Name ______________________ Date ________ Period ________

Arithmetic and Algebra

EXAMPLE

$16 + 2 = 22$ *false*

$10 \div 5 = 2$ *true*

$33 - n = 12$ *open*

Directions Write *true* if the statement is true or *false* if it is false. Write *open* if the statement is neither true nor false.

1. $11 + 5 = 16$ ____________
2. $11 + 3 = 16$ ____________
3. $7 - 7 = 0$ ____________
4. $6 \cdot 6 = 36$ ____________
5. $12 + n = 17$ ____________
6. $32 \div 8 = 4$ ____________
7. $2 \cdot 3 = 5$ ____________
8. $\frac{22}{11} = 3$ ____________
9. $100 + 10 = 120$ ____________
10. $7n = 49$ ____________
11. $7 \cdot 7 = 49$ ____________
12. $37 - n = 12$ ____________
13. $\frac{n}{2} = 6$ ____________
14. $60 - 60 = 10$ ____________
15. $17 \cdot 1 = 18$ ____________
16. $50 - 5 = 45$ ____________
17. $\frac{18}{3} = 6$ ____________
18. $30 + 30 = 60$ ____________
19. $22n = 44$ ____________
20. $27 \div 9 = 3$ ____________
21. $27 - 9 = 18$ ____________
22. $6 \cdot 6 = 38$ ____________
23. $11 + n = 35$ ____________
24. $15 \div 3 = 4$ ____________
25. $18 \div 9 = 2$ ____________
26. $8n = 112$ ____________
27. $4 \cdot 4 = 8$ ____________
28. $14 - n = 1$ ____________
29. $\frac{6}{2} = 3$ ____________
30. $7 + 27 = 35$ ____________

Name Date Period

Workbook Activity 2
Chapter 1, Lesson 2

Representing Numbers Using Letters

EXAMPLE

Numerical expressions:	33 – 13	$\frac{36}{12}$
Algebraic expressions:	$2m \div 5$	$8d + 2$
Variables:	n in $7n + 7$	k in $k - 3$
Operations:	Multiplication and addition in $2y + 3$	Division in $\frac{14}{2}$

Directions Name the variable in each algebraic expression.

1. $4y + 12$ ____________
2. $k - 6$ ____________
3. $2x + 7$ ____________
4. $7n$ ____________
5. $\frac{2m}{4}$ ____________
6. $3(d)$ ____________
7. $\frac{r}{4}$ ____________
8. $14k - 10$ ____________
9. $x - 100$ ____________
10. $3 \div p$ ____________
11. $4 + y$ ____________
12. $2m \div 5$ ____________

Directions Fill in the table. For each expression, write the expression type—*numerical* or *algebraic*—and list the operation or operations.

Expression	Expression Type	Operation(s)
$16 \div 2$	**13.**	**14.**
$8d$	**15.**	**16.**
$5 + 11$	**17.**	**18.**
$\frac{36}{12}$	**19.**	**20.**
$2p - 1$	**21.**	**22.**
$4k + 4$	**23.**	**24.**

Directions Solve the problem.

25. Only 17 members of Mr. Ricardo's class are going on the class trip. The class has a total of k students. Write an algebraic expression for the number of students who are *not* going on the trip. ____________________

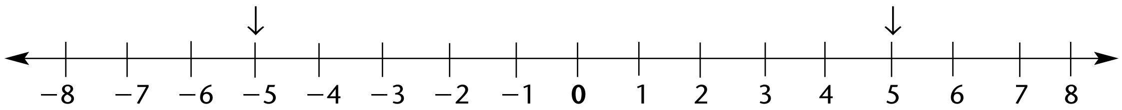
Name ______ Date ______ Period ______

Workbook Activity 3

Chapter 1, Lesson 3

Integers on the Number Line

EXAMPLE



- All the numbers on this number line are examples of *integers.*
- An example of a *negative integer* is –5 (see arrow).
- An example of a *positive integer* is 5 (see arrow).
- The number 0 is neither negative nor positive.
- |–5| = 5. In other words, –5 is 5 units from 0 (count the units).
- |5| = 5. In other words, 5 is 5 units from 0 (count the units).

Directions Identify each integer as either *negative, positive,* or *zero.*

1. 6 ______ **5.** 8 ______ **9.** 20 ______

2. 13 ______ **6.** –9 ______ **10.** 1 ______

3. –2 ______ **7.** 0 ______ **11.** 7 ______

4. 11 ______ **8.** –33 ______ **12.** –1 ______

Directions Write each absolute value.

13. |–5| ______ **17.** |+18| ______ **21.** |12| ______

14. |6| ______ **18.** |5| ______ **22.** |4| ______

15. |–2| ______ **19.** |–11| ______ **23.** |–9| ______

16. |2| ______ **20.** |–12| ______ **24.** |9| ______

Directions Solve this problem.

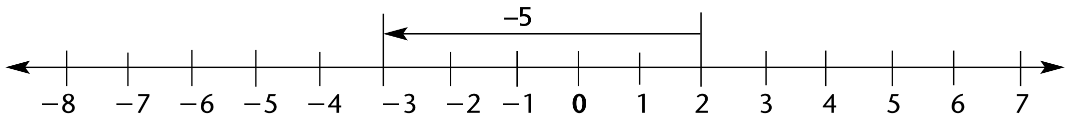
25. On the number line, how could you represent \$5 that you earned? How could you represent \$5 that you had to pay? ______

Name Date Period

Adding Integers

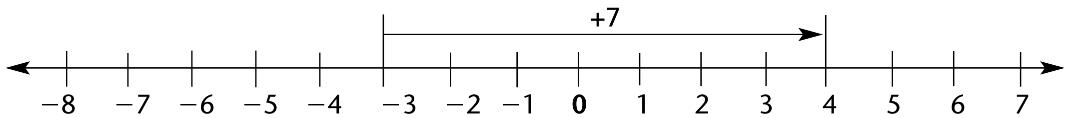
EXAMPLE Add 2 + (–5).

Start at 2, move 5 units to the *left.* The answer is –3.



Add –3 + 7.

Start at –3, move 7 units to the *right.* The answer is 4.



Directions Answer the questions.

1. To add a *negative* number, in which direction do you count on the number line? ________________

2. To add a *positive* number, in which direction do you count on the number line? ________________

Directions Write each sum on the blank.

3. –4 + 4 ____________

4. 1 + (–7) ____________

5. 1 + 5 ____________

6. 0 + 6 ____________

7. –1 + (–5) ____________

8. 5 + (–11) ____________

9. –5 + 3 ____________

10. –6 + 3 ____________

11. 11 + (–12) ____________

12. –2 + (–4) ____________

13. –6 + 6 ____________

14. 6 + (–6) ____________

15. –4 + 8 ____________

16. –6 + 12 ____________

17. –2 + 6 ____________

18. –3 + 9 ____________

19. 7 + 7 ____________

20. 2 + (–8) ____________

Name Date Period

Subtracting Integers

EXAMPLE Find the difference: 14 – (–15)

Rule To subtract in algebra, add the opposite.

15 is the opposite of –15.

14 + 15 = 29

Directions Rewrite each expression as addition. Solve the new expression.

1. –4 – (–11) ____________
2. 9 – (+3) ____________
3. –1 – 13 ____________
4. –6 – (+10) ____________
5. 7 – (–10) ____________
6. 4 – (+4) ____________
7. 2 – (+8) ____________
8. –11 – (–1) ____________
9. 6 – (+2) ____________
10. –5 – (–5) ____________
11. 2 – (+9) ____________
12. 1 – (+4) ____________
13. 6 – 8 ____________
14. –8 – (–3) ____________
15. –3 – (+7) ____________
16. 8 – (–7) ____________
17. 10 – (+5) ____________
18. 5 – 6 ____________

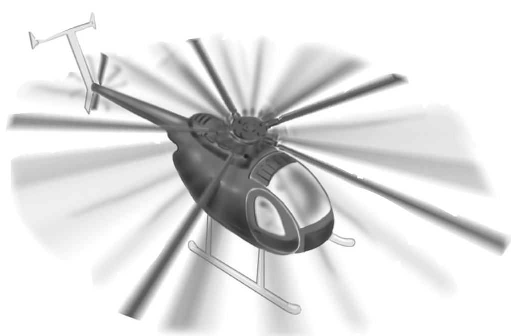
Directions Solve these problems. Write an expression and the answer.

19. Dara's kite is flying 67 feet high. Jill's is flying 40 feet high. What is the difference between the heights of these two kites?

    ____

20. A helicopter hovers 60 m above the ocean's surface. A submarine is resting 30 m underwater, directly below the helicopter. What is the difference between the positions of these two objects?

    ____



Name ______ Date ______ Period ______

Workbook Activity 6
Chapter 1, Lesson 6

Multiplying Integers

EXAMPLE Notice the possible combinations for multiplying positive and negative integers.

positive (positive) = positive	4(4)	= 16
positive (negative) = negative	4(–4)	= –16
negative (positive) = negative	–4(4)	= –16
negative (negative) = positive	–4(–4)	= 16

Multiplying any integer, positive or negative, by 0 gives 0 as the product.

Directions Tell whether the product is *positive*, *negative*, or *zero*.

1. (4)(–7) ______
2. (–6)(3) ______
3. (–7)(0) ______
4. (–9)(–9) ______
5. (2)(–11) ______
6. (5)(–3) ______
7. (–15)(–1) ______
8. (0)(14) ______
9. (–5)(7) ______
10. (–8)(–2) ______
11. (–3)(–9) ______
12. (4)(6) ______
13. (11)(–2) ______
14. (2)(9) ______
15. (–6)(4) ______

Directions Find each product. Write the answer.

16. (2)(9) ______
17. (–5)(9) ______
18. (3)(–9) ______
19. (–10)(2) ______
20. (–9)(–7) ______
21. (–5)(10) ______
22. (12)(2) ______
23. (–32)(0) ______
24. (6)(–4) ______
25. (–11)(–2) ______
26. (–4)(8) ______
27. (–10)(–8) ______
28. (5)(–5) ______
29. (–1)(–1) ______
30. (7)(10) ______

Name Date Period

Integers

Data from a climbing expedition is shown in this table.

Elevation in Feet (Compared to Sea Level)	
Base Camp	–384
Camp 1	+5,027
Camp 2	+7,511
Camp 3	+8,860
Camp 4	+10,103
Camp 5	+10,856
Camp 6	+11,349
Summit	+12,015

During the climb, some climbers began at base camp and climbed to the summit. Other climbers also began at base camp but did not reach the summit—these climbers moved back and forth between camps carrying supplies and other necessities.

Directions The movements of various climbers in the expedition are shown below. Find the number of feet climbed by each climber.

1. Climber A: Base Camp to Camp 1 to Base Camp ______________________
2. Climber C: Base Camp to Camp 5 to Base Camp ______________________
3. Climber F: Base Camp to Camp 3 to Base Camp ______________________
4. Climber B: Base Camp to Camp 2 to Base Camp ______________________
5. Climber H: Base Camp to Camp 6 to Base Camp ______________________
6. Climber E: Base Camp to Summit to Base Camp ______________________
7. Climber G: Base Camp to Camp 4 to Base Camp ______________________
8. Climber D: Base Camp to Camp 5 to Camp 3 to Camp 4 to Base Camp ______________________
9. Climber I: Base Camp to Camp 2 to Camp 1 to Camp 6 to Base Camp ______________________
10. How many feet above base camp is the summit? ______________________

Name Date Period

Dividing Positive and Negative Integers

EXAMPLE Notice the possible combinations for dividing positive and negative integers.

positive ÷ positive = positive	6 ÷ 2	= 3
positive ÷ negative = negative	6 ÷ –2	= –3
negative ÷ positive = negative	–6 ÷ 2	= –3
negative ÷ negative = positive	–6 ÷ –2	= 3

Dividing 0 by any integer, positive or negative, produces 0 as the quotient.

Directions Tell whether the quotient is *positive*, *negative*, or *zero*.

1. 16 ÷ –4 ____________
2. –63 ÷ –9 ____________
3. –10 ÷ 2 ____________
4. 33 ÷ 11 ____________
5. –12 ÷ 4 ____________
6. 100 ÷ 10 ____________
7. 36 ÷ –9 ____________
8. 15 ÷ –5 ____________
9. –27 ÷ 3 ____________
10. 0 ÷ –4 ____________
11. –81 ÷ –9 ____________
12. 19 ÷ –1 ____________
13. 56 ÷ 8 ____________
14. 500 ÷ 5 ____________
15. 32 ÷ –8 ____________

Directions Find and write each quotient.

16. 36 ÷ 12 ________
17. 21 ÷ –7 ________
18. 18 ÷ –3 ________
19. –35 ÷ 7 ________
20. –24 ÷ 2 ________
21. –16 ÷ –8 ________
22. 45 ÷ –9 ________
23. –200 ÷ –200 ________
24. –50 ÷ 10 ________
25. 27 ÷ –9 ________
26. –14 ÷ 2 ________
27. 0 ÷ 16 ________
28. –72 ÷ –9 ________
29. –1 ÷ –1 ________
30. 9 ÷ 3 ________

Name Date Period

Simplifying Expressions—One Variable

EXAMPLE

Simplify $2n + 2 + 4n$.

1. Look for like terms. $2n$ and $4n$ are like terms, because they have the same variable, n.
2. Combine the terms: $2n + 4n = 6n$
3. Rewrite the whole expression: $6n + 2$

Now you are finished, because $6n$ cannot combine with 2.

Directions In each expression, underline the like terms.

1. $3k - 8 + 2k$
2. $p + 12 + p$
3. $100 + 4w + 4w$
4. $5m - 3 + 2m$
5. $7x + 5x - 12$
6. $-2 + 11c + c$
7. $\frac{4}{7} + 2m + 3m$
8. $2y - (-3y) + 7$
9. $4x - 13 + 5x$
10. $8r + (-3r)$

Directions Simplify each expression.

11. $3b + b$ ____________
12. $11y + 2y + y$ ____________
13. $7j + 3j - 2j$ ____________
14. $2k - 17 + k$ ____________
15. $11x + x - 14$ ____________
16. $22 + 2d + 8d$ ____________
17. $9g + (-2g) + 4$ ____________
18. $14h - 3 - 2h$ ____________
19. $2m + (-8m)$ ____________
20. $3 + 4k - 3k$ ____________
21. $2y + (-2y) + 5$ ____________
22. $-5 + 6n - 4n$ ____________
23. $2x + 11x - 13$ ____________
24. $-h + 7h$ ____________
25. $-11 - (-3k) + k$ ____________
26. $7d - d + 40$ ____________
27. $8 + 3m - (-m)$ ____________
28. $3w + (-5w)$ ____________
29. $2 + 5x - 2x$ ____________
30. $8g + (-5g) - 6$ ____________

Name ______ Date ______ Period ______

Simplifying Expressions—Several Variables

EXAMPLE Simplify $2j + 4 + j - 1 + 3k$.

1. Scan for variables. The expression has two: j and k.
2. Combine j terms: $2j + j = 3j$
3. Combine k terms: $3k$ (no combining required)
4. Combine integers: $4 + (-1) = +3$
5. Rewrite the whole expression: $3j + 3k + 3$

Now you are finished, because you cannot combine unlike terms.

Directions Check the column or columns to show which kinds of terms each expression includes.

Expression	*x* terms	*y* terms	Integers
1. $3x + 2x + 3 + 6y$			
2. $3y - 14$			
3. $x + 2y - 10 + 3y$			
4. $72 - 68$			
5. $x - 8$			

Directions Combine like terms. Simplify each expression.

6. $3k - 2k + 12 + 5r$ ______

7. $2c + 3b + 8b + c$ ______

8. $5k + 3 + 2j - 2 - k$ ______

9. $7 + 4p - 6 + 2m - 2p$ ______

10. $-4n + 4 - (-2d) + n - 5$ ______

11. $18 + (-4x) + 1 - 3x + 8y$ ______

12. $2w + (-11) + 18y + 2w - 11$ ______

13. $6h - 12 - 9h + 8k + (-3k)$ ______

14. $3 - 3m - 3m - 8p - 3p$ ______

15. $14x - 7 + 3y - 7x - 7x$ ______

Name Date Period

Positive Exponents

EXAMPLE To multiply *like* variables having exponents, add the exponents.

$k^3 \cdot k^3 = k^{(3+3)} = k^6$

To divide *like* variables having exponents, subtract the exponents.

$m^4 \div m^2 = m^{(4-2)} = m^2$

You *cannot* use these rules to multiply or divide unlike variables.

$y^3 \cdot a^2$ $\quad$ $b^5 \div j^2$

Directions Is the rewritten expression on the right *true* or *false?* Write the answer.

1. $m^4 \cdot m^2 = m^{(4+2)}$ __________
2. $a \cdot a \cdot a = a^{(1+1+1)}$ __________
3. $k^2 \cdot n^3 = k^{(2+3)}$ __________
4. $y^7 \div y = y^{(7-1)}$ __________
5. $b^8 \div b^3 = b^{(8-3)}$ __________
6. $a \cdot a = 2a$ __________
7. $d^6 \div d^2 = d^{(6+2)}$ __________
8. $w^2 \cdot w^4 \cdot w^5 = w^{(2+4+5)}$ __________

Directions Simplify each expression.

9. $k^3 \cdot k^3$ __________
10. $w^5 \div w^2$ __________
11. $j^{14} \div j^{10}$ __________
12. $n^6 \cdot n$ __________
13. $d^2 \cdot d^5 \cdot d^7$ __________
14. $y^7 \div y$ __________
15. $x^2 \cdot x^3 \cdot x^8$ __________
16. $a^2 \cdot a^2 \cdot a^4 \cdot a^4$ __________

Directions Use a calculator to find the value of each expression.

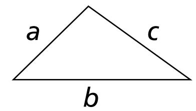
17. x^2 when $x = 17$ __________
18. c^5 when $c = 2$ __________
19. r^5 when $r = 3$ __________
20. k^3 when $k = 0.8$ __________

Name ____________________ Date ________ Period ________

Formulas with Variables

EXAMPLE Find the perimeter of a triangle with unequal sides.

The perimeter is the *sum* of the length of all the sides.



Perimeter = $a + b + c$

If $a = 3$, $b = 5$, and $c = 4$, then the perimeter of the triangle is $3 + 5 + 4 = 12$.

Directions Use the formula for the perimeter of a triangle with unequal sides to find each answer.

1. $a = 8$ cm

$b = 10$ cm Perimeter = ______________

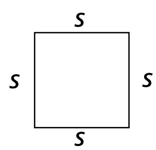
$c = 6$ cm

2. $a = 2$ m

$b = 7$ m Perimeter = ______________

$c = 3$ m

Directions Use the formula for the perimeter of a square. Write each answer.



Perimeter of a square = $4s$

3. $s = 5$ km

Perimeter = ______________

4. $s = 18$ cm

Perimeter = ______________

5. $s = 9$ m

Perimeter = ______________

Name ____ Date ____ Period ____

Commutative Property of Addition

EXAMPLE

$2n + 3n =$ ______

Expanded notation:

$n + n$	$+$	$n + n + n$	$=$	$n + n + n + n + n$
$2n$	$+$	$3n$	$=$	$5n$

Commutative property of addition:

$7a + 6a = 6a + 7a$

Directions Find each sum using expanded notation.

1. $k + 3k$ ______

2. $2r + r$ ______

3. $4y + y$ ______

4. $n + 5n$ ______

Directions Rewrite each sum showing the commutative property of addition.

5. $b + 17$ ______

6. $3k + 5$ ______

7. $x + 5x$ ______

8. $2.7 + 1.2$ ______

9. $5m + 3p$ ______

10. $7q + 6$ ______

11. $164 + 133$ ______

12. $8y + 4y$ ______

Directions Solve these problems.

13. Torri weighs 98 pounds. Carrie weighs 116 pounds. Torri adds her weight to Carrie's weight. What sum will she get? ______

14. Suppose Carrie adds her weight to Torri's weight. What sum will she get? ______

15. What mathematical property do the sums in problems 13 and 14 illustrate?

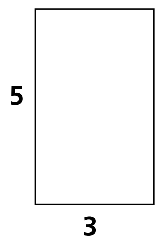
______

Name ______________________ Date ________ Period ________

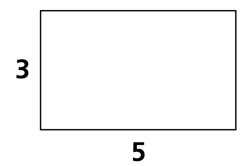
Commutative Property of Multiplication

EXAMPLE Turning a rectangle two different ways shows that the order of factors in a product can change without affecting the result. In each case, the product is the area of the rectangle in square units.

Factors	Product
5 • 3 =	15

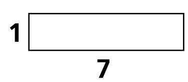


Factors	Product
3 • 5 =	15

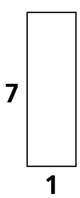


Directions For each pair of rectangles, write two products representing area in square units.

1.

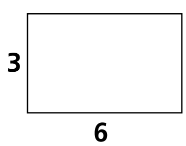


______ • ______ = ______ sq. units

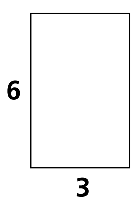


______ • ______ = ______ sq. units

2.



______ • ______ = ______ sq. units



______ • ______ = ______ sq. units

Directions Answer the questions.

Mrs. Rossi buys 6 bags of apples. Each bag holds 8 apples. Mr. Lundgren buys 8 bags of apples. Each bag holds 6 apples.

3. How many apples did Mrs. Rossi buy? ________________

4. How many apples did Mr. Lundgren buy? ________________

5. What mathematical property do problems 3 and 4 illustrate?

____

Name Date Period

Associative Property of Addition

EXAMPLE $(13 + 10) + 4 = 13 + (10 + 4)$

$(b + c) + d = b + (c + d)$

Directions Rewrite each expression to show the associative property of addition.

1. $3k + (2k + 5)$ ____________

2. $(1.3 + 8.1) + 6.6$ ____________

3. $(11x + 10y) + 4$ ____________

4. $7 + (5 + q)$ ____________

5. $(3 + 12n) + 2$ ____________

6. $g + (21 + h)$ ____________

Directions Answer the questions.

In a club, 3 members bring all of the sandwiches for a picnic.

- Mike and Lynn arrive together. They have already put together Mike's 3 sandwiches and Lynn's 5 sandwiches.
- Hosea comes a little later with 4 sandwiches. In all, the club has a total of 12 sandwiches.

7. Write an addition expression that shows the grouping described above.

____

8. Suppose that Mike had come first, alone, and that Lynn and Hosea had come with their combined sandwiches later. Write an addition expression to represent this grouping.

____

9. Would the club's total number of sandwiches be the same with either grouping?

____

10. What mathematical property does this story illustrate?

____

Name Date Period

Associative Property of Multiplication

EXAMPLE (5 • 2)3 = 5(2 • 3)

$(pq)r = p(qr)$

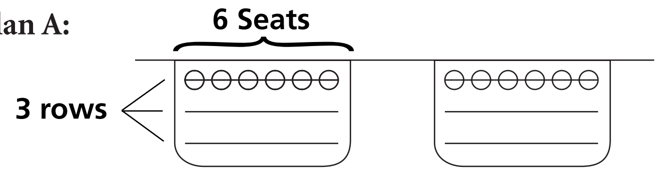
Directions Use the associative property of multiplication to place parentheses in two different ways.

1. mnq __________ __________
2. abc __________ __________
3. $4st$ __________ __________
4. kvz __________ __________
5. $1.5bc$ __________ __________
6. $9mn$ __________ __________
7. aks __________ __________

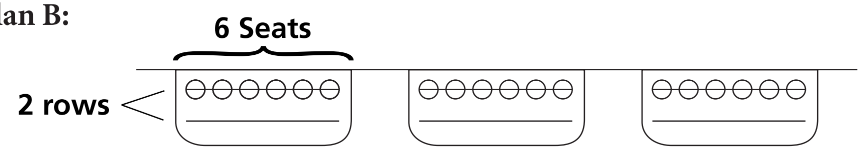
Directions Answer the questions to solve the problem.

A college will build a theater with at least 30 balcony seats. Two architects have drawn up plans. Here are their designs for the balconies:

Plan A:



Plan B:



8. Which plan does (3 • 6)2 describe? __________
   Hint: Think of the parentheses as "inside" dimensions.
9. Which plan does 3(6 • 2) describe? __________
10. Do the two plans have the same number of balcony seats? __________

Name Date Period

Workbook Activity 17

Chapter 2, Lesson 5

The Distributive Property—Multiplication

EXAMPLE

$4(2 + 8) = 4 \bullet 2 + 4 \bullet 8 = 8 + 32 = 40$

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

Directions Fill in the blanks in each rewritten expression.

1. $2(x + y) = 2x +$ ____y

2. $4(m + 4) = 4$____ $+ 16$

3. $7(8 + 1) = 56 +$ ____

4. $5(4 + c) = 20 +$ ____

5. $-1(p + q) =$ ____ $- q$

6. $8(a + 1) = 8a +$ ____

7. $-2(-j + k) =$ ____ $- 2k$

8. $-10(40 + 30) = -400 -$ ____

9. $2[-q + (-3)] =$ ____ $- 6$

10. $-4(-3 + n) =$ ____ $- 4n$

11. $3(-7 + b) = -21 +$ ____

12. $7(d + 2k) = 7d +$ ____

13. $-4(5 + 1) =$ ____ $- 4$

14. $-11(n + p) =$ ____ $- 11p$

15. $k(13 + m) = 13k +$ ____

16. $b(y + z) =$ ____ $+ bz$

Directions Rewrite each expression, using the distributive property. Simplify where possible.

17. $16(2 + 1)$ ____________

18. $6(r + z)$ ____________

19. $-1(d + k)$ ____________

20. $3(11 + w)$ ____________

21. $-2(-4 + m)$ ____________

22. $8[-a + (-3)]$ ____________

23. $-9(x + y)$ ____________

24. $7(g + 10)$ ____________

25. $-8(-v + 8)$ ____________

Name ______ Date ______ Period ______

The Distributive Property—Factoring

EXAMPLE $4j + 4k = 4(j + k)$

$3x^2 - 3y^2 = 3(x^2 - y^2)$

Directions Identify the common factor in each expression.

1. $11k + 11w$ ______

2. $jn + kn$ ______

3. $-2q + (-2r)$ ______

4. $12b - 13b$ ______

5. $3p + 46p$ ______

6. $dx^3 - dy^2$ ______

7. $1.9a + 1.9b$ ______

8. $3r - 1.5r$ ______

9. $7m^2 + 7v^2$ ______

Directions Draw a line to match the expression on the left with its factored form on the right.

10. $7x - 7y$ **a.** $a(x + y)$

11. $ax + ay$ **b.** $-2(x - y)$

12. $4x + 4y$ **c.** $3(ax + y)$

13. $-2x + 2y$ **d.** $7(x - y)$

14. $3ax + 3y$ **e.** $4(x + y)$

Directions Solve the problem.

15. Two children are paid their allowances in dimes and nickels. Each child receives exactly the same number of each type of coin.

Let d stand for the number of dimes each child received. Let n stand for the number of nickels each received. One way to represent total amount of allowance to the children is $2d + 2n$. What is another way? (Hint: Use the distributive property to factor.)

______

Name ____________ Date ______ Period ______

Properties of Zero

EXAMPLE

Additive Property of Zero:	$4 + 0 = 4$	$-2 + 0 = -2$
Additive Inverse Property:	$-3 + 3 = 0$	$5 + (-5) = 0$
Multiplication Property of Zero:	$0(6) = 0$	$-4(0) = 0$

Directions If the two numbers are additive inverses, write *true.* Otherwise, write *false.*

1. -12 12 ______________

2. 7 -7 ______________

3. -5 0 ______________

4. -75 75 ______________

5. -8 -8 ______________

6. x $-x$ ______________

Directions Write each sum.

7. $9 + 0$ ______________

8. $0 + 27$ ______________

9. $0 - 14$ ______________

10. $k + 0$ ______________

11. $-16 + 0$ ______________

12. $0 + m^2$ ______________

13. $0 - 37$ ______________

14. $k^5 + 0$ ______________

15. $0 - y^2$ ______________

Directions Write each product.

16. $0(112)$ ______________

17. $(-17)(0)$ ______________

18. $0 \cdot q$ ______________

19. $(xy)(0)$ ______________

20. $(0)(-9)$ ______________

21. $(cde)(0)$ ______________

22. $(-jk)(0)$ ______________

23. $n^7 \cdot 0$ ______________

24. $(0)(ab^3)$ ______________

Directions Solve the problem.

25. Jenna said to Brett, "I'll give you double the number of marbles you have in your pocket."
Brett replied, "But I don't have *any* marbles in my pocket."
Jenna responded, "So I'll give you double nothing, which is nothing."

How could Jenna say the same thing in a mathematical expression? Underline one.

a. $1 + 2 = 3$ **b.** $0 + 2 = 2$ **c.** $2(0) = 0$

Click here for Main Menu
Click here to print this page. Specify the page or pages you wish to print in the dialog box. Then click OK or Print. If you do not specify the page or pages, all pages will print.

Name Date Period

Properties of 1

EXAMPLE

Multiplication Property of 1: $(1)(7) = 7$ $(1)(y) = y$

Multiplicative Reciprocals: $\frac{1}{8}$, 8: $\frac{1}{8} \bullet \frac{8}{1} = 1$ $\frac{1}{x}$, x: $\frac{1}{x} \bullet \frac{x}{1} = 1$

Directions Complete the table by writing the reciprocal of the term and then checking your answer.

	Term	Reciprocal	Check
1.	$\frac{1}{4}$	________	____________________
2.	$\frac{1}{9}$	________	____________________
3.	7	________	____________________
4.	$\frac{1}{12}$	________	____________________
5.	k	________	____________________
6.	$\frac{1}{m}$	________	____________________
7.	c^2	________	____________________
8.	3	________	____________________

Directions Solve the problems.

9. Each wedge of apple pie is $\frac{1}{5}$ of the pie. How many wedges make one whole pie? Complete the equation to show your answer.

$\frac{1}{5} \bullet$ ______ $= 1$

10. In a geometry study group, 6 students were each given an identical puzzle piece of a hexagon (6-sided figure). The students assembled their pieces to make a whole hexagon. What fraction of the hexagon was each puzzle piece? Complete the equation to show your answer.

$6 \bullet$ ______ $= 1$

Name Date Period

Powers and Roots

EXAMPLE

$3^2 = (3)(3) = 9$ $\sqrt{9} = 3$

$3^3 = (3)(3)(3) = 27$ $\sqrt[3]{27} = 3$

Directions Fill in the blank in each sentence.

1. $(19)(19)(19) = 6{,}859$, so _____ $^3 = 6{,}859$.
2. If $17 \cdot 17 = 289$, then $17^2 = 289$ and $\sqrt{289} =$ _____.
3. If $\sqrt[3]{216} = 6$, then 6 _____ = 216.
4. If $2 \cdot 2 \cdot 2 \cdot 2 = 16$, then the fourth _____ of 16 is 2.
5. $(4)(4)(4)(4)(4) = 1{,}024$, so 4 _____ = 1,024.
6. $11^2 = 121$, which means that $11 \cdot$ _____ = 121.

Directions Find each square root. You may use a calculator.

7. $\sqrt{49}$ __________
8. $\sqrt{81}$ __________
9. $\sqrt{16}$ __________
10. $\sqrt{225}$ __________
11. $\sqrt{729}$ __________
12. $\sqrt{4}$ __________
13. $\sqrt{5{,}929}$ __________
14. $\sqrt{3.61}$ __________
15. $\sqrt{10.24}$ __________
16. $\sqrt{100}$ __________
17. $\sqrt{182.25}$ __________
18. $\sqrt{36}$ __________

Directions Solve the problems.

19. Talia is sewing a quilt with a regular checkerboard pattern—that is, all the squares are identical. In each square of the checkerboard, she plans to stitch a simple flower. Talia will have to stitch 36 flowers in all. How many squares lie along one side of the quilt?

____

20. The volume of a cube of sugar is 2.197 cm^3. Circle the letter of the expression that gives the length of one edge of the cube.

a. $\sqrt[3]{2.197}$ **b.** $(1.3)^3$ **c.** $\sqrt{2.197}$

Name Date Period

More on Powers and Roots

EXAMPLE Simplify the expression: $(-2x)^3$

Step 1 $(-2x)^3 = (-2x)(-2x)(-2x)$

Step 2 Multiply (-2) three times: $(-2)(-2)(-2) = -8$

Step 3 Multiply x three times: $(x)(x)(x) = x^3$

Step 4 Multiply the expanded number and variable: $-8x^3$

Note: $\sqrt{x^2} = x$ or $-x$ $\quad \sqrt[3]{x^3} = x$ $\quad \sqrt[3]{-x^3} = -x$

Directions Simplify each term. You can use a calculator.

1. $(8d)^2$ __________
2. $(-10n)^2$ __________
3. $(-2y)^3$ __________
4. $(3m)^4$ __________

Directions Find each value. Write all the possible roots.

5. $\sqrt{16}$ __________
6. $\sqrt{9}$ __________
7. $\sqrt[3]{8}$ __________
8. $\sqrt[3]{-8}$ __________
9. $\sqrt{k^2}$ __________
10. $\sqrt{100}$ __________
11. $\sqrt[3]{-27}$ __________
12. $\sqrt[3]{-216}$ __________
13. $\sqrt[3]{216}$ __________

Directions Answer the questions to solve the problem.

If a scientist built a machine that could transport people backward in time, then normal time might be represented as a positive number and backward time as a negative number. Suppose you could square or cube backward time.

14. What would be the square of –10 units of backward time? __________
15. What would be the cube of –10 units of backward time? __________

Name Date Period

Order of Operations

EXAMPLE

$2^3 + 12 \bullet 8 =$

Step 1 Calculate the cube, or third power, of 2: $2^3 = 8$

Step 2 Multiply: $12 \bullet 8 = 96$

Step 3 Add: $8 + 96 = 104$

Directions Find the value using the order of operations.

1. $11 - 2 \bullet 3$ ______

2. $2 + 8 \bullet 7$ ______

3. $(2 + 8)7$ ______

4. $64 - 16 \bullet 4$ ______

5. $2 + 2^3$ ______

6. $3 + 27 \div 9$ ______

7. $18 \div 2 + 100$ ______

8. $2 + 5^2 \bullet 4$ ______

9. $2^2 + 3^2 + 2^4$ ______

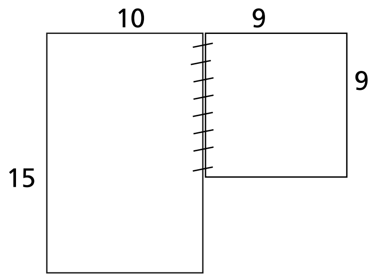
10. $(7 \bullet 7 - 4) \div 15$ ______

11. $(6 + 6) \div (59 - 55)$ ______

12. $8^2 - 7^2$ ______

Directions Answer the questions to solve the problem.

Mr. and Mrs. Wang plan to knock out a wall between two rooms of their house to make one larger room. One room is a rectangle 10 feet by 15 feet, so its area in square feet is 10(15). The other room is a square, 9 feet on a side, so its area is 9^2 square feet. What will be the total area of the new room?



13. Circle the letter of the expression that calculates the answer.

a. $10 + 15 \bullet 9^2$ **b.** $(10 + 15 + 9)^2$ **c.** $10 \bullet 15 + 9^2$

14. State the order to perform the operations when calculating the answer.

(1) ____________________ **(2)** ____________________ **(3)** ____________________

15. Work out the answer. (You can use a calculator.) ________ square feet

Name Date Period

Order of Operations

EXAMPLE

The answer shown below for the computation 10 + 6 ÷ 2 is not correct.

$$\begin{array}{l} 10 + 6 \div 2 \\ \quad\downarrow \\ \quad 16 \div 2 \\ \qquad\downarrow \\ \qquad 8 \end{array}$$

The computation is not correct because the addition 10 + 6 was performed first.
The order of operations states that the division 6 ÷ 2 should have been performed first.

The answer is 13 when the computation is performed correctly.

$$\begin{array}{l} 10 + 6 \div 2 \\ \qquad\quad\downarrow \\ 10 \;+\; 3 \\ \quad\downarrow \\ \quad 13 \end{array}$$

Directions In each problem below, the computation has been performed incorrectly. For each problem, tell why the computation is incorrect. Then give the correct answer.

1. 2 + 4 • 5 = 30 ______
2. 20 ÷ 5 + 5 = 2 ______
3. 50 • 2 – 2 = 0 ______
4. 24 + 6 ÷ 3 = 10 ______
5. 100 ÷ 50 • 2 = 1 ______
6. 5 • 8 + 1 = 45 ______
7. 200 – 100 + 50 ÷ 2 = 75 ______
8. 42 ÷ 6 • 7 = 1 ______
9. 2 + 16 ÷ 4 + 4 = 4 ______
10. 10 • 4 ÷ 2 + 1 = 30 ______

Name ______________________ Date __________ Period __________

Writing Equations

EXAMPLE

10 times some number equals 30.

$10x = 30$

Directions Write an equation for each statement. Let x be the variable in the equation.

1. 6 times some number equals 30. __________

2. 2 times some number plus 5 equals 9. __________

3. 3 times some number minus 8 equals 1. __________

4. 17 subtracted from some number equals 14. __________

5. 10 times some number plus 7 equals 87. __________

6. 11 subtracted from some number equals 2. __________

EXAMPLE

$3x = 18$ $x = 4, 5, 6$

$(3)(4) = 18$	F
$(3)(5) = 18$	F
$(3)(6) = 18$	T

Directions Find the root of each equation by performing the operation on each value for the variable. Write *T* if the equation is true or *F* if the equation is false.

7. $5p = 15$

$p = 1$ ________

$p = 2$ ________

$p = 3$ ________

8. $7w = 49$

$w = 5$ ________

$w = 6$ ________

$w = 7$ ________

9. $10k = 80$

$k = 7$ ________

$k = 8$ ________

$k = 9$ ________

10. $2a = 22$

$a = 11$ ________

$a = 12$ ________

$a = 13$ ________

Name ____________ Date ______ Period ______

Solving Equations: $x - b = c$

EXAMPLE

Solve $m - 2 = 8$ for m.

Step 1	Write the equation.	$m - 2 = 8$
Step 2	Add 2 to both sides of the equation.	$m - 2 + 2 = 8 + 2$
Step 3	Simplify.	$m = 10$
Step 4	Check.	$10 - 2 = 8$

Directions Solve each equation. Check your answer.

1. $x - 4 = 20$ ____________
2. $b - 7 = 1$ ____________
3. $n - 2 = 7$ ____________
4. $k - 13 = 3$ ____________
5. $d - 100 = 100$ ____________
6. $c - 11 = 0$ ____________
7. $y - 4 = 14$ ____________
8. $r - 80 = 20$ ____________
9. $w - 8 = 0$ ____________

Directions Read the problem and follow the directions.

10. A sports store buys a shipment of catcher's mitts at the beginning of the year. By year's end, the store has sold 100 mitts and has 150 left. How many mitts did the store have at the first of the year?

    Let x stand for the number of catcher's mitts the store had at the beginning of the year: $x - 100 = 150$

    How would you solve this equation? Circle the answer.

    a. Subtract 100 from both sides.

    b. Add 100 to both sides.

    c. Subtract 150 from both sides.

Name Date Period

Solving Equations: $x + b = c$

EXAMPLE

Solve $k + 5 = 9$ for k.

Step 1	Write the equation.	$k + 5 = 9$
Step 2	Subtract 5 from both sides of the equation.	$k + 5 - 5 = 9 - 5$
Step 3	Simplify.	$k = 4$
Step 4	Check.	$4 + 5 = 9$

Directions Solve each equation. Check your answer.

1. $w + 3 = 4$ ____________________
2. $r + 8 = 12$ ____________________
3. $y + 2 = 7$ ____________________
4. $c + 1.5 = 4.5$ ____________________
5. $k + 22 = 60$ ____________________
6. $d + 9 = 18$ ____________________
7. $n + 5 = 40$ ____________________
8. $b + 7 = 14$ ____________________
9. $x + 32 = 38$ ____________________

Directions Read the problem and follow the directions.

10. Amy read 17 books over the summer, 11 more than Tim. How many books did Tim read?

    Let r stand for the number of books Tim read over the summer:

    $$r + 11 = 17$$

    How would you solve this equation? Circle the answer.

    a. Add 11 to both sides.

    b. Subtract 11 from both sides.

    c. Subtract 17 from both sides.

Click here for Main Menu
Click here to print this page. Specify the page or pages you wish to print in the dialog box. Then click OK or Print. If you do not specify the page or pages, all pages will print.

Name Date Period

Solving Multiplication Equations

EXAMPLE

Solve $4y = 16$ for y.

Step 1 Write the equation. $4y = 16$

Step 2 Multiply both sides of the equation by $\frac{1}{4}$, the reciprocal of 4. $(\frac{1}{4})4y = 16(\frac{1}{4})$

Step 3 Simplify. $y = 4$

Step 4 Check. $4 \bullet 4 = 16$

Note: Another way to do Step 2 is to *divide* both sides of the equation by 4. $\frac{4y}{4} = \frac{16}{4}$

Directions Solve each equation. Check your answer.

1. $2q = 14$ ______
2. $10k = 30$ ______
3. $7x = 28$ ______
4. $3d = 18$ ______
5. $6w = 66$ ______
6. $4j = -16$ ______
7. $8y = 48$ ______
8. $-5n = -20$ ______
9. $3.2p = 12.8$ ______

Directions Read the problem and follow the directions.

10. Juanita is 15, five times the age of her brother, Frank. How old is Frank?

    Let a stand for Frank's age: $5a = 15$

    How would you solve this equation? Circle the answer.

    a. Subtract 5 from both sides of the equation.

    b. Multiply both sides of the equation by 5.

    c. Multiply both sides of the equation by $\frac{1}{5}$.

Click here for Main Menu

Name Date Period

Solving Equations with Fractions

EXAMPLE

Solve $\frac{1}{3}y = 5$ for y.

Step 1	Write the equation.	$\frac{1}{3}y = 5$
Step 2	Multiply both sides of the equation by the reciprocal of the fraction.	$(\frac{3}{1})\frac{1}{3}y = (\frac{3}{1})5$
Step 3	Simplify.	$y = 15$
Step 4	Check.	$\frac{1}{3}(15) = 5$

Directions Solve each equation. Check your answer.

1. $\frac{1}{4}x = 1$ ______________________
2. $\frac{1}{8}w = 3$ ______________________
3. $\frac{1}{7}q = 2$ ______________________
4. $\frac{2}{5}r = 6$ ______________________
5. $\frac{4}{5}m = 20$ ______________________
6. $\frac{7}{8}k = 42$ ______________________
7. $\frac{2}{3}d = -10$ ______________________
8. $\frac{11}{16}y = 33$ ______________________
9. $\frac{1}{-5}a = -4$ ______________________

Directions Read the problem and follow the directions.

10. Spruceville received 35 inches of snow last winter, or $\frac{5}{8}$ of its average annual snowfall. What is Spruceville's average annual snowfall?

    Let n stand for Spruceville's average annual snowfall:

    $$\frac{5}{8}n = 35$$

    How would you solve this equation? Circle the answer.

    a. Subtract 35 and then multiply by $\frac{5}{8}$.

    b. Multiply both sides by $\frac{8}{5}$.

    c. Subtract $\frac{5}{8}$ from both sides.

Name ________ Date ________ Period ________

Solving Equations—More Than One Step

EXAMPLE

Solve $2m - 7 = 1$ for m.

Step 1 Add 7 to both sides. $2m - 7 + (7) = 1 + (7)$ Simplify: $2m = 8$

Step 2 Divide both sides by 2. $\frac{2m}{2} = \frac{8}{2}$ Simplify: $m = 4$

Step 3 Check. $2(4) - 7 = 1$ Simplify: $1 = 1$

Directions Solve each equation. Check your answer.

1. $4b + 1 = 17$ ____________
2. $2c + 18 = 24$ ____________
3. $7x - 2 = 5$ ____________
4. $3p + 8 = 38$ ____________
5. $8v - 1 = 39$ ____________
6. $2w - 16 = 0$ ____________
7. $5g + 5 = 35$ ____________

Directions One step is missing in the solution to each equation. In a complete sentence, write the missing step.

8. $7y - 4 = 10$

   Step 1 Add 4 to both sides of the equation.

   Step 2 ____________

9. $2d + 1 = 19$

   Step 1 ____________

   Step 2 Divide both sides of the equation by 2.

10. $3k + 3 = 12$

    Step 1 Subtract 3 from both sides of the equation.

    Step 2 ____________

Name Date Period

Equations Without Numbers

EXAMPLE $ax - b = c$ Solve for x.

Step 1	Write the equation.	$2x - 5 = 7$	$ax - b = c$
Step 2	Add 5 or b to both sides.	$2x - 5 + 5 = 7 + 5$	$ax - b + b = c + b$
		$2x = 12$	$ax = b + c$
Step 3	Divide each side by 2 or a.	$\frac{2x}{2} = \frac{12}{2}$	$\frac{ax}{a} = \frac{b+c}{a}$
Step 4	Check.	$x = 6$	$x = \frac{b+c}{a}$
		$2(6) - 5 = 7$	$a(\frac{b+c}{a}) - b = c$
		$7 = 7$	$(b + c) - b = c$
			$c = c$

Directions Solve each equation for x. Check your answer.

1. $ax - c = b$ ____________________

2. $bc = ax$ ____________________

3. $x - b + a = c$ ____________________

4. $abx = -c$ ____________________

Directions Follow the directions to solve the problem.

5. Center School has won two more soccer games than the combined wins of River School and Bluff School.

This statement can be turned into a mathematical equation.
- Let x stand for the number of games Center School has won.
- Let y stand for the number of games River School has won.
- Let z stand for the number of games Bluff School has won.

$$x = y + z + 2$$

Solve the equation for z to show the number of soccer games Bluff School has won.

____

____

Name Date Period

Formulas

EXAMPLE Solve the formula for the perimeter of a triangle for *c*.

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

Directions Solve each equation.

1. $P = 6s$ for s ____________
2. $A = \frac{1}{2}h(m + n)$ for m ____________
3. $P = 2b + 2h$ for b ____________
4. $A = lw$ for l ____________
5. $P = a + b + c$ for b ____________
6. $A = \frac{1}{2}h(m + n)$ for n ____________
7. $V = hm$ for m ____________
8. $P = 2b + 2h$ for h ____________

Directions Answer the questions to solve the problem.

Mr. Jiang is building a deck on his house. He can calculate the perimeter of the deck using this formula:

$$P = 4s$$

9. Solve the equation to show the length of a side—that is, solve for *s*.

____

____

10. Is Mr. Jiang's deck in the shape of a square or a rectangle? Explain your answer.

____

____

____

Name Date Period

The Pythagorean Theorem

EXAMPLE

Use the Pythagorean theorem: $c^2 = a^2 + b^2$

Find c when $a = 4$ and $b = 5$. Use a calculator, and round the answer to the nearest tenth.

$c^2 = (4)^2 + (5)^2$

$c^2 = 16 + 25$

$c^2 = 41$

$c = \sqrt{41} = 6.403124$ Round off: 6.4

Directions Use the Pythagorean theorem and a calculator to find the missing side of each triangle. Round to the nearest tenth.

1. $a = 2$ $b = 7$ $c = \square$ ____________________

2. $a = \square$ $b = 6$ $c = 10$ ____________________

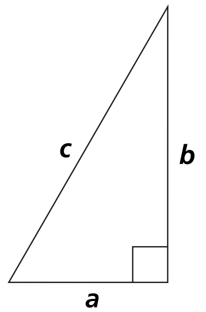
3. $a = \square$ $b = 8$ $c = 14$ ____________________

4. $a = 9$ $b = \square$ $c = 36$ ____________________

Directions Solve the problem.

5. A sailboat has a sail in the shape of a right triangle. You know that side a is 2 m long and side b is 4 m long. How long is side c of the sail?

Substitute known values in the Pythagorean theorem and solve. Use your calculator and round to the nearest tenth.



____

Name Date Period

Using the Pythagorean Theorem

EXAMPLE

The lengths of the sides of a triangle are 3 ft, 4 ft, and 5 ft. Is the triangle a right triangle?

When the lengths of the sides of a right triangle are given, the longest length is the hypotenuse. Substitute 3, 4, and 5 into the formula $a^2 + b^2 = c^2$.

$$a^2 + b^2 = c^2$$
$$3^2 + 4^2 = 5^2$$
$$9 + 16 = 25$$
$$25 = 25 \quad \text{True}$$

When the lengths of the sides of a triangle are 3 ft, 4 ft, and 5 ft, the triangle is a right triangle.

EXAMPLE

The lengths of the sides of a triangle are 10 cm, 13 cm, and 15 cm. Is the triangle a right triangle?

When the lengths of the sides of a right triangle are given, the longest length is the hypotenuse. Substitute 10, 13, and 15 into the formula $a^2 + b^2 = c^2$.

$$a^2 + b^2 = c^2$$
$$10^2 + 13^2 = 15^2$$
$$100 + 169 = 225$$
$$269 = 225 \quad \text{False}$$

When the lengths of the sides of a triangle are 10 cm, 13 cm, and 15 cm, the triangle is not a right triangle.

Directions The lengths of the sides of various triangles are given below. Is the triangle a right triangle?

1. 4 in., 5 in., 7 in. ______

2. 5 cm, 12 cm, 13 cm ______

3. 21 mm, 24 mm, 32 mm ______

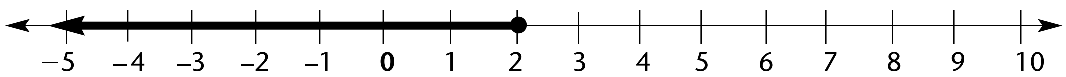
4. 2 yd, 3 yd, $\sqrt{13}$ yd ______

5. 51 m, 68 m, 85 m ______

Name Date Period

Inequalities on the Number Line

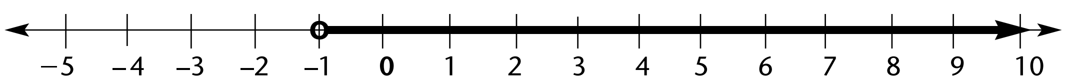
EXAMPLE Write a statement of inequality for the number line. Use *x* as the variable.



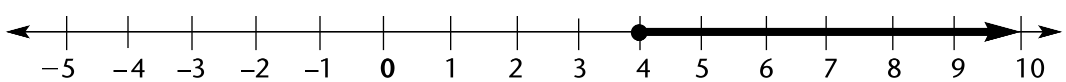
$x \le 2$

Directions Write a statement of inequality for each number line. Use *x* as the variable.

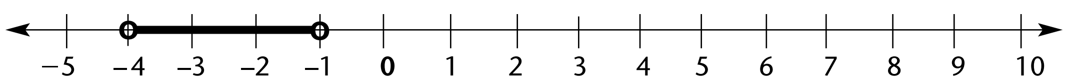
1.



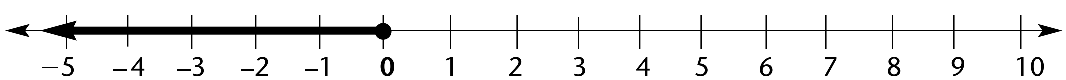
2.



3.



4.



Directions Write *T* if the disjunction is True or *F* if it is False.

5. $3 \le 5$ ________

6. $8 \ge -3$ ________

7. $2 \ge 4$ ________

8. $-1 \ge 1$ ________

9. $0 \ge -5$ ________

10. $-2 \ge -14$ ________

Name Date Period

Solving Inequalities with One Variable

EXAMPLE Solve $x - 5 > 3$ for x.

Step 1	Write the inequality.	$x - 5 > 3$
Step 2	Add 5 to both sides of the inequality.	$x - 5 + 5 > 3 + 5$
Step 3	Simplify.	$x > 8$

Note: For inequalities with addition, multiplication, or fractions, solve in the same way as for equations with the same operations.

Directions Solve each inequality.

1. $x - 3 > 0$ ________________
2. $5d > 10$ ________________
3. $k + 11 < 12$ ________________
4. $4q > 48$ ________________
5. $c + 3 \leq 40$ ________________
6. $g - 1 < 6$ ________________
7. $7p < 21$ ________________
8. $w + 9 \geq 2$ ________________

Directions Solve the problems.

9. A school has arranged teaching loads so that no teacher ever has more than 25 students. Describe the school's teaching load using an inequality and the variable t.

____

10. The sponsor of a concert promises the concert singer a fee based on \$5 per person in the audience. If attendance is below 200, however, the singer will be paid a minimum fee based on 200 seats filled. Using the variable f, write an inequality to represent the singer's minimum fee.

____

Name Date Period

Writing Equations—Odd and Even Integers

EXAMPLE Two times a number added to 4 is 14. What is the number?

Step 1 Let n = the number.

Then $2n$ is "two times" the number.

Step 2 Write and solve the equation.

$$4 + 2n = 14$$

$$4 - 4 + 2n = 14 - 4$$

$$2n = 10$$

$$n = 5$$

Step 3 Check: $4 + 2(5) = 14$

$$14 = 14$$

Directions Write an equation for each statement. Use n as the variable.

1. Three times a number added to 2 is 5. ____________________
2. Four times a number decreased by 5 is 15. ____________________
3. Five added to 8 times a number is 53. ____________________
4. Seven times a number minus 2 is 40. ____________________
5. Eleven times a number added to 10 is 32. ____________________
6. Eight times a number decreased by 25 is –1. ____________________
7. Four added to 9 times a number is 76. ____________________
8. Ten times a number decreased by 1 is 99. ____________________
9. Nine times a number minus 14 is 22. ____________________

Directions Solve the problem.

10. A cook in a cafeteria has only 7 slices of rye bread left at closing time. An assistant immediately goes to a store and buys 4 identical loaves of sliced rye bread. With this additional supply, the cafeteria now has 79 slices of rye bread. How many slices are in one packaged loaf of rye bread?

____

Name Date Period

Using the 1% Solution to Solve Problems

EXAMPLE

A train has traveled 150 miles toward its destination. This distance represents 30% of the total trip. What will the total mileage be?

Step 1	30% of mileage = 150	Given.
Step 2	30% ÷ 30 = 150 ÷ 30	Divide both sides by 30 to solve for 1%.
	1% of mileage = 5	
Step 3	100% of mileage = 500	Multiply both sides by 100 to find the total mileage.

Directions Use the 1% method to find a number when a given percentage of the number is known.

1. 25% of a number is 200. ____________________

2. 11% of a number is 33. ____________________

3. 5% of a number is 35. ____________________

4. 98% of a number is 294. ____________________

5. 17% of a number is 153. ____________________

6. 44% of a number is 88. ____________________

7. 69% of a number is 69. ____________________

8. 30% of a number is 90. ____________________

Directions Solve the problems.

9. At Mayville Community College, 490 students are enrolled in the computer program. If 70% of the students in the college are in the computer program, how many students does Mayville Community College have in all?

____

10. An airline reports that 9% of its flying customers last year were under 12 years of age. If 270,000 children under 12 years of age flew on the airline's planes, how many customers did the airline have last year?

____

Name Date Period

Using the Percent Equation

EXAMPLE

30% of the pencils in a box of 20 pencils are red. How many red pencils are there?

Step 1	Write the percent equation.		$(\frac{p}{100})(n) = r$
Step 2	Change the percent into a fraction.	$p = 30$	$(\frac{30}{100})(n) = r$
Step 3	Write the total number.	$n = 20$	$(\frac{30}{100})(20) = r$
Step 4	Simplify the fraction.		$(\frac{3}{10})(20) = r$
Step 5	Solve the equation.		$(\frac{3}{10})(20) = 6$

30% of 20 is 6. There are 6 red pencils in the box.

Directions Use the percent equation to find the percent of each given number.

1. 10% of 40 ________________

2. 20% of 60 ________________

3. 50% of 34 ________________

4. 25% of 200 ________________

5. 75% of 16 ________________

6. 21% of 100 ________________

7. 50% of 18 ________________

8. 35% of 200 ________________

9. 13% of 1,000 ________________

Directions Solve the problem.

10. Last summer, Jan gave away 15% of the tomatoes she raised in her garden. Jan picked a total of 120 tomatoes. How many did she give away?

____

____

Name Date Period

Using Percents

This chart displays population data of the world's ten largest cities.

Population of the World's Ten Largest Cities

Rank	City/Country	Population 1994	Projected Population 2015
1	Tokyo, Japan	26,518,000	28,700,000
2	New York City, U.S.	16,271,000	17,600,000
3	São Paulo, Brazil	16,110,000	20,800,000
4	Mexico City, Mexico	15,525,000	18,800,000
5	Shanghai, China	14,709,000	23,400,000
6	Bombay (Mumbai), India	14,496,000	27,400,000
7	Los Angeles, U.S.	12,232,000	14,300,000
8	Beijing, China	12,030,000	19,400,000
9	Calcutta, India	11,485,000	17,600,000
10	Seoul, South Korea	11,451,000	13,100,000

Directions The chart shows the 1994 population in each city and a projection of the population in the year 2015. Use the chart to answer these questions.

1. In which city is the population expected to increase the most? By how many people is the population expected to increase? ______________________

2. In which city is the population expected to increase the least? By how many people is the population expected to increase? ______________________

3. Which city is expected to experience the greatest percent of increase? By what percent, to the nearest whole number, is the population expected to increase? ______________________

4. Which city is expected to experience the least percent of increase? By what percent, to the nearest whole number, is the population expected to increase? ______________________

5. In 1996, the population of the world was 5,771,938,000 people. By 2020, the world's population is projected to increase to 7,601,786,000 people. By what percent, to the nearest whole number, is the population of the world expected to increase between 1996 and 2020? ______________________

Name Date Period

Solving Distance, Rate, and Time Problems

EXAMPLE The distance formula is $d = rt$.

d stands for **d**istance, r for **r**ate of speed, and t for **t**ime.

Find d when $r = 20$ kilometers per hour (km/h) and $t = 2$ hours.

Solve: $d = (20)(2) = 40$ kilometers

Use $r = \frac{d}{t}$ to solve for rate of speed.

Find r when $d = 33$ miles and $t = 3$ hours.

Solve: $r = \frac{33}{3} = 11$ miles per hour (mph)

Use $t = \frac{d}{r}$ to solve for total time.

Find t when $d = 450$ kilometers and $r = 90$ km/h.

Solve: $t = \frac{450}{90} = 5$ hours

Directions Use the appropriate version of the distance formula to find the unknown value.

1. $d = ?$	$r = 5$ mph	$t = \frac{1}{2}$ hour	Answer in miles.	________
2. $d = ?$	$r = 38$ km/h	$t = 3$ hours	Answer in kilometers.	________
3. $d = 90$ miles	$r = 60$ mph	$t = ?$	Answer in hours.	________
4. $d = 1{,}968$ kilometers	$r = ?$	$t = 24$ hours	Answer in km/h.	________
5. $d = 54$ miles	$r = 18$ mph	$t = ?$	Answer in hours.	________
6. $d = ?$	$r = 27$ km/h	$t = \frac{1}{3}$ hour	Answer in kilometers.	________
7. $d = 332$ kilometers	$r = ?$	$t = 4$ hours	Answer in km/h.	________
8. $d = 14$ miles	$r = 70$ mph	$t = ?$	Answer in hours.	________
9. $d = 1{,}233$ miles	$r = ?$	$t = 3$ hours	Answer in mph.	________
10. $d = ?$	$r = 96$ km/h	$t = \frac{3}{4}$ hour	Answer in kilometers.	________

Name Date Period

Using a Common Unit—Cents

EXAMPLE

In algebra equations, represent money as cent values.

penny = 1 cent
nickel = 5 cents
dime = 10 cents
quarter = 25 cents
dollar = 100 cents

Change dollar amounts into cents by multiplying by 100.

Suppose you have \$3.00. How many cents do you have?

$3.00 \bullet 100 = 300$ cents

To represent money amounts, multiply the number of coins by value.

Suppose you have n nickels + twice as many ($2n$) dimes. What is the money value?

$n(5) + 2n(10)$ or $5n + 20n$

Directions Write the value of each amount of money in cents.

1. \$1.92 ________

2. \$7.46 ________

3. \$11.00 ________

4. \$2.25 ________

5. \$22.95 ________

6. \$0.89 ________

Directions For each group of coins, choose the expression that gives the total money value of the coins in cents. Circle the letter of your choice.

7. n quarters plus twice as many dimes

a. $n(25) + 2n(10)$ **b.** $n + 2n$

8. n nickels plus half as many quarters

a. $n + \frac{1}{2}n$ **b.** $n(5) + \frac{1}{2}n(25)$

9. n dimes plus 4 times as many pennies

a. $n(1) + 4n(10)$ **b.** $n(10) + 4n(1)$

Directions Write an expression for the money value of the given coins, in cents.

10. n dimes + $\frac{1}{5}$ as many quarters ________________

Name Date Period

Calculating Simple Interest

EXAMPLE

- Use the formula $I = prt$ to calculate simple interest.

  How much interest will \$300 at 6% interest earn in 1 year?

  $I = \$300(0.06)(1) = \$18$
- Use the formula $p = \frac{I}{rt}$ to solve for p and calculate principal.

  Find the principal in an account that has a rate of 5% and earns \$75 interest in 2 years.

  $p = \frac{\$75}{(0.05)(2)} = \$750$
- Use the formula $r = \frac{I}{pt}$ to solve for r and calculate rate of interest.

  What is the rate of interest if \$1,000 earns \$240 interest in 3 years?

  $r = \frac{\$240}{(\$1{,}000)(3)} = 0.08$, or 8%

Directions Calculate interest on the given principal, rate, and time.

1. $p = \$200$ $r = 3\%$ $t = 1$ year ___________

2. $p = \$720$ $r = 4\%$ $t = 1$ year ___________

3. $p = \$1{,}400$ $r = 7\%$ $t = 2$ years ___________

Directions Calculate principal from the given interest, rate, and time.

4. $I = \$90$ $r = 6\%$ $t = 3$ years ___________

5. $I = \$27$ $r = 3\%$ $t = 1$ year ___________

6. $I = \$256$ $r = 8\%$ $t = 1$ year ___________

Directions Calculate rate from the given interest, principal, and time.

7. $I = \$63$ $p = \$700$ $t = 1$ year ___________

8. $I = \$24$ $p = \$150$ $t = 4$ years ___________

9. $I = \$48$ $p = \$960$ $t = 1$ year ___________

Directions Solve the problem.

10. For 2 years, Will kept \$655 in a savings account that earned 4% annual interest. How much interest did Will earn?

____

Name ______________________ Date __________ Period __________

Deriving a Formula for Mixture Problems

EXAMPLE

Use this formula to determine the cost of a mixture:

Price per pound = $\frac{\text{cost of total mixture}}{\text{number of pounds}}$

Peanuts cost \$3.00 per pound. Cashews cost \$6.00 per pound. Suppose you mix 4 pounds of peanuts with 2 pounds of cashews. What will the mixture cost, per pound?

Price per pound = $\frac{4(\$3) + 2(\$6)}{4 + 2} = \frac{\$24}{6} = \$4$

Directions Use the information in each table to answer the questions that follow it. The formula you will need is in the example on this page.

Item	Cost per pound	Number of pounds
beans	\$2.00	7
dried tomatoes	\$6.00	1

1. Fill in the formula with this data. ____________________

2. Find the cost of this mixture. ____________________

Item	Cost per pound	Number of pounds
popcorn	\$9.00	2
peanuts	\$3.00	1

3. Fill in the formula with this data. ____________________

4. Find the cost of this mixture. ____________________

Directions Solve the problem.

5. Suppose a grocery store mixes 4 pounds of oat cereal with 1 pound of almonds. The oat cereal costs \$1.20 per pound, and the almonds cost \$4.80 per pound. What should the mixture cost per pound?

____

Name Date Period

Ratio and Proportion

EXAMPLE

$\frac{2}{3} = \frac{4}{6}$ because the cross products are equal.

$\frac{2}{3} \times \frac{4}{6}$ $2 \bullet 6 = 4 \bullet 3$, so $12 = 12$

Find the missing term in the proportion $\frac{2}{5} = \frac{x}{10}$ by making an equation from the cross products. Then solve the equation.

$\frac{2}{5} \times \frac{x}{10}$ $20 = 5x$ or $5x = 20$

$x = 4$

Therefore, $\frac{2}{5} = \frac{4}{10}$

Directions Tell whether each equation is a proportion. Prove your answer.

1. $\frac{1}{4} = \frac{2}{8}$ ______________________________
2. $\frac{1}{7} = \frac{2}{14}$ ______________________________
3. $\frac{2}{7} = \frac{3}{14}$ ______________________________
4. $\frac{4}{5} = \frac{15}{20}$ ______________________________
5. $\frac{3}{4} = \frac{12}{16}$ ______________________________
6. $\frac{3}{10} = \frac{6}{30}$ ______________________________
7. $\frac{1}{3} = \frac{2}{6}$ ______________________________
8. $\frac{1}{6} = \frac{3}{18}$ ______________________________

Directions Find the missing term in each proportion.

9. $\frac{1}{3} = \frac{x}{15}$ $x =$ __________
10. $\frac{2}{4} = \frac{6}{x}$ $x =$ __________
11. $\frac{2}{9} = \frac{x}{27}$ $x =$ __________
12. $\frac{1}{x} = \frac{2}{10}$ $x =$ __________
13. $\frac{2}{3} = \frac{4}{x}$ $x =$ __________
14. $\frac{2}{7} = \frac{x}{14}$ $x =$ __________
15. $\frac{x}{5} = \frac{3}{15}$ $x =$ __________

Name Date Period

Exponents

EXAMPLE

To multiply terms with exponents, add the exponents.

$n^2 \bullet n^2 = n^{2+2} = n^4$

To raise a power to a power, multiply the exponents.

$(n^2)^3 = n^{2 \bullet 3} = n^6$

To divide terms with exponents, subtract the exponents.

$n^5 \div n^2 = n^{5-2} = n^3$ (Note: $n \neq 0$.)

Directions Use the rule for dividing terms with exponents to find each answer.

1. $4^3 \div 4^2$ ________

2. $y^5 \div y^3, y \neq 0$ ________

3. $m^8 \div m^4, m \neq 0$ ________

4. $r^9 \div r, r \neq 0$ ________

5. $6^5 \div 6$ ________

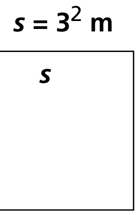
6. $(j+k)^4 \div (j+k)^2, (j+k) \neq 0$ ________

7. $10^8 \div 10^8$ ________

8. $w^7 \div w^7, w \neq 0$ ________

Directions Answer the questions to solve the problem.

A square has a side s that is 3^2 m long. The formula for area of a square is $A = s^2$. Fill in the blank to show how to calculate the area of this square.



9. Area = (_____)^2 square m

Next calculate the area of the square by using the rule for raising a power to a power. (See the previous answer.)

10. Area = ________ square m

Name ______________________ Date ________ Period ________

Negative Exponents

EXAMPLE

Rewrite $\frac{1}{10^2}$ with a negative exponent: 10^{-2}.

Rewrite $\frac{1}{x^3}$ with a negative exponent, $x \neq 0$: x^{-3}.

Rewrite 2^{-5} with a positive exponent: $\frac{1}{2^5}$.

Rewrite n^{-2} with a positive exponent, $n \neq 0$: $\frac{1}{n^2}$.

Directions Rewrite using a negative exponent.

1. $\frac{1}{8^2}$ ______________
2. $\frac{1}{2}$ ______________
3. $\frac{3^2}{3^3}$ ______________
4. $\frac{1}{10^5}$ ______________
5. $\frac{10^3}{10^6}$ ______________
6. $\frac{1}{c^2}, c \neq 0$ ______________
7. $8^2 \div 8^5$ ______________
8. $\frac{1}{y^7}, y \neq 0$ ______________
9. $\frac{1}{18^3}$ ______________
10. $\frac{1}{(3j - 2k)^4}$ ______________

Directions Rewrite using a positive exponent.

11. 5^{-3} ______________
12. 10^{-3} ______________
13. x^{-5} ______________
14. 8^{-5} ______________
15. y^{-7} ______________
16. 10^{-7} ______________
17. $(2d + 3k)^{-3}$ ______________
18. n^{-4} ______________
19. 7^{-2} ______________
20. $(m - 3n)^{-2}$ ______________

Directions Simplify each power of 2.

21. $2^2 =$ ________
22. $2^1 =$ ________
23. $2^0 =$ ________
24. $2^{-1} =$ ________
25. $2^{-2} =$ ________

Name Date Period

Exponents and Scientific Notation

EXAMPLE Write 500.37 and 0.0041 in scientific notation.

Step 1	500.37	0.0041
Step 2	Count decimal places: 2 to the left.	Count decimal places: 3 to the right.
Step 3	$5.0037 \bullet 10^2$	$4.1 \bullet 10^{-3}$
	(Rule: Use a positive exponent if the decimal point moved left.)	(Rule: Use a negative exponent if the decimal point moved right.)

Directions Write each number in scientific notation.

1. 29,900 ____________

2. 0.0016 ____________

3. 0.0199 ____________

4. 883 ____________

5. 11,000 ____________

6. 2,230,000 ____________

7. 0.001 ____________

8. 0.0000314 ____________

9. 0.0009999 ____________

10. 304,922 ____________

11. 17,250 ____________

12. 29,839,250 ____________

13. 0.0000000033 ____________

14. 3,000,000,000 ____________

15. 222.6 ____________

16. 0.0000002 ____________

17. 260,000,000 ____________

18. 0.00007 ____________

Directions Solve the problems.

19. A certain bacteria cell is 0.0008 mm thick. Write this measurement in scientific notation.

____

20. Dinosaurs became extinct (that is, died out) about 65 million years ago. This number is written out as 65,000,000. Rewrite it in scientific notation.

____

Name Date Period

Computing in Scientific Notation

EXAMPLE

Multiply: $0.005 \bullet 7{,}150{,}000$

Step 1 $0.005 = 5.0 \bullet 10^{-3}$ $7{,}150{,}000 = 7.15 \bullet 10^{6}$

Step 2 $(5.0 \bullet 10^{-3})(7.15 \bullet 10^{6}) = (5.0 \bullet 7.15)(10^{-3} \bullet 10^{6})$

Step 3 $(35.75)(10^{-3+6}) = (35.75)(10^{3})$

Step 4 $(3.575)(10)(10^{3}) = (3.575)(10^{1+3}) = (3.575)(10^{4})$

Directions Find each product. Write the answer in scientific notation.

1. $0.0007 \cdot 190$ ______________
2. $2{,}400{,}000 \cdot 0.006$ ______________
3. $0.0018 \cdot 0.054$ ______________
4. $18{,}500 \cdot 2{,}250$ ______________
5. $3{,}600 \cdot 0.00000005$ ______________

EXAMPLE

Divide: $110{,}000{,}000 \div 250$

Step 1 $110{,}000{,}000 = 1.1 \bullet 10^{8}$ $250 = 2.5 \bullet 10^{2}$

Step 2 $\frac{1.1 \bullet 10^{8}}{2.5 \bullet 10^{2}} = (1.1 \div 2.5)(10^{8} \div 10^{2})$

Step 3 $(0.44)(10^{8-2}) = 0.44(10^{6})$

Step 4 $4.4(10^{-1})(10^{6}) = (4.4)(10^{-1+6}) = (4.4)(10^{5})$

Directions Find each quotient. Write the answer in scientific notation.

6. $93{,}000{,}000 \div 3{,}100$ ______________
7. $7{,}700 \div 0.0025$ ______________
8. $1{,}008 \div 900{,}000$ ______________
9. $0.00086 \div 0.025$ ______________
10. $19.8 \div 0.0003$ ______________

Name Date Period

Defining and Naming Polynomials

EXAMPLE

The chart summarizes the kinds of polynomials.
The greatest power of a variable is called *the degree of a polynomial.*

Expression	Name of the Polynomial	Degree
$2y^2$	monomial	2
$2y^2 + 5$	binomial	2
$2y^2 - 3y + 5$	trinomial	2
$y^3 + 2y^2 - 3y + 5$	polynomial	3

Directions Fill in the missing data in the chart. Write on each numbered blank.

Expression	Name of the Polynomial	Degree
$3n^2 + 2n$	**1.** ______________	2
$k^3 - 2k^2 + k - 4$	polynomial	**2.** ________
$5x$	monomial	**3.** ________
$3x^2$	**4.** ______________	2
$7y^2 + 4y - 5$	trinomial	**5.** ________
$n^3 + n^2 - 8n - 8$	**6.** ______________	**7.** ________
$93n$	**8.** ______________	1
$11k^2 - 2k + 17$	**9.** ______________	**10.** ________
$b^2 + 4$	**11.** ______________	**12.** ________

Directions Each expression is described incorrectly. Write what is wrong with the description.

13. $k + 5$ "binomial in k, degree 2" ______________________________

14. $y^2 - 4$ "trinomial in y, degree 2" ______________________________

15. $r^3 - r^2 - 3r + 7$ "polynomial in x, degree 3" ______________________________

Name ____________________ Date ________ Period ________

Adding and Subtracting Polynomials

EXAMPLE Add $(2x^3 + 4x^2 + 8)$ and $(x^3 - 2x^2 - x + 3)$.

$$\begin{array}{rrrrr} & 2x^3 & +\,4x^2 & & +\,8 \\ + & x^3 & -\,2x^2 & -\,x & +\,3 \\ \hline & 3x^3 & +\,2x^2 & -\,x & +\,11 \end{array}$$

Subtract $(2x^3 - 4x - 1)$ from $(4x^3 + 7x^2 - 3x + 4)$.

Find the opposite of the expression to be subtracted:

$$(-1)(2x^3 - 4x - 1) \quad = \quad -2x^3 + 4x + 1$$

$$\begin{array}{rrrrr} \textbf{Add:} & 4x^3 & +\,7x^2 & -\,3x & +\,4 \\ + & -2x^3 & & +\,4x & +\,1 \\ \hline & 2x^3 & +\,7x^2 & +\,x & +\,5 \end{array}$$

Directions Find each sum.

1. $(5k^3 - 9k^2 + 12k - 3)$ and $(k^3 + 10k^2 + k + 14)$ ____________________
2. $(3y^4 + 2y^2 - 7y)$ and $(5y^3 - 2y^2 + 2y + 9)$ ____________________

Directions Find each difference. Remember to add the opposite.

3. $(4n^2 - 8n + 3) - (3n^2 + 5n - 4)$ ____________________
4. $(6x^4 - x^3 + 12x - 16) - (5x^3 + 2)$ ____________________

Directions Solve the problem.

5. A nut company will close one of its two stores and combine all of the inventory (the nuts in stock) from the two stores. The following polynomials give the number of bags of dry-roasted peanuts in each store:

   Lakewood store: $x^2 + 4x - 2$

   Downtown store: $3x^2 - x + 4$

   Find the combined inventory of the dry-roasted peanuts.

   ____

Name Date Period

Multiplying Polynomials

EXAMPLE Multiply $(n + 2)(n - 3)$. Use the distributive property.

$$(n + 2)(n - 3) = n(n - 3) + 2(n - 3)$$
$$= n^2 - 3n + 2n - 6$$
$$= n^2 - n - 6$$

Directions Find each product.

1. $(k + 4)(3k - 6)$ __________

2. $(-2x + 5)(-x - 10)$ __________

3. $(c^2 + c)^2$ __________

4. $(d^2)(d + 5)$ __________

5. $(y + 9)(y^2 - 2y + 6)$ __________

6. $(n - 3)(n^3 + 6n - 3)$ __________

7. $(w^3 + 1)(w^2 - 4)$ __________

8. $(-2x - 5)(3x^5 + x^4 - 4x^3 + 6x^2)$ __________

9. $(c^3)(c^2 - 3c + 9)$ __________

10. $(2k + 7)(2k - 5)$ __________

11. $(m - 3)(m^4 - 3m^3 - 7m - 1)$ __________

12. $(8b + 3)(2b - 9)$ __________

13. $(k^3)(k^6 + 2k^5 - 3k^4 - 8k^3 + 4k^2 - 9k - 9)$ __________

14. $(7n - 4)(3n^3 - 8n^2 - 5n + 8)$ __________

Directions Solve the problem.

15. A machine in a factory turns out a large metal grid (a crisscross or checkerboard pattern), which later gets cut into small pieces for computer parts. The measurements of this large grid are as follows:

length: $(3x + 12)$ width: $(2x - 3)$

Find the area of this grid, using the formula: Area = length • width.

____

Name ______________________ Date __________ Period __________

Special Polynomial Products

Example

Each of these polynomial products forms a pattern.

$(a+b)^2 = (a+b)(a+b) = a(a+b) + b(a+b) = a^2 + 2ab + b^2$

$(a-b)^2 = (a-b)(a-b) = a(a-b) - b(a-b) = a^2 - 2ab + b^2$

$(a+b)(a-b) = a(a-b) + b(a-b) = a^2 - b^2$

$(a+b)^3 = (a+b)(a+b)(a+b) = (a+b)[(a+b)(a+b)] = a^3 + 3a^2b + 3ab^2 + b^3$

Directions Study each product. Decide what polynomials were multiplied to give the product. Use the example above as a guide. Write your answer in the blank.

1. $m^2 + 2mn + n^2$ ______________________

2. $j^2 - k^2$ ______________________

3. $x^2 + 2xy + y^2$ ______________________

4. $c^3 + 3c^2d + 3cd^2 + d^3$ ______________________

5. $w^2 - x^2$ ______________________

6. $g^2 - 2gh + h^2$ ______________________

Directions Find each product. Compare your solutions with the patterns in the example above.

7. $(p+r)(p-r)$ ______________________

8. $(f+g)^2$ ______________________

9. $(y+z)^3$ ______________________

10. $(a+d)(a-d)$ ______________________

11. $(p-q)(p-q)$ ______________________

12. $(t+u)(t+u)(t+u)$ ______________________

13. $(n+p)(n+p)$ ______________________

14. $(c-d)^2$ ______________________

15. $(k+m)(k-m)$ ______________________

Name Date Period

Exponents and Complex Fractions

EXAMPLE

It is possible to simplify complex fractions that contain exponents.

Simplify. $\dfrac{\frac{1}{a^2}}{\frac{b^2}{a}}$

Step 1 Rewrite the complex fraction horizontally. Recall that the fraction bar separating the numerator from the denominator means "divide."

$$\dfrac{\frac{1}{a^2}}{\frac{b^2}{a}} = \frac{1}{a^2} \div \frac{b^2}{a}$$

Step 2 Multiply each term in the expression by the reciprocal of the divisor.

$$\frac{1}{a^2} \div \frac{b^2}{a} = \left(\frac{1}{a^2}\right)\left(\frac{a}{b^2}\right) \div \left(\frac{b^2}{a}\right)\left(\frac{a}{b^2}\right)$$

Step 3 Simplify.

$$\left(\frac{1}{a^2}\right)\left(\frac{a}{b^2}\right) \div \cancel{\left(\frac{b^2}{a}\right)\left(\frac{a}{b^2}\right)} = \left(\frac{1}{a^2}\right)\left(\frac{a}{b^2}\right) = \left(\frac{1}{ab^2}\right)$$

Directions Simplify these complex fractions.

1. $\dfrac{\frac{1}{b^2}}{\frac{a}{b^2}}$ ________

2. $\dfrac{\frac{c^2}{2}}{\frac{2}{d}}$ ________

3. $\dfrac{\frac{5}{a^3}}{\frac{5}{b}}$ ________

4. $\dfrac{\frac{1}{g^3}}{\frac{1}{g}}$ ________

5. $\dfrac{\frac{2xy^2}{z}}{\frac{xy}{z}}$ ________

6. $\dfrac{\frac{10m^3n}{p}}{\frac{2p^2}{n^2}}$ ________

7. $\dfrac{\frac{24cde^4}{d}}{\frac{8e^3}{d}}$ ________

8. $\dfrac{\frac{3r^2st^2}{u}}{\frac{r}{u}}$ ________

9. $\dfrac{\frac{12g^4hi^2}{ah}}{\frac{gh^2}{ai}}$ ________

10. $\dfrac{\frac{8c^2}{9b^5d}}{\frac{2cd}{b^3}}$ ________

Name Date Period

Dividing a Polynomial by a Monomial

EXAMPLE Find the quotient of $(3x^3 - 6x^2 + 9x) \div 3x$.

Step 1 Rewrite the problem. $\frac{3x^3 - 6x^2 + 9x}{3x}$

Step 2 Divide each term of the numerator by the term in the denominator.

$\frac{3x^3}{3x}$ $\frac{6x^2}{3x}$ $\frac{9x}{3x}$

$= x^2 - 2x + 3$ (quotient)

Step 3 Check by multiplying quotient by divisor. The answer should be the dividend.

$(x^2 - 2x + 3)(3x) = 3x^3 - 6x^2 + 9x$ (dividend)

Directions Find each quotient. Check your work using multiplication.

1. $(15n^2 - 5n + 45) \div 5$ ________________
2. $(16y^3 - 4y) \div (4y)$ ________________
3. $(2k^7 - 4k^6 + 16k^5 - 22k^3 - 6k^2) \div (2k^2)$ ________________

Directions Solve the problems.

4. An engineer in a paper-clip factory represents the number of paper clips that come out of a machine in one hour by the following polynomial expression: $2x^5 + 4x^4 + 16x^2 - 128x$. The paper clips are packed in boxes, each of which holds $2x$ paper clips. How many boxes will be filled by an hour's run of the paper-clip machine?

____

5. A textile factory produces a bolt (roll) of cloth 40 yards long. The expression $16k^4 + 8k^3 + 24k^2 - 32k$ gives the number of threads in this bolt of cloth. If the bolt is cut into 8 equal pieces of cloth, how many threads will each piece have?

____

Name Date Period

Dividing a Polynomial by a Binomial

EXAMPLE Find the quotient of $(x^2 - 3x - 5) \div (x + 1)$.

$$\begin{array}{r}
x - 4 \\
x + 1 \overline{)\, x^2 - 3x - 5} \\
\underline{-\,(x^2 + x)} \\
-4x - 5 \\
\underline{-\,(-4x - 4)} \\
-1
\end{array}$$

-1 remainder

Check by multiplication: $(x + 1)(x - 4) - 1 = x^2 - 3x - 5$

Directions Find each quotient. Identify any remainder.

1. $(2x^2 - x - 15) \div (2x + 5)$ ________________

2. $(14a^2 - 26a - 4) \div (7a + 1)$ ________________

3. $(5y^2 + 4y - 12) \div (y + 2)$ ________________

4. $(3d^2 - 3d - 5) \div (d + 2)$ ________________

Directions Tell what is wrong with the following division work. Show how to correct the error.

5.

$$\begin{array}{r}
x^4 \\
x + 3 \overline{)\, x^5 + 3x - 9} \\
\underline{x^5 + 3x^4} \\
?
\end{array}$$

____

____

____

____

Name ______ Date ______ Period ______

Polynomials in Two or More Variables

EXAMPLE Evaluate $P(x, y) = x^2 + xy + y^2$ for $x = 2$ and $y = -2$

Step 1 Substitute the variables with their values.

$P(2, -2) = (2)^2 + (2)(-2) + (-2)^2$

Step 2 Follow the order of operations.

$4 + -4 + 4$

Step 3 Add.

$4 + -4 + 4 = 4$

$P(x, y) = 4$

Directions Evaluate $P(x, y) = x^2 + xy + y^2$ for each set of values.

1. $x = 1, y = -2$ ______

2. $x = -1, y = 6$ ______

3. $x = \frac{1}{3}, y = -3$ ______

4. $x = -6, y = 5$ ______

5. $x = \frac{1}{2}, y = 8$ ______

Directions Evaluate $P(x, y) = x^3y^2 + x^2y + xy^3$ at

6. $P(1, 2)$ ______

7. $P(-3, -2)$ ______

8. $P(7, 0)$ ______

9. $P(8, 2)$ ______

10. $P(-1, -5)$ ______

Directions Evaluate $P(x, y, z) = x^3yz^2 + x^2y^2z^2 + xy^3 + yz$ for

11. $x = 1, y = 2, z = 1$ ______

12. $x = 1, y = 0, z = 4$ ______

13. $x = 2, y = -1, z = 3$ ______

14. $x = 0, y = 5, z = -1$ ______

15. $x = 2, y = -4, z = 0$ ______

Name Date Period

Greatest Common Factor

EXAMPLE

Find the GCF.		140 and 56	$49k^4$ and $21k^2$
Step 1	Write the factorizations.	$140 = 2 \bullet 2 \bullet 5 \bullet 7$ $56 = 2 \bullet 2 \bullet 2 \bullet 7$	$49k^4 = 7 \bullet 7 \bullet k \bullet k \bullet k \bullet k$ $21k^2 = 3 \bullet 7 \bullet k \bullet k$
Step 2	Identify common prime factors.	$2 \bullet 2 \bullet 7$	$7 \bullet k \bullet k$
Step 3	Write the GCF as a product.	$2^2 \bullet 7 = 28$	$7k^2$

Directions Find the GCF for these groups of integers.

1. 60, 126 ____________

2. 63, 70 ____________

3. 45, 225 ____________

4. 64, 114 ____________

5. 42, 90 ____________

Directions Find the GCF for these groups of expressions.

6. $14x^5y^4$, $7xy^3$ ____________

7. $21j^3k^4$, $54j^2k^6$ ____________

8. $4a^3b^2$, $18a^2b$ ____________

9. $25m^6n$, $30m^5n^2$ ____________

Directions Solve the problem.

10. Dad just had a birthday. *Before* this birthday, dividing Dad's age by 2 left a remainder of 1. How do you know that Dad's new age is *not* a prime number?

____

____

____

Name ____________ Date ____________ Period ____________

Factoring Polynomials

EXAMPLE

Factor $35x^3y^2 - 14x^2y^3$.

Step 1 Find the GCF:

$35x^3y^2 = 5 \bullet 7 \bullet x \bullet x \bullet x \bullet y \bullet y$

$14x^2y^3 = 2 \bullet 7 \bullet x \bullet x \bullet y \bullet y \bullet y$ The GCF is $7x^2y^2$.

Step 2 Rewrite the expression using the GCF.

$35x^3y^2 - 14x^2y^3 = 7x^2y^2(5x)(1) - 7x^2y^2(2)(1)(y)$

$= 7x^2y^2(5x - 2y)$ by the distributive property

Step 3 Check. $7x^2y^2(5x - 2y) = 35x^3y^2 - 14x^2y^3$

Directions Find the GCF and factor these expressions.

1. $6a^2 + 9a$ ____________
2. $2b^4 - 4b^2$ ____________
3. $4d^2 + 8d - 2cd$ ____________
4. $6x^3 - 9x^2y$ ____________
5. $12a^2 - 3ab + 9a^2b^2$ ____________
6. $j^2k^2 - jk$ ____________
7. $12xyz^3 - 18xy^2z^2$ ____________
8. $12m^3n^2p + 6m^2np - 3mp$ ____________

Directions Solve the problems.

9. Suppose you have the following in your fruit bowl:
   - x apples
   - $6x$ peaches
   - $2x^2$ pears

   In all, you have $2x^2 + 7x$ pieces of fruit. Factor this expression.

   ____

10. With the same contents in your fruit bowl, suppose you eat all of the x apples? Write an expression to represent the fruit you will now have left. Can this expression be factored? If it can, factor it.

    ____

Name Date Period

Factoring Trinomials: $x^2 + bx + c$

EXAMPLE

Factor $a^2 + 2a - 15$.

Step 1 $a^2 + 2a - 15 = (❑ + ❑)(❑ - ❑)$

Step 2 $a^2 + 2a - 15 = (a + ❑)(a - ❑)$ to give a^2

Step 3 Find factors of –15 whose sum is 2.

$(5)(-3) = -15$, and $(5) + (-3) = 2$

$a^2 + 2a - 15 = (a + 5)(a - 3)$

Step 4 Check by multiplying.
$(a + 5)(a - 3) = a^2 + 2a - 15$

Directions Factor the expressions. Check by multiplying.

1. $y^2 + 7y + 12$ ________________
2. $w^2 - 4w - 21$ ________________
3. $b^2 - 9b + 14$ ________________
4. $x^2 - 11x + 18$ ________________
5. $n^2 - 7n + 12$ ________________
6. $z^2 - z - 30$ ________________
7. $d^2 + 5d + 6$ ________________
8. $a^2 - 5a - 50$ ________________
9. $m^2 - 2m - 15$ ________________

Directions Solve the problem.

10. A grid (checkerboard pattern) is printed on each sheet of graph paper produced in a paper factory. The total number of squares on the printed grid is $x^2 - 6x - 27$. What is the length, in squares, of each side of the grid? (Hint: factor the trinomial.)

____

Name Date Period

Factoring Trinomials: $ax^2 + bx + c$

EXAMPLE

Factor $3x^2 + 13x + 4$.

Step 1 $3x^2 + 13x + 4 = (❑x + ❑)(❑x + ❑)$ to give x^2

Step 2 Find factors of 3 and 4 whose sum is 13.

Factors of 3 = (1)(3) Factors of 4 = (1)(2)(2)

After trying out the possible combinations, the following factors of the trinomial are found: $(3x + 1)(x + 4)$

Step 3 Check by multiplying.

$(3x + 1)(x + 4) = 3x^2 + 13x + 4$

Directions Factor these expressions.

1. $3a^2 + 4a + 1$ ____________________
2. $3x^2 - 4x - 4$ ____________________
3. $6d^2 - d - 15$ ____________________
4. $8x^2 - 18x + 9$ ____________________
5. $4n^2 + 13n + 3$ ____________________
6. $2y^2 - 7y + 3$ ____________________
7. $4x^2 + 11x - 3$ ____________________
8. $2n^2 - 5n + 3$ ____________________
9. $6b^2 + 7b - 20$ ____________________

Directions Solve the problem.

10. A pretzel-maker fills identical bags with an equal number of pretzels. In one hour, the pretzel-maker bags $(4k^2 + 17k + 18)$ pretzels in all. Factor this trinomial to find the number of bags (larger factor) and the number of pretzels per bag (smaller factor).

____

Click here for Main Menu

Click here to print this page. Specify the page or pages you wish to print in the dialog box. Then click OK or Print. If you do not specify the page or pages, all pages will print.

Name ______ Date ______ Period ______

Factoring Expressions: $a^2 - b^2$

EXAMPLE

Find the factors of $x^2 - 4$.

Step 1 Find the square roots of x^2 and 4.

$\sqrt{x^2} = x$ and $\sqrt{4} = 2$

Step 2 Place the values in the model. $a^2 - b^2 = (a + b)(a - b)$.

$x^2 - 4 = (x + 2)(x - 2)$

Step 3 Check by multiplying. $(x + 2)(x - 2) = x^2 - 4$

Directions Factor these expressions. Check your answers.

1. $y^2 - 144$ ______

2. $x^2 - 16$ ______

3. $w^2 - 400$ ______

4. $16b^2 - 81$ ______

5. $9x^2 - 4y^2$ ______

6. $4m^2 - 9n^2$ ______

7. $j^4 - k^2$ ______

8. $a^2b^2 - 100$ ______

9. $25c^2 - 169$ ______

10. $36n^4 - 25p^2$ ______

11. $484x^2 - 900y^2$ ______

12. $36a^8 - 49b^8$ ______

13. $49k^{16} - 25k^2$ ______

14. $121n^2 - 49p^2$ ______

Directions Solve the problem.

15. A town has an exactly rectangular shape. If the town's area is $(p^2 - 121)$ square kilometers, what is the length of the town border on each side of the rectangle it forms?

______

Name Date Period

Factoring Expressions: $a^2 + 2ab + b^2$

EXAMPLE

Find the factors of $n^2 + 8n + 16$.

Model for factoring: $a^2 + 2ab + b^2 = (a + b)^2$

Step 1 Assign values to n^2.

$a^2 = n^2$ or $a = \sqrt{n^2}$

$b^2 = 16$ or $b = \sqrt{16}$

$2ab = 2(n \bullet 4) = 8n$

Step 2 Place the values in the model.

$n^2 + 8n + 16 = (n + 4)^2$

Step 3 Check by multiplication.

$(n + 4)(n + 4) = n^2 + 8n + 16$

Directions Find the factors of each polynomial. Check your answers.

1. $r^2 + 10r + 25$ ____________________
2. $b^2 + 20b + 100$ ____________________
3. $k^2 + 2k + 1$ ____________________
4. $y^2 + 14y + 49$ ____________________
5. $x^2 + 4xy + 4y^2$ ____________________
6. $9v^2 + 42vw + 49w^2$ ____________________
7. $c^2 + 2cd + d^2$ ____________________
8. $4m^2 + 28mn + 49n^2$ ____________________

Directions Solve the problems.

9. A square parking lot has a surface area of $(w^4 - 2w^2x + x^2)$ square feet. Factor this trinomial to find the length of one side in feet.

____

10. The surface of a square window pane is $(k^2 + 8k + 16)$ cm^2 in area. Factor this trinomial to find the length of one side of the pane in cm.

____

Name Date Period

Zero as a Factor

EXAMPLE Find the value of the variable in each example.

$3n = 0$ Since $3 \neq 0$, n must be 0.

$4(y + 1) = 0$ Since $4 \neq 0$, $(y + 1)$ must be 0.

$(x - 1)(x - 2) = 0$ implies that one of the factors is 0.

If $(x - 1) = 0$, solve for x:	If $(x - 2) = 0$, solve for x:
$x - 1 + 1 = 0 + 1$	$x - 2 + 2 = 0 + 2$
$x = 1$	$x = 2$

Directions Find the value of the variable in each expression. Check your work.

1. $8y = 0$ __________
2. $4k = 0$ __________
3. $12p = 0$ __________
4. $32x = 0$ __________
5. $10v = 0$ __________
6. $2b^4 = 0$ __________
7. $11x^2 = 0$ __________
8. $7r^3 = 0$ __________
9. $256n = 0$ __________
10. $256n^3 = 0$ __________

Directions Solve these equations for the variable. Check your solutions.

11. $(13)(b + 5) = 0$ __________
12. $(n - 30)(6) = 0$ __________
13. $(a + 4)(a - 5) = 0$ __________
14. $(x + 4)(x + 7) = 0$ __________
15. $(x - 30)(x - 120) = 0$ __________
16. $(2d - 6)(5d + 5) = 0$ __________
17. $(2x - 1)(x + 2) = 0$ __________
18. $(x + 6)(x - 1) = 0$ __________
19. $(3y + 2)(y - 1) = 0$ __________
20. $(2k - 5)(3k + 6) = 0$ __________

Name Date Period

Solving Quadratic Equations—Factoring

EXAMPLE

Solve $x^2 - 7x + 10 = 0$.

Step 1 Factor the equation. $x^2 - 7x + 10 = (x - 2)(x - 5) = 0$

Step 2 Set each factor equal to 0, and solve each factor for x.

$x - 2 = 0$ $\quad$ $x - 5 = 0$

$x = 2$ $\quad$ $x = 5$

Step 3 Check.

Let $x = 2$: $x^2 - 7x + 10 = (2)^2 - 7(2) + 10 = 4 - 14 + 10 = 0$ True

Let $x = 5$: $x^2 - 7x + 10 = (5)^2 - 7(5) + 10 = 25 - 35 + 10 = 0$ True

Directions Find the solutions. Check your work.

1. $x^2 - 2x - 3 = 0$ ______________
2. $b^2 + b - 12 = 0$ ______________
3. $w^2 - 6w - 16 = 0$ ______________
4. $2n^2 - n - 10 = 0$ ______________
5. $x^2 - 4x - 21 = 0$ ______________
6. $4a^2 + 5a - 6 = 0$ ______________
7. $6x^2 - 7x - 3 = 0$ ______________
8. $2n^2 + 5n - 3 = 0$ ______________
9. $y^2 + 5y - 14 = 0$ ______________

Directions Solve the problem.

10. The square of a number d plus 5 times d plus 6 equals zero. Write an equation for this puzzle. Then factor the equation and solve for the factors to find the possible values of d.

____

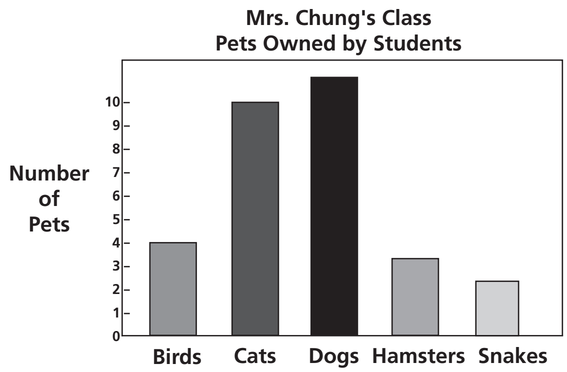
____

____

Name _______________ Date _______ Period _______

Organizing Data

EXAMPLE A bar graph compares data by heights of bars. Study this bar graph.



Directions Answer these questions about the bar graph in the example.

1. Which pet do the greatest number of Mrs. Chung's students own? _______________

2. Which pet do the least number of Mrs. Chung's students own? _______________

3. If the number scale on the left of the graph were covered up, would you still be able to answer questions 1 and 2? Explain.

____

4. How many birds do students in Mrs. Chung's class own? _______________

5. How many hamsters do the students own? _______________

6. If the number scale on the left of the graph were covered up, would you still be able to answer questions 4 and 5? Explain.

____

Directions Suppose 18 people are asked how much money they have in their pockets. Their answers are collected as data to fill the chart on the left. Use this data to complete the frequency table. One is done as an example for you.

How much money do you have in your pocket ? (in cents)		
18	5	30
75	25	95
25	25	120
16	90	65
38	35	75
28	39	42

Frequency Table

Interval	Tally	Frequency
0–25¢	𝍸 I	6
26–50¢	**7.** ______	______
51–75¢	**8.** ______	______
76–100¢	**9.** ______	______
101–125¢	**10.** ______	______

Name Date Period

Range, Mean, Median, and Mode

EXAMPLE

Find range, mean, median, and mode of the following set of data: {\$3.98, \$1.44, \$3.15, \$5.39, \$1.44}.

Range Find the difference between the greatest and least values.
\$5.39 – \$1.44 = \$3.95 range

Mean Find the sum of the values. Then divide the sum by the number of data values (5).
Sum = \$15.40. \$15.40 ÷ 5 = \$3.08 mean

Median Arrange the data from least to greatest. Cross off greatest and least pairs until one value remains in the middle. That value is the median.

~~\$1.44~~ ~~\$1.44~~ \$3.15 ~~\$3.98~~ ~~\$5.39~~

\$3.15 median

Mode Find any repeated values. They make up the mode.
\$1.44 mode

Directions Use a calculator to find the mean of each set of data.

1. {17, 4, 29, 14} ________
2. {172, 51, 100, 87} ________
3. {4.5, 11.6, 8.8} ________
4. {553, 700, 297, 644, 199} ________
5. {600, 400, 100, 300, 500, 200} ________
6. {18.1, 23.7,10.5, 28.8, 21.4} ________

Directions Answer the questions to solve the problem.

Jenny collected data on the number of bulls-eyes she hit in archery practice over a 7-day period. Here is her data set: {7, 4, 9, 12, 6, 19, 6}.

7. Find the range of Jenny's data. ________
8. Find the arithmetic mean of the data. ________
9. Find the median of the data. ________
10. Find the mode of the data. ________

Name Date Period

Box-and-Whiskers Plots

EXAMPLE

The following data represents the number of strikes (knockouts of all bowling pins) the members of a bowling club bowled in their best game. Organize this data for a box-and-whiskers plot.

{11, 3, 4, 8, 6, 2, 9}

Step 1 Arrange the data from least to greatest. Label the lower extreme and upper extreme.

Step 2 Find and label the median of the data.

Step 3 Find the median of all the values below the median. Label this item the lower quartile.

Step 4 In a similar way, find and label the upper quartile.

2	3	4	6	8	9	11
↑	↑		↑		↑	↑
lower extreme	lower quartile		median		upper quartile	upper extreme

Directions For each data set, arrange the data from least to greatest value on the blank. Then answer the questions.

Data set: {$23.95, $8.15, $6.95, $14.69, $4.88, $24.20, $9.29, $13.12, $27.67, $10.99, $12.79}

____

1. What is the median? __________

2. What is the lower extreme? __________

3. What is the upper extreme? __________

4. What is the lower quartile? __________

5. What is the upper quartile? __________

Data set: {66, 27, 15, 72, 21, 44, 39, 55, 48, 35, 19, 45, 40, 58, 30}

____

6. What is the median? __________

7. What is the lower extreme? __________

8. What is the upper extreme? __________

9. What is the lower quartile? __________

10. What is the upper quartile? __________

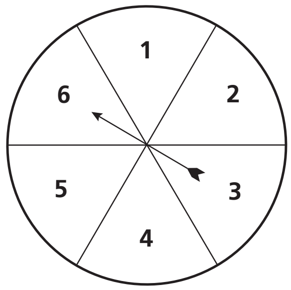
Name Date Period

The Probability Fraction

EXAMPLE

The probability fraction: $\frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$

A board game has a spinner with an arrow and 6 numbered regions. When the player spins the arrow, it lands on one of the six numbers (assume that it never stops on a line). Use the probability fraction to find the probability that the arrow will land on number 6.



Step 1 Find the denominator.
The number of possible outcomes is 6 because there are 6 regions on the spinner.

Step 2 Find the numerator.
The number of favorable outcomes is 1 because the problem asks for number 6.

Step 3 Simplify the fraction if possible: $\frac{1}{6}$. No simplification is necessary.
The probability of spinning to number 6 is $\frac{1}{6}$.

Directions Use the probability fraction to solve these problems.

1. Suppose you drop a photograph on wet pavement. What is the probability that it will land image-side down on the pavement? ________________

2. Suppose a class of 24 has one student named Brad. Each day, the teacher lines up the students in random order. What is the probability on any day that Brad will be in front? ________________

3. In the same class, what is the probability on any day that Brad will be at the end of the line? ________________

4. In the same class, if Brad has a twin brother named Jackson, what is the probability that either twin will be at the front of the line? ________________

5. Suppose you come to a fork in the road and have no idea which fork to take. One fork leads directly to your destination, but the other leads away from it. What is the probability you will choose the correct fork? ________________

Name Date Period

Probability and Complementary Events

EXAMPLE

- Suppose you toss a 1–6 number cube. It is *certain* that the outcome will be in the set {1, 2, 3, 4, 5, 6}.
- Suppose you toss a coin. It is *impossible* that the outcome will be both heads and tails.
- Suppose you close your eyes and point at random to a key on your computer keyboard. It is *likely* that you will point to a letter or number key.
- In the same situation, it is *not likely* that you will point to the letter *Q*.

Directions Write one of the following words on the blank to describe the probability of each event: *certain, impossible, likely, not likely.*

1. With eyes closed, you pick a crayon at random from your box of 48 crayons. The color you pick is green. ______________________
2. The sun will come up tomorrow morning. ______________________
3. The first card you draw from a deck of regular playing cards is an ace. ______________________
4. Opening a book randomly, you open it to page 132. ______________________
5. Your book has 286 pages. You open the book randomly to page 400. ______________________
6. A pollster sends a questionnaire to 40 households in your community of 800 total households. One of these questionnaires arrives in your mailbox. ______________________
7. If you roll a 1–6 number cube, the number that rolls up will be the square of another integer. ______________________
8. If you roll a 1–6 number cube, the number that rolls up will be the square root of an integer. ______________________
9. The next person you pass on the sidewalk has a birthday in January. ______________________
10. You take one egg out of a dozen eggs in the refrigerator. It is *not* the last egg in the carton. ______________________

Name Date Period

Tree Diagrams and Sample Spaces

EXAMPLE

A child is asked to select one crayon and one picture for coloring. Crayon choices are blue or red. The picture choices are a balloon or a star. What is the probability that the child will select *red* and a *star*?

Color choices: blue red

Picture choices: balloon star balloon star

The 4 possible choices:
- blue and balloon
- blue and star
- red and balloon
- red and star

The probability is $\frac{1}{4}$: P (red, star) = $\frac{1}{4}$

Directions Suppose the child is still asked to choose between a blue or red crayon but is now offered 3 picture choices: balloon, star, or box. Use a tree diagram to determine the probability of each outcome.

1. Find P (red, box) ____________

2. Find P (red, star) ____________

3. Find P (blue, not star) ____________

4. Find P (blue, balloon) ____________

5. Find P (not blue, not balloon) ____________

6. Find P (blue *or* red, box) ____________

7. Find P (red, *any* picture) ____________

8. Find P (*any* color, *any* picture) ____________

Directions Solve the problems.

9. Suppose that runners may choose to run in the 5-km or 10-km race. What is the probability that the next runner to sign up will be female and will choose the 5-km race? ____________

10. For the same event, what is the probability that the next runner to sign up will be of either sex and will choose the 10-km race? ____________

Name Date Period

Dependent and Independent Events

EXAMPLE Suppose 2 children take one pencil each from the same box of 10 pencils. Half of the pencils have erasers, half do not. The first child chooses a pencil, then the second child chooses. What is the probability that both will choose a pencil with an eraser?

These events are dependent.

- The probability of an eraser for child A's choice is $\frac{5}{10}$, or $\frac{1}{2}$.
- The probability of an eraser for child B's choice is $\frac{5-1}{10-1}$, or $\frac{4}{9}$.

Suppose instead that each child chooses from an identical separate box of pencils. These events are independent, so each probability is identical.

Directions Write whether the events are *dependent* or *independent*.

1. Each of 5 children chooses and keeps a marble from a bag of 5 marbles. ____________________
2. A player in a board game rolls a number cube. Then a different player rolls the cube. ____________________
3. A clothing store has one of a particular shirt left. One man buys the shirt. Then another man comes in, asking to buy the same shirt. ____________________
4. Three children always sit on the backseat of their family car. Today, the first child sits in the middle. Then the second child sits down. ____________________
5. One person draws a card from the deck, looks at it, and puts it back into the deck. The next person then draws from the deck. ____________________
6. At the start of a board game, one person selects her playing piece from a bag of 7 pieces. Then you select your piece. ____________________
7. A grab bag holds 3 wrapped gifts: one red, one blue, and one green. You take the gift wrapped in red. Then the person on your right takes one. ____________________
8. A friend shows you a card trick, having you select 1 card out of 5. Then your friend repeats the same trick with someone else. ____________________
9. Two trains are on the same track line. Train number one slows down. Train number two then slows down. ____________________
10. A vase in a flower shop holds 3 flowers. After you take one, the florist replaces it. Then another person takes one. ____________________

Name Date Period

The Fundamental Principle of Counting

EXAMPLE

Find 4 factorial, or 4!

The factorial of 4 is the product of all positive integers from 4 down to 1.

Here is the calculation: $4 \bullet 3 \bullet 2 \bullet 1 = 24$

$4! = 24$

Directions Find the following factorials. You may use a calculator.

1. 8! ______________________

2. 11! ______________________

3. 9! ______________________

4. 5! ______________________

5. 7! ______________________

6. 3! ______________________

7. 6! ______________________

8. 10! ______________________

EXAMPLE How many different ways can Ben rearrange the letters in his name?

Possible letters in first position:	3
Possible letters in second position:	$3 - 1 = 2$
Possible letters in third position:	$2 - 1 = 1$

Ben can arrange the letters in his name $3 \bullet 2 \bullet 1 = 6$ ways.

You can also say that Ben can arrange the letters in 3! ways.

Directions Solve the problems.

9. How many different ways can Kristy rearrange the letters in her name? ______________________

10. The last 4 digits of Juan's phone number are 2138. In how many different ways can Juan rearrange these digits? ______________________

Name Date Period

Choosing the Best Measure of Central Tendency

EXAMPLE

Some measures of central tendency more accurately describe a data set than others. Suppose four children and one grandparent are in a room. The ages of the children are 2, 4, 3, and 4 years old. The grandparent is 67 years old. Which measure(s) of central tendency best describes the ages of the people in the room?

Determine the mean, median, mode, and range of the ages. Then choose the best measure(s).

mean = 16 median = 4 mode = 4 range = 65

If the mean were used to describe the ages of the people in the room, the impression would be given that the people in the room were teenagers, and this is not true. If the range were used to describe the ages of the people in the room, the impression would be given that the people in the room were much older than they actually are. Since most of the people in the room are very young, the median or the mode would provide the best description of the ages of the people in the room.

Directions Use the data in the table for Problems 1–5.

Time Spent Studying Last Night in minutes				
30	10	45	0	80
0	40	60	10	5

1. Find the mean of the data. ____________

2. Find the median of the data. ____________

3. Find the mode of the data. ____________

4. Find the range of the data. ____________

5. Which measure(s) best describes the length of time the students shown in the table studied last night? Explain.

____

____

____

Name Date Period

Fractions as Rational Numbers

EXAMPLE

Write $\frac{6}{18}$ in simplest form.

Step 1 Prime factorization of 6 and 18:

$\frac{6}{18} = \frac{2 \bullet 3}{2 \bullet 3 \bullet 3}$

Step 2 Identify common prime factors and calculate the GCF.
- Common prime factors = 2 • 3
- GCF = 2 • 3 = 6

Step 3 Divide the fraction numerator and denominator by the GCF, 6.

$\frac{6}{18} \div \frac{6}{6} = \frac{1}{3}$

Step 4 Check. $\frac{6}{18} = \frac{1}{3}$, so 6 • 3 = 18 • 1, and 18 = 18.

Directions Write each fraction in simplest form. Check your work.

1. $\frac{8}{64}$ ______

2. $\frac{13}{52}$ ______

3. $\frac{12}{39}$ ______

4. $\frac{30}{48}$ ______

5. $\frac{34}{51}$ ______

6. $\frac{3}{63}$ ______

7. $\frac{21}{28}$ ______

8. $\frac{16}{-48}$ ______

9. $\frac{35}{60}$ ______

10. $\frac{19}{57}$ ______

11. $\frac{11}{-88}$ ______

12. $\frac{354}{600}$ ______

Directions Solve the problems.

13. Jamille found that 3 members of her class of 27 are younger than she, so she exclaimed, "$\frac{3}{27}$ of the class is younger than I am." How could Jamille have simplified her statement mathematically?

______

14. A baker bakes 48 dozen doughnuts each morning. She sells 18 dozen in her store and fills orders with the rest. Write a fraction to show the portion of doughnuts the baker sells in her store. Simplify your answer. ______

15. Nick observed that he had finished 15 out of 36 homework problems, or $\frac{15}{36}$ of the total. Simplify Nick's fraction. ______

Name Date Period

Algebraic Fractions—Rational Expressions

EXAMPLE

Simplify $\frac{6n^2}{9n^3}$

Step 1 Find the GCF of numerator and denominator.

$\frac{6n^2}{9n^3} = \frac{2 \bullet 3 \bullet n \bullet n}{3 \bullet 3 \bullet n \bullet n \bullet n}$

The GCF is $3 \bullet n \bullet n$ or $3n^2$

Step 2 Divide both the numerator and denominator by the GCF.

$\frac{6n^2}{9n^3} \div \frac{3n^2}{3n^2} = \frac{2}{3n}$

Step 3 Check. $\frac{6n^2}{9n^3} = \frac{2}{3n}$ $18n^3 = 18n^3$ True

Directions Simplify these expressions. Check your work.

1. $\frac{c^2}{c^4}$ __________
2. $\frac{15x}{27x^3}$ __________
3. $\frac{m^4}{m^9}$ __________
4. $\frac{7c^3d^2}{21c^5d^3}$ __________
5. $\frac{18ab^2}{24a^3b^2}$ __________
6. $\frac{7w^2yz^3}{11w^3y^4z^8}$ __________
7. $\frac{y(x+3)}{y^2(x+8)}$ __________
8. $\frac{(x+2)}{(x+2)^2}$ __________
9. $\frac{y-9}{y^2-11y+18}$ __________
10. $\frac{5(x+1)}{x^2+4x+3}$ __________
11. $\frac{r+10}{r^2-100}$ __________
12. $\frac{a+4}{a^2+8a+16}$ __________
13. $\frac{b^3(k-33)}{b^3(k+14)}$ __________
14. $\frac{x-5}{x^2-25}$ __________
15. $\frac{4y^2(z+1)}{4y^3(z-1)}$ __________
16. $\frac{w-3}{w^2-6w+9}$ __________
17. $\frac{b^2-9}{(b+3)(b-3)}$ __________
18. $\frac{-k^2+49}{(k-7)(5k^5+7)}$ __________

Directions Solve the problems.

19. The storage area of warehouse A is $x^2 - y^2$ square m. The storage area of warehouse B is $x + y$ square m. The expression $\frac{x+y}{x^2-y^2}$ square m shows the relationship between these two areas in fraction form. Is the fraction in its simplest form? If not, simplify. __________

20. Factory A packages $4x^2$ pencils a day. Factory B packages $6x^3$ pencils a day. The expression $\frac{4x^2}{6x^3}$ shows the relationship between the output of the two factories. Simplify the expression. __________

Name Date Period

Multiplying and Dividing Algebraic Fractions

EXAMPLE

Find the quotient of $\frac{4}{5} \div \frac{2}{3}$.

Step 1 Multiply by the reciprocal.

$\frac{4}{5} \bullet \frac{3}{2} = \frac{12}{10}$

Step 2 Simplify.

$\frac{12}{10} = \frac{6}{5}$ $\quad\quad$ $\frac{6}{5} = \frac{5}{5} + \frac{1}{5} = 1 + \frac{1}{5} = 1\frac{1}{5}$

Step 3 Check.

$\frac{6}{5} \bullet \frac{2}{3} = \frac{12}{15} = \frac{4}{5}$ True

Directions Find and check each quotient. Simplify your answer whenever possible.

1. $\frac{1}{7} \div \frac{1}{2}$ __________
2. $\frac{3}{10} \div \frac{2}{5}$ __________
3. $2\frac{1}{2} \div \frac{1}{3}$ __________
4. $1\frac{8}{9} \div \frac{1}{2}$ __________
5. $1\frac{2}{3} \div 1\frac{1}{2}$ __________
6. $\frac{1}{k} \div \frac{4}{5}$ __________
7. $\frac{c}{d^2} \div \frac{d^3}{c^2}$ __________
8. $\frac{3}{2w^2} \div 1\frac{1}{3}$ __________
9. $\frac{11}{4x^2y^3} \div \frac{1}{4}$ __________
10. $\frac{n^2}{2} \div \frac{3}{10}$ __________
11. $\frac{n}{m^2} \div \frac{n^2}{m}$ __________
12. $\frac{5ab}{cd} \div 2\frac{1}{7}$ __________
13. $\frac{b^3}{2c^3} \div \frac{1}{5}$ __________
14. $\frac{3}{ab^2} \div \frac{x}{ab^2}$ __________
15. $\frac{x+1}{x^2y^2} \div \frac{x^2-1}{x^2y^2}$ __________
16. $\frac{1}{w^2-9} \div \frac{w+3}{w-3}$ __________

Directions Answer the questions to solve the problem.

In math class, Raphael learned that dividing by a number is the same as multiplying by its reciprocal. “Four is really $\frac{4}{1}$,” said Raphael. “So dividing by 4 is the same as multiplying by $\frac{1}{4}$.” Use Raphael’s idea about reciprocals to complete the blanks.

17. Dividing by 8 is the same as multiplying by __________.
18. Dividing by __________ is the same as multiplying by $\frac{1}{10}$.
19. Dividing by 22 is the same as multiplying by __________.
20. Dividing by __________ is the same as multiplying by $\frac{1}{7}$.

Name Date Period

Complex Fractions and the LCM

EXAMPLE Simplify $\dfrac{\frac{2}{3}}{\frac{1}{2}}$

Step 1 Find the LCM of each denominator.
Multiples of 3: 3, 6, 9, 12 …
Multiples of 2: 2, 4, 6, 8 …
The LCM = 6.

Step 2 Multiply by the LCM and simplify. $\dfrac{\frac{2}{3}}{\frac{1}{2}} \bullet \dfrac{\frac{6}{1}}{\frac{6}{1}} = \dfrac{\frac{12}{3}}{\frac{6}{2}}$

$= \frac{4}{3}$ or $1\frac{1}{3}$

Directions Find the LCM for each pair.

1. 2, 3 ______
2. 6, 7 ______
3. 15, 6 ______
4. 11, 4 ______
5. 9, 10 ______
6. 3, 17 ______
7. 6, 24 ______
8. 8, 32 ______
9. 7, 22 ______
10. 9, 15 ______
11. $12x$, $5x$ ______
12. $3a$, $7a$ ______
13. $5b$, $8b$ ______
14. k, $12k$ ______
15. $2n$, $13n$ ______
16. $4k$, $7k$ ______

Directions Simplify each complex fraction.

17. $\dfrac{\frac{2}{3}}{\frac{2}{3}}$ ______
18. $\dfrac{\frac{1}{2}}{\frac{2}{3}}$ ______
19. $\dfrac{\frac{7}{8}}{\frac{3}{4}}$ ______
20. $\dfrac{\frac{3}{4}}{\frac{7}{8}}$ ______
21. $\dfrac{\frac{9}{10}}{\frac{3}{4}}$ ______
22. $\dfrac{\frac{1}{6x}}{\frac{1}{7x}}$ ______
23. $\dfrac{\frac{3n}{16}}{\frac{1}{4}}$ ______
24. $\dfrac{\frac{8}{25w}}{\frac{3}{5w}}$ ______
25. $\dfrac{\frac{1}{8a}}{\frac{2}{9}}$ ______

Name Date Period

Least Common Multiples and Prime Factors

EXAMPLE

Find the LCM of 12 and 10.

Step 1 List prime factors of the denominators, 12 and 10.

$12 = 2 \bullet 2 \bullet 3$ $10 = 2 \bullet 5$

Step 2 Count prime factors:

- greatest number of times 2 appears: twice ($2 \bullet 2$)
- greatest number of times 3 appears: once (3)
- greatest number of times 5 appears: once (5)

Step 3 Find the product of the above:

$2 \bullet 2 \bullet 3 \bullet 5 = 60 =$ LCM of 12 and 10

Directions Using prime factorization, find the least common multiple for each pair.

1. 3, 8 __________

2. 15, 25 __________

3. 14, 38 __________

4. 6, 14 __________

5. 16, 10 __________

6. 5, 7 __________

7. x^4y, xy^2 __________

8. cd^4, c^2d^3 __________

Directions Solve the problems.

9. A store display has 2 blinking lights. One blinks every 15 seconds and the other blanks every 12 seconds. After how many seconds will the lights blink at the same instant? (Hint: find the LCM of the numbers.)

____

10. Geri has play blocks that are 4 inches tall. Bette has blocks that are 6 inches tall. Suppose the two tots each stack their own blocks into towers, side by side. What is the *least* height at which both towers can be the same height?

____

Name Date Period

Sums and Differences

EXAMPLE Find the sum of $\frac{2}{9} + \frac{2}{15}$.

Step 1 Find the LCM of the denominators, 9 and 15.

$9 = 3 \bullet 3 \qquad 15 = 3 \bullet 5$

The LCM of 9 and 15 is $3 \bullet 3 \bullet 5 = 45$.

Step 2 Multiply each fraction by 1 in a form that will make the denominator 45.

$\frac{2}{9} \bullet \frac{5}{5} = \frac{10}{45}$

$\frac{2}{15} \bullet \frac{3}{3} = \frac{6}{45}$

Step 3 Add the fractions and simplify.

$\frac{10}{45} + \frac{6}{45} = \frac{16}{45}$

$\frac{16}{45}$ cannot be further simplified.

Directions Find the LCM, then add or subtract. Write your answer in simplest form.

1. $\frac{4}{7} + \frac{3}{5}$ ________

2. $\frac{5}{14} + \frac{2}{21}$ ________

3. $\frac{8n}{15} - \frac{5n}{12}$ ________

4. $\frac{21y}{14} - \frac{5y}{21}$ ________

5. $\frac{w}{2} - \frac{w}{5}$ ________

6. $\frac{2}{c} - \frac{3c}{1}$ ________

7. $\frac{1}{n} + \frac{n}{m}$ ________

8. $\frac{k}{k+1} - \frac{3}{k}$ ________

Directions Solve the problems.

9. Estelle estimated that she mowed $\frac{2}{5}$ of the yard on Friday. Then she estimated that her brother Juaquin mowed another $\frac{1}{7}$ the next day. Together, what portion of the yard had they mowed? ____________

10. Roger figured that he had done $\frac{17}{20}$ of his homework. His friend Mike said he had done $\frac{3}{8}$ of his homework. What is the difference between the amount of homework Roger and Mike had completed? ____________

Name ____________ Date ______ Period ______

Proportions and Fractions in Equations

EXAMPLE

Solve $\frac{4}{x} = \frac{2}{16}$.

Step 1 Set up the cross products.

$(4)(16) = (x)(2)$

$2x = (4)(16)$ Commutative Property

Step 2 Solve for x.

$(\frac{1}{2})(2x) = (4)(16)(\frac{1}{2})$

$x = 32$

Step 3 Check. $\frac{4}{32} = \frac{2}{16}$

$(2)(32) = (4)(16)$

$64 = 64$ True

Directions Solve for the variable. Check your work.

1. $\frac{a}{18} = \frac{2}{3}$ ____________

2. $\frac{9}{x} = \frac{3}{5}$ ____________

3. $\frac{k}{-12} = \frac{-3}{4}$ ____________

4. $\frac{2}{7} = \frac{y}{-35}$ ____________

5. $\frac{3}{4} = \frac{5}{x}$ ____________

6. $\frac{3}{n} = \frac{4}{n-2}$ ____________

7. $\frac{6}{r-2} = -3$ ____________

8. $\frac{3(w+5)}{2} = \frac{5(w-2)}{3}$ ____________

Directions Solve the problems.

9. A slaw recipe for 12 servings uses 6 cups of chopped cabbage. How much cabbage will be needed for 28 servings?

____

10. A farmer uses $1\frac{1}{3}$ bushels of wheat seed to plant 2 acres of wheat. How much will he need to plant 14 acres? (Hint: change $1\frac{1}{3}$ to an improper fraction first.)

____

Click here for Main Menu

Name Date Period

More Solutions to Equations with Fractions

EXAMPLE

Solve $\frac{1}{5}x = 3$ using multiplication and using division.

Multiplication	**Division**
$(\frac{1}{5})x = 3$	$(\frac{1}{5})x = 3$
$(5)(\frac{1}{5})x = (3)(5)$	$\dfrac{\frac{1}{5}x}{\cancel{\frac{1}{5}}} = \dfrac{3}{\frac{1}{5}}$
$x = 15$	$x = 3(\frac{5}{1}) = 15$

Check solution.

$\frac{1}{5}(15) = 3$

$3 = 3$ True

Directions Solve using division or multiplication. Check your answers.

1. $\frac{2}{3}b = 6$ ____________

2. $\frac{3}{7}k = 9$ ____________

3. $\frac{2}{11}a = 4$ ____________

4. $\frac{5}{8}m - \frac{1}{2} = -2$ ____________

5. $\frac{1}{2}x + 4 = 9$ ____________

6. $\frac{2}{3}p - \frac{1}{2} = 4$ ____________

7. $\frac{1}{3}a + 1 = 14$ ____________

8. $\frac{1}{5}y + 12 = 17$ ____________

Directions Solve the problems.

9. Danny subtracted the fraction $\frac{1}{8}$ from $\frac{1}{3}$ of a certain number to get a result of 1. What was the number?

____

10. Tim scored 2,200 on a video game, or $\frac{8}{9}$ of the total points that Dru scored. How many points did Dru score?

____

Name Date Period

The Greatest Common Factor of Large Numbers

EXAMPLE

Using prime factorization to find the GCF of two whole numbers is difficult when the whole numbers are large. To find the GCF of two large whole numbers, use the following theorem.

If x and y are two whole numbers and $x \geq y$, then GCF(x, y) = GCF($x - y$, y).

Find GCF(403, 78)

Apply the theorem repeatedly.

GCF(403, 78) = GCF(403 – 78, 78) = GCF(325, 78)

GCF(325 – 78, 78) = GCF(247, 78)

GCF(247 – 78, 78) = GCF(169, 78)

GCF(169 – 78, 78) = GCF(91, 78)

GCF(91 – 78, 78) = GCF(13, 78)

↑ The GCF of 403 and 78 is 13.

Directions Use the theorem shown above to find the GCF of each pair of whole numbers.

1. (323, 153) ________

2. (135, 54) ________

3. (324, 72) ________

4. (189, 45) ________

5. (312, 96) ________

6. (630, 180) ________

7. (648, 144) ________

8. (954, 424) ________

9. (1,440, 288) ________

10. (15,015, 1,365) ________

Name Date Period

Denominators and Zero

EXAMPLE For what value(s) of n is $\frac{3}{n-4}$ undefined?

If $(n - 4) = 0$, the fraction is undefined. Solving the equation:

$n - 4 = 0$

$n - 4 + 4 = 0 + 4$

$n = 4$

Therefore, the fraction is undefined if $n = 4$.

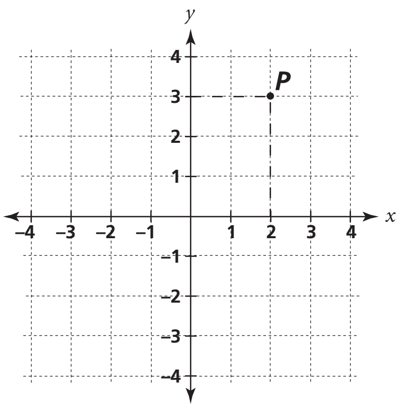
Directions Determine the value(s) for which each expression is undefined.

1. $\frac{1}{d-3}$ ____________
2. $\frac{2}{a+5}$ ____________
3. $\frac{7}{w-9}$ ____________
4. $\frac{1}{5x}$ ____________
5. $\frac{2}{9y}$ ____________
6. $\frac{5b}{b^2-16}$ ____________
7. $\frac{1}{x^2-25}$ ____________
8. $\frac{15k^2}{45k^3}$ ____________
9. $\frac{1}{x^2-9x+14}$ ____________
10. $\frac{3a}{-7a}$ ____________
11. $\frac{4x}{\frac{1}{2}x}$ ____________
12. $\frac{10}{y+5}$ ____________
13. $\frac{10}{\frac{3}{4}y}$ ____________
14. $\frac{12x^2}{48x^3}$ ____________
15. $\frac{2}{\frac{3}{7k}}$ ____________
16. $\frac{2c}{c^2-36}$ ____________
17. $\frac{5b}{-19b}$ ____________
18. $\frac{x+2}{x^2-3x-10}$ ____________
19. $\frac{17}{17x}$ ____________
20. $\frac{15}{x-15}$ ____________

Name _______ Date _______ Period _______

The Coordinate System

EXAMPLE Graph (2, 3).



Point *P* is located at (2, 3).

Directions Write the ordered pair that represents the location of each point on the graph.

1. Point *W* ________

2. Point *K* ________

3. Point *R* ________

4. Point *G* ________

5. Point *T* ________

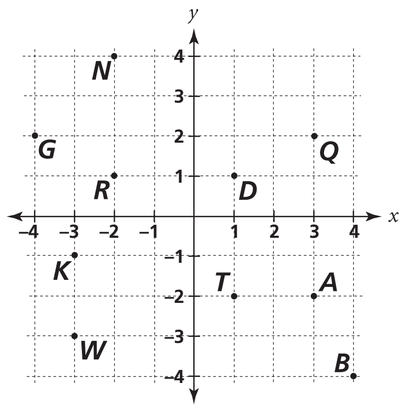
6. Point *A* ________

7. Point *N* ________

8. Point *D* ________

9. Point *Q* ________

10. Point *B* ________



Name Date Period

Graphing Equations

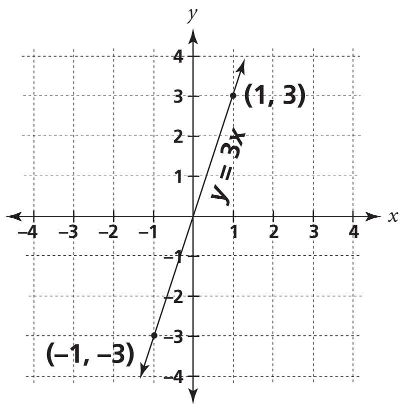
EXAMPLE Graph $y = 3x$.

Step 1 Assign values to x. Let $x = -1$ and $x = 1$.

Step 2 Solve for y in $y = 3x$.

$y = 3(-1)$	$y = 3(1)$
$y = -3$	$y = 3$
So $(-1, -3)$	So $(1, 3)$

Step 3 Plot the points $(-1, -3)$ and $(1, 3)$.
Then graph and label the line.



Directions Solve each equation for y when the value of x is given.

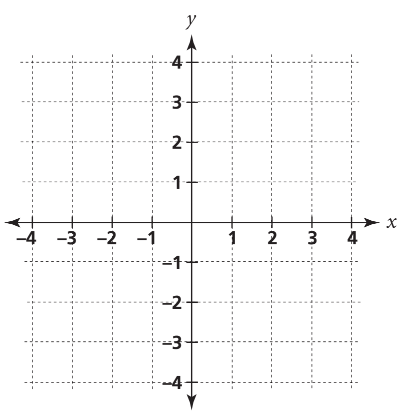
1. $y = 4x - 6; x = 1$ ________
2. $y = 3x - 3; x = 1$ ________
3. $y = 2x - 4; x = 2$ ________
4. $y = 4x - 2; x = -1$ ________

Directions Given the x-values, solve for y. Then graph the equation and label the line.

5. $y = 2x + 1$

   $x = -1$ ________

   $x = 1$ ________



Name Date Period

Intercepts of Lines

EXAMPLE

Find the following x- and y-intercepts.

- Find the y-intercept of $y = 2x - 2$.

  Substitute $x = 0$ into the equation. Solve for y.

  $y = 2(0) - 2$

  $y = -2$ This is the y-intercept.

- Find the x-intercept of $y = 3x + 1$.

  Substitute $y = 0$ into the equation. Solve for x.

  $0 = 3x + 1$

  $x = \frac{1}{-3}$ This is the x-intercept.

Directions Find the x-intercept and y-intercept of each graph.

$y = 2x + 3$

1. x-intercept ________

2. y-intercept ________

$y = 3x - 4$

3. x-intercept ________

4. y-intercept ________

$y = -2x + 2$

5. x-intercept ________

6. y-intercept ________

$y = 2x + 7$

7. x-intercept ________

8. y-intercept ________

$y = -x + 3$

9. x-intercept ________

10. y-intercept ________

Click here for Main Menu

Name ______ Date ______ Period ______

Slopes of Lines

EXAMPLE

Find the slope of a line that passes through (–3, –2) and (2, 4).

Step 1 Label one ordered pair (x_1, y_1) and the other (x_2, y_2).

$(x_1 = -3, y_1 = -2)$ $(x_2 = 2, y_2 = 4)$

Step 2 Substitute in the slope formula and solve.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{4 - (-2)}{2 - (-3)} = \frac{6}{5} \text{ or } 1\frac{1}{5}$$

Directions Find the slope of a line that passes through the following points.

1. (1, 3) (2, 4) ______

2. (–3, 1) (3, 13) ______

3. (1, 3) (5, 6) ______

4. (2, 5) (3, 4) ______

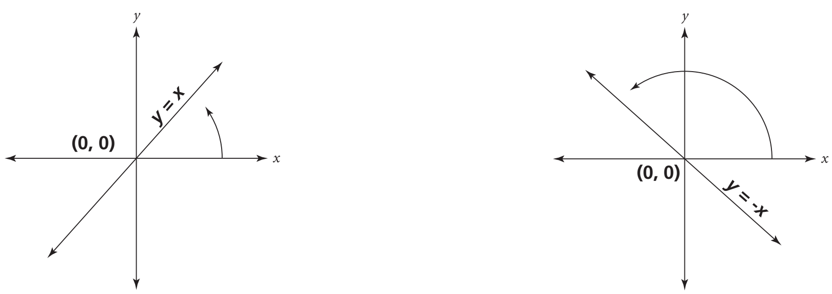
5. (6, –2) (–3, 4) ______

6. (6, 4) (2, 1) ______

7. (–3, 2) (–1, –1) ______

8. (0, 1) (5, –2) ______

EXAMPLE



Positive Slope **Negative Slope**

Directions Solve the problems. Refer to the graphs of slopes shown.

9. Think of a clock as a graph with the pivot of its hands at (0, 0). When the time is 10:20, the hands form a straight line. Does this line have positive or negative slope?

______

10. When the time is 8:10, is the slope of the line the hands form negative or positive?

______

Name Date Period

Writing Linear Equations

EXAMPLE

Write the equation of a line that passes through (6, 1) and (3, –2).

Step 1 Find the slope, *m*.

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{-2 - 1}{3 - 6} = \frac{-3}{-3} = 1$

Step 2 Find the *y*-intercept, using known point (6, 1).

$y = mx + b \qquad 1 = 1(6) + b \qquad b = -5$

Step 3 Substitute slope and *y*-intercept in $y = mx + b$:

$y = (1)x + (-5)$ or $y = x - 5$

Directions Write the equation of the line that passes through each pair of points.

1. (6, 0) (0, 2) ____________________

2. (–2, 0) (–1, –3) ____________________

3. (1, 2) (5, 8) ____________________

4. (6, 6) (3, 2) ____________________

5. (0, 4) (–2, 0) ____________________

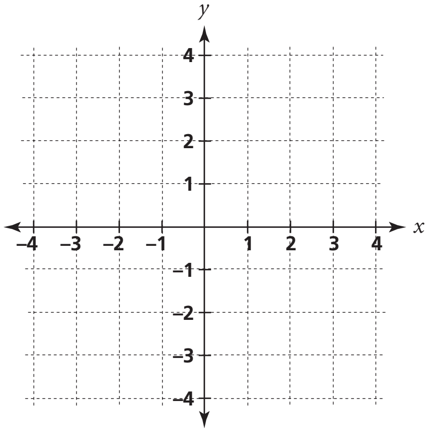
6. (–2, 3)(1, 5) ____________________

7. (–2, 7) (2, 1) ____________________

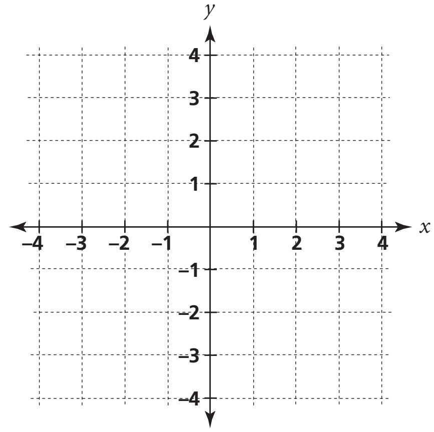
8. (6, 6) (8, 3) ____________________

Directions Graph the line that passes through the following points. Then find the equation of the line and label it on the graph.

9. (2, 1) (–2, –2)



10. (–4, 4) (2, 0)



Name ______________________ Date __________ Period __________

Lines as Functions

EXAMPLE

A function is a rule that associates every *x*-value with one and only one *y*-value. If a vertical line crosses a graph more than once, the graph is *not* a function.

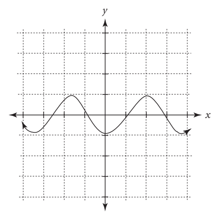
- A *circle* is *not* a function. A vertical line will cross it at two points.
- A *straight line* is a function. A vertical line crosses it at one point only.

Directions Is each graph an example of a function? Write *yes* or *no*. Explain your answer.

1. ____

____

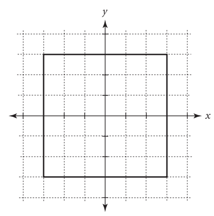
____



2. ____

____

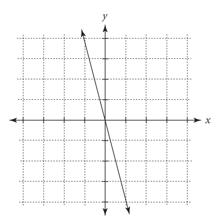
____



3. ____

____

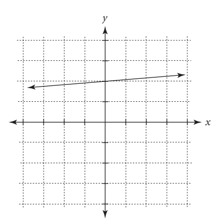
____



4. ____

____

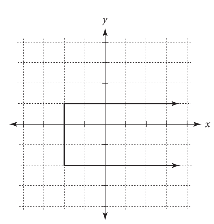
____



5. ____

____

____



Name Date Period

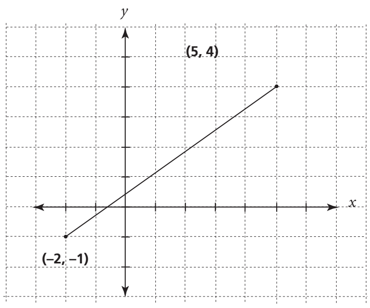
Domain and Range of a Function

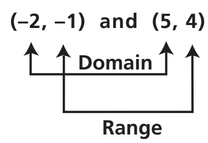
EXAMPLE Find the range of the function $y = f(x) = 3x + 1$ for the domain –2, 0, 3, 6
Substitute the domain values in $f(x)$

$x = -2$ $\quad y = f(-2) = 3(-2) + 1 = -5$ so $y = -5$ $\qquad x = 3$ $\quad y = f(3) = 3(3) + 1 = 10$ so $y = 10$

$x = 0$ $\quad y = f(0) = 3(0) + 1 = 1$ so $y = 1$ $\qquad x = 6$ $\quad y = f(6) = 3(5) + 1 = 16$ so $y = 16$

EXAMPLE Determine the domain and the range of a function from a graphed line and its end points.





Domain = $-2 \leq x \leq 5$
Range = $-1 \leq y \leq 4$

Directions Determine the range for each function with the given domain.

1. $f(x) = 2x + 5$ domain: –1, 0, 3, 7, 10 range: ______

2. $f(x) = x^3$ domain: –1, 0, 2, 5, 8 range: ______

3. $f(x) = \frac{1}{2}x - 2$ domain: $\frac{-1}{2}$, 0, 3, 5, 9 range: ______

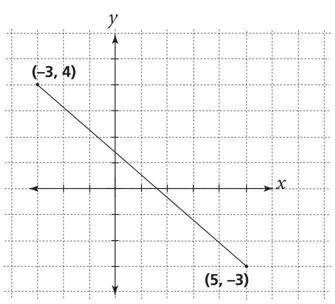
4. $f(x) = x^2 + 3x - 4$ domain: –3, 0, 2, 4, 6 range: ______

5. $f(x) = 3x - 9$ domain: –4, –3, 0, 1, 8 range: ______

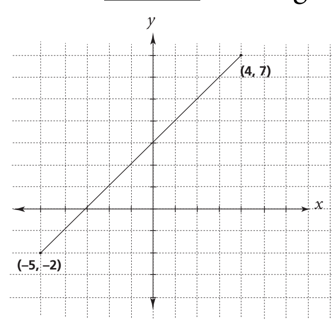
6. $f(x) = x^2 - x$ domain: –3, –1, 0, 2, 3 range: ______

Directions Determine the domain and the range from the graph and the given ordered pairs.

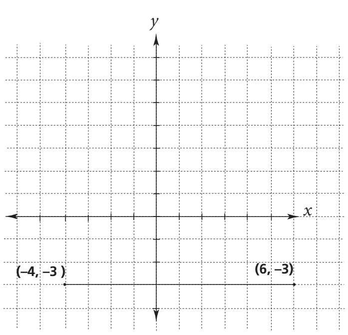
7. domain: ______ range: ______



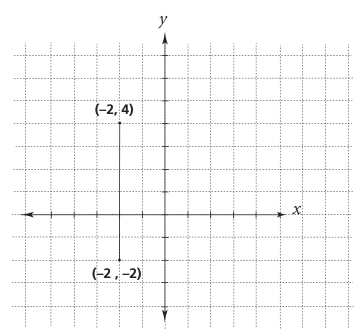
8. domain: ______ range: ______



9. domain: ______ range: ______



10. domain: ______ range: ______



Name Date Period

Graphing Inequalities: $y < mx + b$, $y > mx + b$

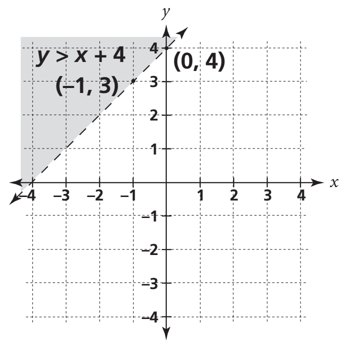
EXAMPLE

Graph the region represented by $y > x + 4$.

Step 1 Use $y = x + 4$ and substitution to find two points on the line. Let $x = 0$, and then let $x = -1$. The two points are (0, 4) and (–1, 3).

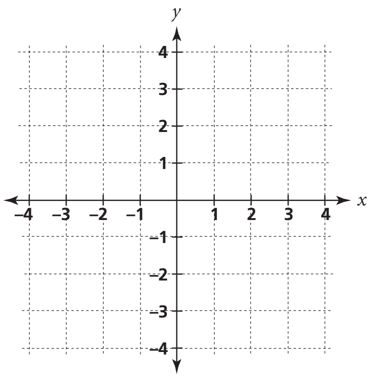
Step 2 Plot the two points and connect them with a broken line.

Step 3 Shade the region *above* the line. Label it $y > x + 4$.

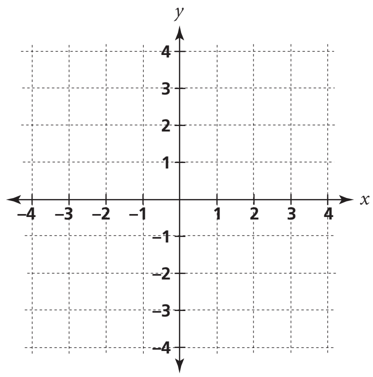


Directions Graph the region represented by each line.

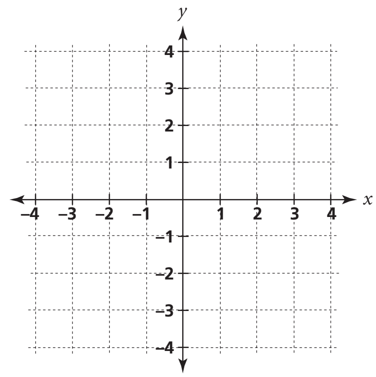
1. $y > 2x - 1$



2. $y < x + 2$

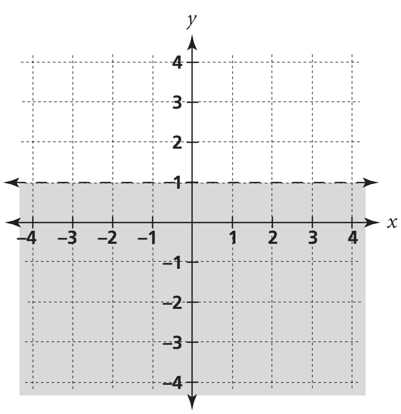


3. $y > -x + 3$

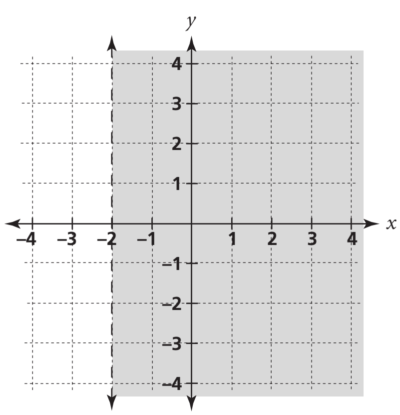


Directions Write an inequality to label the shaded region in each graph.

4. ______________



5. ______________

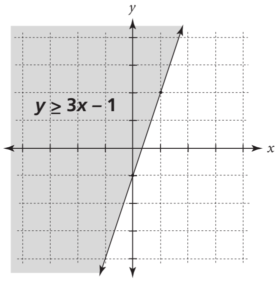


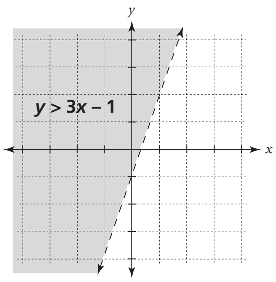
Name Date Period

Graphing Inequalities: $y \le mx + b$, $y \ge mx + b$

EXAMPLE The two graphs show the inequalities $y \ge 3x - 1$ and $y > 3x - 1$. Can you see a difference between these graphs?

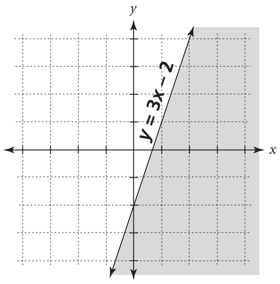
The only difference between the two graphs is that the line of the equation $y \ge 3x - 1$ is a solid, unbroken line. This solid line indicates that the points on the line of the equation are also included in the graph of the inequality.



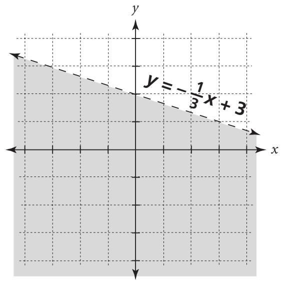


Directions Write the inequality that describes the shaded region.

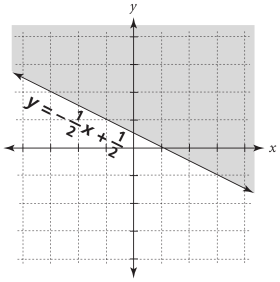
1. ______________________



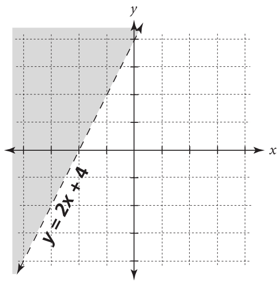
2. ______________________



3. ______________________



4. ______________________



Directions Answer the question.

5. Suppose you were to graph the inequalities $y \le 2x$ and $y < 2x$. What would be the difference between the two graphs?

____

Name Date Period

Graphs Without Numbers

EXAMPLE

Every graph is a picture of something that has happened sometime in the past or is happening now. You can often determine what a graph is about just by its general shape. The first item below is done for you. It shows how to read the shape of a graph.

Directions Match each written description with a graph. Write the letter of the graph on the blank.

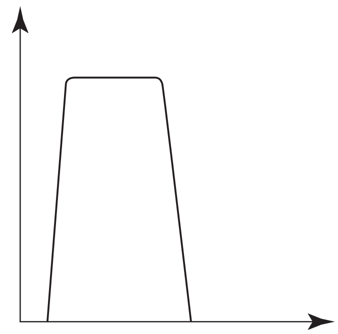
Speeding baseball being caught by an outfielder ___D___

1. Helicopter rising, moving off in a direction for a while, then lowering ______

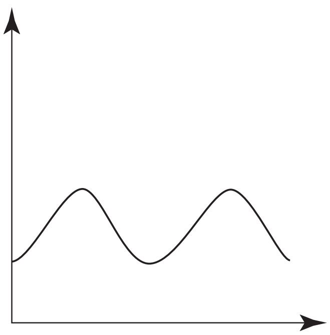
2. Helicopter rising, hovering briefly, then descending ______

3. Wave motion such as an ocean wave or sound wave ______

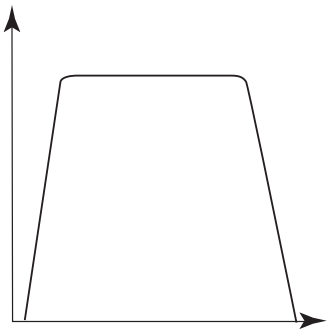
A.



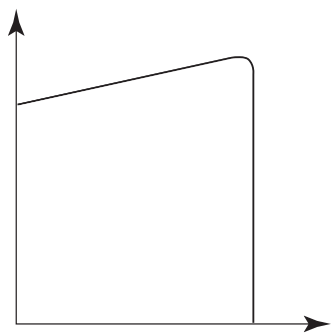
B.



C.



D.



Directions Answer the questions.

4. On all the graphs that appear on this page, what is the understood point of origin? ______________

5. Why do you think it may be convenient in many situations to use a graph with only positive points?

____

____

____

Name Date Period

Parallel Lines

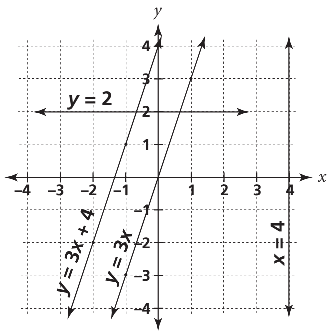
EXAMPLE

Lines having the same slope are parallel. In an equation of the form $y = mx + b$, coefficient m of the variable x gives the slope. For example, in $y = 3x + 4$, the slope is 3.

A line for an equation in the form $y = constant$ is a horizontal line.

A line for an equation in the form $x = constant$ is a vertical line.

Study the example lines in the graph.



Directions Write the equation of the line parallel to the given line and passing through the given point, which is the y-intercept.

1. $y = x + 7$; (0, 4) ______
2. $y = 2x – 2$; (0, 2) ______
3. $y = 4x + 1$; (0, –4) ______
4. $y = 2x + 3$; (0, 5) ______
5. $y = 3x + 3$; (0, –3) ______
6. $y = 4x – 2$; (0, –1) ______
7. $y = x – 3$; (0, 1) ______
8. $y = 5x –1$; (0, 1) ______

Directions Solve the problems.

9. If you plotted the following equations on a single graph, which line would stand out? Write the letter of the answer and explain.

______

______

a. $x = –7$	**d.** $y = 3$	**g.** $x = –8$
b. $y = –6$	**e.** $x = 4$	**h.** $y = 2x + 4$
c. $x = 3$	**f.** $y = 9$	**i.** $y = 2$

10. Will graphs for these equations show parallel lines? Explain.

$y = 6x + 1$ $y = 6x – 5$

______

______

Name Date Period

Describing Parallel Lines

EXAMPLE

Write the equation of a line that is parallel to the line $y = 2x + 3$ and passes through the point (–2, 1).

Step 1 The slope is 2, so $y = 2x + b$.

Step 2 Substitute the values from the point (–2, 1) and solve for b.

$y = 2x + b$

$1 = 2(-2) + b$

$b = 5$

Step 3 Substitute this value for b in the equation.

$y = 2x + 5$

Directions Write the equation of the line parallel to the given line and passing through the given point.

1. $y = x + 4$; (2, 5) ________________
2. $y = 3x - 1$; (1, 4) ________________
3. $y = 2x - 2$; (2, 8) ________________
4. $y = x - 7$; (4, 6) ________________
5. $y = 3x - 3$; (–2, –5) ________________

Directions Rewrite each equation in the form $y = mx + b$. Then write an equation for a line parallel to the first and passing through the given point.

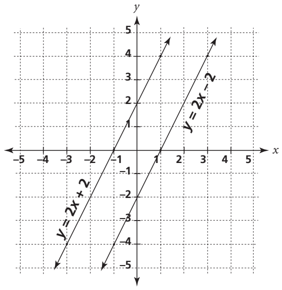
6. $6y = 3x - 12$; (2, –4) ____________________________
7. $\frac{1}{2}y = 3x$; (–2, –9) ____________________________
8. $5y = 4x + 5$; (–5, –4) ____________________________
9. $10y = -20x - 20$; (1, –3) ____________________________
10. $3x = 3y - 12$; (–5, –11) ____________________________

Name Date Period

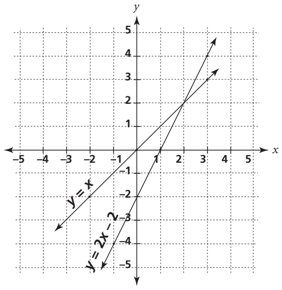
Intersecting Lines—Common Solutions

EXAMPLE Look at these examples of graphed equations.

A.



B.



- Equations having the same slope are represented by parallel lines that do not intersect. In Example A, $y = 2x + 2$ and $y = 2x - 2$ have the same slope, 2.
- Equations having unlike slope are represented by lines that *do* intersect. In Example B, $y = x$ has slope of 1 and $y = 2x - 2$ has slope of 2.

Directions Do these systems of equations have a common solution? Tell why or why not.

1. $y = 2x + 3$
$y = 2x - 1$

____

____

____

2. $y = 3x - 4$
$y = -3x + 1$

____

____

____

3. $y = \frac{2}{3}x + 2$
$y = \frac{3}{2}x + 2$

____

____

____

Directions Answer the questions to solve the problem. Explain your answer.

A large state in a desert country consists of flat land with few towns. The state has a rectangular shape, and the major roads are straight lines. Engineers use a grid map with x-axis and y-axis to design roads in this desert state. They describe road positions by equations, as follows:

Road A-1: $y = 3x + 5$ **Road A-2:** $y = x - 2$ **Road B-1:** $y = 3x - 1$

4. Will roads A-1 and B-1 ever intersect?

____

5. Will roads A-1 and A-2 ever intersect?

____

Name _______________ Date _______ Period _______

Solving Linear Equations—Substitution

EXAMPLE

Find the common solution for the system:

$y = -2x + 4 \qquad y = -x + 1$

Step 1 From the second equation, substitute the value of y into the first equation.

$-x + 1 = -2x + 4$

Step 2 Solve for x.

$x = 3$

Step 3 Substitute this value of x into the first equation to solve for y.

$y = -2x + 4$

$y = -2(3) + 4$

$y = -2$ The common solution is the ordered pair (3, –2).

Step 4 Check. Substitute the x and y values in each equation.

$y = -2x + 4$	$y = -x + 1$
$-2 = -2(3) + 4$	$-2 = -(3) + 1$
$-2 = -2$ True	$-2 = -2$ True

Directions Find the common solution for each system of equations. Check each solution.

1. $2x + y = 4 \qquad 2x + 3y = 0$ _______________
2. $2x + y = 0 \qquad x - y = 1$ _______________
3. $3x + 4y = -11 \qquad 7x - 5y = 3$ _______________
4. $2x + y = -1 \qquad -2x + y = 3$ _______________
5. $3x - 5y = 4 \qquad 4x + 3y = 15$ _______________
6. $3x - 2y = 5 \qquad -4x + 3y = 1$ _______________
7. $3x - 4y = 5 \qquad 5x + 4y = 3$ _______________
8. $4x = 3y - 10 \qquad 2y = 22 - 5x$ _______________
9. $2x + 6y = 14 \qquad 3x - 4y = -5$ _______________
10. $\frac{1}{2}y = 2 - 2x \qquad 6x = y + 1$ _______________

Name Date Period

Solving Linear Equations—Elimination

EXAMPLE

Find the common solution for the system:

$x + y = 3$ $3x - y = 1$

Step 1 Add the equations to eliminate the y-term.

$$\begin{aligned} x + y &= 3 \\ 3x - y &= 1 \\ 4x \quad &= 4 \end{aligned}$$ so $x = 1$

Step 2 Substitute the value of x into either equation.

$$\begin{aligned} 1 + y &= 3 \\ y &= 2 \end{aligned}$$ The common solution is (1, 2).

Step 3 Check. Substitute for x and y in each equation.

$x + y = 3$	$3x - y = 1$
$1 + 2 = 3$	$3(1) - 2 = 1$
$3 = 3$ True	$1 = 1$ True

Directions Find the common solution for each system of equations using elimination and/or substitution.

1. $x + y = 20$ $x - y = 10$ ______________

2. $x + y = 8$ $x - y = -2$ ______________

3. $x + y = 5$ $x - y = -3$ ______________

4. $x - y = 4$ $3x + 2y = 7$ ______________

5. $5x + 5y = -5$ $3x - y = -7$ ______________

6. $4x - y = 1$ $2x + y = 17$ ______________

7. $2x - y = 4$ $2x + 4y = 4$ ______________

8. $-x + 3y = 14$ $x + 22 = 5y$ ______________

9. $8x - 6y = 2$ $2x + 3y = 2$ ______________

10. $2x - 5y = 10$ $3x - 2y = -7$ ______________

Name　　　　　　　　　　　　　　　　Date　　　　　Period

Graphing Systems of Linear Equations

EXAMPLE

Use a graph to find the common solution for these equations:

$x + y = 3$　　　　$3x - y = 1$

Step 1 Find the x- and y-intercepts for each equation.

$x + y = 3$	$3x - y = 1$
$0 + y = 3$, so $y = 3$	$3(0) - y = 1$, so $y = -1$
$x + 0 = 3$, so $x = 3$	$3x - 0 = 1$, so $x = \frac{1}{3}$
x-int. = 3, y-int. = 3	x-int. = $\frac{1}{3}$, y-int. = -1

Step 2 Plot the intercepts for each equation (2 points). Draw the line connecting them. Read the point of intersection from the graph: (1, 2).

Step 3 Check by substituting the solution in the equations.

Directions Find the x- and y-intercepts for each equation.

1. $y = -2x + 8$

x-intercept: ________

y-intercept: ________

2. $\frac{1}{2}x + y = -2$

x-intercept: ________

y-intercept: ________

3. $5x - 3y = 11$

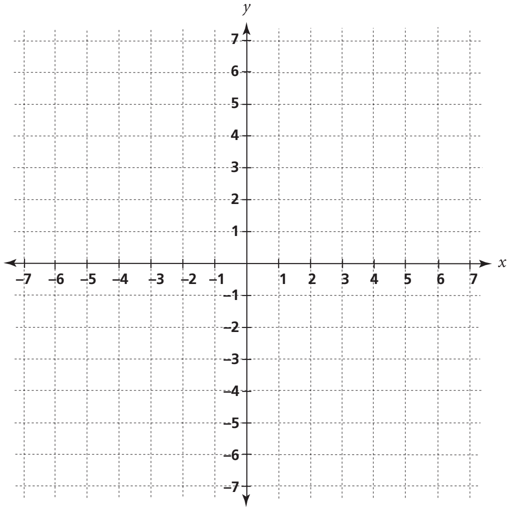
x-intercept: ________

y-intercept: ________

Directions Graph each system of equations and identify the point of intersection.

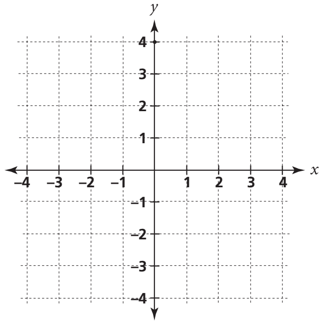
4. $3x - y = -7$

$5x + 5y = -5$



5. $x + y = 2$

$x - y = 4$



Name Date Period

And Statements—Conjunctions

EXAMPLE

Study the patterns in the following conjunctions.

$10^1 = 10$	and	$10^2 = 100$	
T		**T**	**= True**
$3^2 \bullet 3^3 = 3^5$	and	$\frac{1}{2} \bullet \frac{2}{1} = \frac{1}{4}$	
T		**F**	**= False**
$\sqrt{100} = 50$	and	$(-5)^2 = -25$	
F		**F**	**= False**

Directions Complete each conjunction in the chart by choosing an appropriate statement from the Statement Box and writing it on the blank. (Hint: In the box, left-side statements are true, right-side are false.)

p	q	$p \wedge q$
$4^3 = 64$	**1.** ______________	T
$(3)(9) = 27$	**2.** ______________	F
3. ______________	$x = 3$ is a vertical line	F
x has a value of 3 in $3x = 9$	**4.** ______________	T

Statement Box

$4^2 = 16$	17 is not a prime number
$\frac{1}{2}(14) = 14 \div 2$	$\sqrt{-16} = -4$
$(x^2)(x^3) = x^5$	$a^4 \div a = a^4$
$\sqrt{16} = \pm 4$	$-8 + 8 = -16$

Directions Write your own conjunction so that the value of $p \wedge q$ will be true.

5. ____

Name Date Period

Problem Solving Using Linear Equations

EXAMPLE

Dean's cat is one year less than twice the age of Drina's cat. The difference in the cats' ages is 7 years. Find the ages of the two cats.

Step 1 Let x = age of Dean's cat y = age of Drina's cat

$x = 2y - 1$ one less than twice the age

$x - y = 7$ difference in the cats' ages

$x = y + 7$ last equation rewritten to put x on left

Step 2 Solve by substituting $y + 7$ for x in the first equation.

$y = 8$ age of Drina's cat $x = 15$ age of Dean's cat

Step 3 Check by substituting x and y values in both equations.

$x = 2y - 1$		$x - y = 7$	
$15 = 2(8) - 1$		$15 - 8 = 7$	
$15 = 15$	True	$7 = 7$	True

Directions Use any method to solve each system of equations. Check your answer.

1. $x + y = 9$
$x - 2y = -6$
____

2. $x + y = 14$
$x - y = 10$
____

3. $2x + 3y = 2$
$8x - 3y = 3$
____

Directions Use systems of equations to solve the problems.

4. A farmer raises wheat and oats on 180 acres. She plants wheat on 20 more acres than she plants oats on. How many acres of each crop does the farmer plant?

____

5. Enrico says, "I'm thinking of 2 mystery numbers. One number is 3 times the other. The sum of the two numbers is 48." What are Enrico's mystery numbers?

____

Name Date Period

Introduction to Matrices: Addition and Subtraction

EXAMPLE

Add the matrices.

$$\begin{bmatrix} 1 & 4 \\ 6 & 5 \end{bmatrix} + \begin{bmatrix} 6 & 5 \\ 3 & 5 \end{bmatrix}$$

Step 1 Add corresponding entries or members of each matrix.

$$\begin{bmatrix} 1+6 & 4+5 \\ 6+3 & 5+5 \end{bmatrix}$$

Step 2 Write the sums in matrix form.

$$\begin{bmatrix} 7 & 9 \\ 9 & 10 \end{bmatrix}$$

Subtract the matrices.

$$\begin{bmatrix} 10 & 87 & 21 \\ -6 & 12 & 7 \end{bmatrix} - \begin{bmatrix} 7 & 88 & 0 \\ -8 & 12 & 6 \end{bmatrix}$$

Step 1 Subtract corresponding entries or members of each matrix.

$$\begin{bmatrix} 10-7 & 87-88 & 21-0 \\ (-6)-(8) & 12-12 & 7-6 \end{bmatrix}$$

Step 2 Write the differences in matrix form.

$$\begin{bmatrix} 3 & -1 & 21 \\ 2 & 0 & 1 \end{bmatrix}$$

Directions Add or subtract the matrices.

1. $\begin{bmatrix} 5 & 9 \\ -8 & 6 \end{bmatrix} + \begin{bmatrix} 7 & 14 \\ 12 & 94 \end{bmatrix}$

2. $\begin{bmatrix} 8 & 4 \\ 6 & 5 \\ 12 & 21 \end{bmatrix} + \begin{bmatrix} 6 & 47 \\ 4 & 34 \\ 72 & 5 \end{bmatrix}$

3. $\begin{bmatrix} 33 & 41 & 36 & 59 \\ 76 & 15 & 87 & 5 \\ 21 & 32 & 43 & 54 \\ -8 & -14 & -51 & -23 \end{bmatrix} + \begin{bmatrix} 8 & 6 & 12 & 7 \\ -6 & -12 & -98 & -5 \\ 54 & 43 & 32 & 21 \\ -9 & 0 & -35 & -77 \end{bmatrix}$

4. $\begin{bmatrix} 52 & 36 \\ -9 & 93 \end{bmatrix} - \begin{bmatrix} 27 & 27 \\ 14 & 94 \end{bmatrix}$

5. $\begin{bmatrix} 61 & 23 & 17 \\ -16 & 31 & 7 \end{bmatrix} - \begin{bmatrix} 13 & 47 & 17 \\ -28 & 0 & 36 \end{bmatrix}$

Name Date Period

Multiplication of Matrices

EXAMPLE Let $A = \begin{bmatrix} 2 & 3 \\ 5 & 1 \end{bmatrix}$. Find $4A$.

Multiply each entry by 4. $\begin{bmatrix} 4\cdot 2 & 4\cdot 3 \\ 4\cdot 5 & 4\cdot 1 \end{bmatrix}$ $4A = \begin{bmatrix} 8 & 12 \\ 20 & 4 \end{bmatrix}$

EXAMPLE Let $X = \begin{bmatrix} 4 & 6 \\ 5 & 7 \end{bmatrix}$. Let $Y = \begin{bmatrix} 8 & 9 \\ 2 & 3 \end{bmatrix}$. Find XY.

Multiply matrix X by matrix Y. $\begin{bmatrix} 4 & 6 \\ 5 & 7 \end{bmatrix} \times \begin{bmatrix} 8 & 9 \\ 2 & 3 \end{bmatrix}$

Step 1 Multiply the rows in X by the columns in Y.

$$\begin{bmatrix} 4 \cdot 8 + 6 \cdot 2 & 4 \cdot 9 + 6 \cdot 3 \\ 5 \cdot 8 + 7 \cdot 2 & 5 \cdot 9 + 7 \cdot 3 \end{bmatrix}$$

Step 2 Add the products.

$$\begin{bmatrix} 32 + 12 & 36 + 18 \\ 40 + 14 & 45 + 21 \end{bmatrix}$$

$$X \times Y = \begin{bmatrix} 44 & 54 \\ 54 & 66 \end{bmatrix}$$

Directions Find the product of each matrix and the number shown.

1. $3 \times \begin{bmatrix} 3 & 8 \\ 9 & 5 \end{bmatrix}$

2. $7 \times \begin{bmatrix} 10 & 15 & 20 \\ 6 & 8 & 10 \\ 4 & 2 & 0 \end{bmatrix}$

3. $y \times \begin{bmatrix} x & 4 & 17 \\ 2x & 9 & 0 \\ 3x & 1 & y \end{bmatrix}$

Directions Multiply the two matrices.

4. $\begin{bmatrix} x & y \\ n & r \end{bmatrix} \times \begin{bmatrix} 4 & 5 \\ 6 & 7 \end{bmatrix}$

5. $\begin{bmatrix} 9 & 10 & 11 \\ 14 & 15 & 16 \end{bmatrix} \times \begin{bmatrix} 8 & 4 \\ -1 & \frac{1}{2} \\ 14 & 0 \end{bmatrix}$

Name Date Period

Rational Numbers as Decimals

EXAMPLE Is the decimal form of these fractions *terminating* or *repeating*? $\frac{1}{5}$ $\frac{2}{3}$

Step 1 Divide numerator by denominator. Divide numerator by denominator.

$$5\overline{)1.000} = .2000,\quad 10,\ 0$$

$$3\overline{)2.000000} = .666\ldots,\quad 18,\ 20,\ 18,\ 20\ldots$$

Step 2 $\frac{1}{5} = 0.2\overline{0}$ Terminating $\frac{2}{3} = 0.\overline{6}$ Repeating

Directions Write the decimal expansion for these rational numbers. Tell whether each is *terminating* or *repeating*.

1. $\frac{1}{4}$ ______________________

2. $\frac{4}{5}$ ______________________

3. $\frac{19}{20}$ ______________________

4. $\frac{5}{6}$ ______________________

5. $\frac{2}{15}$ ______________________

6. $\frac{1}{9}$ ______________________

7. $\frac{7}{8}$ ______________________

8. $\frac{11}{25}$ ______________________

9. $\frac{1}{5}$ ______________________

10. $\frac{2}{7}$ ______________________

Directions Using a calculator, perform the division to change each fraction into an expanded decimal. Tell whether each is *terminating* or *repeating*.

11. $\frac{1}{11}$ ______________________

12. $\frac{8}{9}$ ______________________

13. $\frac{3}{8}$ ______________________

14. $\frac{1}{16}$ ______________________

15. $\frac{3}{4}$ ______________________

16. $\frac{1}{13}$ ______________________

17. $\frac{7}{10}$ ______________________

18. $\frac{13}{15}$ ______________________

19. $\frac{6}{7}$ ______________________

20. $\frac{69}{80}$ ______________________

Name Date Period

Rational Number Equivalents

EXAMPLE

What rational number is equal to $0.58\overline{3}$?

Step 1 Let $x = 0.58333...$

Step 2 Multiply to place the first repeating digit(s) to the *left* of the decimal.

$(1000)x = (1000)0.583333...$ Simplify: $1000x = 583.333...$

Step 3 Multiply to place the repeating digit(s) to the *right* of the decimal.

$(100)x = (100)0.583333...$ Simplify: $100x = 58.333...$

Step 4 Subtract the smaller from the larger result.

$$\begin{aligned} 1000x &= 583.333... \\ -100x &= 58.333... \\ \hline 900x &= 525.000 \end{aligned}$$

$x = \frac{525}{900}$ Simplify: $\frac{525}{900} \div \frac{75}{75} = \frac{7}{12}$

Directions Find the rational number equivalents for these decimal expansions. Show your work.

1. $0.1\overline{3}$ ____________

2. $0.8\overline{3}$ ____________

3. $0.\overline{1}$ ____________

4. $0.\overline{6}$ ____________

5. $0.8\overline{6}$ ____________

6. $0.\overline{8}$ ____________

7. $0.1\overline{6}$ ____________

8. $0.\overline{36}$ ____________

9. $0.\overline{18}$ ____________

10. $0.\overline{4}$ ____________

Click here for Main Menu

Click here to print this page. Specify the page or pages you wish to print in the dialog box. Then click OK or Print. If you do not specify the page or pages, all pages will print.

Name Date Period

Irrational Numbers as Decimals

EXAMPLE Find each root. Tell whether it is *rational* or *irrational*.

$\sqrt{3}$

Using a calculator: $\sqrt{3} = 1.73205...$

The number is *irrational* because it neither ends in zeroes nor has a repeating pattern.

$\sqrt[3]{27}$

Using a calculator: $\sqrt[3]{27} = 3.0$

The number is *rational* because it ends in zeroes.

Directions Complete the chart. Find each root and tell whether it is *rational* or *irrational*. You may use a calculator.

Radical	Root	Rational or Irrational?
$\sqrt{49}$	**1.** _______________	**2.** _______________
$\sqrt{15}$	**3.** _______________	**4.** _______________
$\sqrt{11}$	**5.** _______________	**6.** _______________
$\sqrt{6}$	**7.** _______________	**8.** _______________
$\sqrt{144}$	**9.** _______________	**10.** _______________
$\sqrt{121}$	**11.** _______________	**12.** _______________
$\sqrt{50}$	**13.** _______________	**14.** _______________
$\sqrt[3]{50}$	**15.** _______________	**16.** _______________
$\sqrt{36}$	**17.** _______________	**18.** _______________
$\sqrt[3]{18}$	**19.** _______________	**20.** _______________
$\sqrt{169}$	**21.** _______________	**22.** _______________
$\sqrt[3]{125}$	**23.** _______________	**24.** _______________

Directions Solve the problem.

25. Caitlin has cut out a square piece of graph paper that contains a total of 81 blocks. How many blocks are there along one side of the square?

____

Click here for Main Menu

Name ______ Date ______ Period ______

Products and Quotients of Radicals

EXAMPLE

Simplify $\sqrt{48}$.

$\sqrt{48} = \sqrt{16 \bullet 3} = \sqrt{16} \bullet \sqrt{3} = 4\sqrt{3}$

Simplify $\sqrt{27x^3}$.

$\sqrt{27x^3} = \sqrt{27} \bullet \sqrt{x^3} = (\sqrt{9} \bullet \sqrt{3})(\sqrt{x^2} \bullet \sqrt{x}) = (3\sqrt{3})(x\sqrt{x}) = 3x\sqrt{3x}$

Check. $(3x\sqrt{3x})^2 = 9x^2 \bullet 3x = 27x^3$ True

Directions Simplify the following radicals. Check your answers.

1. $\sqrt{12}$ ______
2. $\sqrt{20}$ ______
3. $\sqrt{48}$ ______
4. $\sqrt{18}$ ______
5. $\sqrt{32}$ ______
6. $\sqrt{50}$ ______
7. $\sqrt{84}$ ______
8. $\sqrt{180a^2b^3}$ ______
9. $\sqrt{98}$ ______
10. $\sqrt{45}$ ______
11. $\sqrt{16xy^2}$ ______
12. $\sqrt{96}$ ______
13. $\sqrt{3a^2}$ ______
14. $\sqrt{45x^2y^3}$ ______
15. $\sqrt{8x^3y^3}$ ______
16. $\sqrt{25x^2y^3}$ ______
17. $\sqrt{1{,}000}$ ______
18. $\sqrt{396x^2}$ ______
19. $\sqrt{9x^2y}$ ______
20. $\sqrt{32k^3}$ ______
21. $\sqrt{12a^7b^7}$ ______
22. $\sqrt{18x^3y^5}$ ______
23. $\sqrt{50a^3b^5}$ ______
24. $\sqrt{192}$ ______

Directions Solve the problem.

25. To repair a wall, Van and Mai have cut out a square piece of wallboard whose area is 396 square inches. The length of one side of this piece is $\sqrt{396}$ inches. Use the first rule of radicals to simplify this expression.

______

Name Date Period

Sums and Differences of Radicals

EXAMPLE

Find the sum of $\sqrt{2} + \sqrt{18}$.

Step 1 Simplify $\sqrt{18}$. $\sqrt{18} = \sqrt{(9 \bullet 2)} = \sqrt{9} \bullet \sqrt{2} = 3\sqrt{2}$

Step 2 Add. $\sqrt{2} + 3\sqrt{2} = (1)\sqrt{2} + 3\sqrt{2} = (1 + 3)\sqrt{2} = 4\sqrt{2}$

Subtract $\sqrt{12} - \sqrt{3}$.

Step 1 Simplify. $\sqrt{12} = \sqrt{(4 \bullet 3)} = \sqrt{4} \bullet \sqrt{3} = 2\sqrt{3}$

Step 2 Subtract. $2\sqrt{3} - (1)\sqrt{3} = (1)\sqrt{3} = \sqrt{3}$

Directions Add or subtract. If you cannot add or subtract, write *not possible.*

1. $3\sqrt{2} + 5\sqrt{2}$ ______________

2. $\sqrt{20} + \sqrt{45}$ ______________

3. $3\sqrt{2} + 5\sqrt{7}$ ______________

4. $\sqrt{18} - \sqrt{8}$ ______________

5 $\sqrt{21} + 3\sqrt{21}$ ______________

6. $9\sqrt{2} - \sqrt{18}$ ______________

7. $\sqrt{12} + \sqrt{27}$ ______________

8. $6\sqrt{14} - 2\sqrt{7}$ ______________

9. $\sqrt{72} - \sqrt{32}$ ______________

10. $\sqrt{20} + \sqrt{180}$ ______________

11. $3\sqrt{2} + 5\sqrt{8}$ ______________

12. $\sqrt{12} - \sqrt{48}$ ______________

13. $\sqrt{2x^2} + \sqrt{8x^2}$ ______________

14. $\sqrt{24} + 2\sqrt{54}$ ______________

15. $\sqrt{8x^2y} + \sqrt{18x^2y}$ ______________

16. $2\sqrt{12} - \sqrt{5}$ ______________

17. $8\sqrt{96} - 5\sqrt{24}$ ______________

18. $3\sqrt{125} - 2\sqrt{80}$ ______________

19. $\sqrt{1{,}000} - \sqrt{360}$ ______________

20. $\sqrt{6x^2} - x\sqrt{54}$ ______________

Name Date Period

Radicals and Fractions

EXAMPLE Rationalize the denominator of $\frac{3}{4\sqrt{2}}$.

$$\frac{3}{4\sqrt{2}} \bullet \frac{\sqrt{2}}{\sqrt{2}} = \frac{3\sqrt{2}}{4 \bullet 2} = \frac{3\sqrt{2}}{8}$$

Directions Rationalize the denominator of each fraction. Be sure your answer is in simplest form.

1. $\frac{3}{\sqrt{3}}$ ____________
2. $\frac{1}{\sqrt{2}}$ ____________
3. $\frac{5}{\sqrt{5}}$ ____________
4. $\frac{5}{\sqrt{20}}$ ____________
5. $\frac{1}{\sqrt{7}}$ ____________
6. $\frac{4}{\sqrt{12}}$ ____________
7. $\frac{1}{\sqrt{5}}$ ____________
8. $\frac{10}{\sqrt{x}}$ ____________
9. $\frac{9}{\sqrt{27}}$ ____________
10. $\frac{\sqrt{9}}{\sqrt{2x}}$ ____________

EXAMPLE Rationalize the denominator of $\frac{1}{2-\sqrt{2}}$.

The conjugate of $2 - \sqrt{2}$ is $2 + \sqrt{2}$.

$$\frac{1}{2-\sqrt{2}} \bullet \frac{2+\sqrt{2}}{2+\sqrt{2}} = \frac{2+\sqrt{2}}{4-2} = \frac{2+\sqrt{2}}{2}$$

You cannot further simplify, because the 2 in the numerator is a separate term.

Directions Use a conjugate to rationalize the denominator of each fraction. Be sure your answer is in simplest form.

11. $\frac{2}{\sqrt{3}-1}$ ____________
12. $\frac{2}{3-\sqrt{2}}$ ____________
13. $\frac{3}{\sqrt{3}-1}$ ____________
14. $\frac{2}{2-\sqrt{2}}$ ____________
15. $\frac{12}{3-\sqrt{3}}$ ____________

Name Date Period

Radicals in Equations

EXAMPLE

Solve for x: $\sqrt{x} + 2 = 13$

Step 1 Isolate the variable, x. $\sqrt{x} + 2 - 2 = 13 - 2$

$\sqrt{x} = 11$

Step 2 Square both sides. $(\sqrt{x})^2 = 11^2$

$x = 121$

Step 3 Check. $\sqrt{121} + 2 = 13$

$11 + 2 = 13$ $13 = 13$

True

Directions Solve each equation for the variable. Check your answers.

1. $\sqrt{x} = 5$ __________
2. $\sqrt{n} = 8$ __________
3. $\sqrt{k + 3} = 2$ __________
4. $\sqrt{a} = 13$ __________
5. $\sqrt{r + 8} = 12$ __________
6. $\sqrt{y - 5} = 5$ __________
7. $\sqrt{m} = 16$ __________
8. $\sqrt{4n - 3} = 3$ __________

Directions Solve the problems. Show the equation as well as your answer.

9. Kristen challenges you with this puzzle: "Add the square root of a mystery number to the square root of 100. The result is 19. What is the mystery number?"

____

10. Jaime buys a square tablecloth. The package label declares, "The area of this tablecloth is 800 square inches." What is the length of a side of the cloth? (Express your answer as a simplified radical.)

____

Name Date Period

Simplifying Equations with Radicals

EXAMPLE

One way to simplify an equation containing a radical sign is to raise each side of the equation to the second power.

Suppose an object is dropped from a tall building. At the moment the object reaches a velocity of 24 feet per second, how far has the object fallen? Use the formula $V = \sqrt{64d}$ where V = velocity in feet per second and d = distance in feet.

Solution:

$$V = \sqrt{64d}$$
$$24 = \sqrt{64d}$$
$$(24)^2 = (\sqrt{64d})^2$$
$$576 = 64d$$
$$9 = d$$

The object has fallen 9 feet.

Directions Use a calculator to solve these problems.

1. Suppose the formula $V = \sqrt{32d}$ is used to find the distance in feet (d) an object falls at a velocity (V) measured in feet per second. An object is dropped from the edge of a roof. At the moment the object reaches a velocity of 36 feet per second, it hits the ground. How far did the object fall? __________

2. Suppose the formula $S = 5.5\sqrt{d}$ is used to determine the distance in feet (d) it takes an automobile to stop if it were traveling a certain speed in miles per hour (S). Find the distance it would take an automobile traveling 70 miles per hour to stop. Round your answer to the nearest whole number. __________

3. Suppose the formula $d = 0.25\sqrt{h}$ is used to determine the height in inches (h) that a submarine periscope must be for an observer looking through that periscope to see an object that is a distance of (d) miles away. How far does a submarine periscope have to extend above the water to see a surface ship that is 1 mile away? __________

4. A rectangle measures 4 inches by 6 inches. What is the length in inches, to the nearest tenth, of a diagonal of that rectangle? Use the formula $a^2 + b^2 = c^2$, where a and b represent the legs of a right triangle and c represents the hypotenuse. __________

5. A 16-foot ladder is leaning against the side of a building. If the bottom of the ladder is 8 feet from the side of the building, how far above the ground does the ladder touch the building? Use the formula $a^2 + b^2 = c^2$, where a and b represent the legs of a right triangle and c represents the hypotenuse, and round your answer to the nearest tenth. __________

Name Date Period

Radicals and Exponents

EXAMPLE Rewrite $\sqrt[3]{3a}$ using exponents.

$\sqrt[3]{3a} = 3^{\frac{1}{3}} \bullet a^{\frac{1}{3}}$

Directions Rewrite each expression using exponents.

1. $\sqrt[3]{5x}$ ________________
2. $\sqrt{7b}$ ________________
3. $\sqrt[4]{13d}$ ________________
4. $\sqrt[3]{5y}$ ________________
5. $\sqrt{17xy}$ ________________
6. $\sqrt[7]{11ab}$ ________________

EXAMPLE Write $w \bullet \sqrt[3]{w}$ with exponents and simplify.

$w \bullet \sqrt[3]{w} = w^1 \bullet w^{\frac{1}{3}} = w^{(1 + \frac{1}{3})} = w^{\frac{4}{3}}$

Directions Simplify using exponents. Then find the products.

7. $c \bullet \sqrt{c}$ ________________
8. $n \bullet \sqrt[3]{n}$ ________________
9. $d^2 \bullet \sqrt[3]{d}$ ________________
10. $x^3 \bullet \sqrt{x}$ ________________
11. $y^2 \bullet \sqrt[6]{y}$ ________________
12. $b^3 \bullet \sqrt[7]{b}$ ________________

EXAMPLE Simplify $\sqrt{3^3}$.

$\sqrt{3^3} = (3^3)^{\frac{1}{2}} = 3^{\frac{3}{2}}$

Directions Rewrite each expression using exponents. Then find the product.

13. $\sqrt[3]{a^2}$ ________
14. $\sqrt[3]{k^5}$ ________
15. $\sqrt[5]{n^2}$ ________
16. $\sqrt[7]{m^3}$ ________
17. $\sqrt[5]{c^3}$ ________
18. $\sqrt[4]{b^5}$ ________
19. $\sqrt{x^5}$ ________
20. $\sqrt[3]{n^4}$ ________

Name Date Period

Drawing and Using a Square Root Graph

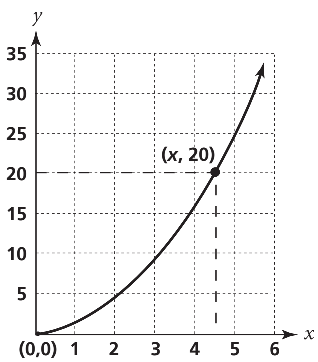
EXAMPLE

Use the square root graph to find the value of x when $x^2 = 20$.

Step 1 Find $y = 20$ on the y-axis. Follow the dashed horizontal line to the square root graph (curved solid line). The point at which the dashed line meets the graph is $(x, 20)$, where $20 = x^2$.

Step 2 Follow the dashed vertical line from $(x, 20)$ to the x-axis. The dashed line intersects the x-axis at the value, $x = \sqrt{20}$.

Step 3 Read the approximate value: $x \approx 4.5$.



Directions Use the square root graph to find the following square roots. Estimate to the nearest tenth.

1. $\sqrt{2}$ ________

2. $\sqrt{30}$ ________

3. $\sqrt{10}$ ________

4. $\sqrt{27}$ ________

5. $\sqrt{12}$ ________

6. $\sqrt{23}$ ________

7. $\sqrt{14}$ ________

8. $\sqrt{8}$ ________

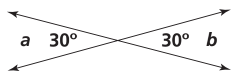
9. $\sqrt{17}$ ________

10 $\sqrt{28}$ ________

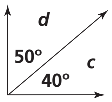
Name Date Period

Angles and Angle Measure

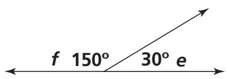
EXAMPLE Identify angle pairs.



∠*a* and ∠*b* are *vertical* angles.



∠*c* and ∠*d* are *complementary* angles.



∠*e* and ∠*f* are *supplementary* angles.

Directions Describe each pair of angles. Use one of the following words: *vertical*, *complementary*, *supplementary*.

Diagram 1

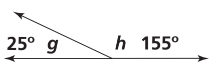


Diagram 2

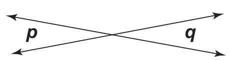


Diagram 3

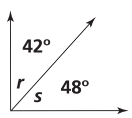
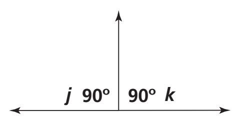


Diagram 4



1. ∠*g*, ∠*h* ____________________

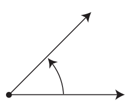
2. ∠*p*, ∠*q* ____________________

3. ∠*r*, ∠*s* ____________________

4. ∠*j*, ∠*k* ____________________

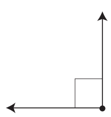
EXAMPLE Study these angles. The letter *m* stands for *measure of.*

Acute angle



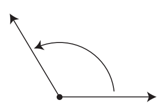
0° < m < 90°

Right angle



m = 90°

Obtuse angle



90° < m < 180°

Directions Refer to diagrams 1–4 on this page and answer the questions.

5. Is ∠*g* acute? __________

6. Is ∠*r* a right angle? __________

7. Is ∠*h* obtuse? __________

8. Is ∠*j* a right angle? __________

9. Is ∠*k* acute? __________

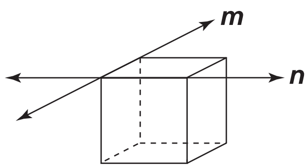
10. Is ∠*s* acute? __________

Click here for Main Menu

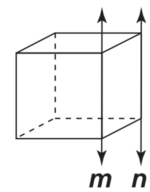
Name Date Period

Pairs of Lines in a Plane and in Space

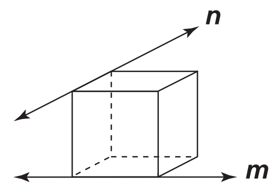
EXAMPLE Intersecting lines, *m* and *n*



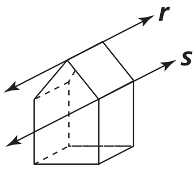
Parallel lines, *m* and *n*



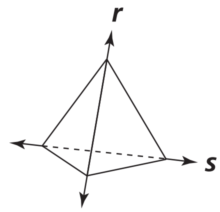
Skew lines, *m* and *n*



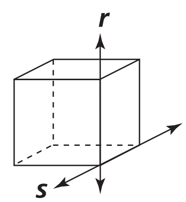
Directions Identify lines *r* and *s* in each figure. Write *intersecting*, *parallel*, or *skew*.



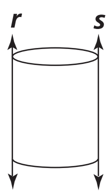
1. ______________



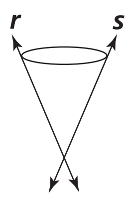
2. ______________



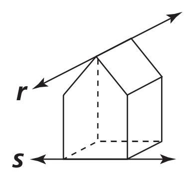
3. ______________



4. ______________

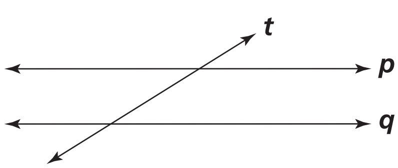


5. ______________

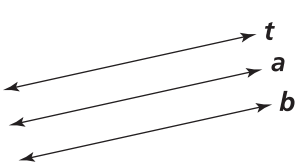


6. ______________

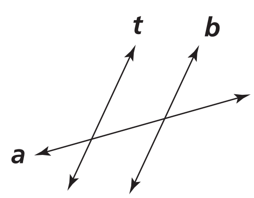
EXAMPLE A transversal, *t*, intersects two or more lines.



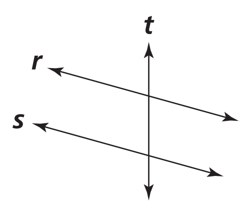
Directions If *t* is a transversal, write *yes*. Otherwise, write *no*.



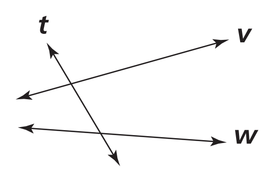
7. __________



8. __________



9. __________



10. __________

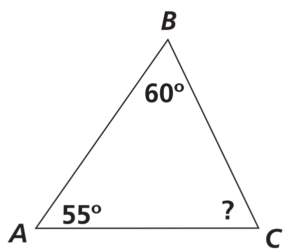
Name Date Period

Angle Measures in a Triangle

EXAMPLE

Theorem

m∠A + m∠B + m∠C = 180°



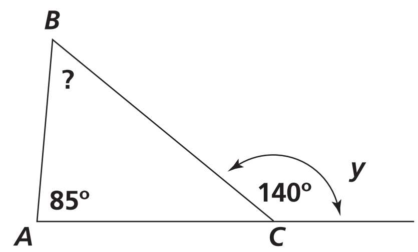
Find the measure of ∠C.

Let n = m∠C.

n + 60° + 55° = 180° Solve: n = 65°

Theorem

m∠A + m∠B = m∠y

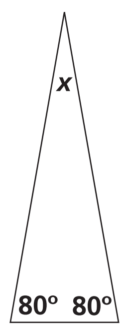


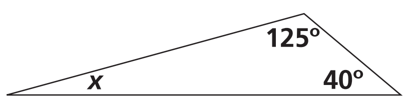
Find the measure of ∠B.

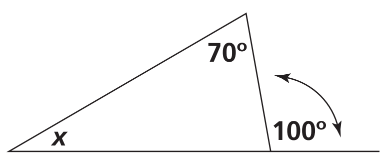
Let k = m∠B.

85° + k = 140° Solve: k = 55°

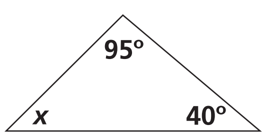
Directions Find m∠x in each triangle.

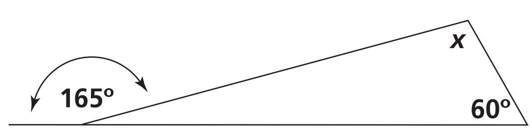






1. ____________ **2.** ____________ **3.** ____________



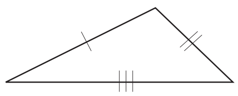


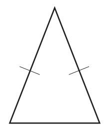
4. ____________ **5.** ____________

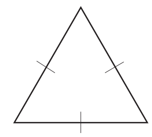
Name Date Period

Naming Triangles

EXAMPLE Triangles can be classified according to their sides.


Scalene

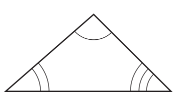

Isosceles

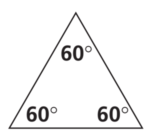

Equilateral

Directions Fill in the chart by writing the classification word to describe the triangle with the given sides.

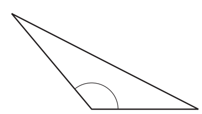
Triangle—Measurements of the Sides	Classification
2.5 inches, 1.5 inches, 2.0 inches	**1.** ______________________
11 cm, 8 cm, 6.5 cm	**2.** ______________________
2 feet, 3 feet, 3 feet	**3.** ______________________
35 mm, 35 mm, 35 mm	**4.** ______________________
5 units, 10 units, 5 units	**5.** ______________________

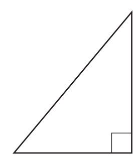
EXAMPLE Triangles can be classified according to their angles.


Acute



Equiangular


Obtuse


Right

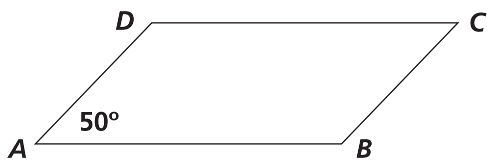
Directions Fill in the chart by writing the classification word to describe the triangle with the given angles.

Triangle—Measurements of the Angles	Classification
60°, 60°, 60°	**6.** ______________________
30°, 110°, 40°	**7.** ______________________
60°, 15°, 105°	**8.** ______________________
90°, 70°, 20°	**9.** ______________________
70°, 30°, 80°	**10.** ______________________

Name Date Period

Quadrilaterals

EXAMPLE Find m∠*D* in the parallelogram.



Step 1 Because $\overline{AB} \parallel \overline{CD}$, ∠*A* and ∠*D* are supplementary. Thus, 50° + m∠*D* = 180°.

Step 2 Solve for m∠*D*.

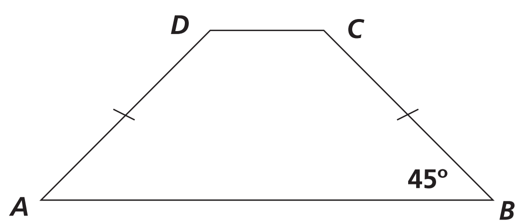
50° + m∠*D* = 180°

50° + m∠*D* – 50° = 180° – 50°

m∠*D* = 130°

Step 3 Check. 50° + m∠*D* = 180° 50° + 130°= 180° True

Directions Find the measures of the angles in the isosceles trapezoid.



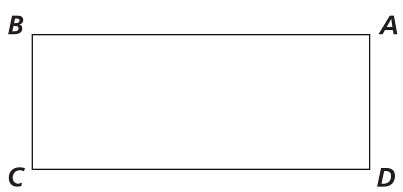
1. ∠*A* _______ **2.** ∠*C* _______ **3.** ∠*D* _______

Directions Tell whether enough information is given to calculate the measures of the angles in each described figure. Explain your answer.

4. Given: The figure is a rectangle.

____

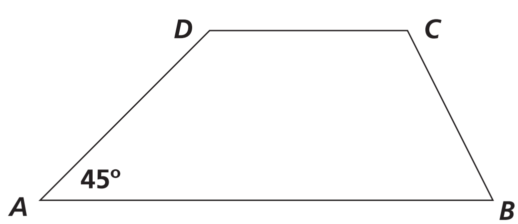
____



5. Given: The figure is a trapezoid in which no sides are equal.

____

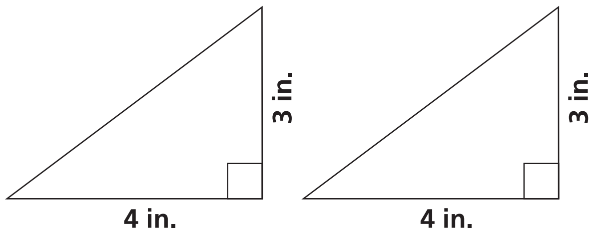
____



Name Date Period

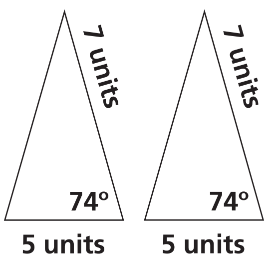
Congruent and Similar Triangles

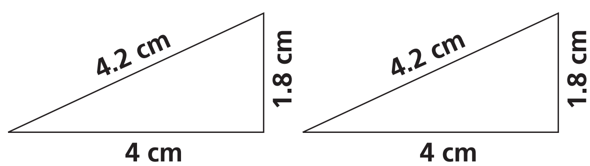
EXAMPLE Are these triangles congruent? Give a reason for the answer.



Yes. They are congruent by the Side-Angle-Side (SAS) theorem, which states that if two sides and the included angle of two triangles are equal, the triangles are congruent.

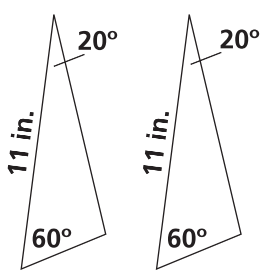
Directions Tell whether each pair of triangles is congruent. If the pair is congruent, name the theorem that proves congruence (SAS, SSS, ASA).

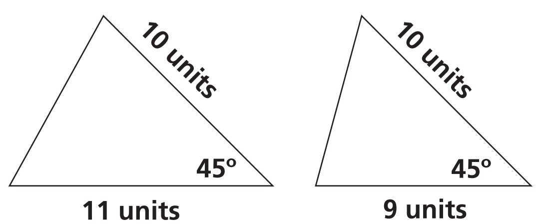




1. ________ ________

2. ________ ________





3. ________ ________

4. ________ ________

Directions Answer the question.

5. Are all right triangles similar? Tell why or why not.

____

____

Name Date Period

Trigonometric Ratios

EXAMPLE

Find the value of x, using trigonometric (trig) ratios.

Step 1 Set up an equation using the appropriate trig ratio. Since the side opposite from the given angle and the hypotenuse are known, use the sine (or sin) ratio.

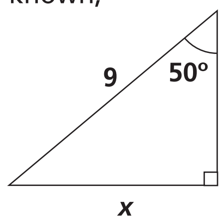
$\sin 50° = \frac{x}{9}$

Step 2 Using a calculator, find and substitute the sine value.

$0.766 = \frac{x}{9}$

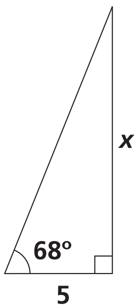
Step 3 Solve for x.

$x = 6.894$ or approximately 6.9 units.

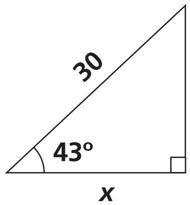


Directions Find the value of x to the nearest tenth. Use a calculator.

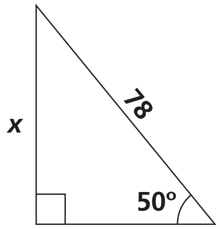
1. ____________



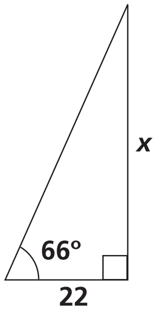
2. ____________



3. ____________



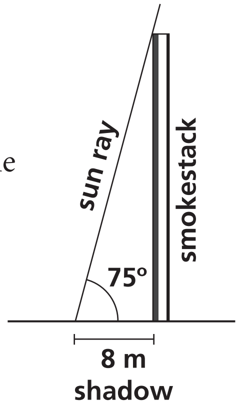
4. ____________



Directions Solve the problem.

5. On a summer afternoon, a smokestack casts an 8-meter shadow. At this time of day, rays from the sun are striking the ground at an angle of 75°. To the nearest tenth of a meter, how high is the smokestack?

____



Name Date Period

Solutions by Factoring

EXAMPLE

Put $6x^2 = x + 15$ in standard quadratic form.

Step 1 Match the terms with terms in the standard form.

Standard Quadratic Form: $ax^2 + bx + c = 0$

$$6x^2 = (1)x + 15$$

Step 2 Subtract x from both sides of the equation.

$6x^2 - x = x + 15 - x$ Result: $6x^2 - x = 15$

Step 3 Subtract 15 from both sides of the equation.

$6x^2 - x - 15 = 15 - 15$ Result: $6x^2 - x - 15 = 0$

Directions Rearrange the terms of each equation to put it in standard quadratic form: $ax^2 + bx + c = 0$.

1. $x^2 = -6 - 5x$ ____________________

2. $2x + 15 = x^2$ ____________________

3. $y^2 - 7y + 6 = -4$ ____________________

4. $3x = 2 - 2x^2$ ____________________

EXAMPLE

Solve $x^2 - 3x - 4 = 0$ by factoring.

Step 1 Factor: $(x - 4)(x + 1) = 0$

Step 2 Set each factor = 0, and solve for x.

$x - 4 = 0$ $x + 1 = 0$

$x = 4$ $x = -1$

Step 3 Check the results.

$(4)^2 - 3(4) - 4 = 0$ $(-1)^2 - 3(-1) - 4 = 0$

$0 = 0$ True $0 = 0$ True

Directions Use factoring to solve the equation you rearranged in problem 1 above.

5. ____

Name ______________________ Date ________ Period ________

Writing the Equations from Their Roots

EXAMPLE

The roots of a quadratic equation are –1 and –3. What is the general form of the equation?

Step 1 Given the roots, $x = -1$ or $x = -3$.

Step 2 Set the factors equal to zero. $(x + 1) = 0$ $(x + 3) = 0$

Step 3 Multiply the factors. $(x + 1)(x + 3) = 0$

Step 4 Use the distributive property to place the equation in general form. $x^2 + 4x + 3 = 0$

Directions Find the quadratic equation that has these roots.

1. –3, 2 ______________________

2. –1, 4 ______________________

3. –6, 3 ______________________

4. 2, 5 ______________________

5. –6, 1 ______________________

6. –10, 2 ______________________

7. 2, 3 ______________________

8. –5, –2 ______________________

9. –3, 5 ______________________

10. 12, 1 ______________________

11. –8, 2 ______________________

12. –5, 10 ______________________

13. –7, 5 ______________________

14. –5, 6 ______________________

15. –8, 4 ______________________

Name Date Period

Solving by Completing the Square

EXAMPLE Find the roots of $x^2 + 4x - 3 = 0$ by completing the square.

Step 1 Rewrite the equation so that the constant is isolated.

$x^2 + 4x = 3$

Step 2 Find the constant that must be added to complete the square.
Take $\frac{1}{2}$ of the x coefficient and square it.

$\frac{1}{2}(4) = 2$ $\quad 2^2 = 4$

Step 3 Add the constant to both sides of the equation.

$x^2 + 4x + 4 = 3 + 4$ Result: $x^2 + 4x + 4 = 7$

Step 4 Factor the trinomial on the left side, and solve for x.

$(x + 2)^2 = 7$ Therefore, $x + 2 = \pm\sqrt{7}$

$x = -2 + \sqrt{7}$ or $x = -2 - \sqrt{7}$

Step 5 Check by substituting the roots in the equation.

Directions Find the roots of each equation by completing the square.

1. $x^2 + 4x + 3 = 0$ ______________

2. $x^2 - 2x = 0$ ______________

3. $m^2 - 6m - 7 = 0$ ______________

4. $k^2 + 12k = 0$ ______________

5. $y^2 + 8y - 9 = 0$ ______________

6. $x^2 - 10x = 0$ ______________

7. $x^2 - 6x + 2 = 0$ ______________

8. $a^2 - 4a - 12 = 0$ ______________

9. $x^2 - 2x - 15 = 0$ ______________

10. $d^2 - 2d - 24 = 0$ ______________

Name Date Period

Solving Using the Quadratic Formula

EXAMPLE

Use the quadratic formula to find roots of $x^2 + 5x + 6 = 0$.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Values of a, b, and c from the equation: $a = 1$ $b = 5$ $c = 6$

Substitute: $x = \frac{-5 \pm \sqrt{5^2 - 4(1)(6)}}{2(1)}$

$x = -2$ or -3

To check, substitute the roots in the original equation.

Directions Use the quadratic formula to find the roots of these equations. Remember to write the equation in standard form first.

1. $y^2 - 5y + 6 = 0$ ________

2. $x^2 + 7x + 12 = 0$ ________

3. $2n^2 - n - 1 = 0$ ________

4. $x^2 = 3x + 4$ ________

EXAMPLE

Check that the roots of the equation are valid.

$2x^2 + 4x - 2 = 0$ Roots: $-1 + \sqrt{2}$ or $-1 - \sqrt{2}$

Substitute for x: $2(-1 + \sqrt{2})^2 + 4(-1 + \sqrt{2}) - 2 = 0$

$0 = 0$ Therefore, $-1 + \sqrt{2}$ is valid.

Substitute for x: $2(-1 - \sqrt{2})^2 + 4(-1 - \sqrt{2}) - 2 = 0$

$0 = 0$ Therefore, $-1 - \sqrt{2}$ is valid.

Directions Check the roots of the equation. Tell whether they are valid.

5. $x^2 - 2x - 4 = 0$ Roots: $1 + \sqrt{5}$ or $1 - \sqrt{5}$

____

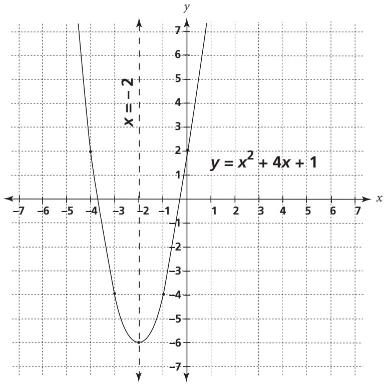
Name Date Period

Graphing Quadratic Equations

EXAMPLE

The graph of a quadratic equation is a parabola.

The graph box shows the parabola graph of $y = x^2 + 4x + 1$.



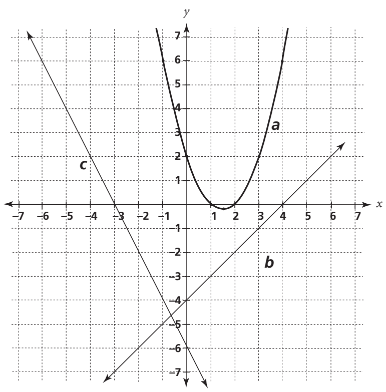
Calculate the *axis of symmetry* for this quadratic graph.

a = coefficient of $x^2 = 1$ b = coefficient of $x = 4$

Formula: $x = \frac{-b}{2a}$ Substitute: $\frac{-4}{2(1)} = -2$

The axis of symmetry is $x = -2$. It is the dashed line on the graph.

Directions Use this equation to answer problems 1–5: $y = x^2 - 3x + 2$.



1. Identify the graph of the equation. Write its letter here. ________
2. Find the point (2, 0). Is it on the graph of the equation? ________
3. Find the point (–2, 3). Is it on the graph of the equation? ________
4. Use $x = \frac{-b}{2a}$ to calculate the axis of symmetry. ________
5. Plot the axis of symmetry on the graph.