1-1 Study Guide and Intervention

Variables and Expressions

Write Verbal Expressions An **algebraic expression** consists of one or more numbers and variables along with one or more arithmetic operations. In algebra, **variables** are symbols used to represent unspecified numbers or values. Any letter may be used as a variable.

Example **Write a verbal expression for each algebraic expression.**

a. $6n^2$

the product of 6 and n squared

b. $n^3 - 12m$

the difference of n cubed and twelve times m

Exercises

Write a verbal expression for each algebraic expression.

1. $w - 1$

2. $\frac{1}{3}a^3$

3. $81 + 2x$

4. $12d$

5. 8^4

6. 6^2

7. $2n^2 + 4$

8. $a^3 \cdot b^3$

9. $2x^3 - 3$

10. $\frac{6k^3}{5}$

11. $\frac{1}{4}b^2$

12. $7n^5$

13. $3x + 4$

14. $\frac{2}{3}k^5$

15. $3b^2 + 2a^3$

16. $4(n^2 + 1)$

NAME ______________________ DATE ____________ PERIOD ____________

1-1 Study Guide and Intervention *(continued)*

Variables and Expressions

Write Algebraic Expressions Translating verbal expressions into algebraic expressions is an important algebraic skill.

Example **Write an algebraic expression for each verbal expression.**

a. four more than a number n

The words *more than* imply addition.
four more than a number n
$4 + n$
The algebraic expression is $4 + n$.

b. the difference of a number squared and 8

The expression *difference of* implies subtraction.
the difference of a number squared and 8
$n^2 - 8$
The algebraic expression is $n^2 - 8$.

Exercises

Write an algebraic expression for each verbal expression.

1. a number decreased by 8

2. a number divided by 8

3. a number squared

4. four times a number

5. a number divided by 6

6. a number multiplied by 37

7. the sum of 9 and a number

8. 3 less than 5 times a number

9. twice the sum of 15 and a number

10. one-half the square of b

11. 7 more than the product of 6 and a number

12. 30 increased by 3 times the square of a number

NAME ______________________ DATE __________ PERIOD __________

1-2 Study Guide and Intervention

Order of Operations

Evaluate Numerical Expressions Numerical expressions often contain more than one operation. To evaluate them, use the rules for order of operations shown below.

Order of Operations	**Step 1** Evaluate expressions inside grouping symbols. **Step 2** Evaluate all powers. **Step 3** Do all multiplication and/or division from left to right. **Step 4** Do all addition and/or subtraction from left to right.

Example 1 Evaluate each expression.

a. 3^4

$3^4 = 3 \cdot 3 \cdot 3 \cdot 3$ — Use 3 as a factor 4 times.

$= 81$ — Multiply.

b. 6^3

$6^3 = 6 \cdot 6 \cdot 6$ — Use 6 as a factor 3 times.

$= 216$ — Multiply.

Example 2 Evaluate each expression.

a. $3[2 + (12 \div 3)^2]$

$3[2 + (12 \div 3)^2] = 3(2 + 4^2)$ — Divide 12 by 3.

$= 3(2 + 16)$ — Find 4 squared.

$= 3(18)$ — Add 2 and 16.

$= 54$ — Multiply 3 and 18.

b. $\dfrac{3 + 2^3}{4^2 \cdot 3}$

$\dfrac{3 + 2^3}{4^2 \cdot 3} = \dfrac{3 + 8}{4^2 \cdot 3}$ — Evaluate power in numerator.

$= \dfrac{11}{4^2 \cdot 3}$ — Add 3 and 8 in the numerator.

$= \dfrac{11}{16 \cdot 3}$ — Evaluate power in denominator.

$= \dfrac{11}{48}$ — Multiply.

Exercises

Evaluate each expression.

1. 5^2

2. 3^3

3. 10^4

4. 12^2

5. 8^3

6. 2^8

7. $(8 - 4) \cdot 2$

8. $(12 + 4) \cdot 6$

9. $10 + 8 \cdot 1$

10. $15 - 12 \div 4$

11. $12(20 - 17) - 3 \cdot 6$

12. $24 \div 3 \cdot 2 - 3^2$

13. $3^2 \div 3 + 2^2 \cdot 7 - 20 \div 5$

14. $\dfrac{4 + 3^2}{12 + 1}$

15. $250 \div [5(3 \cdot 7 + 4)]$

16. $\dfrac{2 \cdot 4^2 - 8 \div 2}{(5 + 2) \cdot 2}$

17. $\dfrac{4(5^2) - 4 \cdot 3}{4(4 \cdot 5 + 2)}$

18. $\dfrac{5^2 - 3}{20(3) + 2(3)}$

Lesson 1-2

1-2 Study Guide and Intervention *(continued)*

Order of Operations

Evaluate Algebraic Expressions Algebraic expressions may contain more than one operation. Algebraic expressions can be evaluated if the values of the variables are known. First, replace the variables with their values. Then use the order of operations to calculate the value of the resulting numerical expression.

Example **Evaluate $x^3 + 5(y - 3)$ if $x = 2$ and $y = 12$.**

$x^3 + 5(y - 3) = 2^3 + 5(12 - 3)$	Replace x with 2 and y with 12.
$= 8 + 5(12 - 3)$	Evaluate 2^3.
$= 8 + 5(9)$	Subtract 3 from 12.
$= 8 + 45$	Multiply 5 and 9.
$= 53$	Add 8 and 45.

The solution is 53.

Exercises

Evaluate each expression if $x = 2$, $y = 3$, $z = 4$, $a = \frac{4}{5}$, and $b = \frac{3}{5}$.

1. $x + 7$

2. $3x - 5$

3. $x + y^2$

4. $x^3 + y + z^2$

5. $6a + 8b$

6. $23 - (a + b)$

7. $\frac{y^2}{x^2}$

8. $2xyz + 5$

9. $x(2y + 3z)$

10. $(10x)^2 + 100a$

11. $\frac{3xy - 4}{7x}$

12. $a^2 + 2b$

13. $\frac{z^2 - y^2}{x^2}$

14. $6xz + 5xy$

15. $\frac{(z - y)^2}{x}$

16. $\frac{25ab + y}{xz}$

17. $\frac{5a^2b}{y}$

18. $(z \div x)^2 + ax$

19. $\left(\frac{x}{z}\right)^2 + \left(\frac{y}{z}\right)^2$

20. $\frac{x + z}{y + 2z}$

21. $\left(\frac{z \div x}{y}\right) + \left(\frac{y \div x}{z}\right)$

NAME ______________________ DATE __________ PERIOD __________

1-3 Study Guide and Intervention

Properties of Numbers

Identity and Equality Properties The identity and equality properties in the chart below can help you solve algebraic equations and evaluate mathematical expressions.

Additive Identity	For any number a, $a + 0 = a$.
Additive Inverse	For any number a, $a + (-a) = 0$.
Multiplicative Identity	For any number a, $a \cdot 1 = a$.
Multiplicative Property of 0	For any number a, $a \cdot 0 = 0$.
Multiplicative Inverse Property	For every number $\frac{a}{b}$, where $a, b \neq 0$, there is exactly one number $\frac{b}{a}$ such that $\frac{a}{b} \cdot \frac{b}{a} = 1$.
Reflexive Property	For any number a, $a = a$.
Symmetric Property	For any numbers a and b, if $a = b$, then $b = a$.
Transitive Property	For any numbers a, b, and c, if $a = b$ and $b = c$, then $a = c$.
Substitution Property	If $a = b$, then a may be replaced by b in any expression.

Example **Evaluate $24 \cdot 1 - 8 + 5(9 \div 3 - 3)$. Name the property used in each step.**

$24 \cdot 1 - 8 + 5(9 \div 3 - 3) = 24 \cdot 1 - 8 + 5(3 - 3)$	Substitution; $9 \div 3 = 3$
$= 24 \cdot 1 - 8 + 5(0)$	Substitution; $3 - 3 = 0$
$= 24 - 8 + 5(0)$	Multiplicative Identity; $24 \cdot 1 = 24$
$= 24 - 8 + 0$	Multiplicative Property of Zero; $5(0) = 0$
$= 16 + 0$	Substitution; $24 - 8 = 16$
$= 16$	Additive Identity; $16 + 0 = 16$

Exercises

Evaluate each expression. Name the property used in each step.

1. $2\left[\frac{1}{4} + \left(\frac{1}{2}\right)^2\right]$

2. $15 \cdot 1 - 9 + 2(15 \div 3 - 5)$

3. $2(3 \cdot 5 \cdot 1 - 14) - 4 \cdot \frac{1}{4}$

4. $18 \cdot 1 - 3 \cdot 2 + 2(6 \div 3 - 2)$

NAME ______________________ DATE __________ PERIOD __________

1-3 Study Guide and Intervention *(continued)*

Properties of Numbers

Commutative and Associative Properties The Commutative and Associative Properties can be used to simplify expressions. The Commutative Properties state that the order in which you add or multiply numbers does not change their sum or product. The Associative Properties state that the way you group three or more numbers when adding or multiplying does not change their sum or product.

Commutative Properties	For any numbers a and b, $a + b = b + a$ and $a \cdot b = b \cdot a$.
Associative Properties	For any numbers a, b, and c, $(a + b) + c = a + (b + c)$ and $(ab)c = a(bc)$.

Example 1 **Evaluate $6 \cdot 2 \cdot 3 \cdot 5$ using properties of numbers. Name the property used in each step.**

$6 \cdot 2 \cdot 3 \cdot 5 = 6 \cdot 3 \cdot 2 \cdot 5$ Commutative Property

$= (6 \cdot 3)(2 \cdot 5)$ Associative Property

$= 18 \cdot 10$ Multiply.

$= 180$ Multiply.

The product is 180.

Example 2 **Evaluate $8.2 + 2.5 + 2.5 + 1.8$ using properties of numbers. Name the property used in each step.**

$8.2 + 2.5 + 2.5 + 1.8$

$= 8.2 + 1.8 + 2.5 + 2.5$ Commutative Prop.

$= (8.2 + 1.8) + (2.5 + 2.5)$ Associative Prop.

$= 10 + 5$ Add.

$= 15$ Add.

The sum is 15.

Exercises

Evaluate each expression using properties of numbers. Name the property used in each step.

1. $12 + 10 + 8 + 5$

2. $16 + 8 + 22 + 12$

3. $10 \cdot 7 \cdot 2.5$

4. $4 \cdot 8 \cdot 5 \cdot 3$

5. $12 + 20 + 10 + 5$

6. $26 + 8 + 4 + 22$

7. $3\frac{1}{2} + 4 + 2\frac{1}{2} + 3$

8. $\frac{3}{4} \cdot 12 \cdot 4 \cdot 2$

9. $3.5 + 2.4 + 3.6 + 4.2$

10. $4\frac{1}{2} + 5 + \frac{1}{2} + 3$

11. $0.5 \cdot 2.8 \cdot 4$

12. $2.5 + 2.4 + 2.5 + 3.6$

13. $\frac{4}{5} \cdot 18 \cdot 25 \cdot \frac{2}{9}$

14. $32 \cdot \frac{1}{5} \cdot \frac{1}{2} \cdot 10$

15. $\frac{1}{4} \cdot 7 \cdot 16 \cdot \frac{1}{7}$

16. $3.5 + 8 + 2.5 + 2$

17. $18 \cdot 8 \cdot \frac{1}{2} \cdot \frac{1}{9}$

18. $\frac{3}{4} \cdot 10 \cdot 16 \cdot \frac{1}{2}$

Lesson 1-3

NAME ____________________ DATE __________ PERIOD __________

1-4 Study Guide and Intervention

The Distributive Property

Evaluate Expressions The Distributive Property can be used to help evaluate expressions.

Distributive Property	For any numbers a, b, and c, $a(b + c) = ab + ac$ and $(b + c)a = ba + ca$ and $a(b - c) = ab - ac$ and $(b - c)a = ba - ca$.

Example 1 **Use the Distributive Property to rewrite 6(8 + 10). Then evaluate.**

$6(8 + 10) = 6 \cdot 8 + 6 \cdot 10$ Distributive Property
$= 48 + 60$ Multiply.
$= 108$ Add.

Example 2 **Use the Distributive Property to rewrite $-2(3x^2 + 5x + 1)$. Then simplify.**

$-2(3x^2 + 5x + 1) = -2(3x^2) + (-2)(5x) + (-2)(1)$ Distributive Property
$= -6x^2 + (-10x) + (-2)$ Multiply.
$= -6x^2 - 10x - 2$ Simplify.

Exercises

Use the Distributive Property to rewrite each expression. Then evaluate.

1. $20(31)$

2. $12 \cdot 4\frac{1}{2}$

3. $5(311)$

4. $5(4x - 9)$

5. $3(8 - 2x)$

6. $12\left(6 - \frac{1}{2}x\right)$

7. $12\left(2 + \frac{1}{2}x\right)$

8. $\frac{1}{4}(12 - 4t)$

9. $3(2x - y)$

10. $2(3x + 2y - z)$

11. $(x - 2)y$

12. $2(3a - 2b + c)$

13. $\frac{1}{4}(16x - 12y + 4z)$

14. $(2 - 3x + x^2)3$

15. $-2(2x^2 + 3x + 1)$

1-4 Study Guide and Intervention *(continued)*

The Distributive Property

Simplify Expressions A **term** is a number, a variable, or a product or quotient of numbers and variables. **Like terms** are terms that contain the same variables, with corresponding variables having the same powers. The Distributive Property and properties of equalities can be used to simplify expressions. An expression is in **simplest form** if it is replaced by an **equivalent** expression with no like terms or parentheses.

Example **Simplify $4(a^2 + 3ab) - ab$.**

$4(a^2 + 3ab) - ab$	$= 4(a^2 + 3ab) - 1ab$	Multiplicative Identity
	$= 4a^2 + 12ab - 1ab$	Distributive Property
	$= 4a^2 + (12 - 1)ab$	Distributive Property
	$= 4a^2 + 11ab$	Substitution

Exercises

Simplify each expression. If not possible, write *simplified*.

1. $12a - a$

2. $3x + 6x$

3. $3x - 1$

4. $20a + 12a - 8$

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

6. $-6x + 3x^2 + 10x^2$

7. $2p + \frac{1}{2}q$

8. $10xy - 4(xy + xy)$

9. $21a + 18a + 31b - 3b$

10. $4x + \frac{1}{4}(16x - 20y)$

11. $2 - 1 - 6x + x^2$

12. $4x^2 + 3x^2 + 2x$

Write an algebraic expression for each verbal expression. Then simplify, indicating the properties used.

13. six times the difference of $2a$ and b, increased by $4b$

14. two times the sum of x squared and y squared, increased by three times the sum of x squared and y squared

Lesson 1-4

NAME ______________________ DATE ____________ PERIOD ____________

1-5 Study Guide and Intervention

Equations

Solve Equations A mathematical sentence with one or more variables is called an **open sentence**. Open sentences are **solved** by finding replacements for the variables that result in true sentences. The set of numbers from which replacements for a variable may be chosen is called the **replacement set**. The set of all replacements for the variable that result in true statements is called the **solution set** for the variable. A sentence that contains an equal sign, =, is called an **equation**.

Example 1 **Find the solution set of $3a + 12 = 39$ if the replacement set is {6, 7, 8, 9, 10}.**

Replace a in $3a + 12 = 39$ with each value in the replacement set.

$3(6) + 12 \stackrel{?}{=} 39 \rightarrow 30 \neq 39$ false

$3(7) + 12 \stackrel{?}{=} 39 \rightarrow 33 \neq 39$ false

$3(8) + 12 \stackrel{?}{=} 39 \rightarrow 36 \neq 39$ false

$3(9) + 12 \stackrel{?}{=} 39 \rightarrow 39 = 39$ true

$3(10) + 12 \stackrel{?}{=} 39 \rightarrow 42 \neq 39$ false

Since $a = 9$ makes the equation $3a + 12 = 39$ true, the solution is 9.

The solution set is {9}.

Example 2 **Solve $\frac{2(3 + 1)}{3(7 - 4)} = b$.**

$\frac{2(3 + 1)}{3(7 - 4)} = b$ Original equation

$\frac{2(4)}{3(3)} = b$ Add in the numerator; subtract in the denominator.

$\frac{8}{9} = b$ Simplify.

The solution is $\frac{8}{9}$.

Exercises

Find the solution of each equation if the replacement sets are $x = \left\{\frac{1}{4}, \frac{1}{2}, 1, 2, 3\right\}$ and $y = \{2, 4, 6, 8\}$.

1. $x + \frac{1}{2} = \frac{5}{2}$
2. $x + 8 = 11$
3. $y - 2 = 6$
4. $x^2 - 1 = 8$
5. $y^2 - 2 = 34$
6. $x^2 + 5 = 5\frac{1}{16}$
7. $2(x + 3) = 7$
8. $(y + 1)^2 = 9$
9. $y^2 + y = 20$

Solve each equation.

10. $a = 2^3 - 1$
11. $n = 6^2 - 4^2$
12. $w = 6^2 \cdot 3^2$
13. $\frac{1}{4} + \frac{5}{8} = k$
14. $\frac{18 - 3}{2 + 3} = p$
15. $t = \frac{15 - 6}{27 - 24}$
16. $18.4 - 3.2 = m$
17. $k = 9.8 + 5.7$
18. $c = 3\frac{1}{2} + 2\frac{1}{4}$

1-5 Study Guide and Intervention *(continued)*

Equations

Solve Equations with Two Variables Some equations contain two variables. It is often useful to make a table of values in which you can use substitution to find the corresponding values of the second variable.

Example

MUSIC DOWNLOADS Emily belongs to an Internet music service that charges \$5.99 per month and \$0.89 per song. Write and solve an equation to find the total amount Emily spends if she downloads 10 songs this month.

The cost of the music service is a flat rate. The variable is the number of songs she downloads. The total cost is the price of the service plus \$0.89 times the number of songs.

$C = 0.89n + 5.99$

To find the total cost for the month, substitute 10 for n in the equation.

$C = 0.89n + 5.99$	Original equation
$= 0.89(10) + 5.99$	Substitute 10 for *n*.
$= 8.90 + 5.99$	Multiply.
$= 14.89$	Add.

Emily spent \$14.89 on music downloads in one month.

Exercises

1. **AUTO REPAIR** A mechanic repairs Mr. Estes' car. The amount for parts is \$48.00 and the rate for the mechanic is \$40.00 per hour. Write and solve an equation to find the total cost of repairs to Mr. Estes' car if the mechanic works for 1.5 hours.

2. **SHIPPING FEES** Mr. Moore purchases an inflatable kayak weighing 30 pounds from an online company. The standard rate to ship his purchase is \$2.99 plus \$0.85 per pound. Write and solve an equation to find the total amount Mr. Moore will pay to have the kayak shipped to his home.

3. **SOUND** The speed of sound is 1088 feet per second at sea level at 32° F. Write and solve an equation to find the distance sound travels in 8 seconds under these conditions.

4. **VOLLEYBALL** Your town decides to build a volleyball court. If the court is approximately 40 by 70 feet and its surface is of sand, one foot deep, the court will require about 166 tons of sand. A local sand pit sells sand for \$11.00 per ton with a delivery charge of \$3.00 per ton. Write and solve an equation to find the total cost of the sand for this court.

NAME ______________________ DATE ________ PERIOD ________

1-6 Study Guide and Intervention

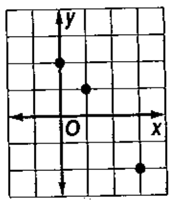
Relations

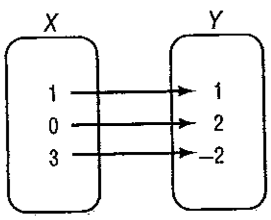
Lesson 1-6

Represent a Relation A **relation** is a set of ordered pairs. A relation can be represented by a set of ordered pairs, a table, a graph, or a **mapping**. A mapping illustrates how each element of the domain is paired with an element in the range. The set of first numbers of the ordered pairs is the **domain**. The set of second numbers of the ordered pairs is the **range** of the relation.

Example **a. Express the relation {(1, 1), (0, 2), (3, −2)} as a table, a graph, and a mapping.**

x	y
1	1
0	2
3	−2





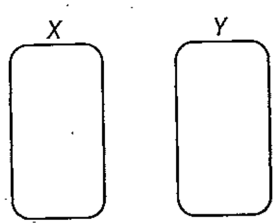
b. Determine the domain and the range of the relation.

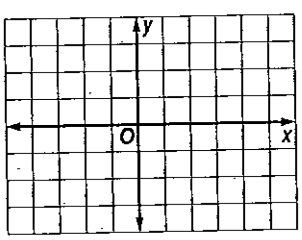
The domain for this relation is {0, 1, 3}. The range for this relation is {−2, 1, 2}.

Exercises

1A. Express the relation {(−2, −1), (3, 3), (4, 3)} as a table, a graph, and a mapping.

x	y





1B. Determine the domain and the range of the relation.

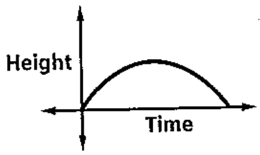
NAME ______________________ DATE __________ PERIOD __________

1-6 Study Guide and Intervention *(continued)*

Relations

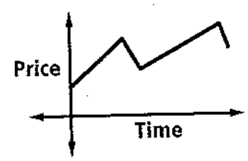
Graphs of a Relation The value of the variable in a relation that is subject to choice is called the **independent variable**. The variable with a value that is dependent on the value of the independent variable is called the **dependent variable**. These relations can be graphed without a scale on either axis, and interpreted by analyzing the shape.

Example 1 **The graph below represents the height of a football after it is kicked downfield. Identify the independent and the dependent variable for the relation. Then describe what happens in the graph.**



The independent variable is time, and the dependent variable is height. The football starts on the ground when it is kicked. It gains altitude until it reaches a maximum height, then it loses altitude until it falls to the ground.

Example 2 **The graph below represents the price of stock over time. Identify the independent and dependent variable for the relation. Then describe what happens in the graph.**

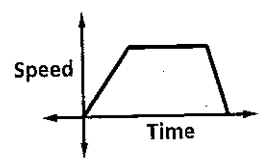


The independent variable is time and the dependent variable is price. The price increases steadily, then it falls, then increases, then falls again.

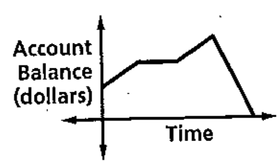
Exercises

Identify the independent and dependent variables for each relation. Then describe what is happening in each graph.

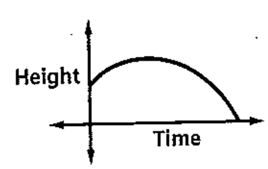
1. The graph represents the speed of a car as it travels to the grocery store.



2. The graph represents the balance of a savings account over time.



3. The graph represents the height of a baseball after it is hit.



NAME ______________________ DATE __________ PERIOD __________

1-7 Study Guide and Intervention

Functions

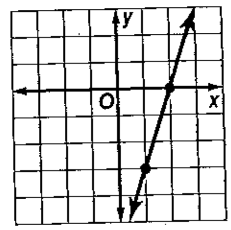
Identify Functions Relations in which each element of the domain is paired with exactly one element of the range are called **functions.**

Example 1 **Determine whether the relation {(6, −3), (4, 1), (7, −2), (−3, 1)} is a function. Explain.**

Since each element of the domain is paired with exactly one element of the range, this relation is a function.

Example 2 **Determine whether $3x - y = 6$ is a function.**

Since the equation is in the form $Ax + By = C$, the graph of the equation will be a line, as shown at the right.

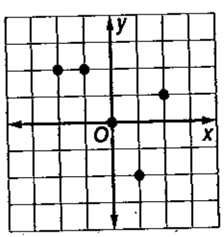


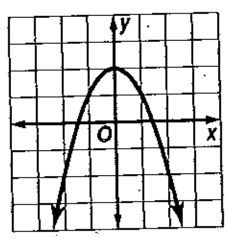
If you draw a vertical line through each value of x, the vertical line passes through just one point of the graph. Thus, the line represents a function.

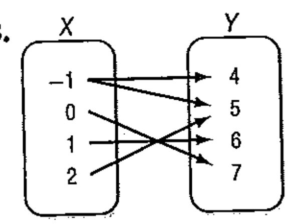
Lesson 1-7

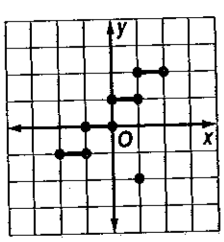
Exercises

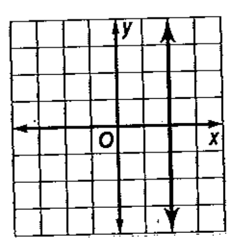
Determine whether each relation is a function.

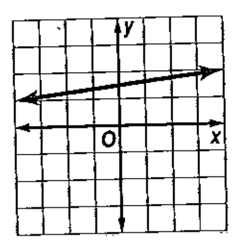
1.


2.


3.


4.


5.


6.


7. {(4, 2), (2, 3), (6, 1)}

8. {(−3, −3), (−3, 4), (−2, 4)}

9. {(−1, 0), (1, 0)}

10. $-2x + 4y = 0$

11. $x^2 + y^2 = 8$

12. $x = -4$

1-7 Study Guide and Intervention *(continued)*

Functions

Find Function Values Equations that are functions can be written in a form called **function notation**. For example, $y = 2x - 1$ can be written as $f(x) = 2x - 1$. In the function, x represents the elements of the domain, and $f(x)$ represents the elements of the range. Suppose you want to find the value in the range that corresponds to the element 2 in the domain. This is written $f(2)$ and is read "f of 2." The value of $f(2)$ is found by substituting 2 for x in the equation.

Example **If $f(x) = 3x - 4$, find each value.**

a. $f(3)$

$f(3) = 3(3) - 4$ Replace x with 3.
$= 9 - 4$ Multiply.
$= 5$ Simplify.

b. $f(-2)$

$f(-2) = 3(-2) - 4$ Replace x with -2.
$= -6 - 4$ Multiply.
$= -10$ Simplify.

Exercises

If $f(x) = 2x - 4$ and $g(x) = x^2 - 4x$, find each value.

1. $f(4)$

2. $g(2)$

3. $f(-5)$

4. $g(-3)$

5. $f(0)$

6. $g(0)$

7. $f(3) - 1$

8. $f\left(\frac{1}{4}\right)$

9. $g\left(\frac{1}{4}\right)$

10. $f(a^2)$

11. $f(k + 1)$

12. $g(2n)$

13. $f(3x)$

14. $f(2) + 3$

15. $g(-4)$

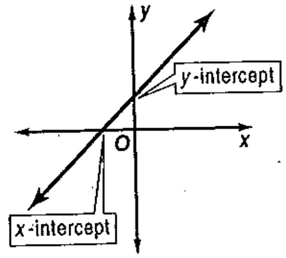
NAME ____________________ DATE ____________ PERIOD ____________

1-8 Study Guide and Intervention

Interpreting Graphs of Functions

Interpret Intercepts and Symmetry

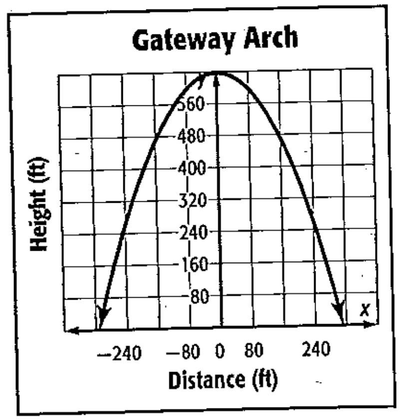
The **intercepts** of a graph are points where the graph intersects an axis. The y-coordinate of the point at which the graph intersects the y-axis is called a **y-intercept.** Similarly, the x-coordinate of the point at which a graph intersects the x-axis is called an **x-intercept.**



A graph possesses **line symmetry** in a line if each half of the graph on either side of the line matches exactly.

Example

ARCHITECTURE The graph shows a function that approximates the shape of the Gateway Arch, where x is the distance from the center point in feet and y is the height in feet. Identify the function as *linear* or *nonlinear*. Then estimate and interpret the intercepts, and describe and interpret any symmetry.



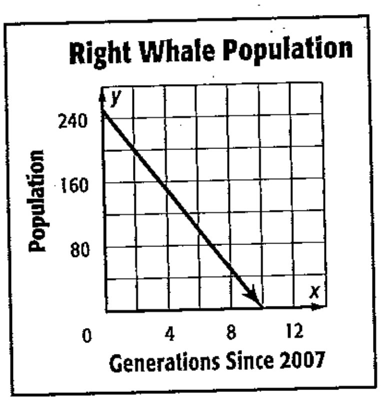
Linear or Nonlinear: Since the graph is a curve and not a line, the graph is nonlinear.

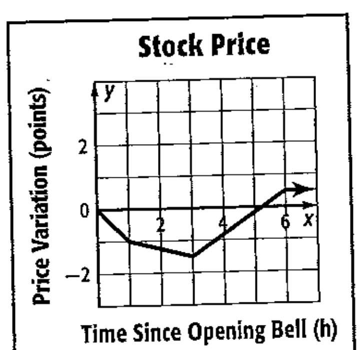
y-Intercept: The graph intersects the y-axis at about (0, 630), so the y-intercept of the graph is about 630. This means that the height of the arch is 630 feet at the center point.

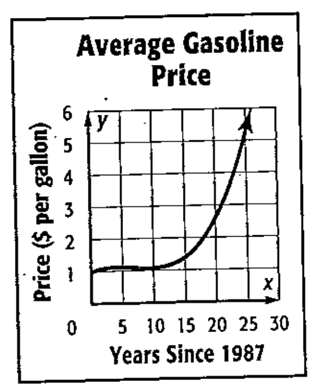
x-Intercept(s): The graph intersects the x-axis at about (−320, 0) and (320, 0). So the x-intercepts are about −320 and 320. This means that the object touches the ground to the left and right of the center point.

Symmetry: The right half of the graph is the mirror image of the left half in the y-axis. In the context of the situation, the symmetry of the graph tells you that the arch is symmetric. The height of the arch at any distance to the right of the center is the same as its height that same distance to the left.

Identify the function graphed as *linear* or *nonlinear*. Then estimate and interpret the intercepts of the graph and any symmetry.

1.


2.


3.


NAME ____________________ DATE __________ PERIOD __________

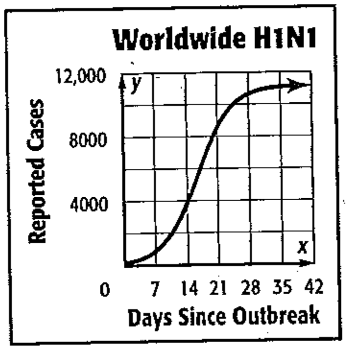
1-8 Study Guide and Intervention *(continued)*

Interpreting Graphs of Functions

Interpret Extrema and End Behavior Interpreting a graph also involves estimating and interpreting where the function is increasing, decreasing, positive, or negative, and where the function has any extreme values, either high or low.

Example

HEALTH The outbreak of the H1N1 virus can be modeled by the function graphed at the right. Estimate and interpret where the function is positive, negative, increasing, and decreasing, the x-coordinates of any relative extrema, and the end behavior of the graph.



Positive: for x between 0 and 42

Negative: no parts of domain

This means that the number of reported cases was always positive. This is reasonable because a negative number of cases cannot exist in the context of the situation.

Increasing: for x between 0 and 42 **Decreasing:** no parts of domain

The number of reported cases increased each day from the first day of the outbreak.

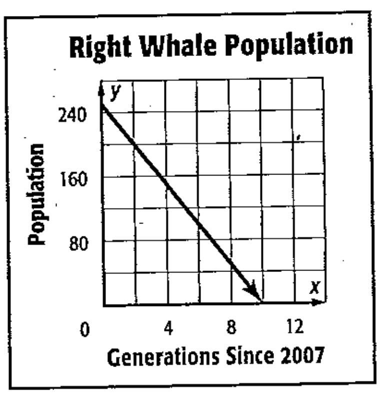
Relative Maximum: at about $x = 42$ **Relative Minimum:** at $x = 0$

The extrema of the graph indicate that the number of reported cases peaked at about day 42.

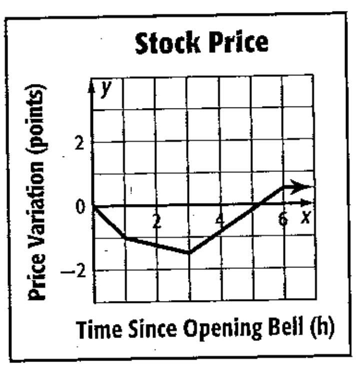
End Behavior: As x increases, y appears to approach 11,000. As x decreases, y decreases. The end behavior of the graph indicates a maximum number of reported cases of 11,000.

Estimate and interpret where the function is positive, negative, increasing, and decreasing, the x-coordinate of any relative extrema, and the end behavior of the graph.

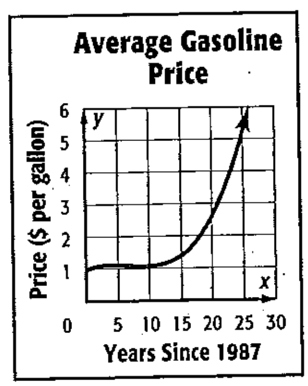
1.



2.



3.



NAME ______________________ DATE __________ PERIOD __________

SCORE ______

1 Chapter 1 Test, Form 1

Assessment

Write the letter for the correct answer in the blank at the right of each question.

1. Write an algebraic expression for *the sum of a number and 8.* **1.** ______

A $8x$ **B** $x - 8$ **C** $x + 8$ **D** $x \div 8$

2. Write an algebraic expression for *27 decreased by a number.* **2.** ______

F $27 + m$ **G** $27 - m$ **H** $m - 27$ **J** $\frac{27}{m}$

3. Write a verbal expression for $19a$. **3.** ______

A the sum of 19 and a number **C** the quotient of 19 and a number
B the difference of 19 and a number **D** the product of 19 and a number

4. Write a verbal expression for $x + y$. **4.** ______

F the sum of x and y **H** the difference of x and y
G the quotient of x and y **J** the product of x and y

5. Evaluate $6(8 - 3)$. **5.** ______

A 45 **B** 30 **C** 11 **D** 66

6. Evaluate $2k + m$ if $k = 11$ and $m = 5$. **6.** ______

F 32 **G** 216 **H** 27 **J** 18

7. Name the property used in $n + 0 = 7$. **7.** ______

A Multiplicative Inverse Property **C** Additive Identity Property
B Substitution Property **D** Multiplicative Identity Property

8. Evaluate $13 + 6 + 7 + 4$. **8.** ______

F 2184 **G** 29 **H** 20 **J** 30

9. Simplify $7b + 2b + 3c$. **9.** ______

A $12bc$ **B** $9b + 3c$ **C** $7b + 5c$ **D** $5b + 3c$

10. Simplify $5(2g + 3)$. **10.** ______

F $10g + 3$ **G** $7g + 3$ **H** $10g + 15$ **J** $7g + 8$

11. Evaluate $4 \cdot 1 + 6 \cdot 16 + 0$. **11.** ______

A 100 **B** 0 **C** 8 **D** 185

12. Which of the following uses the Distributive Property to determine the product 12(185)? **12.** ______

F $12(100) + 12(13)$ **H** $12(18) + 12(5)$
G $12(1) + 12(8) + 12(5)$ **J** $12(100) + 12(80) + 12(5)$

13. Find the solution of $x + 4 = 7$ if the replacement set is $\{1, 2, 3, 4, 5\}$. **13.** ______

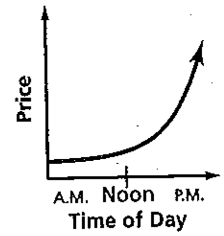
A 1 **B** 3 **C** 4 **D** 2

14. A car rental company charges a rental fee of \$20 per day in addition to a charge of \$0.30 per mile driven. How much does it cost to rent a car for a day and drive it 25 miles? **14.** ______

F \$45.30 **G** \$20.30 **H** \$27.50 **J** \$26.00

1 Chapter 1 Test, Form 1 *(continued)*

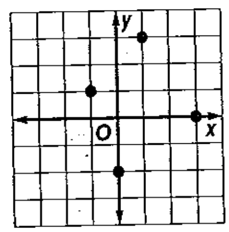
15. Which statement best describes the graph of the price of one share of a company's stock shown at the right?



A The price increased more in the morning than in the afternoon.
B The price decreased more in the morning than in the afternoon.
C The price increased more in the afternoon than in the morning.
D The price decreased more in the afternoon than in the morning.

15. ______

16. What is the domain of the relation?

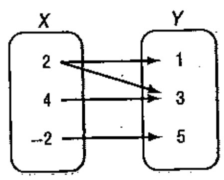


F {–1, 0, 1, 3} **H** {–2, –1, 0, 1, 2, 3}
G {–2, 0, 1, 3} **J** {0, 1, 2, 3}

16. ______

17. Determine which relation is a function.

A



C

x	3	4	4	5
y	–1	2	3	6

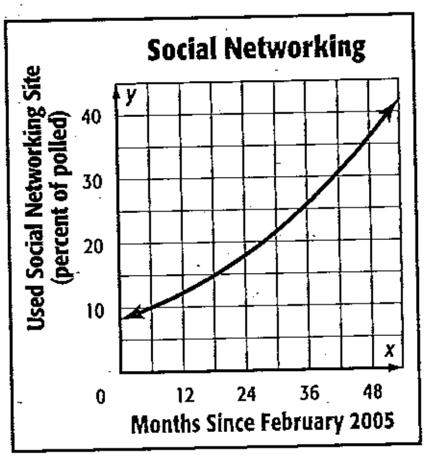
B $y = \frac{1}{5}x + 2$ **D** {(3, 0), (– 2, – 2), (7, – 2), (– 2, 0)}

17. ______

18. If $h(r) = \frac{2}{3}r - 6$, what is the value of $h(-9)$?
F 12 **G** 0 **H** $-6\frac{2}{3}$ **J** –12

18. ______

For Questions 19 and 20, use the graph.



19. Interpret the y-intercept of the graph.
A All those polled used a social networking site 8 months after February 2005.
B About 8% of those polled used a social networking site in February 2005.
C No one used a social networking site in February 2005.
D There were 8 social networking sites in February 2005.

19. ______

20. Interpret the end behavior of the function in terms of social networking.
F expected to decrease **H** expected to level off at 55%
G expected to increase **J** expected to level off at 8%

20. ______

Bonus Simplify (4x + 2)3.

B: ______________