.

$$\begin{array}{r} \cancel{2(x + 4) - (5x - 7)} \\ \cancel{2x + 4 - 5x - 7} \\ \cancel{-3x - 3} \end{array}$$

24. **Open-Ended** Write an example of an algebraic expression that always has the same value regardless of the value of the variable.

Match the property name with the appropriate equation.

25. Opposite of a Difference

A.  $-[(-r) + 2p] = -(-r) - 2p$

26. Opposite of a Sum

B.  $16d - (3d + 2)(0) = 16d - 0$

27. Opposite of an Opposite

C.  $5(2 - x) = 10 - 5x$

28. Multiplication by 0

D.  $-(4r + 3s) + t = (-1)(4r + 3s) + t$

29. Multiplication by  $-1$

E.  $-(8 - 3m) = 3m - 8$

30. Distributive Property

F.  $-[-(9 - 2w)] = 9 - 2w$