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Review 209

Algebraic Expressions and the Order of Operations

A *variable* represents a number. An *algebraic expression* is formed from numbers, variables, and operations.

To evaluate an algebraic expression, substitute a number for each variable. Then follow the order of operations.

	Evaluate $4(n + 2)$ for $n = 3$.	Evaluate $n + 12 \div (3 \times m)$ for $n = 4$ and $m = 2$.
① Substitute for each variable.	$4(3 + 2)$	$4 + 12 \div (3 \times 2)$
② Work inside grouping symbols.	$= 4(5)$	$= 4 + 2 \div 6$
③ Multiply and divide from left to right.	$= 20$	$= 4 + 2$
④ Add and subtract from left to right.		$= 6$

Evaluate each expression for $g = 4$, $k = 2$, and $t = 9$.

1. $4t$ _____
2. $3k$ _____
3. $g + 4$ _____
4. $5t + 7$ _____
5. $4(g - 1)$ _____
6. $15k + 6$ _____
7. $3t - g$ _____
8. $gt \div k$ _____
9. $27 \div t \times k$ _____
10. $g + 12 - 3 \times k$ _____
11. $32 \div g \times k$ _____
12. $(2t + 2) \div g$ _____
13. $(20 \div g) \times k$ _____
14. $4g + t - k$ _____
15. $3(3g - t)$ _____
16. $2g + 2 \times 3$ _____
17. $kt - 3$ _____
18. $10 + 4k \div 8$ _____

19. The formula for the perimeter of a rectangle is $P = 2l + 2w$. If $l = 2$ in. and $w = 4$ in., what operation(s) would you do first?

_____

Course 3 Topics

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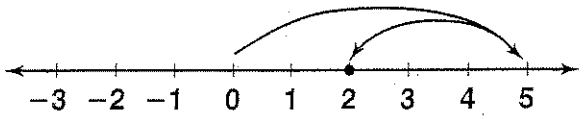
Review 212

Adding and Subtracting Integers

A number line can help you add integers. For positive integers, move to the right. For negative integers, move to the left.

Example Add $5 + (-3)$:

First, move 5 spaces to the right.
Then move 3 spaces to the left.



$5 + (-3) = 2$

- To add integers with the same sign, add absolute values and use the same sign.

  $3 + 5 = 8$ $\quad -2 + -4 = -6$

- To add integers with different signs, subtract absolute values and use the sign of the integer with the greater absolute value.

  $-7 + 3 = ?$
  $|-7| - |3| = 7 - 3 = 4$
  Use the sign of -7.
  So, $-7 + 3 = -4$.

- To subtract an integer, add its opposite.

  $3 - (-2) = 3 + 2 = 5$ The opposite of -2 is 2.

  $3 - 4 = 3 + (-4) = -1$ The opposite of 4 is -4.

  $-4 - (-5) = -4 + 5 = 1$ The opposite of -5 is 5.

Simplify each expression.

1. $8 + (-4) =$ _____
2. $8 + 4 =$ _____
3. $-8 + 4 =$ _____
4. $-3 + (-3) =$ _____
5. $6 + (-2) =$ _____
6. $11 + (-16) =$ _____
7. $-7 + 11 =$ _____
8. $-4 + 16 =$ _____
9. $8 + (-12) =$ _____
10. $-9 + (-10) =$ _____
11. $23 + (-3) =$ _____
12. $-5 + 2 =$ _____
13. $9 - (-3) =$ _____
14. $18 - 14 =$ _____
15. $-6 - 7 =$ _____
16. $-3 - (-3) =$ _____
17. $-4 - 16 =$ _____
18. $8 - (-9) =$ _____
19. $-3 - 12 =$ _____
20. $6 - (-2) =$ _____
21. $10 - (-16) =$ _____
22. $-9 - (-10) =$ _____
23. $2 - (-3) =$ _____
24. $-5 - 2 =$ _____
25. $12 - 32 =$ _____
26. $42 - (-15) =$ _____
27. $-16 - 23 =$ _____

28. You owe your teacher $26 for the class trip. You give her a payment of $11. How much do you still owe?

    _____

29. A golf ball is 6 inches under water. While trying to retrieve it, the golfer accidentally kicks it so that it descends another 9 inches. How far under the surface of the water is the golf ball?

    _____

Course 3 Topics

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Review 213

Multiplying and Dividing Integers

- If two integers have the same sign, the product is positive.

  $8 \cdot 7 = 56$ $(-8) \cdot (-7) = 56$

- If two integers have opposite signs, the product is negative.

  $(-8) \cdot 7 = -56$ $8 \cdot (-7) = -56$

- If two integers have the same sign, the quotient is positive.

  $8 \div 2 = 4$ $(-8) \div (-2) = 4$

- If two integers have opposite signs, the quotient is negative.

  $(-8) \div 2 = -4$ $8 \div (-2) = -4$

Determine the sign of the product.

1. $-9 \cdot 3 =$ ☐27
2. $80 \cdot (-2) =$ ☐160
3. $-23 \cdot (-20) =$ ☐460
4. $7 \cdot (-5) =$ ☐35
5. $-6 \cdot (-8) =$ ☐48
6. $64 \cdot 5 =$ ☐320

Determine the sign of the quotient.

7. $24 \div (-3) =$ ☐8
8. $-(24) \div (-2) =$ ☐12
9. $-25 \div 5 =$ ☐5
10. $-27 \div (-9) =$ ☐3
11. $160 \div 4 =$ ☐40
12. $90 \div (-30) =$ ☐3

Simplify each expression.

13. $12 \cdot (-3)$
14. $-9 \cdot (-9)$
15. $9 \cdot (-1)$
16. $(-8) \cdot (-4)$
17. $5 \cdot 70$
18. $(-8) \cdot (-3)$
19. $-10 \cdot (-5)$
20. $-9 \cdot 8$
21. $4 \cdot 7$
22. $14 \cdot (-3)$
23. $-16 \cdot (-3)$
24. $5 \cdot (-25)$
25. $\frac{30}{5}$
26. $\frac{-72}{-8}$
27. $\frac{45}{-9}$
28. $-2 \div (-2)$
29. $6 \div (-1)$
30. $40 \div 2$
31. $48 \div (-12)$
32. $-99 \div (-9)$
33. $-21 \div 3$
34. $-33 \div 3$
35. $100 \div (-5)$
36. $75 \div (-3)$

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Review 215

Powers and Exponents

Follow the order of operations when evaluating expressions with exponents.

Example 1 Evaluate $-(3 + 1)^2 + 5 \cdot 3^2$

① Work inside grouping symbols first. $-(3 + 1)^2 + 5 \cdot 3^2 = -(4)^2 + 5 \cdot 3^2$

② Work with exponents. $= -16 + 5(9)$

- To evaluate a power, write the factors and multiply.

$5^4 = 5 \cdot 5 \cdot 5 \cdot 5 = 625$ $\quad (-2)^4 = (-2) \cdot (-2) \cdot (-2) \cdot (-2) = 16$ $\quad -2^4 = -(2 \cdot 2 \cdot 2 \cdot 2) = -16$

- To multiply numbers or variables with the same base, add the exponents.

Simplify. $3^2 \cdot 3^4$: $3^2 \cdot 3^4 = 3^{(2+4)} = 3^6$

Simplify. $n^3 \cdot n^4$: $n^3 \cdot n^4 = n^{(3+4)} = n^7$

Simplify. $-4^3 \cdot -4^5$: $-4^3 \cdot -4^5 = 4^{(3+5)} = 4^8$

③ Multiply and divide from left to right. $= -16 + 45$

④ Add and subtract from left to right. $= 29$

To evaluate a variable expression with exponents, substitute a number for the variable and then evaluate as above.

Example 2 Evaluate $-2a^3$ for $a = 3$.

$-2a^3 = (-2)(3)^3$
$= (-2)(27)$
$= -54$

Write using exponents.

1. $7 \cdot 7 \cdot 7 =$ _____
2. $(-6) \cdot (-6) \cdot (-6) \cdot (-6) \cdot (-6) =$ _____
3. $10 \cdot 10 \cdot 10 \cdot 10 =$ _____
4. $1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 =$ _____
5. $(-8) \cdot (-8) \cdot (-8) \cdot (-8) \cdot (-8) =$ _____
6. $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 =$ _____

Simplify each expression.

7. $3^2 + 7 \cdot 9$ _____
8. $9 \cdot 3 - 2^3$ _____
9. $2 + (10 - 3)^2$ _____
10. $6 - 3^2 \cdot 4$ _____

Evaluate each expression for the given values of the variables.

11. $m^2 - 6; m = 4$ _____
12. $4c^3; c = 2$ _____
13. $-2k^2 + 3; k = -5$ _____
14. $2d^2 \div 6; d = 3$ _____
15. $-2n^2 - 4; n = 4$ _____
16. $3ab^2; a = -4, b = 2$ _____

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Review 217

Solving One-Step Equations

To solve one-step equations:

① Use opposite, or inverse, operations to isolate the variable.

② Simplify.

③ Check by substituting your answer for the variable.

Solve and check each equation.

$$x + 7 = 34$$
$$x + 7 - 7 = 34 - 7 \quad \leftarrow \text{Subtract 7 from each side.}$$
$$x = 27 \quad \leftarrow \text{Simplify.}$$

Check: $x + 7 = 34$

$27 + 7 \stackrel{?}{=} 34$

$34 = 34$ ✔

$$\frac{w}{5} = 20$$
$$5 \cdot \frac{w}{5} = 5 \cdot 20 \quad \leftarrow \text{Multiply each side by 5.}$$
$$w = 100 \quad \leftarrow \text{Simplify.}$$

Check: $\frac{w}{5} = 20$

$\frac{100}{5} \stackrel{?}{=} 20$

$20 = 20$ ✔

Show your steps to solve each equation. Then check.

1. $n + 5 = 11$

$n + 5 - \square = 11 - \square$

$n = \square$

Check: $n + 5 = 11$

$\square + 5 \stackrel{?}{=} 11$

$\square = 11$

2. $13 + b = 27$

$13 + b - \square = 27 - \square$

$b = \square$

Check: $13 + b = 27$

$13 + \square \stackrel{?}{=} 27$

$\square = 27$

3. $y - 18 = 24$

_____

_____

Check: _____

_____

_____

4. $3x = 18$

$\frac{3x}{\square} = \frac{18}{\square}$

$x = 6$

Check: $3x = 18$

$3 \cdot \square \stackrel{?}{=} 18$

$\square = 18$

5. $\frac{y}{-5} = -13$

$\frac{y}{-5} \cdot \square = -13 \cdot \square$

$y = \square$

Check: $\frac{y}{-5} = -13$

$\frac{\square}{-5} \stackrel{?}{=} -13$

$\square = -13$

6. $y \cdot 8 = 24$

_____

_____

Check: $y \cdot 8 = 24$

_____

_____

7. $6 = f + 12$

$f =$ _____

8. $-18 = s + (-23)$

$s =$ _____

9. $w + 4 = \frac{1}{2}$

$w =$ _____

10. $-16 = -8x$

$x =$ _____

11. $\frac{b}{0.4} = 1.6$

$b =$ _____

12. $7.5 = 1.5c$

$c =$ _____

Name _____ Class _____ Date _____

Review 218

Solving Two-Step Equations

Michael bought 4 books for the same price at a fair. Admission to the fair was $5. How much was each book if Michael spent a total of $17 at the fair?

Follow these steps to solve the two-step equation: $4b + 5 = 17$

① Add or subtract on each side.

$4b + 5 - 5 = 17 - 5$

$4b = 12$

② Multiply or divide to isolate the variable.

$\frac{4b}{4} = \frac{12}{4}$

$b = 3$ ← Each book cost $3.

③ Check by substituting your answer for the variable.

Check: $4b + 5 = 17$

$4 \cdot 3 + 5 \stackrel{?}{=} 17$

$17 = 17$ ✔

Show your steps to solve each equation. Then check.

1. $2k + 5 = 25$

$2k + 5 - \square = 25 - \square$

$\frac{2k}{\square} = \frac{20}{\square}$

$k = \square$

Check: $2k + 5 = 25$

$2 \cdot \square + 5 \stackrel{?}{=} 25$

$\square = 25$

2. $\frac{p}{2} - 2 = 2$

$\frac{p}{2} - 2 + \square = 2 + \square$

$\frac{p}{2} \cdot \square = 4 \cdot \square$

$p = \square$

Check: $\frac{p}{2} - 2 = 2$

$\frac{\square}{2} - 2 \stackrel{?}{=} 2$

$\square = 2$

3. $7y - 17 = -38$

_____

_____

_____

Check: _____

_____

_____

Solve each equation.

4. $\frac{x}{-2} + 6 = 4$

$x =$ _____

5. $14j - 7 = 91$

$j =$ _____

6. $240a - 3 = 5$

$a =$ _____

7. $2.4 + 3s = -0.6$

$s =$ _____

8. $2 + \frac{n}{-5} = 4$

$n =$ _____

9. $140 = -4 - 12e$

$e =$ _____

Course 3 Topics

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Review 219

Simplifying Algebraic Expressions

A *term* is a number, a variable, or the product of a number and variable(s). The two terms in $-2x + 4y$ are $-2x$ and $4y$.

Terms with exactly the same variable factor are called *like terms*. In $-3x + 4y + 5x$, $-3x$ and $5x$ are like terms.

One way to *combine like terms* is by addition or subtraction.

- Add to combine like terms in $4y + y$.

  $4y + y = (4 + 1)y = 5y$

- Subtract to combine like terms in $2m - 5m$.

  $2m - 5m = (2 - 5)m = -3m$

To *simplify* an expression, combine its like terms. Perform as many of its operations as possible.

Simplify: $3a + 5b - a + 2b$
$= (3a - a) + (5b + 2b)$
$= 2a + 7b$

Simplify: $2(x - 4)$
$= 2x - 2(4)$
$= 2x - 8$

Combine like terms.

1. $6x + 2x =$ _____
2. $4c - c =$ _____
3. $-h - h =$ _____
4. $-3y + 4y =$ _____
5. $m - 5m =$ _____
6. $6n + n =$ _____
7. $2s - 6s =$ _____
8. $-t - 2t =$ _____
9. $3b - 9b =$ _____
10. $-2p - 5p =$ _____
11. $v + 9v =$ _____
12. $-4j + j =$ _____

Simplify each expression.

13. $8(c - 5) =$ _____
14. $4(d + 6) =$ _____
15. $5n + 3 + n =$ _____
16. $x + 2y + x + y =$ _____
17. $3(m + 4) - 5m =$ _____
18. $(v - 4)5 =$ _____
19. $4a + 2 - 8a + 1 =$ _____
20. $6s + 5 - (s - 6) =$ _____
21. $3(u + 4) - 5u =$ _____
22. $2x + y - (9 - 4x) =$ _____
23. $-5x + 3(x - y) =$ _____
24. $v + 6v - 2v =$ _____
25. $-2s + 6 - s - 4 =$ _____
26. $-x + 4(x - 2) =$ _____
27. $3(k + j) - 4k - k =$ _____
28. $4a - 6 - a + 1 =$ _____

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Review 220

Solving Multi-Step Equations

Combining terms can help solve equations.

Solve: $5n + 6 + 3n = 22$
$5n + 3n + 6 = 22$ ← Commutative Property
$8n + 6 = 22$
$8n + 6 - 6 = 22 - 6$
$8n = 16$
$\frac{8n}{8} = \frac{16}{8}$
$n = 2$

Check: $5n + 6 + 3n = 22$
$5(2) + 6 + 3(2) \stackrel{?}{=} 22$
$22 = 22$ ✔

When an equation has a variable on both sides, add or subtract to get the variable on one side.

Solve: $-6m + 45 = 3m$
$-6m + 6m + 45 = 3m + 6m$ ← Add 6m to each side.
$45 = 9m$
$\frac{45}{9} = \frac{9m}{9}$
$5 = m$

Check: $-6m + 45 = 3m$
$-6(5) + 45 \stackrel{?}{=} 3(5)$
$15 = 15$ ✔

Solve each equation. Check the solution.

1. $a - 4a = 36$
$a =$ _____

2. $3b - 5 - 2b = 5$
$b =$ _____

3. $5n + 4 - 8n = -5$
$n =$ _____

4. $12k + 6 = 10$
$k =$ _____

5. $3(x - 4) = 15$
$x =$ _____

6. $y - 8 + 2y = 10$
$y =$ _____

7. $3(s - 10) = 36$
$s =$ _____

8. $-15 = p + 4p$
$p =$ _____

9. $2g + 3g + 5 = 0$
$g =$ _____

10. $6c + 4 - c = 24$
$c =$ _____

11. $3(x - 2) = 15$
$x =$ _____

12. $4y + 9 - 7y = -6$
$y =$ _____

13. $4(z - 2) + z = -13$
$z =$ _____

14. $24 = -2(b - 3) + 8$
$b =$ _____

15. $17 = 3(g + 3) - g$
$g =$ _____

16. $5(k - 4) = 4 - 3k$
$k =$ _____

17. $8 - m - 3m = 16$
$m =$ _____

18. $6n + n + 14 = 0$
$n =$ _____

19. $7(p + 1) = 9 - p$
$p =$ _____

20. $36 = 4(q - 5)$
$q =$ _____

21. $25 + 2t = 5(t + 2)$
$t =$ _____

Course 3 Topics

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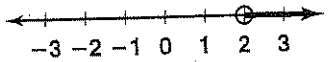
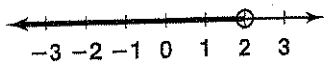
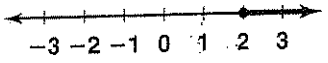
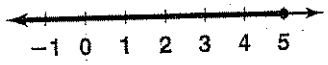
Review 222

Solving Inequalities by Adding and Subtracting

You can graph inequality solutions on a number line.

Inequality	Graph	How to Read the Graph
$x > 2$ x is *greater than* 2		An open dot at 2 shows that 2 is not included. All numbers greater than 2 are included.
$x < 2$ x is *less than* 2		An open dot at 2 shows that 2 is not included. All numbers less than 2 are included.
$x \geq 2$ x is *equal to or greater than* 2		A solid dot at 2 shows that 2 is included. All numbers greater than 2 are also included.
$x \leq 2$ x is *equal to or less than* 2		A solid dot at 2 shows that 2 is included. All numbers less than 2 are also included.

To help solve an inequality, you can subtract the same number from or add the same number to each side.

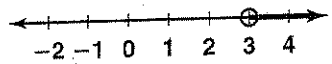
Solve: $x + 5 > 8$.

$x + 5 > 8$

$x + 5 - 5 > 8 - 5$ ← Subtract 5 from each side.

$x > 3$ ← Simplify.

Graph the solution:



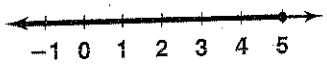
Solve: $y - 4 \leq 1$.

$y - 4 \leq 1$

$y - 4 + 4 \leq 1 + 4$ ← Add 4 to each side.

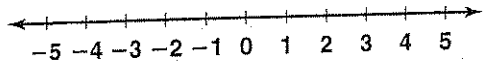
$y \leq 5$ ← Simplify.

Graph the solution:

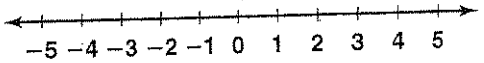


Graph each inequality on a number line.

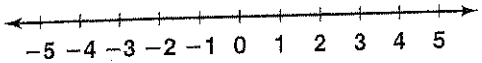
1. $x > -2$



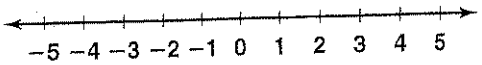
2. $4 \geq a$



3. $y \leq -1$

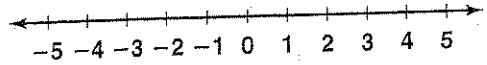


4. $t \geq 0$

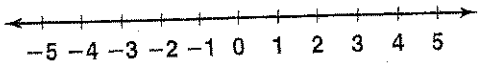


Solve each inequality. Graph the solution.

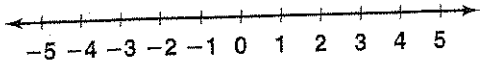
5. $9 + a > 11$ _____



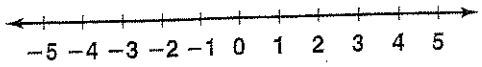
6. $-4 + r < 0$ _____



7. $2 > n - 1$ _____



8. $1 + s \leq 5$ _____



Course 3 Topics

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Review 223

Solving Inequalities by Multiplying or Dividing

To help solve an inequality, you can divide or multiply each side by the same number. However, if the number is a negative number, you must also *reverse* the direction of the inequality.

Solve: $-3y \geq 6$. Graph the solution.

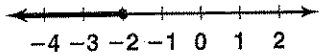
$-3y \geq 6$

Divide each side by 23.

$\frac{-3y}{-3} \leq \frac{6}{-3}$ ← Reverse the direction of the inequality.

$y \leq -2$ ← Simplify.

Graph:



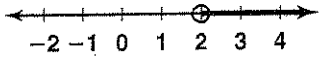
Solve: $\frac{a}{2} > 1$. Graph the solution.

$\frac{a}{2} > 1$

$2\left(\frac{a}{2}\right) > 1(2)$ ← Multiply each side by 2.

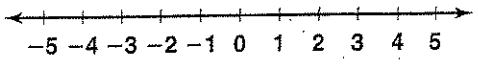
$a > 2$ ← Simplify.

Graph:

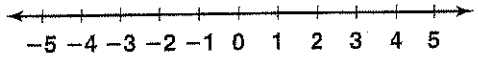


Solve each inequality and graph the solutions.

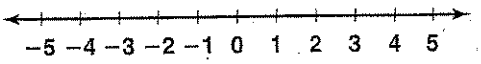
1. $2a > 8$ _____



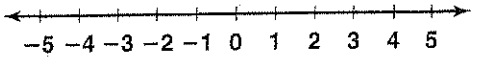
2. $12 < -3r$ _____



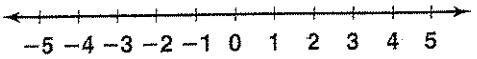
3. $\frac{1}{3}n > 1$ _____



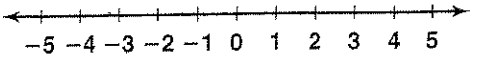
4. $12 \geq 6s$ _____



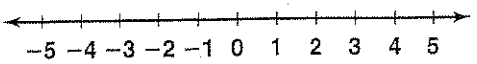
5. $\frac{m}{4} < 1$ _____



6. $5q \geq 5$ _____



7. $-4x \leq 8$ _____



8. What is the least whole number solution of $-9x < -27$?

_____

9. Donna sings on average $2\frac{1}{2}$ minutes per song. If a cassette holds 20 minutes of songs, what is the greatest number of songs she can record on a cassette?

_____

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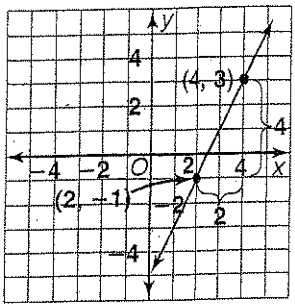
Review 227

Understanding Slope



The *slope of a line* is $\frac{\text{change in } y}{\text{change in } x}$, found by using two points on the line.

Find the slope of the line that passes through these two points: (4, 3) and (2, −1).

- To find the change in y, subtract one y-coordinate from the other: $(3 - (-1)) = 4$.
- To find the change in x, subtract one x-coordinate from the other: $(4 - 2) = 2$.

When you find the slope of a line, the y-coordinate you use first for the rise must belong to the same point as the x-coordinate you use for the run.

The slope of the line is: $\frac{\text{change in } y}{\text{change in } x} = \frac{3 - (-1)}{4 - 2} = \frac{4}{2} = 2$

A table of values from the graph also shows the slope.

−1 *change in x*

x	5	4	3	2	1
y	5	3	1	−1	−3

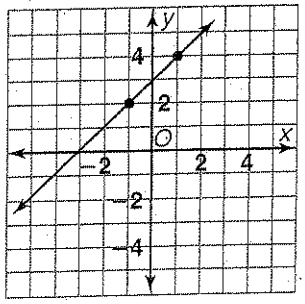
−2 *change in y*

Compare the change in each coordinate.

$\frac{\text{change in } y}{\text{change in } x} = \frac{-2}{-1} = 2$

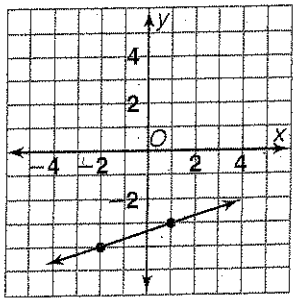
Find the slope of each line.

1.



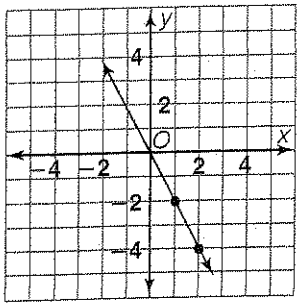
slope = _____

2.



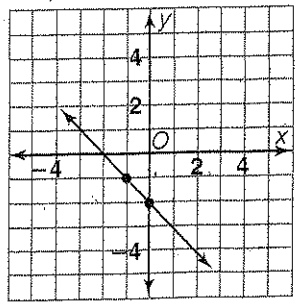
slope = _____

3.



slope = _____

4.



slope = _____

Name _____ Class _____ Date _____

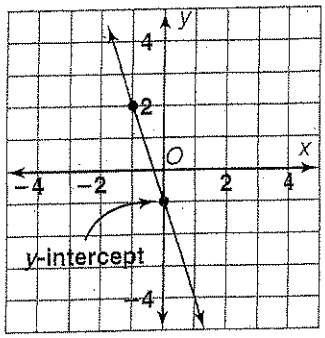
Review 228

Using the *y*-intercept

An equation of a line can be written in the *slope-intercept form:* $y = mx + b$. The slope of the line is m and the y-intercept is b.

The *y-intercept* is the y-coordinate of the point where the line crosses the y-axis.

Example: For $y = -3x - 1$, the slope is -3. The y-intercept is -1.



Use the graph to write an equation for the line through $(-1, 2)$ and $(0, -1)$.

① Find m: slope $\frac{\text{change in } y}{\text{change in } x} = \frac{2 - (-1)}{-1 - 0} = \frac{3}{-1} = -3$

② Find b: y-intercept $= -1$

③ In the equation $y = mx + b$, substitute $m = -3$ and $b = -1$.

The equation for the line is $y = -3x - 1$.

Find the slope and *y*-intercept of each equation.

1. $y = 2x + 3$

   $m =$ _____

   $b =$ _____

2. $y = -5x - 2$

   $m =$ _____

   $b =$ _____

3. $y = -3x + 2$

   $m =$ _____

   $b =$ _____

4. $y = x - 3$

   $m =$ _____

   $b =$ _____

5. $y = \frac{1}{2}x - 4$

   $m =$ _____

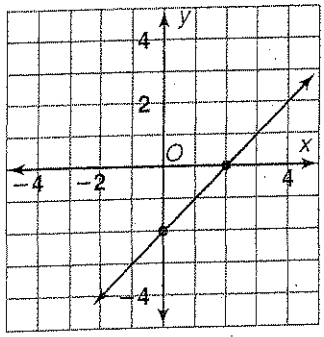
   $b =$ _____

6. $y = 5x$

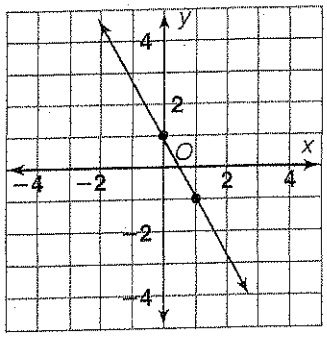
   $m =$ _____

   $b =$ _____

Write an equation for each line.

7. 

   _____

8. 

   _____

Course 3 Topics

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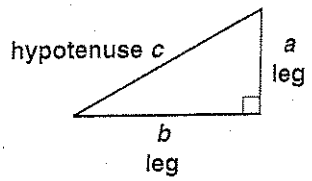
Review 243

The Pythagorean Theorem

The Pythagorean Theorem

The sum of the squares of the lengths of the *legs* of a right triangle is equal to the square of the length of the *hypotenuse.*

Also, if $a^2 + b^2 = c^2$, then the triangle is a right triangle.



$a^2 + b^2 = c^2$

Example 1: Find the length of a leg of a right triangle if the length of the other leg is 12 cm and the length of the hypotenuse is 13 cm.

$$\begin{aligned} a^2 + b^2 &= c^2 \\ 12^2 + b^2 &= 13^2 \\ 144 + b^2 &= 169 \\ 144 - 144 + b^2 &= 169 - 144 \\ b^2 &= 25 \\ b &= \sqrt{25} \\ b &= 5 \end{aligned}$$

The length of the leg is 5 cm.

Example 2: Is a triangle with sides 6 m, 7 m, and 10 m a right triangle?

$a^2 + b^2 = c^2$
$6^2 + 7^2 \stackrel{?}{=} 10^2$ ← Substitute.
$36 + 49 \stackrel{?}{=} 100$ ← Simplify.
$85 \neq 100$

The triangle is *not* a right triangle.

The lengths of two sides of a right triangle are given. Find the length of the third side.

1. legs: 6 ft and 8 ft
   hypotenuse: _____

2. leg: 15 m
   hypotenuse: 17 m
   leg: _____

3. leg: 12 in.
   hypotenuse: 15 in.
   leg: _____

4. leg: 1.5 km
   hypotenuse: 2.5 km
   leg: _____

5. legs: 15 in. and 20 in.
   hypotenuse: _____

6. leg: 16 m
   hypotenuse: 34 m
   leg: _____

Is a triangle with the given side lengths a right triangle?

7. 10 cm, 24 cm, 26 cm _____

8. 5 ft, 7 ft, 9 ft _____

9. 6 m, 12 m, 15 m _____

10. 5 in., 12 in., 13 in. _____

11. 30 mm, 40 mm, 50 mm _____

12. 2 yd, 5 yd, 8 yd _____

Name _____ Class _____ Date _____

Review 247

Solving Proportions

A *proportion* states that two ratios are equal. To solve a proportion that contains a variable, find a value of the variable that makes the statement true. Use *cross products.*

Example 1: Solve the proportion $\frac{3}{4} = \frac{n}{20}$.

① Write the proportion. $\frac{3}{4} = \frac{n}{20}$

② Use cross products. $3 \cdot 20 = 4 \cdot n$

③ Solve. $60 = 4n$
$15 = n$

When you write a proportion, remember that matching terms in the ratios should represent the same thing.

Example 2: Minh makes bouquets having 4 roses out of 7 flowers. How many roses are there out of 14 flowers?

① Write the proportion. $\frac{4}{7} = \frac{n}{14}$ $\frac{(roses)}{(flowers)}$

② Use cross products. $4 \cdot 14 = 7n$

③ Solve. $56 = 7n$
$8 = n$

There are 8 roses out of 14 flowers.

Solve each proportion.

1. $\frac{5}{3} = \frac{n}{6}$

   $30 =$ _____

   $n =$ _____

2. $\frac{s}{4} = \frac{7}{2}$

   $2s =$ _____

   $s =$ _____

3. $\frac{15}{12} = \frac{5}{y}$

   $15y =$ _____

   $y =$ _____

4. $\frac{5}{7} = \frac{w}{21}$

   $105 =$ _____

   $w =$ _____

5. $\frac{b}{10} = \frac{6}{15}$

   $15b =$ _____

   $b =$ _____

6. $\frac{9}{12} = \frac{3}{n}$

   $9n =$ _____

   $n =$ _____

Write a proportion for each situation. Then solve.

7. Eight out of 10 fish are trout. How many trout are there out of 40 fish?

   _____

   $w =$ _____

8. There is 1 robin for every 5 birds. How many robins are there for 15 birds?

   _____

   $b =$ _____

9. Two flowers cost $.66. How much does 1 flower cost?

   _____

   $n =$ _____

Name _____ Class _____ Date _____

Review 263

- To multiply numbers or variables with the same base, add the exponents.

Simplify $3^2 \cdot 3^4$.	Simplify $n^3 \cdot n^4$.	Simplify $-4^3 \cdot -4^5$.
$3^2 \cdot 3^4 = 3^{(2+4)}$	$n^3 \cdot n^4 = n^{(3+4)}$	$-4^3 \cdot -4^5 = -4^{(3+5)}$
$= 3^6$	$= n^7$	$= -4^8$

- To multiply numbers in scientific notation.

Find the product $(5 \times 10^4)(7 \times 10^5)$. Write the result in scientific notation.

$(5 \times 10^4)(7 \times 10^5)$

$(5 \cdot 7)(10^4 \cdot 10^5)$ ← Use the Associative and Commutative properties.

$35 \times (10^4 \cdot 10^5)$ ← Multiply 5 and 7.

$35 \times 10^{4+5}$ ← Add the exponents for the powers of 10.

35×10^9

$3.5 \times 10^1 \times 10^9$ ← Write 35 in scientific notation.

3.5×10^{10} ← Add the exponents.

Write each expression using a single exponent.

1. $5^3 \cdot 5^4$ _____
2. $a^2 \cdot a^5$ _____
3. $(-8)^4 \cdot (-8)^5$ _____
4. $n^6 \cdot n^2$ _____
5. $m^3 \cdot m^6$ _____
6. $(-7)^4 \cdot (-7)^2$ _____
7. $(-3)^2 \cdot (-3)^2$ _____
8. $2^5 \cdot 2^2$ _____
9. $c^5 \cdot c^3$ _____
10. $7^5 \cdot 7^9$ _____
11. $n^3 \cdot n^{11}$ _____
12. $3^5 \cdot 3^2$ _____

Find each product. Write the answer in scientific notation.

13. $(3 \times 10^4)(5 \times 10^3)$ _____
14. $(2 \times 10^3)(7 \times 10^6)$ _____
15. $(8 \times 10^2)(5 \times 10^2)$ _____
16. $(9 \times 10^4)(7 \times 10^4)$ _____
17. $(4 \times 10^2)(7 \times 10^5)$ _____
18. $(8 \times 10^3)(4 \times 10^5)$ _____

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Review 264

Exponents and Division

To divide powers with the same base, subtract exponents.

$\frac{8^6}{8^4} = 8^{6-4}$ $\quad$ $\frac{a^5}{a^3} = a^{5-3}$

$= 8^2$ $\quad$ $= a^2$

$= 64$

- For any nonzero number a, $a^0 = 1$.

$3^0 = 1$ $\quad$ $(-6)^0 = 1$ $\quad$ $4t^0 = 4(1) = 4$

- For any nonzero number a and any integer n, $a^{-n} = \frac{1}{a^n}$.

$2^{-4} = \frac{1}{2^4}$ $\quad$ $3c^{-2} = \frac{3}{c^2}$ $\quad$ $\frac{5^3}{5^6} = 5^{3-6}$ $\quad$ $\frac{10z^3}{5z} = 2z^{3-1}$

$= \frac{1}{16}$ $\quad$ $= 5^{-3}$ $\quad$ $= 2z^2$

$= \frac{1}{5^3}$

$= \frac{1}{125}$

Write each expression using a single exponent.

1. $\frac{6^5}{6^3} =$ _____
2. $(-4)^5 \div (-4)^3 =$ _____
3. $9^8 \div 9^6 =$ _____
4. $(-3)^{-2} =$ _____
5. $\frac{2^5}{2^7} =$ _____
6. $(-8)^0 =$ _____
7. $\frac{5^0}{5^2} =$ _____
8. $(-4)^{-3} =$ _____
9. $\frac{(-6)^4}{(-6)^6} =$ _____
10. $7^3 \div 7^5 =$ _____
11. $9^8 \div 9^{10} =$ _____
12. $\frac{2^7}{2^3} =$ _____

Simplify each expression. Use only positive exponents.

13. $w^8 \div w^3 =$ _____
14. $x^6 \div x^1 =$ _____
15. $\frac{d^7}{d^3} =$ _____
16. $y^6 \div y^9 =$ _____
17. $a^{10} \div a^4 =$ _____
18. $3m^6 \div m^2 =$ _____
19. $\frac{w^2}{w^6} =$ _____
20. $4c^5 \div c^8 =$ _____
21. $\frac{8x^2}{4x^5} =$ _____
22. $8a^4 \div 2a^2 =$ _____
23. $6w^2 \div 2w^5 =$ _____
24. $\frac{6x^6}{3x^9} =$ _____

Course 3 Topics