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1-1 Skills Practice***Variables and Expressions***

Write a verbal expression for each algebraic expression.

1. $9a^2$

2. 5^2

3. $c + 2d$

4. $4 - 5h$

5. $2b^2$

6. $7x^3 - 1$

7. $p^4 + 6r$

8. $3n^2 - x$

Write an algebraic expression for each verbal expression.

9. the sum of a number and 10

10. 15 less than k 11. the product of 18 and q 12. 6 more than twice m

13. 8 increased by three times a number

14. the difference of 17 and 5 times a number

15. the product of 2 and the second power of y 16. 9 less than g to the fourth power

1-1 Practice**Variables and Expressions**

Write a verbal expression for each algebraic expression.

1. $23f$

2. 7^3

3. $5m^2 + 2$

4. $4d^3 - 10$

5. $x^3 \cdot y^4$

6. $b^2 - 3c^3$

7. $\frac{k^5}{6}$

8. $\frac{4n^2}{7}$

Write an algebraic expression for each verbal expression.

9. the difference of 10 and u

10. the sum of 18 and a number

11. the product of 33 and j

12. 74 increased by 3 times y

13. 15 decreased by twice a number

14. 91 more than the square of a number

15. three fourths the square of b

16. two fifths the cube of a number

17. **BOOKS** A used bookstore sells paperback fiction books in excellent condition for \$2.50 and in fair condition for \$0.50. Write an expression for the cost of buying x excellent-condition paperbacks and f fair-condition paperbacks.

18. **GEOMETRY** The surface area of the side of a right cylinder can be found by multiplying twice the number π by the radius times the height. If a circular cylinder has radius r and height h , write an expression that represents the surface area of its side.

1-2 Skills Practice**Order of Operations**

Evaluate each expression.

1. 8^2

2. 3^4

3. 5^3

4. 3^3

5. $(5 + 4) \cdot 7$

6. $(9 - 2) \cdot 3$

7. $4 + 6 \cdot 3$

8. $12 + 2 \cdot 2$

9. $(3 + 5) \cdot 5 + 1$

10. $9 + 4(3 + 1)$

11. $30 - 5 \cdot 4 + 2$

12. $10 + 2 \cdot 6 + 4$

13. $14 \div 7 \cdot 5 - 3^2$

14. $4[30 - (10 - 2) \cdot 3]$

15. $5 + [30 - (6 - 1)^2]$

16. $2[12 + (5 - 2)^2]$

Evaluate each expression if $x = 6$, $y = 8$, and $z = 3$.

17. $xy + z$

18. $yz - x$

19. $2x + 3y - z$

20. $2(x + z) - y$

21. $5z + (y - x)$

22. $5x - (y + 2z)$

23. $x^2 + y^2 - 10z$

24. $z^3 + (y^2 - 4x)$

25. $\frac{y + xz}{2}$

26. $\frac{3y + x^2}{z}$

1-2 Practice**Order of Operations**

Evaluate each expression.

1. 11^2

2. 8^3

3. 5^4

4. $(15 - 5) \cdot 2$

5. $9 \cdot (3 + 4)$

6. $5 + 7 \cdot 4$

7. $4(3 + 5) - 5 \cdot 4$

8. $22 \div 11 \cdot 9 - 3^2$

9. $6^2 + 3 \cdot 7 - 9$

10. $3[10 - (27 \div 9)]$

11. $2[5^2 + (36 \div 6)]$

12. $162 \div [6(7 - 4)^2]$

13. $\frac{5^2 \cdot 4 - 5 \cdot 4^2}{5(4)}$

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

15. $\frac{7 + 3^2}{4^2 \cdot 2}$

Evaluate each expression if $a = 12$, $b = 9$, and $c = 4$.

16. $a^2 + b - c^2$

17. $b^2 + 2a - c^2$

18. $2c(a + b)$

19. $4a + 2b - c^2$

20. $(a^2 \div 4b) + c$

21. $c^2 \cdot (2b - a)$

22. $\frac{bc^2 + a}{c}$

23. $\frac{2c^3 - ab}{4}$

24. $2(a - b)^2 - 5c$

25. $\frac{b^2 - 2c^2}{a + c - b}$

26. CAR RENTAL Ann Carlyle is planning a business trip for which she needs to rent a car. The car rental company charges \$36 per day plus \$0.50 per mile over 100 miles. Suppose Ms. Carlyle rents the car for 5 days and drives 180 miles.

- Write an expression for how much it will cost Ms. Carlyle to rent the car.
- Evaluate the expression to determine how much Ms. Carlyle must pay the car rental company.

27. GEOMETRY The length of a rectangle is $3n + 2$ and its width is $n - 1$. The perimeter of the rectangle is twice the sum of its length and its width.

- Write an expression that represents the perimeter of the rectangle.
- Find the perimeter of the rectangle when $n = 4$ inches.

1-3 Skills Practice***Properties of Numbers***

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

1. $7(16 \div 4^2)$

2. $2[5 - (15 \div 3)]$

3. $4 - 3[7 - (2 \cdot 3)]$

4. $4[8 - (4 \cdot 2)] + 1$

5. $6 + 9[10 - 2(2 + 3)]$

6. $2(6 \div 3 - 1) \cdot \frac{1}{2}$

7. $16 + 8 + 14 + 12$

8. $36 + 23 + 14 + 7$

9. $5 \cdot 3 \cdot 4 \cdot 3$

10. $2 \cdot 4 \cdot 5 \cdot 3$

1-3 Practice***Properties of Numbers***

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

1. $2 + 6(9 - 3^2) - 2$

2. $5(14 - 39 \div 3) + 4 \cdot \frac{1}{4}$

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

3. $13 + 23 + 12 + 7$

4. $6 \cdot 0.7 \cdot 5$

5. SALES Althea paid \$5.00 each for two bracelets and later sold each for \$15.00. She paid \$8.00 each for three bracelets and sold each of them for \$9.00.

- Write an expression that represents the profit Althea made.
- Evaluate the expression. Name the property used in each step.

6. SCHOOL SUPPLIES Kristen purchased two binders that cost \$1.25 each, two binders that cost \$4.75 each, two packages of paper that cost \$1.50 per package, four blue pens that cost \$1.15 each, and four pencils that cost \$.35 each.

- Write an expression to represent the total cost of supplies before tax.
- What was the total cost of supplies before tax?

1-4 Skills Practice***The Distributive Property***

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

1. $4(3 + 5)$

2. $2(6 + 10)$

3. $5(7 - 4)$

4. $(6 - 2)8$

5. $5 \cdot 89$

6. $9 \cdot 99$

7. $15 \cdot 104$

8. $15 \left(2\frac{1}{3}\right)$

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

9. $(a + 7)2$

10. $7(h - 10)$

11. $3(m + n)$

12. $2(x - y + 1)$

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

13. $2x + 8x$

14. $17g + g$

15. $2x^2 + 6x^2$

16. $7a^2 - 2a^2$

17. $3y^2 - 2y$

18. $2(n + 2n)$

19. $4(2b - b)$

20. $3q^2 + q - q^2$

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

21. The product of 9 and t squared, increased by the sum of the square of t and 2

22. 3 times the sum of r and d squared minus 2 times the sum of r and d squared

1-4 Practice***The Distributive Property***

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

1. $9(7 + 8)$

2. $7(6 - 4)$

3. $(4 + 6)11$

4. $9 \cdot 499$

5. $7 \cdot 110$

6. $16\left(4\frac{1}{4}\right)$

Use the Distributive property to rewrite each expression. Then simplify.

7. $(9 - p)3$

8. $(5y - 3)7$

9. $15\left(f + \frac{1}{3}\right)$

10. $16(3b - 0.25)$

11. $m(n + 4)$

12. $(c - 4)d$

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

13. $w + 14w - 6w$

14. $3(5 + 6h)$

15. $12b^2 + 9b^2$

16. $25t^3 - 17t^3$

17. $3a^2 + 6a + 2b^2$

18. $4(6p + 2q - 2p)$

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

19. 4 times the difference of f squared and g , increased by the sum of f squared and $2g$

20. 3 times the sum of x and y squared plus 5 times the difference of $2x$ and y

21. **DINING OUT** The Ross family recently dined at an Italian restaurant. Each of the four family members ordered a pasta dish that cost \$11.50, a drink that cost \$1.50, and dessert that cost \$2.75.

a. Write an expression that could be used to calculate the cost of the Ross' dinner before adding tax and a tip.

b. What was the cost of dining out for the Ross family?

1-5 Skills Practice**Equations**

Find the solution of each equation if the replacement sets are $A = \{4, 5, 6, 7, 8\}$ and $B = \{9, 10, 11, 12, 13\}$.

1. $5a - 9 = 26$

2. $4a - 8 = 16$

3. $7a + 21 = 56$

4. $3b + 15 = 48$

5. $4b - 12 = 28$

6. $\frac{36}{b} - 3 = 0$

Find the solution of each equation using the given replacement set.

7. $\frac{1}{2} + x = \frac{5}{4}; \left\{ \frac{1}{2}, \frac{3}{4}, 1, \frac{5}{4} \right\}$

8. $x + \frac{2}{3} = \frac{13}{9}; \left\{ \frac{5}{9}, \frac{2}{3}, \frac{7}{9} \right\}$

9. $\frac{1}{4}(x + 2) = \frac{5}{6}; \left\{ \frac{2}{3}, \frac{3}{4}, \frac{5}{4}, \frac{4}{3} \right\}$

10. $0.8(x + 5) = 5.2; \{1.2, 1.3, 1.4, 1.5\}$

Solve each equation.

11. $10.4 - 6.8 = x$

12. $y = 20.1 - 11.9$

13. $\frac{46 - 15}{3 + 28} = a$

14. $c = \frac{6 + 18}{31 - 25}$

15. $\frac{2(4) + 4}{3(3 - 1)} = b$

16. $\frac{6(7 - 2)}{3(8) + 6} = n$

17. SHOPPING ONLINE Jennifer is purchasing CDs and a new CD player from an online store. She pays \$10 for each CD, as well as \$50 for the CD player. Write and solve an equation to find the total amount Jennifer spent if she buys 4 CDs and a CD player from the store.

18. TRAVEL An airplane can travel at a speed of 550 miles per hour. Write and solve an equation to find the time it will take to fly from London to Montreal, a distance of approximately 3300 miles.

1-5 Practice**Equations**

Find the solution of each equation if the replacement sets are $a = \left\{0, \frac{1}{2}, 1, \frac{3}{2}, 2\right\}$ and $b = \{3, 3.5, 4, 4.5, 5\}$.

1. $a + \frac{1}{2} = 1$

2. $4b - 8 = 6$

3. $6a + 18 = 27$

4. $7b - 8 = 16.5$

5. $120 - 28a = 78$

6. $\frac{28}{b} + 9 = 16$

Solve each equation.

7. $x = 18.3 - 4.8$

8. $w = 20.2 - 8.95$

9. $\frac{37 - 9}{18 - 11} = d$

10. $\frac{97 - 25}{41 - 23} = k$

11. $y = \frac{4(22 - 4)}{3(6) + 6}$

12. $\frac{5(2^2) + 4(3)}{4(2^3 - 4)} = p$

13. TEACHING A teacher has 15 weeks in which to teach six chapters. Write and then solve an equation that represents the number of lessons the teacher must teach per week if there is an average of 8.5 lessons per chapter.

14. CELL PHONES Gabriel pays \$40 a month for basic cell phone service. In addition, Gabriel can send text messages for \$0.20 each. Write and solve an equation to find the total amount Gabriel spent this month if he sends 40 text messages.

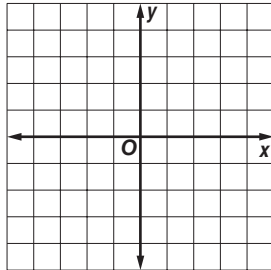
1-6 Skills Practice

Representing Relations

Express each relation as a table, a graph, and a mapping. Then determine the domain and range.

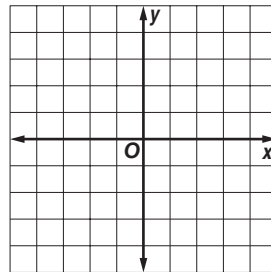
1. $\{(-1, -1), (1, 1), (2, 1), (3, 2)\}$

x	y



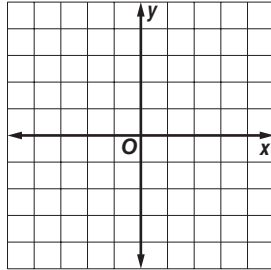
2. $\{(0, 4), (-4, -4), (-2, 3), (4, 0)\}$

x	y



3. $\{(3, -2), (1, 0), (-2, 4), (3, 1)\}$

x	y



Identify the independent and dependent variables for each relation.

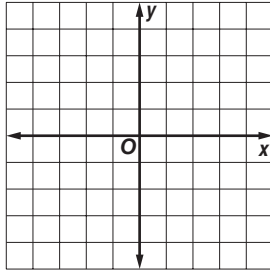
- The more hours Maribel works at her job, the larger her paycheck becomes.
- Increasing the price of an item decreases the amount of people willing to buy it.

1-6 Practice

Representing Relations

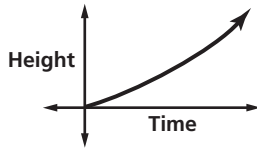
Express each relation as a table, a graph, and a mapping. Then determine the domain and range.

1. $\{(4, 3), (-1, 4), (3, -2), (-2, 1)\}$

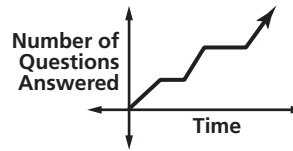


Describe what is happening in each graph.

2. The graph below represents the height of a tsunami (tidal wave) as it approaches shore.



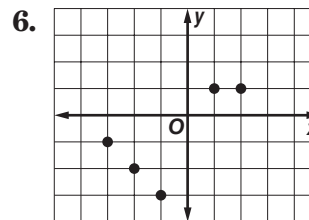
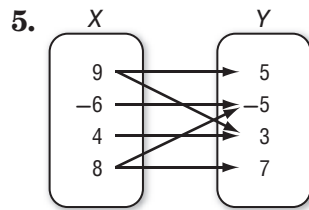
3. The graph below represents a student taking an exam.



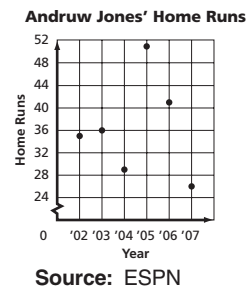
Express the relation shown in each table, mapping, or graph as a set of ordered pairs.

4.

X	Y
0	9
-8	3
2	-6
1	4



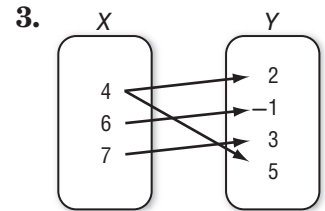
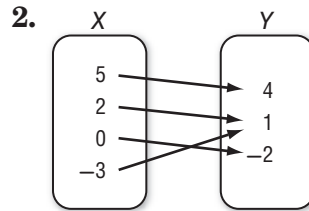
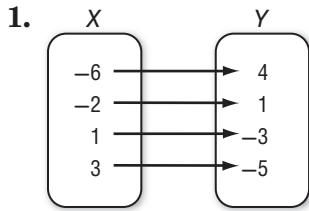
7. **BASEBALL** The graph shows the number of home runs hit by Andruw Jones of the Atlanta Braves. Express the relation as a set of ordered pairs. Then describe the domain and range.



1-7 Skills Practice

Representing Functions

Determine whether each relation is a function. Explain.



4.

x	y
4	-5
-1	-10
0	-9
1	-7
9	1

5.

x	y
2	7
5	-3
3	5
-4	-2
5	2

6.

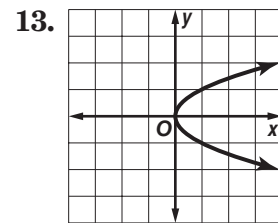
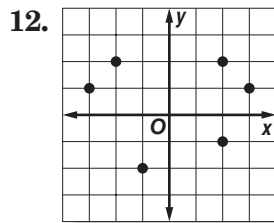
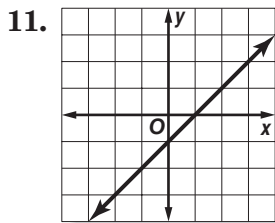
x	y
3	7
-1	1
1	0
3	5
7	3

7. $\{(2, 5), (4, -2), (3, 3), (5, 4), (-2, 5)\}$

8. $\{(6, -1), (-4, 2), (5, 2), (4, 6), (6, 5)\}$

9. $y = 2x - 5$

10. $y = 11$



If $f(x) = 3x + 2$ and $g(x) = x^2 - x$, find each value.

14. $f(4)$

15. $f(8)$

16. $f(-2)$

17. $g(2)$

18. $g(-3)$

19. $g(-6)$

20. $f(2) + 1$

21. $f(1) - 1$

22. $g(2) - 2$

23. $g(-1) + 4$

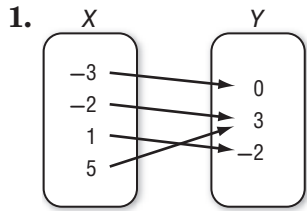
24. $f(x + 1)$

25. $g(3b)$

1-7 Practice

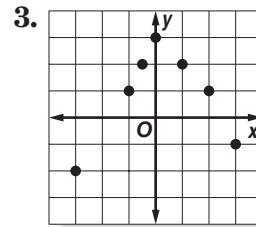
Representing Functions

Determine whether each relation is a function. Explain.



2.

X	Y
1	-5
-4	3
7	6
1	-2



4. $\{(1, 4), (2, -2), (3, -6), (-6, 3), (-3, 6)\}$ 5. $\{(6, -4), (2, -4), (-4, 2), (4, 6), (2, 6)\}$

6. $x = -2$ 7. $y = 2$

If $f(x) = 2x - 6$ and $g(x) = x - 2x^2$, find each value.

- | | | |
|----------------------------------|---------------------------------|-------------------|
| 8. $f(2)$ | 9. $f\left(-\frac{1}{2}\right)$ | 10. $g(-1)$ |
| 11. $g\left(-\frac{1}{3}\right)$ | 12. $f(7) - 9$ | 13. $g(-3) + 13$ |
| 14. $f(h + 9)$ | 15. $g(3y)$ | 16. $2[g(b) + 1]$ |

17. **WAGES** Martin earns \$7.50 per hour proofreading ads at a local newspaper. His weekly wage w can be described by the equation $w = 7.5h$, where h is the number of hours worked.

- Write the equation in functional notation.
- Find $f(15)$, $f(20)$, and $f(25)$.

18. **ELECTRICITY** The table shows the relationship between resistance R and current I in a circuit.

Resistance (ohms)	120	80	48	6	4
Current (amperes)	0.1	0.15	0.25	2	3

- Is the relationship a function? Explain.
- If the relation can be represented by the equation $IR = 12$, rewrite the equation in functional notation so that the resistance R is a function of the current I .
- What is the resistance in a circuit when the current is 0.5 ampere?

1-8 Skills Practice**Logical Reasoning and Counterexamples**

Identify the hypothesis and conclusion of each statement.

1. If it is Sunday, then mail is not delivered.
2. If you are hiking in the mountains, then you are outdoors.
3. If $6n + 4 > 58$, then $n > 9$.

Identify the hypothesis and conclusion of each statement. Then write the statement in if-then form.

4. Martina works at the bakery every Saturday.
5. Ivan only runs early in the morning.
6. A polygon that has five sides is a pentagon.

Determine whether a valid conclusion follows from the statement *If Hector scores an 85 or above on his science exam, then he will earn an A in the class for the given condition*. If a valid conclusion does not follow, write *no valid conclusion* and explain why.

7. Hector scored an 86 on his science exam.
8. Hector did not earn an A in science.
9. Hector scored 84 on the science exam.
10. Hector studied 10 hours for the science exam.

Find a counterexample for each conditional statement.

11. If the car will not start, then it is out of gas.
12. If the basketball team has scored 100 points, then they must be winning the game.
13. If the Commutative Property holds for addition, then it holds for subtraction.
14. If $2n + 3 < 17$, then $n \leq 7$.

1-8 Practice**Logical Reasoning and Counterexamples**

Identify the hypothesis and conclusion of each statement.

1. If it is raining, then the meteorologist's prediction was accurate.
2. If $x = 4$, then $2x + 3 = 11$.

Identify the hypothesis and conclusion of each statement. Then write the statement in if-then form.

3. When Joseph has a fever, he stays home from school.
4. Two congruent triangles are similar.

Determine whether a valid conclusion follows from the statement *If two numbers are even, then their product is even* for the given condition. If a valid conclusion does not follow, write *no valid conclusion* and explain why.

5. The product of two numbers is 12.
6. Two numbers are 8 and 6.

Find a counterexample for each conditional statement.

7. If the refrigerator stopped running, then there was a power outage.
8. If $6h - 7 < 5$, then $h \leq 2$.
9. **GEOMETRY** Consider the statement: If the perimeter of a rectangle is 14 inches, then its area is 10 square inches.
 - a. State a condition in which the hypothesis and conclusion are valid.
 - b. Provide a counterexample to show the statement is false.
10. **ADVERTISING** A recent television commercial for a car dealership stated that "no reasonable offer will be refused." Identify the hypothesis and conclusion of the statement. Then write the statement in if-then form.