1-1 Expressions and Formulas

Evaluate each expression.

11. $[28 - (16 + 3)] \div 3$ **3**

12. $\frac{2}{3}(3^3 + 12)$ **26**

13. $\frac{15(9 - 7)}{3}$ **10**

Evaluate each expression if $w = 0.2$, $x = 10$, $y = \frac{1}{2}$, and $z = -4$.

14. $4w - 8y$ **−3.2**

15. $z^2 + xy$ **21**

16. $\frac{5w - xy}{z}$ **1**

17. **GEOMETRY** The formula for the volume of a cylinder is $V = \pi r^2 h$, where V is the volume, r is the radius, and h is the height. What is the volume of a cylinder that is 6 inches high and has a radius of 3 inches? **≈169.65 in³**

Example 1

Evaluate $(12 - 15) \div 3^2$.

$(12 - 15) \div 3^2 = -3 \div 3^2$ Subtract.

$= -3 \div 9$ $3^2 = 9$

$= -\frac{1}{3}$ Divide.

Example 2

Evaluate $\frac{a^2}{2ac - b}$ if $a = -6$, $b = 5$, and $c = 0.25$.

$\frac{a^2}{2ac - b} = \frac{(-6)^2}{2(-6)(0.25) - 5}$ $a = -6$, $b = 5$, and $c = 0.25$

$= \frac{36}{2(-1.5) - 5}$ Evaluate the numerator and denominator separately.

$= \frac{36}{-8}$ or $-\frac{9}{2}$ Simplify.

1-2 Properties of Real Numbers

Name the sets of numbers to which each value belongs.

18. $1.\overline{3}$ **Q, R** **19.** $\sqrt{4}$ **N, W, Z, Q, R** **20.** $-\frac{3}{4}$ **Q, R**

Simplify each expression.

21. $4x - 3y + 7x + 5y$ **$11x + 2y$**

22. $2(a + 3) - 4a + 8b$ **$-2a + 8b + 6$**

23. $4(2m + 5n) - 3(m - 7n)$ **$5m + 41n$**

24. **MONEY** At Fun City Amusement Park, hot dogs sell for $3.50 and sodas sell for $2.50. Dion bought 3 hot dogs and 3 sodas during one day at the park.

a. Illustrate the Distributive Property by writing two expressions to represent the cost of the hot dogs and the sodas. **3(3.50 + 2.50) or 3(3.50) + 3(2.50)**

b. Use the Distributive Property to find how much money Dion spent on food and drinks. **$18**

Example 3

Name the sets of numbers to which $\sqrt{50}$ belongs.

$\sqrt{50} = 5\sqrt{2}$ Irrationals (I), and reals (R)

Example 4

Simplify $-4(a + 3b) + 5b$.

$-4(a + 3b) + 5b$ Original expression

$= -4(a) + -4(3b) + 5b$ Distributive Property

$= -4a - 12b + 5b$ Multiply.

$= -4a - 7b$ Simplify.

1-3 Solving Equations

Solve each equation. Check your solution.

25. $8 + 5r = -27$ **-7**

26. $4w + 10 = 6w - 13$ **$\frac{23}{2}$**

27. $\frac{x}{6} + \frac{x}{3} = \frac{3}{4}$ **$\frac{3}{2}$**

28. $6b - 5 = 3(b + 2)$ **$\frac{11}{3}$**

29. **MONEY** It cost Lori $14 to go to the movies. She bought popcorn for $3.50 and a soda for $2.50. How much was her ticket? **$8**

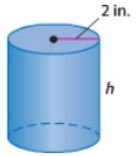
Solve each equation or formula for the specified variable.

30. $2k - 3m = 16$ for k **$k = \frac{16 + 3m}{2}$**

31. $\frac{r + 5}{mn} = p$ for m **$m = \frac{r + 5}{pn}$**

32. $A = \frac{1}{2}h(a + b)$ for h **$h = \frac{2A}{a + b}$**

33. **GEOMETRY** Yu-Jun wants to fill the water container at the right. He knows that the radius is 2 inches and the volume is 100.48 cubic inches. What is the height of the water bottle? Use the formula for the volume of a cylinder, $V = \pi r^2 h$, to find the height of the bottle. **8 in.**



Example 5

Solve $-3(a - 3) + 2(3a - 2) = 14$.

$-3(a - 3) + 2(3a - 2) = 14$	Original equation
$-3a + 9 + 6a - 4 = 14$	Distributive Property
$-3a + 6a + 9 - 4 = 14$	Commutative Property
$3a + 5 = 14$	Substitution Property
$3a = 9$	Subtraction Property
$a = 3$	Division Property

Example 6

Solve each equation or formula for the specified variable.

a. $y = 2x + 3z$ for x

$y = 2x + 3z$	Original equation
$y - 3z = 2x$	Subtract $3z$ from each side.
$\frac{y - 3z}{2} = x$	Divide each side by 2.

b. $V = \frac{\pi r^2 h}{3}$ for h

$V = \frac{\pi r^2 h}{3}$	Original equation
$3V = \pi r^2 h$	Multiply each side by 3.
$\frac{3V}{\pi r^2} = h$	Divide each side by πr^2.

1-4 Solving Absolute Value Equations

Solve each equation. Check your solution.

34. $|r + 5| = 12$ **$\{-17, 7\}$**

35. $4|a - 6| = 16$ **$\{2, 10\}$**

36. $|3x + 7| = -15$ **$\varnothing$**

37. $|b + 5| = 2b - 9$ **$\{14\}$**

38. **MEASUREMENT** Marcos is cutting ribbons for a craft project. Each ribbon needs to be $\frac{3}{4}$ yard long. If each piece is always within plus or minus $\frac{1}{16}$ yard, how long are the shortest and longest pieces of ribbon? **$\frac{11}{16}$ yd; $\frac{13}{16}$ yd**

Example 7

Solve $|3m + 7| = 13$.

Case 1

$a = b$

$3m + 7 = 13$

$3m = 6$

$m = 2$

Case 2

$a = -b$

$3m + 7 = -13$

$3m = -20$

$m = -\frac{20}{3}$

The solutions are 2 and $-\frac{20}{3}$.

1-5 Solving Inequalities

Solve each inequality. Then graph the solution set on a number line.

39. $-4a \leq 24$ **39–42. See margin.**

40. $\frac{r}{5} - 8 > 3$

41. $4 - 7x \geq 2(x + 3)$

42. $-p - 13 < 3(5 + 4p) - 2$

43. MONEY Ms. Hawkins is taking her science class on a field trip to a museum. She has $572 to spend on the trip. There are 52 students that will go to the museum. The museum charges $5 per student, and Ms. Hawkins gets in for free. If the students will have slices of pizza for lunch that cost $2 each, how many slices can each student have?
3 or fewer slices each

Example 8

Solve $2m - 7 < -11$. Graph the solution set on a number line.

$2m - 7 < -11$ Original inequality

$2m < -4$ Add 7 to each side.

$m < -2$ Divide each side by 2.

The solution set is $\{m \mid m < -2\}$.

The graph of the solution set is shown below.

1-6 Solving Compound and Absolute Value Inequalities

Solve each inequality. Graph the solution set on a number line. **44–52. See margin.**

44. $2m + 4 < 7$ or $3m + 5 > 14$

45. $-5 < 4x + 3 < 19$

46. $6y - 1 > 17$ or $8y - 6 \leq -10$

47. $-2 \leq 5(m - 3) < 9$

48. $|a| + 2 < 15$

49. $|p - 14| \leq 19$

50. $|6k - 1| < 15$

51. $|2r + 7| < -1$

52. $\frac{1}{3}|8q + 5| \geq 7$

53. MONEY Cara is making a beaded necklace for a gift. She wants to spend between $20 and $30 on the necklace. The bead store charges $2.50 for large beads and $1.25 for small beads. If she buys 3 large beads, how many small beads can she buy to stay within her budget? Write and solve a compound inequality to describe the range of possible beads.
$20 \leq 2.50(3) + 1.25b \leq 30$; $10 \leq b \leq 18$

Example 9

Solve each inequality. Graph the solution set on a number line.

a. $-14 \leq 3x - 8 < 16$

$-14 \leq 3x - 8 < 16$ Original inequality

$-6 \leq 3x < 24$ Add 8 to each part.

$-2 \leq x < 8$ Divide each part by 3.

The solution set is $\{x \mid -2 \leq x < 8\}$.

b. $|3a - 5| > 13$

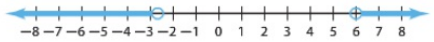
$|3a - 5| > 13$ is equivalent to $3a - 5 > 13$ or $3a - 5 < -13$.

$3a - 5 > 13$ or $3a - 5 < -13$

$3a > 18$ $3a < -8$ Subtract.

$a > 6$ $a < -\frac{8}{3}$ Divide.

The solution set is $\left\{a \mid a > 6 \text{ or } a < -\frac{8}{3}\right\}$.



51. $\varnothing$

52. $\left\{q \mid q \leq -\frac{13}{4} \text{ or } q \geq 2\right\}$

Additional Answers (Practice Test)

8. $b < -2$

10. $\left\{r \mid r < -2 \text{ or } r > \frac{7}{2}\right\}$

11. $\{p \mid -7 \leq p \leq 15\}$

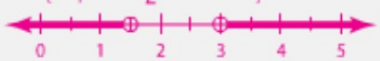
39. $a \geq -6$

40. $r > 55$

41. $x \leq -\frac{2}{9}$

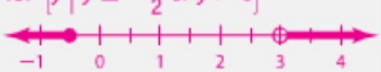
42. $p > -2$

44. $\left\{m \mid m < \frac{3}{2} \text{ or } m > 3\right\}$



45. $\{x \mid -2 < x < 4\}$

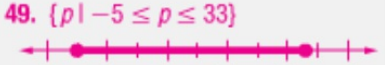
46. $\left\{y \mid y \leq -\frac{1}{2} \text{ or } y > 3\right\}$



47. $\left\{m \mid \frac{13}{5} \leq m < \frac{24}{5}\right\}$

48. $\{a \mid -13 < a < 13\}$

49. $\{p \mid -5 \leq p \leq 33\}$



50. $\left\{k \mid -\frac{7}{3} < k < \frac{8}{3}\right\}$