Chapter 1 - Equations and Inequalities - Get Ready for Chapter 1

Simplify

1. \(15.7 + (-3.45) = 15.7 - 3.45 = 12.25\)

2. \(-18.54 - (-32.05) = -18.54 + 32.05 = 13.51\)

3. \(-9.8 \cdot 6.75 = -(9.8)(6.75) = -66.15\)

4. \(4 \div (-0.5) = \frac{4}{-0.5} = \frac{-4}{0.5} = -8\)

5. \(3\frac{2}{3} + (-1\frac{4}{5}) = \frac{11}{3} + \left(-\frac{9}{5}\right) = \frac{11 \cdot 5 - 9 \cdot 3}{15} = \frac{55 - 27}{15} = \frac{28}{15} = \frac{13}{15}\)
6. \[
\frac{54}{7} - \frac{26}{6} = \frac{54(6) - 26(7)}{42}
\]
\[
= \frac{324 - 182}{42}
\]
\[
= \frac{142}{42}
\]
\[
= 3 \frac{16}{42}
\]
\[
= 3 \frac{16}{2} \div 2
\]
\[
= 3 \frac{8}{21}
\]

7. \[
\left( \frac{6}{5} \right) \left( -\frac{10}{9} \right) = -\frac{(6)(10)}{(5)(9)}
\]
\[
= -\frac{60}{45}
\]
\[
= -\frac{60}{45} \div 15
\]
\[
= -\frac{4}{3}
\]
\[
= -1 \frac{1}{3}
\]

8. \[
-3 \div \frac{7}{8} = -\frac{3}{\left( \frac{7}{8} \right)}
\]
\[
= -3 \left( \frac{8}{7} \right)
\]
\[
= -\frac{3(8)}{7}
\]
\[
= -\frac{24}{7}
\]
\[
= -3 \frac{3}{7}
\]
9. Multiply $\frac{7}{8}$ with 12.

\[
\frac{7}{8} \times 12 = \frac{7 \times 12}{8} = \frac{84}{8} = 10\frac{4}{8} = 10\frac{1}{2}
\]

Felisa will need $10\frac{1}{2}$ yards of material to make 12 quilts.

Evaluate each power.

10. $6^3 = (6)(6)(6) = 216$

11. $(-4)^3 = (-4)(-4)(-4) = -64$

12. $-(0.6)^2 = -(0.6)(0.6) = -0.36$

13. $-(2.5)^3 = -[(2.5)(2.5)(2.5)] = -[15.625] = 15.625$

14. $\left(\frac{4}{5}\right)^2 = \left(\frac{4}{5}\right) \times \left(\frac{4}{5}\right) = \frac{4 	imes 4}{5 	imes 5} = \frac{16}{25}$

15. $\left(\frac{7}{3}\right)^4 = \left(\frac{7}{3}\right) \times \left(\frac{7}{3}\right) \times \left(\frac{7}{3}\right) \times \left(\frac{7}{3}\right) = \frac{7 	imes 7 	imes 7 	imes 7}{3 	imes 3 	imes 3 	imes 3} = \frac{2401}{81}$
16. \[ \left( -\frac{7}{10} \right)^2 = \left( -\frac{7}{10} \right) \left( -\frac{7}{10} \right) = \frac{(-7)(-7)}{(10)(10)} = \frac{49}{100} \]

17. \[ \left( -\frac{15}{2} \right)^3 = \left( -\frac{15}{2} \right) \left( -\frac{15}{2} \right) \left( -\frac{15}{2} \right) = \frac{(-15)(-15)(-15)}{(2)(2)(2)} = \frac{-3375}{8} \]

18. \[ 3^3 = (3)(3)(3) = 27 \]

Identify each statement as true or false

19. True

20. True

21. \[ \frac{1}{7} \leq \frac{1}{9} \]
   \[ \frac{1.9}{7} \leq \frac{1.7}{9} \]
   \[ \frac{9}{63} \leq \frac{7}{63} \]
   False; \( \frac{9}{63} \not\leq \frac{7}{63} \) because \( \frac{9}{63} > \frac{7}{63} \).

22. \[ \frac{5}{6} \leq \frac{25}{30} \]
   \[ \frac{5}{6} \leq \frac{25 \div 5}{30 \div 5} \]
   \[ \frac{5}{6} \leq \frac{5}{6} \]
   True.
23. \[
\frac{2?}{3} > 0.6
\]
\[
\frac{0.6}{?} > 0.6
\]
\[
0.6 > 0.6\checkmark
\]
Yes, Marissa is correct.
1-1 Expressions and Formulas - Check Your Understanding

Evaluate each expression if \( a = -2, b = 3, \) and \( c = 4.2. \)

1. \[ a - 2b + 3c = (-2) - 2(3) + 3(4.2) \]
   \[ = -2 - 6 + 12.6 \]
   \[ = -8 + 12.6 \]
   \[ = 4.6 \]

2. \[ 2a + (b + 3)^2 = 2(-2) + (3 + 3)^2 \]
   \[ = 2(-2) + (6)^2 \]
   \[ = -4 + 36 \]
   \[ = 32 \]

3. \[ a + 3\left(b^2 -(a+c)\right) = -2 + 3\left[3^2 - (-2 + 4.2)\right] \]
   \[ = -2 + 3\left[9 - 2.2\right] \]
   \[ = -2 + 3[6.8] \]
   \[ = -2 + 20.4 \]
   \[ = 18.4 \]

4. \[ 5c - 2\left[(b-a) + c\right] = 5(4.2) - 2\left[(3 - (-2)) + 4.2\right] \]
   \[ = 21 - 2\left[(3 + 2) + 4.2\right] \]
   \[ = 21 - 2[5 + 4.2] \]
   \[ = 21 - 2[9.2] \]
   \[ = 21 - 18.4 \]
   \[ = 2.6 \]

5. \[ 4(2a + 3b) - 2c = 4\left[2(-2) + 3(3)\right] - 2(4.2) \]
   \[ = 4[-4 + 9] - 8.4 \]
   \[ = 4[5] - 8.4 \]
   \[ = 20 - 8.4 \]
   \[ = 11.6 \]

6. \[ \frac{a^2 + 4c}{3b + 2a} = \frac{(-2)^2 + 4(4.2)}{3(3) + 2(-2)} \]
   \[ = \frac{4 + 16.8}{9 - 4} \]
   \[ = \frac{20.8}{5} \]
   \[ = 4.16 \]
7. \[ \frac{b^3 + ac}{ab + 2bc} = \frac{3^3 + (-2)(4.2)}{(-2)(3) + 2(3)(4.2)} \]
   \[= \frac{27 - 8.4}{-6 + 25.2} \]
   \[= \frac{18.6}{19.2} \]
   \[= 0.96875 \]

8. \[ \frac{3b + 2a}{5 - c} = \frac{3(3) + 2(-2)}{5 - 4.2} \]
   \[= \frac{9 - 4}{0.8} \]
   \[= \frac{5}{0.8} \]
   \[= 6.25 \]

9. \[ \frac{3a - 2c}{4ab} = \frac{3(-2) - 2(4.2)}{4(-2)(3)} \]
   \[= \frac{-6 - 8.4}{-24} \]
   \[= \frac{-14.4}{-24} \]
   \[= 0.6 \]

10. a. Substitute \( k = 22 \), \( e = 11 \), and \( t = 35 \) in the formula \( A = \frac{k - e}{t} \).

    \[ A = \frac{22 - 11}{35} \]
    \[= \frac{11}{35} \]
    \[= 0.314 \text{ or } 31.4\% \]

    The attack percentage is about 31.4%.

b. Substitute \( k = 33 \), \( e = 9 \), and \( t = 50 \) in the formula \( A = \frac{k - e}{t} \).

    \[ A = \frac{33 - 9}{50} \]
    \[= \frac{24}{50} \]
    \[= 0.48 \text{ or } 48\% \]

    The attack percentage is 48%.
1-1 Expressions and Formulas - Practice and Problem Solving

Evaluate each expression if \( w = -3, x = 4, y = 2.6, \) and \( z = \frac{1}{3} \).

11. Substitute \( x = 4, y = 2.6 \) or \( \frac{13}{5} \), and \( z = \frac{1}{3} \) in the expression \( y + x - z \).

\[
y + x - z = \frac{13}{5} + 4 - \frac{1}{3} = \frac{13(3) + 4(15) - 1(5)}{15} = \frac{39 + 60 - 5}{15} = \frac{94}{15} = 6 \frac{4}{15}
\]

12. \( w - 2x + y \div 2 = w - 2x + \frac{y}{2} \)

\[
-3 - 2(4) + \frac{2.6}{2} = -3 - 8 + 1.3 = -11 + 1.3 = -9.7
\]

13. \( 4(x - w) = 4(4 - (-3)) \)

\[
4(4 + 3) = 4(7) = 28
\]

14. \( 6(y + x) = 6(2.6 + 4) \)

\[
6(6.6) = 39.6
\]

15. \( 9z - 4y + 2w = 9 \left( \frac{1}{3} \right) - 4(2.6) + 2(-3) \)

\[
= 3 - 10.4 - 6 = 3 - 16.4 = -13.4
\]
16. Substitute $x = 4, y = 2.6$ or $\frac{13}{5}$, and $z = \frac{1}{3}$ in the expression $3y - 4z + x$.

$$3y - 4z + x = 3\left(\frac{13}{5}\right) - 4\left(\frac{1}{3}\right) + 4$$

$$= \frac{39}{5} - \frac{4}{3} + 4$$

$$= \frac{39(3) - 4(5) + 4(15)}{15}$$

$$= \frac{117 - 20 + 60}{15}$$

$$= \frac{117 + 40}{15}$$

$$= \frac{157}{15}$$

$$= 10 \frac{7}{15}$$

17. a. miles per gallon $\times$ number of gallons = distance traveled

$33 \times 46.2 = \text{distance traveled}$

$1524.6 = \text{distance traveled}$

Distance traveled was 1524.6 miles.

b. distance traveled $= 60 \times 12$ or 720 miles.

Evaluate each expression if $a = -4, b = -0.8, c = 5$, and $d = \frac{1}{5}$.

18. \[
\frac{a + b}{c - d} = \frac{-4 + (-0.8)}{5 - \frac{1}{5}}
\]

$$= \frac{-4 - 0.8}{\left(\frac{25 - 1}{5}\right)}$$

$$= \frac{-4.8}{\left(\frac{24}{5}\right)}$$

$$= -4.8\left(\frac{5}{24}\right)$$

$$= \frac{-24}{24}$$

$$= -1$$
19. \[
\frac{a-b}{bd} = \frac{-4-(-0.8)}{(-0.8)\left(\frac{1}{5}\right)}
= \frac{-4 + 0.8}{\frac{-0.8}{5}}
= \frac{-3.2}{-0.16}
= 20
\]

20. \[
\frac{ac}{d+b} = \frac{(-4)(5)}{\frac{1}{5} + (-0.8)}
= \frac{-20}{\frac{1}{5} - 0.8}
= \frac{-20}{\frac{1 - 0.8(5)}{5}}
= \frac{-20}{\frac{1 - 4}{5}}
= \frac{-20}{\frac{-3}{5}}
= \frac{-20(5)}{-3}
= \frac{100}{3}
= 33\frac{1}{3}
\]
21. \[
\frac{b^2c^2}{ad} = \frac{(-0.8)^2(5)^2}{(-4)\left(\frac{1}{5}\right)}
\]
\[
= \frac{(0.64)(25)}{\left(-\frac{4}{5}\right)}
\]
\[
= \frac{16}{\left(-\frac{4}{5}\right)}
\]
\[
= 16\left(-\frac{5}{4}\right)
\]
\[
= -\left(16\right)(5)
\]
\[
= \frac{-80}{4}
\]
\[
= -20
\]

22. \[
\frac{b + 6}{4(d + c)} = \frac{-0.8 + 6}{4\left(\frac{1}{5} + 5\right)}
\]
\[
= \frac{-0.8 + 6}{4\left(\frac{1 + 25}{5}\right)}
\]
\[
= \frac{5.2}{4\left(\frac{26}{5}\right)}
\]
\[
= \frac{5.2}{\left(4\frac{26}{5}\right)}
\]
\[
= \frac{5.2}{\frac{104}{5}}
\]
\[
= \frac{5.2(5)}{104}
\]
\[
= \frac{26}{104}
\]
\[
= 0.25
\]
23. \[
\frac{5(d + a)}{2ab^2} = \frac{5\left(\frac{1}{5} + (-4)\right)}{2(-4)(-0.8)^2}
\]
\[
= \frac{5\left(\frac{1}{5} - 4\right)}{(-8)(0.64)}
\]
\[
= \frac{5\left(\frac{1 - 20}{5}\right)}{-5.12}
\]
\[
= \frac{5\left(-\frac{19}{5}\right)}{-5.12}
\]
\[
= \frac{-19}{-5.12}
\]
\[
\approx 3.71
\]
24. a. Substitute 64 for $F$ in the formula $C = \frac{5(F - 32)}{9}$.

\[
C = \frac{5(64 - 32)}{9} = \frac{5(32)}{9} = \frac{160}{9} \approx 17.8
\]

Substitute 73 for $F$ in the formula $C = \frac{5(F - 32)}{9}$.

\[
C = \frac{5(73 - 32)}{9} = \frac{5(41)}{9} = \frac{205}{9} \approx 22.8
\]

The room temperature range is about 17.8°C to 22.8°C.

b. Substitute 98.6 for $F$ in the formula $C = \frac{5(F - 32)}{9}$.

\[
C = \frac{5(98.6 - 32)}{9} = \frac{5(66.6)}{9} = \frac{333}{9} = 37
\]

So, 98.6°F = 37°C. Since 42 > 37, this temperature indicates a fever.

25. 

\[
A = \frac{1}{2}bh = \frac{1}{2}(x + 7)(2x)
\]

26. Let $x$ be the profit made by each share.

\[
x = \frac{536,897,000}{10,995,000} \approx 48.83
\]

Each share made a profit of about $48.83.
27. a. 
\[ C = 2\pi r \]
\[ = 2\pi (93,000,000) \]
\[ \approx 584,336,233.6 \]
The circumference of Earth’s orbit is about 584,336,233.6 miles.

b. Substitute \( C = 584,336,233.6 \) and \( V = 66,698 \) in the formula \( T = \frac{C}{V} \).

\[ T = \frac{584,336,233.6}{66,698} \]
\[ \approx 8761 \]
Therefore, it takes about 8761 hours for Earth to revolve around the Sun.

c. Yes, because \( \frac{8761}{24} \approx 365 \) days or 1 year.

28. a. Substitute \( l = 230 \) and \( w = 230 \) in the formula \( A = lw \).

\[ A = lw \]
\[ = (230)(230) \]
\[ = 52,900 \]
The base area of the pyramid is 52,900 m².

b. Substitute \( B = 52,900 \) and \( h = 146.7 \) in the formula \( V = \frac{1}{3} Bh \).

\[ V = \frac{1}{3} (52900)(146.7) \]
\[ = \frac{7760430}{3} \]
\[ = 2,586,810 \]
The volume of the pyramid is about 2,586,810 m³.

Evaluate each expression if \( w = \frac{3}{4}, x = 8, y = -2, \) and \( z = 0.4 \).

29. \[ x^3 + 2y^4 = 8^3 + 2(-2)^4 \]
\[ = 512 + 2(16) \]
\[ = 512 + 32 \]
\[ = 544 \]

30. \[ (x - 6z)^2 = (8 - 6(0.4))^2 \]
\[ = (8 - 2.4)^2 \]
\[ = 5.6^2 \]
\[ = 31.36 \]
31.  
$$2(6w - 2y) - 8z = 2 \left[ 6 \left( \frac{3}{4} \right) - 2(-2) \right] - 8(0.4)$$
$$= 2 \left[ \frac{18}{4} + 4 \right] - 3.2$$
$$= 2 \left( \frac{18 + 16}{4} \right) - 3.2$$
$$= 2 \left( \frac{34}{4} \right) - 3.2$$
$$= \frac{68}{4} - 3.2$$
$$= 17 - 3.2$$
$$= 13.8$$

32.  
$$\frac{(y + z)^2}{xw} = \frac{(-2 + 0.4)^2}{8 \left( \frac{3}{4} \right)}$$
$$= \frac{(-1.6)^2}{(2)(3)}$$
$$= \frac{2.56}{6}$$
$$\approx 0.427$$

33.  
$$\frac{12w - 6y}{z^2} = \frac{12 \left( \frac{3}{4} \right) - 6(-2)}{(0.4)^2}$$
$$= \frac{(3)(3) + 12}{0.16}$$
$$= \frac{9 + 12}{0.16}$$
$$= \frac{21}{0.16}$$
$$= 131.25$$
34. \[
\frac{wx + yz}{wx - yz} = \frac{\left(\frac{3}{4}\right)(8) + (-2)(0.4)}{\left(\frac{3}{4}\right)(8) - (-2)(0.4)}
\]
\[
= \frac{(3)(2) - 0.8}{(3)(2) + 0.8}
\]
\[
= \frac{6 - 0.8}{6 + 0.8}
\]
\[
= \frac{5.2}{6.8}
\]
\[
= 0.765
\]

35. \[
r = \frac{6x}{2}
\]
\[
= 3x
\]
The expression for the radius of the cone is 3x.

\[
V = \frac{1}{3}\pi r^2 h
\]
\[
= \frac{1}{3}\pi (3x)^2 (2x)
\]
\[
= \frac{1}{3}\pi (9x^2)(2x)
\]
\[
= \frac{18\pi x^3}{3}
\]
\[
= 6\pi x^3
\]
The expression for the volume of the cone is \(6\pi x^3\).

36. Substitute \(L = 10\) in the formula \(PR = 0.15 + 0.85L\).

\[
PR = 0.15 + 0.85(10)
\]
\[
= 0.15 + 8.5
\]
\[
= 8.65
\]

37. Substitute \(n = 120\) in the formula \(t = 50 + \frac{n - 40}{4}\).

\[
t = 50 + \frac{120 - 40}{4}
\]
\[
= 50 + \frac{80}{4}
\]
\[
= 50 + 20
\]
\[
= 70
\]
The temperature is 70°F.
\[
\left( \frac{C - 0.3}{A} + \frac{Y - 3}{4} + \frac{T}{0.05} + \frac{0.095 - I}{0.04} \right) \cdot \frac{100}{6} = \left( \frac{C - 0.3A + Y - 3A + T}{4A} + \frac{0.095A - I}{0.04A} \right) \cdot \frac{100}{6}
\]

\[
= \left( \frac{20(C - 0.3A) + Y - 3A + 80T + 100(0.095A - I)}{4A} \right) \cdot \frac{100}{6}
\]

\[
= \frac{20C - 6A + Y - 3A + 80T + 9.5A - 100I}{4A} \left( \frac{25}{6} \right)
\]

Substitute \( C = 108 \), \( A = 183 \), \( Y = 1159 \), \( T = 7 \), and \( I = 5 \).

\[
\frac{20C + 0.5A + Y + 80T - 100I}{A} \left( \frac{25}{6} \right) = \frac{20(108) + 0.5(183) + 1159 + 80(7) - 100(5)}{183} \left( \frac{25}{6} \right)
\]

\[
= \frac{2160 + 91.5 + 1159 + 560 - 500}{183} \left( \frac{25}{6} \right)
\]

\[
= \frac{3470.5}{183} \left( \frac{25}{6} \right)
\]

\[
= \frac{86762.5}{1098}
\]

\[
\approx 79.0
\]

Byron Leftwich’s efficiency rating is about 79.0.
39. a. Substitute \( y = 10 \) in the equation \( P = \frac{y^2}{400} + \frac{7y}{100} + 2.96 \).

\[
P = \frac{y^2}{400} + \frac{7y}{100} + 2.96
\]

\[
P = \frac{10^2}{400} + \frac{7(10)}{100} + 2.96
\]

\[
= \frac{100}{400} + \frac{70}{100} + 2.96
\]

\[
= \frac{1}{4} + \frac{7}{10} + 2.96
\]

\[
= 0.25 + 0.70 + 2.96
\]

\[
= 3.91
\]

So, the average price of a ticket in 1990 was $3.91.

b. Substitute \( y = 20 \) in the equation \( P = \frac{y^2}{400} + \frac{7y}{100} + 2.96 \).

\[
P = \frac{y^2}{400} + \frac{7y}{100} + 2.96
\]

\[
P = \frac{20^2}{400} + \frac{7(20)}{100} + 2.96
\]

\[
= \frac{400}{400} + \frac{140}{100} + 2.96
\]

\[
= \frac{1}{1} + \frac{1.4}{1} + 2.96
\]

\[
= 5.36
\]

So, the average price of a ticket in 2000 was $5.36.

c. Substitute \( y = 30 \) in the equation \( P = \frac{y^2}{400} + \frac{7y}{100} + 2.96 \).

\[
P = \frac{y^2}{400} + \frac{7y}{100} + 2.96
\]

\[
P = \frac{30^2}{400} + \frac{7(30)}{100} + 2.96
\]

\[
= \frac{900}{400} + \frac{210}{100} + 2.96
\]

\[
= \frac{2.25}{1} + \frac{2.10}{1} + 2.96
\]

\[
= 7.31
\]

So, the average price of a ticket in 2010 will be $7.31.

Sample answer: The average prices found in part (a) become increasingly higher with time.
40. \[ s = \frac{11 + 14 + 6}{2} \]
\[ = \frac{31}{2} \]
\[ = 15.5 \]
\[ A = \sqrt{15.5(15.5 - 11)(15.5 - 14)(15.5 - 6)} \]
\[ = \sqrt{15.5(4.5)(1.5)(9.5)} \]
\[ = \sqrt{993.9375} \]
\[ \approx 31.5 \]
The area of the triangle is about 31.5 square inches.

41. \[ y = \sqrt{\frac{b^2\left(1 - \frac{x^2}{a^2}\right)}{1 - \frac{2^2}{6^2}}} \]
\[ = \sqrt{\frac{8^2\left(1 - \frac{2^2}{6^2}\right)}{1 - \frac{9}{36}}} \]
\[ = \sqrt{\frac{64\left(1 - \frac{9}{36}\right)}{36}} \]
\[ = \sqrt{\frac{64\left(\frac{27}{36}\right)}{36}} \]
\[ = \sqrt{\frac{64\cdot27}{36}} \]
\[ = \sqrt{1728} \]
\[ = \sqrt{48} \]
\[ \approx 6.9 \]

42. a. 

b. Answers will vary.

<table>
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<tr>
<th>cylinder</th>
<th>radius</th>
<th>height</th>
<th>volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 in</td>
<td>5 in</td>
<td>(20\pi \approx 62.8 \text{ in}^3)</td>
</tr>
<tr>
<td>2</td>
<td>4 in</td>
<td>1 in</td>
<td>(16\pi \approx 50.3 \text{ in}^3)</td>
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c. Sample answer: \(\pi\) times 2 squared times 5 minus \(\pi\) times 4 squared times 1.

d. \(\pi(2)^2(5) - \pi(4)^2(1) = 4\pi \approx 12.5 \text{ cm}^3\)

43. Lauren is correct, since \(-12 - 20 = -32\).
44. \[ -28(-4) = \frac{-(2) - (-4) - 5}{5 - (-4) - (-2)} \]
\[ = \frac{2 + 4 - 5}{5 + 4 + 2} \]
\[ = \frac{6 - 5}{11} \]
\[ = \frac{1}{11} \]

45. Subtract 8 from each side.
\[ 4\left(\frac{k + 6}{3} - 12\right) + 8 - 8 = -48 - 8 \]
\[ 4\left(\frac{k + 6}{3} - 12\right) = -56 \]
Divide each side by 4.
\[ \frac{4\left(\frac{k + 6}{3} - 12\right)}{4} = \frac{-56}{4} \]
\[ \left(\frac{k + 6}{3} - 12\right) = -14 \]
Add 12 to each side.
\[ \left(\frac{k + 6}{3} - 12\right) + 12 = -14 + 12 \]
\[ \frac{k + 6}{3} = -2 \]
Multiply each side by 3.
\[ 3\left(\frac{k + 6}{3}\right) = 3(-2) \]
\[ k + 6 = -6 \]
Subtract 6 from each side.
\[ k + 6 - 6 = -6 - 6 \]
\[ k = -12 \]

46. Halfway between \( \frac{m}{n} \) and \( \frac{p}{q} \) is the average of the two:
\[ \frac{1}{2}\left(\frac{m + p}{n + q}\right) = \frac{1}{2}\left(\frac{mq + pn}{nq}\right) \]
\[ = \frac{mq + pn}{2nq} \]
47. Sample answer:
\[ y = \left( \frac{-4z}{x^2} - x \right) + z \]
\[ = -3 \left( \frac{-4(4)}{(-2)^2} - (-2) \right) + 4 \]
\[ = -3 \left( \frac{-16}{4} + 2 \right) + 4 \]
\[ = -3(-4 + 2) + 4 \]
\[ = -3(-2) + 4 \]
\[ = 6 + 4 \]
\[ = 10 \]

48. Sample answer: A formula is used to calculate the price of filling a gasoline tank in which the price = number of gallons × price per gallon. If calculated incorrectly, you may underestimate or overestimate how much you will need to pay.

49. A table of on-base percentages is limited to those situations listed, while a formula can be used to find any on-base percentage.

50. \[ A = (4x)^2 \]
\[ A = 16x^2 \]
\[ = 16(9) \]
\[ = 144 \]
The area of a square of side 4x is 144 square units. The correct choice is B.

51. Every month, the daily customer average increases by 73.

<table>
<thead>
<tr>
<th>Month</th>
<th>Daily Customer Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>225</td>
</tr>
<tr>
<td>2</td>
<td>298</td>
</tr>
<tr>
<td>3</td>
<td>371</td>
</tr>
<tr>
<td>4</td>
<td>444</td>
</tr>
<tr>
<td>5</td>
<td>444 + 73 = 517</td>
</tr>
<tr>
<td>6</td>
<td>517 + 73 = 590</td>
</tr>
<tr>
<td>7</td>
<td>590 + 73 = 663</td>
</tr>
<tr>
<td>8</td>
<td>663 + 73 = 736</td>
</tr>
<tr>
<td>9</td>
<td>736 + 73 = 809</td>
</tr>
</tbody>
</table>

So, he can open a second shop during the 9th month.
52. Let \( m\angle F = 2x, m\angle G = 2y \).
\[
2x + 2y + 84 = 180
\]
\[
2(x + y + 42) = 180
\]
\[
x + y + 42 = 90
\]
\[
x + y + 42 - 42 = 90 - 42
\]
\[
x + y = 48
\]
Use the Triangle Sum Theorem for the triangle \( FHG \).
\[
m\angle FHG + (x + y) = 180
\]
\[
m\angle FHG + 48 = 180
\]
\[
m\angle FHG + 48 - 48 = 180 - 48
\]
\[
m\angle FHG = 132
\]
The correct choice is G.

53. Since the skydiver falls from a height of 3000 m at a rate of 55 meters per second, the height after \( t \) seconds of free fall represents the equation \( h = -55t + 3000 \). The correct choice is B.

54. Because the longest side is 18 inches, use 18 as \( c \), the measure of the hypotenuse.
\[
c^2 = a^2 + b^2
\]
\[
18^2 = 10^2 + 14^2
\]
\[
324 = 100 + 196
\]
\[
324 \neq 296
\]
Because \( c^2 \neq a^2 + b^2 \), the triangle is not a right triangle.

55. \[
c^2 = a^2 + b^2
\]
\[
c^2 = 6^2 + 8^2
\]
\[
c^2 = 36 + 64
\]
\[
c^2 = 100
\]
\[
c = \sqrt{100}
\]
\[
c = 10
\]
The length of the hypotenuse is 10 cm.

56. Let \( x \) be the length of the reduced photo.
\[
\frac{6}{2} = \frac{x}{670}
\]
\[
6.5 = \frac{x}{670}
\]
\[
x = 6.5(465)
\]
\[
x = \frac{3022.5}{670}
\]
\[
x \approx 4.5
\]
The length of the reduced photo will be \( 4 \frac{1}{2} \) inches.
Name:

57. \[6x^2 = 2 \cdot 3 \cdot x \cdot x\]
\[12x = 2 \cdot 2 \cdot 3 \cdot x\]
The GCF of the terms \(6x^2\) and \(12x\) is \(6x\).
\[6x^2 + 12x = 6x(x) + 6x(2)\]
\[= 6x(x + 2)\]

58. Use the FOIL method to find the product.
\[(a + 2)(a - 4) = (a)(a) + a(-4) + 2(a) + 2(-4)\]
\[= a^2 - 4a + 2a - 8\]
\[= a^2 - 2a - 8\]

59. Let \(x\) be a number. Therefore, the two integers in terms of \(x\) are \((x - 2)\) and \((2x + 1)\).
Let \(y = x - 2\) and \(z = 2x + 1\) and \(y + z = 14\).
Substitute \(x = y + 2\) in the equation \(z = 2x + 1\).
\[z = 2x + 1\]
\[= 2(y + 2) + 1\]
\[= 2y + 4 + 1\]
\[= 2y + 5\]
Since both \(z\) and \(y\) are integers, substitute any integer value for \(y\) and find the corresponding \(z\) value.
Sample answer: Substitute \(y = 3\) in the equation \(z = 2y + 5\).
\[z = 2(3) + 5\]
\[= 6 + 5\]
\[= 11\]
Therefore, the two integers are 3 and 11. Note that there are infinite number of such pairs of integers exist.

Evaluate each expression.

60. \[\sqrt{4} = \sqrt{2^2}\]
\[= 2\]

61. \[\sqrt{25} = \sqrt{5^2}\]
\[= 5\]

62. \[\sqrt{81} = \sqrt{9^2}\]
\[= 9\]

63. \[\sqrt{121} = \sqrt{11^2}\]
\[= 11\]

64. \[-\sqrt{9} = -\sqrt{3^2}\]
\[= -3\]

65. \[-\sqrt{16} = -\sqrt{4^2}\]
\[= -4\]
66. \[
\frac{\sqrt{49}}{\sqrt{100}} = \frac{\sqrt{49}}{\sqrt{100}}
\]
\[
= \frac{\sqrt{7^2}}{\sqrt{10^2}}
\]
\[
= \frac{7}{10}
\]

67. \[
\frac{\sqrt{25}}{\sqrt{64}} = \frac{\sqrt{25}}{\sqrt{64}}
\]
\[
= \frac{\sqrt{5^2}}{\sqrt{8^2}}
\]
\[
= \frac{5}{8}
\]
1-2 Properties of Real Numbers - Check Your Understanding

Name the sets of numbers to which each number belongs.

1. N, W, Z, Q, R
2. Q, R
3. I, R
4. Z, Q, R

Name the property illustrated by each equation.

5. Associate Property of Multiplication
6. Distributive Property
7. Commutative Property of Addition
8. Distributive Property

Find the additive inverse and multiplicative inverse for each number.

9. Since \(-7 + 7 = 0\), the additive inverse of \(-7\) is 7.
   Since \((-7) \left(\frac{-1}{7}\right) = 1\), the multiplicative inverse of \(-7\) is \(\frac{-1}{7}\).

10. Since \(\frac{4}{9} + \left(-\frac{4}{9}\right) = 0\), the additive inverse of \(\frac{4}{9}\) is \(-\frac{4}{9}\).
    Since \(\left(\frac{4}{9}\right) \left(\frac{-9}{4}\right) = 1\), the multiplicative inverse of \(\frac{4}{9}\) is \(\frac{9}{4}\).

11. Since \(3.8 + (-3.8) = 0\), the additive inverse of \(3.8\) is \(-3.8\).
    Since \(3.8 \left(\frac{1}{3.8}\right) = 1\), the multiplicative inverse of \(3.8\) is \(\frac{1}{3.8}\).

12. Since \(\sqrt{5} + (-\sqrt{5}) = 0\), the additive inverse of \(\sqrt{5}\) is \(-\sqrt{5}\).
    Since \(\sqrt{5} \left(\frac{1}{\sqrt{5}}\right) = 1\), the multiplicative inverse of \(\sqrt{5}\) is \(\frac{1}{\sqrt{5}}\).

13. a. 22(2 + 4 + 3 + 1 + 5 + 6 + 7)
    b. Use the Distributive Property to evaluate the expression 22(2 + 4 + 3 + 1 + 5 + 6 + 7).
    \[22(2 + 4 + 3 + 1 + 5 + 6 + 7) = 22(2) + 22(4) + 22(3) + 22(1) + 22(5) + 22(6) + 22(7)\]
    \[= 44 + 88 + 66 + 22 + 110 + 132 + 154\]
Simplify each expression.

14. \[5(3x + 6y) + 4(2x - 9y) = 5(3x) + 5(6y) + 4(2x) + 4(-9y)\]
   \[= 15x + 30y + 8x - 36y\]
   \[= 15x + 8x + 30y - 36y\]
   \[= (15 + 8)x + (30 - 36)y\]
   \[= 23x - 6y\]

15. \[6(6a + 5b) - 3(4a + 7b) = 6(6a) + 6(5b) - 3(4a) - 3(7b)\]
   \[= 36a + 30b - 12a - 21b\]
   \[= 36a - 12a + 30b - 21b\]
   \[= (36 - 12)a + (30 - 21)b\]
   \[= 24a + 9b\]

16. \[-4(6c - 3d) - 5(-2c - 4d) = (-4)(6c) + (-4)(-3d) + (-5)(-2c) + (-5)(-4d)\]
   \[= -24c + 12d + 10c + 20d\]
   \[= -24c + 10c + 12d + 20d\]
   \[= (-24 + 10)c + (12 + 20)d\]
   \[= -14c + 32d\]

17. \[-5(8x - 2y) - 4(-6x - 3y) = -5(8x) + (-5)(-2y) + (-4)(-6x) + (-4)(-3y)\]
   \[= -40x + 10y + 24x + 12y\]
   \[= -40x + 24x + 10y + 12y\]
   \[= (-40 + 24)x + (10 + 12)y\]
   \[= -16x + 22y\]
1-2 Properties of Real Numbers - Practice and Problem Solving

Name the sets of numbers to which each number belongs.

18. Q, R
19. Q, R
20. N, W, Z, Q, R
21. Q, R
22. N, W, Z, Q, R
23. Z, Q, R
24. N, W, Z, Q, R
25. I, R

Name the property illustrated by each equation.

26. Additive Inverse Property
27. Distributive Property
28. Associative Property of Addition
29. Multiplicative Inverse Property

Find the additive inverse and multiplicative inverse for each number.

30. Since \(-8 + 8 = 0\), the additive inverse of \(-8\) is \(8\).
    Since \(-8\left(\frac{-1}{8}\right) = 1\), the multiplicative inverse of \(-8\) is \(-\frac{1}{8}\).

31. Since \(12.1 + (-12.1) = 0\), the additive inverse of \(12.1\) is \(-12.1\).
    Since \(12.1\left(\frac{1}{12.1}\right) = 1\), the multiplicative inverse of \(12.1\) is \(\frac{1}{12.1}\).

32. Since \(-0.25 + 0.25 = 0\), the additive inverse of \(-0.25\) is \(0.25\).
    Since \(-0.25\left(\frac{-1}{0.25}\right) = -0.25(-4) = 1\), the multiplicative inverse of \(-0.25\) is \(-4\).

33. Since \(\frac{6}{12} - \frac{6}{12} = 0\), the additive inverse of \(\frac{6}{12}\) is \(-\frac{6}{12}\).
34. Since \(-\frac{3}{8} + \frac{3}{8} = 0\), the additive inverse of \(-\frac{3}{8}\) is \(\frac{3}{8}\).

Since \(\frac{3}{8} \cdot \left(\frac{8}{3}\right) = 1\), the multiplicative inverse of \(-\frac{3}{8}\) is \(-\frac{8}{3}\).

35. Since \(\sqrt{15} - \sqrt{15} = 0\), the additive inverse of \(\sqrt{15}\) is \(-\sqrt{15}\).

Since \(\sqrt{15} \cdot \left(\frac{1}{\sqrt{15}}\right) = 1\), the multiplicative inverse of \(\sqrt{15}\) is \(\frac{1}{\sqrt{15}}\).

36. a.

\[
5\left(2\frac{1}{2}\right) + 3\left(1\frac{1}{4}\right) = 5\left(\frac{5}{2}\right) + 3\left(\frac{5}{4}\right)
\]

\[
= \frac{(5)(5)}{2} + \frac{(3)(5)}{4}
\]

\[
= \frac{25}{2} + \frac{15}{4}
\]

\[
= \frac{25(2) + 15}{4}
\]

\[
= \frac{50 + 15}{4}
\]

\[
= \frac{65}{4}
\]

\[
= 16\frac{1}{4}
\]

He will need \(16\frac{1}{4}\) pounds of dry cement.

b.

\[
5\left(2\frac{1}{2}\right) + 3\left(1\frac{1}{4}\right)
\]

\[
= 5\left(2 + \frac{1}{2}\right) + 3\left(1 + \frac{1}{4}\right)
\]

Definition of a mixed number

\[
= 5\left(\frac{5}{2}\right) + 3\left(\frac{5}{4}\right)
\]

Distributive Property

\[
= \frac{10 + \frac{5}{2} + 3 + \frac{3}{4}}{}
\]

Multiply.

\[
= \frac{10 + \frac{5}{2} + \frac{3}{4}}{}
\]

Commutative Property (+)

\[
= \frac{13 + \frac{5}{2} + \frac{3}{4}}{}
\]

Add.

\[
= \frac{13 + \frac{5}{2} + \frac{3}{4}}{}
\]

Associative Property (+)

\[
= \frac{13 + 3\frac{1}{4} or 16\frac{1}{4}}{}
\]

Add.

Simplify each expression.
Name:

37. \[8b - 3c + 4b + 9c = 8b + 4b - 3c + 9c\]
\[= (8 + 4)b + (-3 + 9)c\]
\[= 12b + 6c\]

38. \[-2a + 9d - 5a - 6d = -2a - 5a + 9d - 6d\]
\[= (-2 - 5)a + (9 - 6)d\]
\[= -7a + 3d\]

39. \[4(4x - 9y) + 8(3x + 2y) = 4(4x) + 4(-9y) + 8(3x) + 8(2y)\]
\[= 16x - 36y + 24x + 16y\]
\[= 16x + 24x - 36y + 16y\]
\[= (16 + 24)x + (-36 + 16)y\]
\[= 40x - 20y\]

40. \[6(9a - 3b) - 8(2a + 4b) = 6(9a) + 6(-3b) + (-8)(2a) + (-8)(4b)\]
\[= 54a - 18b - 16a - 32b\]
\[= 54a - 16a - 18b - 32b\]
\[= (54 - 16)a + (-18 - 32)b\]
\[= 38a - 50b\]

41. \[-2(-5g + 6k) - 9(-2g + 4k) = (-2)(-5g) + (-2)(6k) + (-9)(-2g) + (-9)(4k)\]
\[= 10g - 12k + 18g - 36k\]
\[= 10g + 18g - 12k - 36k\]
\[= (10 + 18)g + (-12 - 36)k\]
\[= 28g - 48k\]

42. \[-5(10x + 8z) - 6(4x - 7z) = (-5)(10x) + (-5)(8z) + (-6)(4x) + (-6)(-7z)\]
\[= -50x - 40z - 24x + 42z\]
\[= -50x - 24x - 40z + 42z\]
\[= (-50 - 24)x + (-40 + 42)z\]
\[= -74x + 2z\]

43. The width of the football field is 35 yards and the length is \((60 + 60)\) yards. The expression for the area of the field is \(35(60 + 60)\) square yards. Use the Distributive Property to rewrite the expression.
\[53(60 + 60) = 53(120)\]
\[= 6360\]
So, the area of the field is 6360 square yards.
Name:

44.  a. Expression representing the number of registered dogs of the top four breeds is 870,192(0.142 + 0.056 + 0.05 + 0.049).
Use the Distributive Property to rewrite the expression.
870,192(0.142 + 0.056 + 0.05 + 0.049) = 870,192(0.142) + 870,192(0.056) + 870,192(0.05) + 870,192(0.049)
b. 870,192(0.142) + 870,192(0.056) + 870,192(0.05) + 870,192(0.049) = 123567.264 + 48730.752 + 43509.6 + 426.4 = 258447.024
So, the number of registered dogs of the top four breeds is about 258,447.

45.  a. Billie buys a hot lunch on Thursday and Friday of the first week and Wednesday of the second week.
4.50 + 4.50 + 4.50 = 4.50(1 + 1 + 1)
4.50 + 4.50 + 4.50 = 4.50(1+1+1)
= 4.50(3)
= 13.50
Hot lunch will cost $13.50.
b. Subtract $13.50 from $20.
$20 − $13.50 = $6.50
$6.50
$2 ≈ 3
So, Billie can buy 3 cold sandwiches with the amount left over.
c. Since Billie can buy 3 hot lunches and 3 cold sandwiches, she have to pack her lunch for 4 times if both the weeks are Monday through Friday.

Simplify each expression.

46. \[ \frac{1}{3}(5x+8y)+\frac{1}{4}(6x-2y) = \frac{1}{3}(5x)+\frac{1}{3}(8y)+\frac{1}{4}(6x)+\frac{1}{4}(-2y) \]
\[ = \frac{5x}{3}+\frac{8y}{3}+\frac{6x}{4}+\frac{-2y}{4} \]
\[ = \frac{5x}{3}+\frac{8y}{3}+\frac{3x}{2}+\frac{-y}{2} \]
\[ = \frac{5x(2)+8y(2)+3x(3)-y(3)}{6} \]
\[ = \frac{10x+16y+9x-3y}{6} \]
\[ = \frac{10x+9x+16y-3y}{6} \]
\[ = \frac{(10+9)x+(16-3)y}{6} \]
\[ = \frac{19x+13y}{6} \]
\[ = \frac{19}{6}x+\frac{13}{6}y \]
Name:

47. \[
\frac{2}{5}(6c - 8d) + \frac{3}{4}(4c - 9d) = \frac{2}{5}(6c) + \frac{2}{5}(-8d) + \frac{3}{4}(4c) + \frac{3}{4}(-9d)
\]
\[
= \frac{12c}{5} - \frac{16d}{5} + \frac{12c}{4} - \frac{27d}{4}
\]
\[
= \frac{12c(4) - 16d(4) + 12c(5) - 27d(5)}{20}
\]
\[
= \frac{48c - 64d + 60c - 135d}{20}
\]
\[
= \frac{48c + 60c - 64d - 135d}{20}
\]
\[
= \frac{(48 + 60)c + (-64 - 135)d}{20}
\]
\[
= \frac{108c - 199d}{20}
\]
\[
= \frac{108c - 199d}{20}
\]
\[
= \frac{-18c - 199d}{20}
\]
\[
= \frac{27c - 199d}{5}
\]

48. \[-6(3a + 5b) - 3(6a - 8c) = -6(3a) + (-6)(5b) - 3(6a) + (-3)(-8c)\]
\[
= -18a - 30b - 18a + 24c
\]
\[
= -18a - 18a - 30b + 24c
\]
\[
= (-18 - 18)a - 30b + 24c
\]
\[
= -36a - 30b + 24c
\]

49. \[-9(3x + 8y) - 3(5x + 10z) = (-9)(3x) + (-9)(8y) + (-3)(5x) + (-3)(10z)\]
\[
= -27x - 72y - 15x - 20z
\]
\[
= -27x - 15x - 72y - 20z
\]
\[
= (-27 - 15)x - 72y - 20z
\]
\[
= -42x - 72y - 20z
\]
a. Since one larger window requires \(3\frac{3}{4}\) yards of fabric and a smaller window requires \(2\frac{1}{3}\) yards of fabric, the expression that represents the requirement of total yards of fabric is 
\[2\left(3\frac{3}{4}\right) + 3\left(2\frac{1}{3}\right)\].

\[
2\left(\frac{15}{4}\right) = \frac{15}{2} + 7
= \frac{15 + 14}{2}
= \frac{29}{2}
= 14\frac{1}{2}
\]

So, Mary requires \(14\frac{1}{2}\) yards of fabric.

b. 
\[
2\left(3\frac{3}{4}\right) + 3\left(2\frac{1}{3}\right) = 2\left(3 + \frac{3}{4}\right) + 3\left(2 + \frac{1}{3}\right) \quad \text{(Definition of a mixed number)}
\]
\[
= 2(3) + 2\left(\frac{3}{4}\right) + 3(2) + 3\left(\frac{1}{3}\right) \quad \text{(Distributive Property)}
\]
\[
= 6 + \frac{3}{2} + 6 + 1 \quad \text{(Multiply)}
\]
\[
= 6 + 6 + 1 + \frac{3}{2} \quad \text{(Commutative Property of Addition)}
\]
\[
= 13 + \frac{3}{2} \quad \text{(Addition)}
\]
\[
= 14\frac{1}{2}
\]
51.  

a. Sample answer:

<table>
<thead>
<tr>
<th>irrational</th>
<th>rational</th>
<th>integer</th>
<th>whole</th>
<th>natural</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-\sqrt{6}$, $\pi$</td>
<td>$3, \frac{-15}{3}, 4.1, 0$, $\frac{3}{8}, \sqrt{36}$</td>
<td>$3, \frac{-15}{3}, 0$, $\frac{3}{8}, \sqrt{36}$</td>
<td>$3, 0$, $\sqrt{36}$</td>
<td>$3$, $\sqrt{36}$</td>
</tr>
</tbody>
</table>

b. 

$-\sqrt{6} \approx -2.449$, $3 = 3.0$

$-\frac{15}{3} = -5$, $4.1 = 4.1$

$\pi \approx 3.14$, $0 = 0$, $\frac{3}{8} = 0.375$

$\sqrt{36} = 6$

The numbers listed from least to greatest is $-\frac{15}{3}, -\sqrt{6}, 0, \frac{3}{8}, 3, \pi, 4.1, \sqrt{36}$.

c. 

![Number line diagram]

d. Sample answer: By converting the real numbers into decimal form, they can be easily lined up and compared.

52.  

a. 12.50(2 + 3 + 1)

Use the Distributive Property to rewrite the expression.

$12.50(2 + 3 + 1) = 12.50 \cdot 2 + 12.50 \cdot 3 + 12.50 \cdot 1$

b. 

$12.50(2 + 3 + 1) = 12.50 \cdot 2 + 12.50 \cdot 3 + 12.50 \cdot 1$

$= 25 + 37.50 + 12.50$

$= 75$

So, the store received $75.

53.  

$\sqrt{81} = 9$, so it is a rational number, while the other three are irrational numbers.

54.  

$48(30r + 36t) = 48\left[6(5r + 6t)\right]$

$= 24 \cdot 2 \cdot 6(5r + 6t)$

$= 24 \cdot 12(5r + 6t)$

$= 24 \cdot w$

$= 24w$
55. No, Luna did not distribute the negative sign to the second term and Sophia switched the \( a \) and \( b \) terms because usually \( a \) comes first.
\[
4(14a - 10b) - 6(b + 4a) = 4(14a) + 4(-10b) - 6(b) +(-6)(4a)
\]
\[
= 56a - 40b - 6b - 24a \\
= 56a - 24a - 40b - 6b \\
= (56 - 24)a + (-40 - 6)b \\
= 32a - 46b
\]
The correct answer is \( 32a - 46b \).

56. Sometimes, \( \pi \) and \( e \) are two examples of irrational numbers that do not involve the radical symbol.

57. Sample answer:
\[
\sqrt{5} \cdot \sqrt{5} = \sqrt{5 \cdot 5}
\]
\[
= \sqrt{25}
\]
\[
= 5
\]
So, \( \sqrt{5} \cdot \sqrt{5} = 5 \), which is not irrational.

**OPEN ENDED** The set of all real numbers is *dense*, meaning between any two distinct members of the set there lies infinitely many other members of the set. Find an example of (a) a rational number, and (b) an irrational number between the given numbers.

58. Sample answer:
   a. 2.46
   b. 2.4844844484448...

59. Sample answer:
   a. 3.2
   b. \( \sqrt{10} \)

60. Sample answer:
   a. 2.001
   b. 2.00100100001...

61. Sample answer: The Commutative Property does not hold for subtraction or division because order matters with these two operations. In addition or multiplication, the order does not matter. For example, \( 2 + 4 = 4 + 2 \) and \( 2 \cdot 4 = 4 \cdot 2 \). However, with subtraction, \( 2 - 4 \neq 4 - 2 \), and with division, \( \frac{2}{4} \neq \frac{4}{2} \).
62. Let $c$ be the number of pounds of cashews and $a$ be the number of pounds of almonds. Eight pounds of cashews and 6 pounds of almonds costs $48. So, $8c + 6a = 48$. Lenora bought 7 pounds of cashews and almonds. So, $c + a = 7$. Substitute $c = 7 - a$ in the equation $8c + 6a = 48$.

$$8c + 6a = 48$$

$$8(7 - a) + 6a = 48$$

$$56 - 8a + 6a = 48$$

$$56 - 2a = 48$$

$$56 - 2a - 56 = 48 - 56$$

$$-2a = -8$$

$$-2a \div -2 = 8 \div -2$$

$$a = 4$$

Substitute $a = 4$ in the equation $c = 7 - a$.

$$c = 7 - a$$

$$= 7 - 4$$

$$= 3$$

Therefore, Lenora bought 3 pounds of cashews and 4 pounds of almonds.

63. $2 + 2 = 4$

$4 + 3 = 7$

$7 + 4 = 11$

$11 + 5 = 16$

$16 + 6 = 22$

$22 + 7 = 29$

$29 + 8 = 37$

$37 + 9 = 46$

$46 + 10 = 56$

So, the $10^{th}$ term in the series is 56. The correct choice is B.

64. Since the points $A$ and $B$ are in the horizontal line segment, the $y$-coordinate of the point $A$ is equal to the $y$-coordinate of $B$. From the figure, the $x$-coordinate of $A$ is negative. Since $OABC$ is a parallelogram, the distance between $O$ and $C$ is same as the distance between $A$ and $B$. Since $b > a$, the $x$-coordinate of $A$ is $a - b$. So, the coordinate of $A$ is $A(a - b, c)$. So, the correct choice is G.

65. The domain is the set of $x$-coordinates.

$D = \{-3, -2, 0, 6\}$

So, the correct choice is B.

66. $8(4 - 2)^3 = 8(2)^3$

$= 8(2)(2)(2)$

$= 8(8)$

$= 64$
Name:

67. Substitute \( a = 5, b = 4, c = 3 \), and \( d = 2 \) in the expression \( a + 3(b + c) - d \).
\[
a + 3(b + c) - d = 5 + 3(4 + 3) - 2 \\
= 5 + 3(7) - 2 \\
= 5 + 21 - 2 \\
= 26 - 2 \\
= 24
\]

68. Substitute \( d = (x + 3) \) in the formula \( A = \pi \left( \frac{d}{2} \right)^2 \).
\[
A = \pi \left( \frac{x + 3}{2} \right)^2
\]
The area of the circle is \( \pi \left( \frac{x + 3}{2} \right)^2 \).

69. Use the Pythagorean Theorem.
Substitute \( a = 9.64 \) and \( c = 10 \) in the formula \( c^2 = a^2 + b^2 \).
\[
c^2 = a^2 + b^2 \\
10^2 = (9.64)^2 + b^2 \\
100 = 92.9296 + b^2 \\
b^2 = 100 - 92.9296 \\
b = \sqrt{7.0704} \\
b \approx 2.66
\]
The distance from the wall to the base of the ladder is about 2.66 meters.

Factor each polynomial.

70. \( 14x^2 = 2 \cdot 7 \cdot x \cdot x \)
\( 10x = 2 \cdot 5 \cdot x \)
\( 8 = 2 \cdot 2 \cdot 2 \)
The GCF of the terms \( 14x^2, 10x \) and \( 8 \) is 2.
\[
14x^2 + 10x - 8 = 2(7x^2) + 2(5x) + 2(-4) \\
= 2(7x^2 + 5x - 4)
\]

71. \( 9x^2 = 3 \cdot 3 \cdot x \cdot x \)
\( 3x = 3 \cdot x \)
\( 18 = 2 \cdot 3 \cdot 3 \)
The GCF of the terms \( 9x^2, 3x \) and \( 18 \) is 3.
\[
9x^2 - 3x + 18 = 3(3x^2) + 3(-x) + 3(6) \\
= 3(3x^2 - x + 6)
\]
Name:

72. \[8x^2 = 2 \cdot 2 \cdot 2 \cdot x \cdot x\]
\[16x = 2 \cdot 2 \cdot 2 \cdot 2 \cdot x\]
\[12 = 2 \cdot 2 \cdot 3\]
The GCF of the terms \(8x^2\), \(16x\) and \(12\) is \(2 \cdot 2\) or \(4\).
\[8x^2 + 16x + 12 = 4 \left(2x^2\right) + 4(4x) + 4(3)\]
\[= 4 \left(2x^2 + 4x + 3\right)\]

73. \[10x^2 = 2 \cdot 5 \cdot x \cdot x\]
\[20x = 2 \cdot 2 \cdot 5 \cdot x\]
The GCF of the terms \(10x^2\) and \(20x\) is \(2 \cdot 5 \cdot x\) or \(10x\).
\[10x^2 - 20x = 10x(x) + 10x(-2)\]
\[= 10x(x - 2)\]

74. \[7x^2 = 7 \cdot x \cdot x\]
\[14x = 2 \cdot 7 \cdot x\]
\[21 = 3 \cdot 7\]
The GCF of the terms \(7x^2\), \(14x\) and \(21\) is \(7\).
\[7x^2 - 14x - 21 = 7 \left(x^2\right) + 7(-2x) + 7(-3)\]
\[= 7 \left(x^2 - 2x - 3\right)\]
\[= 7(x - 3)(x + 1)\]

75. \[12x^2 = 2 \cdot 2 \cdot 3 \cdot x \cdot x\]
\[18x = 2 \cdot 3 \cdot 3 \cdot x\]
\[24 = 2 \cdot 2 \cdot 2 \cdot 3\]
The GCF of the terms \(12x^2\), \(18x\) and \(24\) is \(2 \cdot 3\) or \(6\).
\[12x^2 - 18x - 24 = 6 \left(2x^2\right) + 6(-3x) + 6(-4)\]
\[= 6 \left(2x^2 - 3x - 4\right)\]

Find each product.

76. Use the FOIL method to find the product.
\[(x + 2)(x - 3) = x(x) + x(-3) + 2(x) + 2(-3)\]
\[= x^2 - 3x + 2x - 6\]
\[= x^2 - x - 6\]

77. Use the FOIL method to find the product.
\[(y + 2)(y - 1) = y(y) + y(-1) + 2(y) + 2(-1)\]
\[= y^2 - y + 2y - 2\]
\[= y^2 + y - 2\]
78. Use the FOIL method to find the product.
\[(a - 5)(a + 4) = a(a) + a(4) + (-5)(a) + (-5)(4)\]
\[= a^2 + 4a - 5a - 20\]
\[= a^2 - a - 20\]

79. Use the FOIL method to find the product.
\[(b - 7)(b - 3) = b(b) + b(-3) + (-7)(b) + (-7)(-3)\]
\[= b^2 - 3b - 7b + 21\]
\[= b^2 - 10b + 21\]

80. Use the FOIL method to find the product.
\[(n + 6)(n + 8) = n(n) + n(8) + 6(n) + 6(8)\]
\[= n^2 + 8n + 6n + 48\]
\[= n^2 + 14n + 48\]

81. Use the FOIL method to find the product.
\[(p + 9)(p + 1) = p(p) + p(1) + (-9)(p) + (-9)(1)\]
\[= p^2 + p - 9p - 9\]
\[= p^2 - 8p - 9\]

Evaluate each expression if \(a = 3\), \(b = \frac{2}{3}\), and \(c = -1.7\).

82. \[6b - 5 = 6\left(\frac{2}{3}\right) - 5\]
\[= \frac{12}{3} - 5\]
\[= 4 - 5\]
\[= -1\]

83. \[\frac{1}{6}b + 1 = \frac{1}{6}\left(\frac{2}{3}\right) + 1\]
\[= \frac{2}{18} + 1\]
\[= \frac{1}{9} + 1\]
\[= \frac{1 + 9}{9}\]
\[= \frac{10}{9}\]
84. \[2.3c - 7 = 2.3(-1.7) - 7\]
    \[= -3.91 - 7\]
    \[= -10.91\]

85. \[-8(a - 4) = -8(3 - 4)\]
    \[= -8(-1)\]
    \[= 8\]

86. \[a + b + c = 3 + \frac{2}{3} + (-1.7)\]
    \[= \frac{3(3) + 2 - 1.7(3)}{3}\]
    \[= \frac{9 + 2 - 5.1}{3}\]
    \[= \frac{5.9}{3}\]
    \[\approx 1.967\]

87. \[\frac{a \cdot b}{c} = \frac{3 \cdot 2}{-1.7}\]
    \[= \frac{2}{-1.7}\]
    \[\approx -1.176\]

88. \[a^2 - c = 3^2 - (-1.7)\]
    \[= 9 + 1.7\]
    \[= 10.7\]

89. \[\frac{a \cdot c}{a} = \frac{3 \cdot (-1.7)}{3}\]
    \[= -1.7\]
1-3 Solving Equations - Check Your Understanding

Write an algebraic expression to represent each verbal expression.

1. Let \( x \) be the number.
   The sum of \( x \) and negative 3 is \( x + (-3) \).
   The product of 12 and the sum of \( x \) and negative 3 is \( 12[x + (-3)] \).

2. Let \( x \) be the number.
   4 times \( x \) is \( 4x \). The square of \( x \) is \( x^2 \).
   The keyword ‘difference’ means subtraction.
   So, the algebraic expression is \( 4x - x^2 \).

Write a verbal sentence to represent each equation.

3. The sum of five times a number and 7 equals 18.

4. The difference between the square of a number and 9 is 27.

5. The difference between five times a number and the cube of that number is 12.

6. Eight more than the quotient of a number and four is \(-16\).

Name the property illustrated by each statement.

7. Reflexive Property.

8. Transitive Property.

Solve each equation. Check your solution.

9. \[ z - 19 = 34 \]
   \[ z - 19 + 19 = 34 + 19 \]
   \[ z = 53 \]

   Substitute \( z = 53 \) in the equation.
   \[ 53 - 19 = 34 \]
   \[ 34 = 34 \checkmark \]
   Therefore, the solution is \( z = 53 \).

10. \[ x + 13 = 7 \]
    \[ x + 13 - 13 = 7 - 13 \]
    \[ x = -6 \]

   Substitute \( x = -6 \) in the equation.
   \[ -6 + 13 = 7 \]
   \[ 7 = 7 \checkmark \]
   The solution of the equation is \( \boxed{x = -6} \).
11. \(-y = 8\)
\[y = -8\]
Substitute \(y = -8\) in the equation.
\[\frac{(-8)}{8} = 8\]
\[8 = 8\] \(\checkmark\)
So, the solution is \(y = -8\).

12. \(-6x = 42\)
\[\frac{-6x}{-6} = \frac{42}{-6}\]
\[x = -7\]
Substitute \(x = -7\) in the equation.
\[\frac{-6(-7)}{42} = \frac{42}{42}\]
\[42 = 42\] \(\checkmark\)
So, the solution is \(x = -7\).

13. \(5x - 3 = -33\)
\[5x - 3 + 3 = -33 + 3\]
\[5x = -30\]
\[\frac{5x}{5} = \frac{-30}{5}\]
\[x = -6\]
Substitute \(x = -6\) in the equation.
\[5(-6) - 3 = -33\]
\[\frac{-30 - 3}{-33} = \frac{-33}{-33}\]
\[-33 = -33\] \(\checkmark\)
So, the solution is \(x = -6\).

14. \(-6y - 8 = 16\)
\[\frac{-6y}{-6} = \frac{-8}{-6}\]
\[-6y = 24\]
\[\frac{-6y}{-6} = \frac{24}{-6}\]
\[y = -4\]
Substitute \(y = -4\) in the equation.
\[\frac{-6(-4)}{8} = \frac{-16}{16}\]
\[24 - 8 = 16\]
\[16 = 16\] \(\checkmark\)
So, the solution is \(y = -4\).
15. \[3(2a + 3) - 4(3a - 6) = 15\]
   \[6a + 9 - 12a + 24 = 15\]
   \[-6a + 33 = 15\]
   \[-6a = -18\]
   \[a = 3\]

Substitute \(a = 3\) in the equation.

\[3(2(3) + 3) - 4(3(3) - 6) = 15\]
\[3(6 + 3) - 4(9 - 6) = 15\]
\[15 = 15\]

So, the solution is \(a = 3\).

16. \[5(c - 8) - 3(2c + 12) = -84\]
   \[5c - 40 - 6c - 36 = -84\]
   \[-c - 76 = -84\]
   \[-c = -8\]
   \[c = 8\]

Substitute \(c = 8\) in the equation.

\[5(8 - 8) - 3(2(8) + 12) = -84\]
\[5(0) - 3(28) = -84\]
\[-84 = -84\]

So, the solution is \(c = 8\).

17. \[-3(-2x + 20) + 8(x + 12) = 92\]
   \[6x - 60 + 8x + 96 = 92\]
   \[14x + 36 = 92\]
   \[14x = 56\]
   \[x = 4\]

Substitute \(x = 4\) in the equation.

\[-3(-2(-4) + 20) + 8(4 + 12) = 92\]
\[-3(12) + 8(16) = 92\]
\[92 = 92\]

So, the solution is \(x = 4\).
18. 
\[-4(3m-10)-6(-7m-6) = -74\]
\[-12m+40+42m+36 = -74\]
\[30m+76 = -74\]
\[30m = -150\]
\[m = -5\]
Substitute \(m = -5\) in the equation.
\[-4(3(-5)-10)-6(-7(-5)-6) = -74\]
\[-4(-15)-6(29) = -74\]
\[100-174 = -74\]
\[-74 = -74\]  \(\checkmark\)
So, the solution is \(m = -5\).

Solve each equation or formula for the specified variable.

19. 
\[8r-5q = 3\]
\[-8r + 8r - 5q = 3 - 8r\]
\[-5q = 3 - 8r\]
\[-\frac{5q}{5} = \frac{3 - 8r}{-5}\]
\[q = \frac{8r - 3}{5}\]

20. 
\[Pv = nrt\]
\[\frac{Pv}{rt} = \frac{nrt}{rt}\]
\[Pv\]
\[\frac{Pv}{rt} = n\]

21. 
\[\frac{y}{5} + 8 = 7\]
\[\frac{y}{5} + 8 - 8 = 7 - 8\]
\[\frac{y}{5} = -1\]
\[\frac{y}{5} - 2 = -1 - 2\]
\[\frac{y}{5} - 2 = -3\]
The correct choice is B.
1-3 Solving Equations - Practice and Problem Solving

Write an algebraic expression to represent each verbal expression.

22. Let the number be $n$.
The product of four and $n$ is $4n$.
The keyword ‘difference’ indicates subtraction.
The algebraic expression is $4n - 6$.

23. Let the number be $x$.
The square of $x$ is $x^2$.
The algebraic expression is $8x^2$.

24. Let the number be $x$.
Cube of $x$ is $x^3$.
15 less than $x^3$ is $x^3 - 15$.

25. Let the number be $x$. The quotient of $x$ and 4 is $\frac{x}{4}$.
Five more than $\frac{x}{4}$ is $\frac{x}{4} + 5$.

Write a verbal sentence to represent each equation.

26. Four less than 8 times a number is 16.

27. The quotient of the sum of 3 and a number and 4 is 5.

28. Three less than four times the square of a number is 13.

29. $n = \text{number of home runs Jacobs hit}$.
Cabrera hit 6 more home runs than Jacobs. The keyword ‘more than’ mean addition.
So, number of home runs Cabrera hit = $n + 6$.
Total number of home runs is 46.
Therefore:
$n + n + 6 = 46$
$2n + 6 = 46$
$2n = 40$
$n = 20$
Jacobs hit 20 home runs and Cabrera hit 26 home runs.

Name the property illustrated by each statement.

30. Subtraction Property of Equality

31. Substitution Property of Equality

32. Transitive Property
Name:

34. Let \( n \) be the total number of rides. 
The entrance fee for two persons = \( 2(\$7.50) = \$15.00 \)
\[ n(2.50) + 15.00 = 32.50 \]
\[ 2.50n + 15.00 = 32.50 \]
\[ 2.50n = 17.5 \]
\[ n = 7 \]
So, Aiko and Kendra can go on a total of 7 rides.

Solve each equation. Check your solution.

35. \[ 3y + 4 = 19 \]
\[ 3y + 4 - 4 = 19 - 4 \]
\[ 3y = 15 \]
\[ \frac{3y}{3} = \frac{15}{3} \]
\[ y = 5 \]
Substitute \( y = 5 \) in the original equation.
\[ 3(5) + 4 = 19 \]
\[ 15 + 4 = 19 \]
\[ 19 = 19 \checkmark \]
The solution is \( y = 5 \).

36. \[ -9x - 8 = 55 \]
\[ -9x - 8 + 8 = 55 + 8 \]
\[ -9x = 63 \]
\[ \frac{-9x}{-9} = \frac{63}{-9} \]
\[ x = -7 \]
Substitute \( x = -7 \) in the equation.
\[ -9(-7) - 8 = 55 \]
\[ 63 - 8 = 55 \]
\[ 55 = 55 \checkmark \]
The solution is \( x = -7 \).

37. \[ 7y - 2y + 4 + 3y = -20 \]
\[ 8y + 4 = -20 \]
\[ 8y = -24 \]
\[ y = -3 \]
Substitute \( y = -3 \) in the equation.
\[ 7(-3) - 2(-3) + 4 + 3(-3) = -20 \]
\[ -21 + 6 + 4 - 9 = -20 \]
\[ -20 = -20 \checkmark \]
The solution is \( y = -3 \).
38. \[5g + 18 - 7g + 4g = 8\]
\[2g + 18 = 8\]
\[2g + 18 - 18 = 8 - 18\]
\[2g = -10\]
\[\frac{2g}{2} = \frac{-10}{2}\]
\[g = -5\]
Substitute \(g = -5\) in the original equation.
\[5(-5) + 18 - 7(-5) + 4(-5) = 8\]
\[-25 + 18 + 35 - 20 = 8\]
\[53 - 45 = 8\]
\[8 = 8\]
The solution is \(g = -5\).

39. \[5(-2x - 4) - 3(4x + 5) = 97\]
\[-10x - 20 - 12x - 15 = 97\]
\[-22x - 35 = 97\]
\[-22x = 132\]
\[x = -6\]
Substitute \(x = -6\) in the equation.
\[5(-2(-6) - 4) - 3(4(-6) + 5) = 97\]
\[5(12 - 4) - 3(-24 + 5) = 97\]
\[5(8) - 3(-19) = 97\]
\[40 + 57 = 97\]
\[97 = 97\]
The solution is \(x = -6\).

40. \[-2(3y - 6) + 4(5y - 8) = 92\]
\[-6y + 12 + 20y - 32 = 92\]
\[14y - 20 = 92\]
\[14y = 112\]
\[y = 8\]
Substitute \(y = 8\) in the equation.
\[-2(3(8) - 6) + 4(5(8) - 8) = 92\]
\[-2(18) + 4(32) = 92\]
\[-36 + 128 = 92\]
\[92 = 92\]
The solution is \(y = 8\).
41. \[
\frac{2}{3}(6c - 18) + \frac{3}{4}(8c + 32) = -18
\]
\[
\frac{2}{3} \cdot 6c - \frac{2}{3} \cdot 18 + \frac{3}{4} \cdot 8c + \frac{3}{4} \cdot 32 = -18
\]
\[
4c - 12 + 6c + 24 = -18
\]
\[
10c + 12 = -18
\]
\[
10c = -30
\]
\[
c = -3
\]
Substitute \(c = -3\) in the equation.
\[
\frac{2}{3}(6(-3) - 18) + \frac{3}{4}(8(-3) + 32) = -18
\]
\[
\frac{2}{3}(-36) + \frac{3}{4}(8) = -18
\]
\[
-24 + 6 = -18
\]
\[
-18 = -18 \checkmark
\]
The solution is \(c = -18\).

42. \[
\frac{3}{5}(15d + 20) - \frac{1}{6}(18d - 12) = 38
\]
\[
9d + 12 - 3d + 2 = 38
\]
\[
6d + 14 = 38
\]
\[
6d = 24
\]
\[
d = 4
\]
Substitute \(d = 4\) in the equation.
\[
\frac{3}{5}(15(4) + 20) - \frac{1}{6}(18(4) - 12) = 38
\]
\[
\frac{3}{5}(80) - \frac{1}{6}(60) = 38
\]
\[
48 - 10 = 38
\]
\[
38 = 38 \checkmark
\]
The solution is \(d = 4\).

43. The perimeter of a regular pentagon is given by \(P = 5s\), where \(s\) is the side length. Substitute \(P = 100\).
\[
5s = 100
\]
\[
\frac{5s}{5} = \frac{100}{5}
\]
\[
s = 20
\]
The length of each side of the pentagon is 20 inches.
Name:

44. Let $x$ be the number of days Nina takes 2 pills. Total number of pills = 28.
So:
\[
4 + 2x = 28
\]
\[
-4 + 4 + 2x = -4 + 28
\]
\[
2x = 24
\]
\[
\frac{2x}{2} = \frac{24}{2}
\]
\[
x = 12
\]
Nina takes 2 pills a day for 12 days.

Solve each equation or formula for the specified variable.

45. \[E = mc^2\]
\[
\frac{E}{c^2} = \frac{mc^2}{c^2}
\]
\[
E \quad \text{c}^2 = m
\]

46. \[c(a + b) - d = f\]
\[
ca + cb - d = f
\]
\[
ca + cb = f + d
\]
\[
ca = f + d - cb
\]
\[
a = \frac{f + d - cb}{c}
\]
\[
= \frac{f + d}{c} - b
\]

47. \[z = \pi q^3 h\]
\[
\frac{z}{\pi q^3} = \frac{\pi q^3 h}{\pi q^3}
\]
\[
\frac{z}{\pi q^3} = h
\]

48. \[\frac{x+y}{z} - a = b\]
\[
\frac{x+y}{z} = a + b
\]
\[x + y = z(a + b)
\]
\[y = z(a + b) - x\]
49. 
\[ y = ax^2 + bx + c \]
\[ y - bx - c = ax^2 \]
\[ \frac{y - bx - c}{x^2} = \frac{ax^2}{x^2} \]
\[ \frac{y - bx - c}{x^2} = a \]

50. 
\[ wx + yz = bc \]
\[ -wx + wx + yz = bc - wx \]
\[ yz = bc - wx \]
\[ \frac{yz}{y} = \frac{bc - wx}{y} \]
\[ z = \frac{bc - wx}{y} \]

51. a. The keyword ‘times’ indicates multiplication.
Let \( V \) be the volume of the cylinder.
\[ V = \pi \times r \times r \times h \]

b. Divide both sides by \( \pi r^2 \).
\[ V = \pi r^2 h \]
\[ \frac{V}{\pi r^2} = \frac{\pi r^2 h}{\pi r^2} \]
\[ \frac{V}{\pi r^2} = h \]

52. Let \( n \) be the number of guests each student can bring.
The maximum number of people can be seated in the room is 69. The tennis team, coach, principal and vice principal gives 25 to attend the banquet.
\[ 22n + 25 = 69 \]
Solve for \( n \).
\[ 22n + 25 = 69 \]
\[ 22n = 44 \]
\[ n = 2 \]
Therefore, each student can bring 2 guests.

Solve each equation. Check your solution.
53. \[ 5x - 9 = 11x + 3 \]
   \[-9 = 6x + 3 \]
   \[6x = -12 \]
   \[x = -2 \]

Check:
\[ 5x - 9 = 11x + 3 \]
\[ 5(-2) - 9 = 11(-2) + 3 \]
\[-10 - 9 = -22 + 3 \]
\[-19 = -19 \checkmark \]

The solution is \( x = -2 \).

54. \[ \frac{1}{x} + \frac{1}{4} = \frac{7}{12} \]
   \[\frac{1}{x} + \frac{1}{4} = \frac{7}{12} - \frac{1}{4} \]
   \[\frac{1}{x} = \frac{4}{12} \]
   \[x = 3 \]

Check:
\[ \frac{1}{x} + \frac{1}{4} = \frac{7}{12} \]
\[ \frac{1}{3} + \frac{1}{4} = \frac{7}{12} \]
\[4 + 3 = \frac{7}{12} \]
\[\frac{7}{12} = \frac{7}{12} \checkmark \]

The solution is \( x = 3 \).

55. \[ 5.4(3k - 12) + 3.2(2k + 6) = -136 \]
   \[16.2k - 64.8 + 6.4k + 19.2 = -136 \]
   \[22.6k = -45.6 \]
   \[22.6k = -90.4 \]
   \[k = -4 \]

Check:
\[ 5.4(3(-4) - 12) + 3.2(2(-4) + 6) = -136 \]
\[5.4(-12 - 12) + 3.2(-8 + 6) = -136 \]
\[5.4(-24) + 3.2(-2) = -136 \]
\[-129.6 - 6.4 = -136 \]
\[-136 = -136 \checkmark \]

The solution is \( k = -4 \).
56. \[ 8.2p - 33.4 = 1.7 - 3.5p \]
\[ 8.2p + 3.5p - 33.4 = 1.7 - 3.5p + 3.5p \]
\[ 11.7p - 33.4 = 1.7 \]
\[ 11.7p - 33.4 + 33.4 = 1.7 + 33.4 \]
\[ 11.7p = 35.1 \]
\[ p = 3 \]

Check:
\[ 8.2p - 33.4 = 1.7 - 3.5p \]
\[ 8.2(3) - 33.4 = 1.7 - 3.5(3) \]
\[ 24.6 - 33.4 = 1.7 - 10.5 \]
\[ -8.8 = -8.8 \checkmark \]

The solution is \( p = 3 \).

57. \[ \frac{4}{9}y + 5 = -\frac{7}{9}y - 8 \]
\[ \frac{4}{9} - \frac{7}{9}y + 5 = \frac{7}{9}y - \frac{7}{9}y - 8 \]
\[ \frac{11}{9}y + 5 = -8 \]
\[ \frac{11}{9}y = -13 \]
\[ 11y = -117 \]
\[ y = -\frac{117}{11} \]

Check:
\[ \frac{4}{9}y + 5 = -\frac{7}{9}y - 8 \]
\[ \frac{4}{9}\left(-\frac{117}{11}\right) + 5 = -\frac{7}{9}\left(-\frac{117}{11}\right) - 8 \]
\[ -\frac{468}{99} + 5 = \frac{819}{99} - 8 \]
\[ \frac{-468 + 495}{99} = \frac{819 - 792}{99} \]
\[ \frac{27}{99} = \frac{27}{99} \checkmark \]

The solution is \( y = -\frac{117}{11} \).
58. \[ \frac{-z - 1}{4} = \frac{2z + 1}{3} \]
\[ \frac{3z - 1}{4} = \frac{2}{3}z + \frac{1}{3} \]
\[ \frac{1}{12}z = \frac{1}{5} \]
\[ \frac{1}{12} = \frac{8}{15} \]
\[ z = \frac{96}{15} \]
\[ = \frac{32}{5} \]
Check:
\[ \frac{3z}{4} - \frac{1}{3} = \frac{2}{3}z + \frac{1}{5} \]
\[ \frac{3\left(32 \div 5\right)}{4} - \frac{1}{3} = \frac{2}{3} \left(\frac{32}{5}\right) + \frac{1}{5} \]
\[ 24 - \frac{64}{15} + \frac{1}{5} \]
\[ 72 - \frac{64}{15} + \frac{15}{15} \]
\[ = \frac{67}{15} \]
The solution is \( z = \frac{32}{5} \).

59. Let \( x \) be the cost of rent each month.
Expense excluding rent = $622 + $428 + $240 + $144 = $1434
So:
\[ 12x + 1434 = 10,734 \]
\[ 12x = 9300 \]
\[ x = 775 \]
The rent is $775.

60. a. Let \( x \) be represent the average number of feet built per month by the Bradenton crew.
The number of feet the St. Petersburg crew built in 5 years is \( 5 \times 12 \times 176 = 10,560 \).
Therefore:
\[ 60x + 10,560 = 21,120 \]
\[ 60x = 10,560 \]
\[ x = 176 \]
The Bradenton crew built an average of 176 feet per month.
b. Each crew built a distance of 10,560 feet.
5,280 feet = 1 mile
Therefore, each crew built a distance of 2 miles.
c. Yes; it seems reasonable that two crews working 4 miles apart would be able to complete the same amount of miles in the same amount of time.
Name:

61. a.

b. 

<table>
<thead>
<tr>
<th>Integer</th>
<th>Distance from Zero</th>
</tr>
</thead>
<tbody>
<tr>
<td>-5</td>
<td>5</td>
</tr>
<tr>
<td>-4</td>
<td>4</td>
</tr>
<tr>
<td>-3</td>
<td>3</td>
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<tr>
<td>-2</td>
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<tr>
<td>-1</td>
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<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

d. For positive integers, the distance from zero is the same as the integer. For negative integers, the distance is the integer with the opposite sign because distance is always positive.

62. Sample answer: Jade; in the last step, when Steven subtracted $b_1$ from each side, he mistakenly put the $-b_1$ in the numerator instead of after the entire fraction.

63. 

\[ d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \]

\[ d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2 \]

\[ d^2 - (x_2 - x_1)^2 = (y_2 - y_1)^2 \]

\[ \sqrt{d^2 - (x_2 - x_1)^2} = y_2 - y_1 \]

\[ y_1 = y_2 - \sqrt{d^2 - (x_2 - x_1)^2} \]

64. Translating this number trick into an expression yields:

\[ \frac{10x - 30}{5} + 6 = 2x \]

\[ \frac{10x - 30}{5} = 2x - 6 \]

\[ (2x - 6) + 6 = 2x \]

65. Sample answer:

\[ 3(x - 4) = 3x + 5; 2(3x - 1) = 6x - 2 \]
Name:

66. Sample answer: The Transitive Property utilizes the Substitution Property. While the Substitution Property is done with two values, that is, one being substituted for another, the Transitive Property deals with three values, determining that since two values are equal to a third value, then they must be equal.

67. The slope of the line is \( \frac{3}{2} \) and the \( y \)-intercept is 4. So, the equation corresponding to the inequality is

\[
y = \frac{3}{2} x + 4.
\]

Since the upper region of the line is shaded, the inequality is \( y > \frac{3}{2} x + 4 \). So, the correct choice is D.

68. \[
\frac{1}{3} \times \frac{4}{3} = \frac{4}{9}
\]

The reciprocal of \( \frac{4}{3} \) is \( \frac{3}{4} \).

\[
\frac{3}{4} \div \frac{4}{3} = \frac{3(3)}{4(4)} = \frac{9}{12} - \frac{16}{12} = -\frac{7}{12}
\]

So, the correct choice is F.

69. A. a reflection across the \( y \)-axis and a translation down 2 units

70. Difference = 1200 – 840 = 360

Percentage of decrease = \( \frac{360}{1200} \)

= 0.3

= 30%

71. \( 3x + 8y + 5z - 2y - 6x + z = 3x - 6x + 8y - 2y + 5z + z \)

\[= -3x + 6y + 6z \]

72. \[
2 \left( \frac{2}{2} \right) + 3 \left( \frac{1}{4} \right) = 2 \left( \frac{5}{2} \right) + 3 \left( \frac{7}{4} \right)
\]

\[= 5 + \frac{21}{4}
\]

\[= \frac{41}{4}
\]

\[= 10 \frac{1}{4} \text{ cups} \]
73. Let \( h \) be the height of the Space Needle.
\[
\begin{align*}
\frac{h}{220} &= \frac{5 \frac{1}{2}}{2} \\
\frac{h}{220} &= \frac{11}{4} \\
\frac{h}{220} &= \frac{2420}{4} \\
\frac{h}{220} &= \frac{605}{4}
\end{align*}
\]
The height of the Space Needle is 605 feet.

74. Substitute \( a = 5, b = 7, \text{ and } c = 2. \)
\[
5 - \left[2(7 - 5)\right] = 5 - \left[2(2)\right] \\
= 5 - 4 \\
= 1
\]
Identify the additive inverse for each number or expression.

75. \[
\begin{align*}
-\frac{4}{5} &= -\frac{4(5) + 1}{5} \\
&= -\frac{20 + 1}{5} \\
&= -\frac{21}{5}
\end{align*}
\]
Since \(-\frac{21}{5} + \frac{21}{5} = 0\), the additive inverse of \(-\frac{4}{5}\) or \(-\frac{21}{5}\) is \(\frac{4}{5}\) or \(\frac{21}{5}\).

76. Since \(3.5 - 3.5 = 0\), the additive inverse of \(3.5\) is \(-3.5\).

77. Since \((-2x) + 2x = 0\), the additive inverse of \(-2x\) is \(2x\).

78. The additive inverse of \(6\) is \(-6\) and the additive inverse of \(-7y\) is \(7y\).
The additive inverse of \(6 - 7y\) is \(-6 + 7y\).

79. \[
\begin{align*}
\frac{2}{3} &= \frac{11}{3} \\
\text{Since } \frac{11}{3} - \frac{11}{3} &= 0, \text{ the additive inverse of } \frac{2}{3} \text{ or } \frac{11}{3} \text{ is } -\frac{2}{3} \text{ or } -\frac{11}{3}.
\end{align*}
\]

80. Since \((-1.25) + 1.25 = 0\), the additive inverse of \(-1.25\) is \(1.25\).

81. Since \(5x - 5x = 0\), the additive inverse of \(5x\) is \(-5x\).

82. The additive inverse of \(4\) is \(-4\) and the additive inverse of \(9x\) is \(-9x\).
So, the additive inverse of \(4 - 9x\) is \(-4 + 9x\).
Chapter 1 - Equations and Inequalities - Mid-Chapter Quiz: Lessons 1-1 through 1-3

1. \[3c - 4(a + b) = 3\left(\frac{1}{3}\right) - 4(-1 + 2)\]
   \[= (1) - 4(1)\]
   \[= 1 - 4\]
   \[= -3\]

2. Substitute \(r = 16, \ t = 2.5\) in the formula \(d = rt\).
   \[d = rt\]
   \[= (16)(2.5)\]
   \[= 40\]
   Maurice traveled 40 meters.

3. \[(5 - m)^3 + n(m - n) = (5 - 6)^3 + (-3)(6 - (-3))\]
   \[= (-1)^3 + (-3)(9)\]
   \[= -1 - 27\]
   \[= -28\]

4. \[S = 2xy + 2yz + 2xz\]
   \[= 2(2.2)(3.5) + 2(3.5)(5.1) + 2(2.2)(5.1)\]
   \[= 2(7.7) + 2(17.85) + 2(11.22)\]
   \[= 15.4 + 35.7 + 22.44\]
   \[= 73.54\]
   The surface area of the prism is 73.54 square units.

5. \[\frac{q^2 + rt}{qr - 2t} = \frac{(-4)^2 + (3)(8)}{(-4)(3) - 2(8)}\]
   \[= \frac{16 + 24}{-12 - 16}\]
   \[= \frac{40}{-28}\]
   \[= \frac{10}{7}\]
   So, the correct choice is C.

6. Q, R

7. Z, Q, R
10. Distributive Property

11. 
\[-3(7a - 4b) + 2(-3a + b) = -3(7a) + (-3)(-4b) + 2(-3a) + 2(b)\]
\[= -21a + 12b - 6a + 2b\]
\[= -21a - 6a + 12b + 2b\]
\[= (-21 - 6)a + (12 + 2)b\]
\[= -27a + 14b\]

12. The cost of a T-shirt is $10.50 and a pair of jeans is $26.50. Brittany buys 3 T-shirts and 3 pairs of jeans. So, the expression is 
\[3(10.50 + 26.50)\]
Use the Distributive Property to rewrite the expression.
\[3(10.50 + 26.50) = 3(10.50) + 3(26.50)\]

13. 
\[\frac{2}{3}(4m - 5n) + \frac{1}{5}(2m + n) = \frac{2}{3}(4m) + \frac{2}{3}(-5n) + \frac{1}{5}(2m) + \frac{1}{5}(n)\]
\[= \frac{8m}{3} - \frac{10n}{3} + \frac{2m}{5} + \frac{n}{5}\]
\[= \frac{8m(5)}{15} - \frac{10n(5)}{15} + \frac{2m(3)}{15} + \frac{n(3)}{15}\]
\[= \frac{40m - 50n + 6m + 3n}{15}\]
\[= \frac{40m + 6m - 50n + 3n}{15}\]
\[= \frac{46m - 47n}{15}\]
\[= \frac{46m}{15} - \frac{47n}{15}\]
The correct choice is F.

14. Since \(\frac{7}{6} + \left(\frac{-7}{6}\right) = 0\), the additive inverse of \(\frac{7}{6}\) is \(\frac{-7}{6}\).

Since \(\frac{7(\frac{6}{7})}{6} = 1\), the multiplicative inverse of \(\frac{7}{6}\) is \(\frac{6}{7}\).

15. The quotient of a number \(a\) and the difference of a number \(a\) and 3 is equal to 1.

16. 
\[6x + 4y = -1\]
\[6x + 4y - 4y = -4y - 1\]
\[6x = -4y - 1\]
\[\frac{6x}{6} = -\frac{4y}{6} - \frac{1}{6}\]
\[x = -\frac{4}{6}y - \frac{1}{6}\]
\[x = -\frac{2}{3}y - \frac{1}{6}\]
17. The product of 4 and the difference of a number and 13 is \(4(n - 13)\).
   So, the correct choice is B.

18. 
   \[-3(6x + 5) + 2(4x) = 20\]
   \[-3(6x) + (-3)(5) + 2(4x) = 20\]
   \[-18x - 15 + 8x = 20\]
   \[-10x - 15 = 20\]
   \[-10x = 35\]
   \[-10x = \frac{35}{10}\]
   \[x = \frac{35}{-10}\]
   \[x = -\frac{7}{2}\]

19. Substitute \(A = 80.625\), \(a = 15.5\), and \(b = 6\) in the formula \(A = \frac{1}{2}(a + b)h\).

   \[80.625 = \frac{1}{2}(15.5 + 6)h\]
   \[80.625 = \frac{1}{2}(21.5)h\]
   \[80.625 = 10.75h\]
   \[80.625 = \frac{10.75h}{10.75}\]
   \[7.5 = h\]
   So, the height of the trapezoid is 7.5 units.
20. 

a. Substitute $r = 2$ in the formula $V = \frac{4}{3} \pi r^3$.

\[
V = \frac{4}{3} \pi r^3 \\
= \frac{4}{3} \pi (2)^3 \\
= \frac{4}{3} \pi (8) \\
= \frac{32}{3} \pi
\]

The volume of the sphere is $\frac{32}{3} \pi$ cubic inches.

Substitute $r = 2$ in the formula $SA = 4\pi r^2$.

\[
SA = 4\pi (2)^2 \\
= 4\pi (4) \\
= 16\pi
\]

The surface area of the sphere is $16\pi$ square inches.

b. Equate the formulas for the volume of a sphere and the surface area of a sphere.

\[
\frac{4}{3} \pi r^3 = 4\pi r^2
\]

\[
\frac{3}{4} \left( \frac{4}{3} \pi r^3 \right) = \frac{3}{4} \left( 4\pi r^2 \right)
\]

\[
\pi r^3 = 3\pi r^2
\]

\[
\frac{\pi r^3}{\pi r^2} = \frac{3\pi r^2}{\pi r^2}
\]

\[
r = 3
\]

Yes, when the radius is 3 units, the sphere have the same numerical value for the surface area and volume.
1-4 Solving Absolute Value Equations - Check Your Understanding

Evaluate each expression if \( x = -4 \) and \( y = -9 \).

1. \[ |x - 8| = |(-4) - 8| \]
   \[ = |-4 - 8| \]
   \[ = |-12| \]
   \[ = 12 \]

2. \[ |7y| = |7(-9)| \]
   \[ = |63| \]
   \[ = 63 \]

3. \[ -3|xy| = -3|(-4)(-9)| \]
   \[ = -3|36| \]
   \[ = -3(36) \]
   \[ = -108 \]

4. \[ -2|3x + 8| - 4 = -2|3(-4) + 8| - 4 \]
   \[ = -2|-12 + 8| - 4 \]
   \[ = -2|-4| - 4 \]
   \[ = -2(4) - 4 \]
   \[ = -8 - 4 \]
   \[ = -12 \]

5. a. Freshwater tropical fish thrive if the water is within 2°F of 78°F. So, substitute \( c = 78 \) and \( r = 2 \) in the equation \( |x - c| = r \).
   \[ |x - 78| = 2 \]
   So, the equation to determine the least and greatest optimal temperatures is \( |x - 78| = 2 \).

b. Case 1: \[ x - 78 = 2 \]
   \[ x - 78 + 78 = 2 + 78 \]
   \[ x = 80 \]

   Case 2: \[ x - 78 = -2 \]
   \[ x - 78 + 78 = -2 + 78 \]
   \[ x = 76 \]

So, the least temperature is 76°F and the greatest temperature is 80°F.

c. 77°F; This would ensure a minimum temperature of 76°F.

Solve each equation. Check your solutions.
6. Case 1:  \[ x + 8 = 12 \]  
\[ x - 8 = 12 - 8 \]  
\[ x = 4 \]

Case 2:  \[ x + 8 = -12 \]  
\[ x + 8 = -12 - 8 \]  
\[ x = -20 \]

There appear to be two solutions, 4 and -20.

**Check:** Substitute each value in the original equation.

\[ |x + 8| = 12 \]  
\[ |4 + 8| = 12 \]  
\[ |-20 + 8| = 12 \]  
\[ |12| = 12 \]  
\[ |12| = 12 \]

The solution set is \( \{4, -20\} \).

7. Case 1:  \[ y - 4 = 11 \]  
\[ y - 4 + 4 = 11 + 4 \]  
\[ y = 15 \]

Case 2:  \[ y - 4 = -11 \]  
\[ y - 4 + 4 = -11 + 4 \]  
\[ y = -7 \]

There appear to be two solutions, 15 and -7.

**Check:** Substitute each value in the original equation.

\[ |y - 4| = 11 \]  
\[ |15 - 4| = 11 \]  
\[ |-7 - 4| = 11 \]  
\[ |11| = 11 \]  
\[ |11| = 11 \]

The solution set is \( \{15, -7\} \).

8.  
\[ |a - 5| + 4 = 9 \]  
\[ |a - 5| + 4 - 4 = 9 - 4 \]  
\[ |a - 5| = 5 \]

Case 1:  \[ a - 5 = 5 \]  
\[ a = 10 \]

Case 2:  \[ a - 5 = -5 \]  
\[ a = 0 \]

There appear to be two solutions, 10 and 0.

**Check:** Substitute each value in the original equation.

\[ |a - 5| + 4 = 9 \]  
\[ |10 - 5| + 4 = 9 \]  
\[ |5| + 4 = 9 \]

\[ |a - 5| + 4 = 9 \]  
\[ |0 - 5| + 4 = 9 \]  
\[ |-5| + 4 = 9 \]

\[ 5 + 4 = 9 \]  
\[ 9 = 9 \]  
\[ 9 = 9 \]

The solution set is \( \{10, 0\} \).
9. \[|b - 3| + 8 = 3\]
\[|b - 3| + 8 - 8 = 3 - 8\]
\[|b - 3| = -5\]

Case 1: \[b - 3 = -5\]  
Case 2: \[b - 3 = 5\]

\[b - 3 + 3 = -5 + 3\]  
\[b - 3 + 3 = 5 + 3\]

\[b = -2\]  
\[b = 8\]

There appear to be two solutions, \(-2\) and \(8\).

Check: Substitute each value in the original equation.

\[|b - 3| + 8 = 3\]  
\[|b - 3| + 8 = 3\]

\[|b - 3| + 8 = 3\]  
\[|b - 3| + 8 = 3\]

\[7 + 8 = 3\]  
\[5 + 8 = 3\]

\[15 \neq 3\]  
\[13 \neq 3\]

Because \(15 \neq 3\) and \(13 \neq 3\), the solution set is \(\emptyset\).

10. \[3|2x - 3| - 5 = 4\]
\[3|2x - 3| = 9\]
\[|2x - 3| = 3\]

Case 1: \[2x - 3 = 3\]  
Case 2: \[2x - 3 = -3\]

\[2x - 3 + 3 = 3 + 3\]  
\[2x - 3 + 3 = -3 + 3\]

\[2x = 6\]  
\[2x = 0\]

\[x = 3\]  
\[x = 0\]

There appear to be two solutions, \(3\) and \(0\).

Check: Substitute each value in the original equation.

\[3|2x - 3| - 5 = 4\]  
\[3|2x - 3| - 5 = 4\]

\[3|2(0) - 3| - 5 = 4\]  
\[3|0 - 3| - 5 = 4\]

\[3|3| - 5 = 4\]  
\[3|-3| - 5 = 4\]

\[9 - 5 = 4\]  
\[9 - 5 = 4\]

\[4 = 4\]  
\[4 = 4\]

The solution set is \(\{3, 0\}\).
11. 

\[ -2|5y - 1| = -10 \]

\[ \frac{-2|5y - 1|}{-2} = \frac{-10}{-2} \]

\[ |5y - 1| = 5 \]

**Case 1:** \[ 5y - 1 = 5 \] \[ 5y - 1 = -5 \]

\[ 5y - 1 + 1 = 5 + 1 \] \[ 5y - 1 + 1 = -5 + 1 \]

\[ 5y = 6 \] \[ 5y = -4 \]

\[ \frac{5y}{5} = \frac{6}{5} \] \[ \frac{5y}{5} = \frac{-4}{5} \]

\[ y = \frac{6}{5} \] \[ y = -\frac{4}{5} \]

There appear to be two solutions, \( \frac{6}{5} \) and \( -\frac{4}{5} \).

**Check:** Substitute each value in the original equation.

\[ -2|5y - 1| = -10 \] \[ -2|5y - 1| = -10 \]

\[ -2\left| \frac{6}{5} - 1 \right| = -10 \] \[ -2\left| -\frac{4}{5} - 1 \right| = -10 \]

\[ -2|6 - 1| = -10 \] \[ -2|-4 - 1| = -10 \]

\[ -2|5| = -10 \] \[ -2|-5| = -10 \]

\[ -2(5) = -10 \] \[ -2(5) = -10 \]

\[ -10 = -10 \checkmark \] \[ -10 = -10 \checkmark \]

The solution set is \( \left\{ \frac{6}{5}, -\frac{4}{5} \right\} \).
12. Case 1: 
\[ a - 4 = 3a - 6 \]
\[ a - 4 + 4 = 3a - 6 + 4 \]
\[ a = 3a - 2 \]
\[ a - 3a = 3a - 2 - 3a \]
\[ -2a = -2 \]
\[ \frac{-2a}{-2} = \frac{-2}{-2} \]
\[ a = 1 \]

Case 2: 
\[ a - 4 = -(3a - 6) \]
\[ a - 4 = -3a + 6 \]
\[ a - 4 + 4 = -3a + 6 + 4 \]
\[ a - 3a = -3a + 10 \]
\[ a + 3a = -3a + 10 + 3a \]
\[ 4a = 10 \]
\[ \frac{4a}{4} = \frac{10}{4} \]
\[ a = \frac{10}{4} \]
\[ a = \frac{5}{2} \]

There appear to be two solutions, 1 and \( \frac{5}{2} \).

Check: Substitute each value in the original equation.
\[ |a - 4| = 3a - 6 \]
\[ |1 - 4| = 3(1) - 6 \]
\[ \frac{5 - 4}{2} = \frac{\frac{5}{2}}{2} - 6 \]
\[ |3| = 3 - 6 \]
\[ \frac{5 - 4(2)}{2} = \frac{5 - 6}{2} \]
\[ 3 \neq -3 \]

Since \( 3 \neq -3 \), \( a = 1 \) is an extraneous solution. The solution is \( \frac{5}{2} \) or 2.5.
13.  

**Case 1:**  
\[ b + 5 = 2b + 3 \]
\[ b + 5 - 5 = 2b + 3 - 5 \]
\[ b = 2b - 2 \]
\[ b - 2b = 2b - 2 - 2b \]
\[ -b = -2 \]
\[ \frac{-b}{-1} = \frac{-2}{-1} \]
\[ 3b = -8 \]
\[ b = 2 \]
\[ \frac{3b}{3} = \frac{-8}{3} \]
\[ b = \frac{8}{3} \]

**Case 2:**  
\[ b + 5 = -(2b + 3) \]
\[ b + 5 = -2b - 3 \]
\[ b + 5 - 5 = -2b - 3 - 5 \]
\[ b = -2b - 8 \]
\[ b + 2b = -2b - 8 + 2b \]
\[ 3b = -8 \]
\[ b = \frac{8}{3} \]

There appear to be two solutions, \( 2 \) and \( -\frac{8}{3} \).

Check: Substitute each value in the original equation.

\[ |b + 5| = 2b + 3 \]
\[ \frac{|b + 5|}{2} = 2 + \frac{3}{2} \]
\[ \frac{8}{3} + 5 = \frac{8}{3} + \frac{15}{3} \]
\[ = \frac{23}{3} \]
\[ \frac{8}{3} + 3 = \frac{16}{3} + 3 \]
\[ = \frac{25}{3} \]
\[ 7 = 7 \sqrt{ } \]
\[ \frac{-8 + 15}{3} = \frac{-16 + 3(3)}{3} \]
\[ \frac{-7}{3} = \frac{-16 + 9}{3} \]
\[ \frac{7}{3} \neq \frac{7}{3} \]

Since \( \frac{7}{3} \neq \frac{7}{3} \), \( b = -\frac{8}{3} \) is an extraneous solution. So, the solution is 2.
1-4 Solving Absolute Value Equations - Practice and Problem Solving

Evaluate each expression if $a = -3$, $b = -5$, and $c = 4.2$.

14. $|−3c| = |−3(4.2)|$
   
   $= |−12.6|$
   
   $= 12.6$

15. $|5b| = |5(−5)|$
   
   $= |−25|$
   
   $= 25$

16. $|a−b| = |−3−(−5)|$
   
   $= |−3+5|$
   
   $= |2|$
   
   $= 2$

17. $|b−c| = |−5−4.2|$
   
   $= |−9.2|$
   
   $= 9.2$

18. $|3b−4a| = |3(−5)−4(−3)|$
   
   $= |−15+12|$
   
   $= |−3|$
   
   $= 3$

19. $2|4a−3c| = 2|4(−3)−3(4.2)|$
   
   $= 2|−12−12.6|$
   
   $= 2|−24.6|$
   
   $= 2(24.6)$
   
   $= 49.2$

20. $−|3c−a| = −|3(4.2)−(−3)|$
   
   $= −|12.6+3|$
   
   $= −|15.6|$
   
   $= −15.6$

21. $−|abc| = −|(−3)(−5)(4.2)|$
   
   $= −|63|$
   
   $= −63$
22.  \[|x - 300| = 25\]
Solve the equation \(|x - 300| = 25\). 

Case 1:  
\[x - 300 = 25\]
\[x = 325\]

Case 2:  
\[x - 300 = -25\]
\[x = 275\]

So, the maximum temperature is 325°F and the minimum temperature is 275°F.

Solve each equation. Check your solutions.

23.  

Case 1:
\[z - 13 = 21\]
\[z = 34\]

Case 2:
\[z - 13 = -21\]
\[z = -8\]

There appear to be two solutions, 34 and -8.
Check: Substitute each value in the original equation.
\[|z - 13| = 21\]
\[|34 - 13| = 21\]
\[|21| = 21\]
\[21 = 21\]

The solution set is \(\{34, -8\}\).

24.  

Case 1:
\[w + 9 = 17\]
\[w = 8\]

Case 2:
\[w + 9 = -17\]
\[w = -26\]

There appear to be two solutions, 8 and -26.
\[|w + 9| = 17\]
\[|8 + 9| = 17\]
\[|17| = 17\]
\[17 = 17\]

The solution set is \(\{8, -26\}\).
Name:

25. Case 1: \[ d + 5 = 9 \]
   \[ d + 5 - 5 = 9 - 5 \]
   \[ d = 4 \]

Case 2: \[ d + 5 = -9 \]
   \[ d + 5 - 5 = -9 - 5 \]
   \[ d = -14 \]

There appear to be two solutions, 4 and -14.
Check: Substitute each value in the original equation.
   \[ 9 = |d + 5| \]
   \[ 9 = |4 + 5| \]
   \[ 9 = |-14 + 5| \]
   \[ 9 = |9| \]
   \[ 9 = -9| \]
   \[ 9 = 9 \checkmark \]

The solution set is \( \{4, -14\} \).

26. Case 1: \[ 35 = x - 6 \]
   \[ 35 + 6 = x - 6 + 6 \]
   \[ 41 = x \]

Case 2: \[ -35 = x - 6 \]
   \[ -35 + 6 = x - 6 + 6 \]
   \[ -29 = x \]

There appear to be two solutions, 41 and -29.
Check: Substitute each value in the original equation.
   \[ 35 = |x - 6| \]
   \[ 35 = |41 - 6| \]
   \[ 35 = |-29 - 6| \]
   \[ 35 = |35| \]
   \[ 35 = -35| \]
   \[ 35 = 35 \checkmark \]

The solution set is \( \{-29, 41\} \).

27. \[ 5|q + 6| = 20 \]

Case 1: \[ \frac{5|q + 6|}{5} = 20 \]
   \[ |q + 6| = 4 \]

Case 2: \[ \frac{5|q + 6|}{5} = 20 \]
   \[ |q + 6| = 4 \]

There appear to be two solutions, -2 and -10.
Check: Substitute each value in the original equation.
   \[ 5|q + 6| = 20 \]
   \[ 5|q + 6| = 20 \]
   \[ 5|-2 + 6| = 20 \]
   \[ 5|-10 + 6| = 20 \]
   \[ 5|4| = 20 \]
   \[ 5|-4| = 20 \]
   \[ 5(4) = 20 \]
   \[ 5(4) = 20 \]

The solution set is \( \{-2, -10\} \).
28. \[ -3|r + 4| = -21 \]
\[ \frac{-3|r + 4|}{-3} = \frac{-21}{-3} \]
\[ |r + 4| = 7 \]

Case 1: \[ r + 4 = 7 \]
\[ r = 3 \]
Case 2: \[ r + 4 = -7 \]
\[ r + 4 - 4 = 7 - 4 \]
\[ r = -11 \]

There appear to be two solutions, 3 and -11.

Check: Substitute each value in the original equation.
\[ -3|r + 4| = -21 \]
\[ -3|3 + 4| = -21 \]
\[ -3|7| = -21 \]
\[ -3(7) = -21 \]
\[ -21 = -21 \checkmark \]

The solution set is \{3, -11\}.

29. \[ 3|2a - 4| = 0 \]
\[ \frac{3|2a - 4|}{3} = \frac{0}{3} \]
\[ |2a - 4| = 0 \]
\[ 2a - 4 = 0 \]
\[ 2a = 4 \]
\[ \frac{2a}{2} = \frac{4}{2} \]
\[ a = 2 \]

Check: Substitute \(a = 2\) in the original equation.
\[ 3|2a - 4| = 0 \]
\[ 3|2(2) - 4| = 0 \]
\[ 3|4 - 4| = 0 \]
\[ 3|0| = 0 \]
\[ 3(0) = 0 \]
\[ 0 = 0 \checkmark \]

The solution is \(a = 2\).
30. \[ 8 |5w - 1| = 0 \]
\[ \frac{8 |5w - 1|}{8} = \frac{0}{8} \]
\[ |5w - 1| = 0 \]
\[ 5w - 1 = 0 \]
\[ 5w - 1 + 1 = 0 + 1 \]
\[ 5w = 1 \]
\[ \frac{5w}{5} = \frac{1}{5} \]
\[ w = \frac{1}{5} \]

Check:
\[ 8 |5w - 1| = 0 \]
\[ 8 \left| \frac{1}{5} \right| = 0 \]
\[ 8 \left| \frac{1}{5} \right| = 0 \]
\[ 8 \left| \frac{1}{5} \right| = 0 \]
\[ 8(0) = 0 \]
\[ 0 = 0 \checkmark \]

The solution is \( \frac{1}{5} \).
31. \[2|3x - 4| + 8 = 6\]
\[2|3x - 4| + 8 - 8 = 6 - 8\]
\[2|3x - 4| = -2\]
\[\frac{2|3x - 4|}{2} = \frac{-2}{2}\]
\[|3x - 4| = -1\]

Case 1: \[3x - 4 = -1\] \[3x - 4 = -( -1)\]
\[3x - 4 + 4 = -1 + 4\] \[3x - 4 = 1\]
\[3x = 3\] \[3x - 4 + 4 = 1 + 4\]
\[\frac{3x}{3} = \frac{3}{3}\] \[3x = 5\]
\[x = 1\] \[\frac{3x}{3} = \frac{5}{3}\]
\[x = \frac{5}{3}\]

There appear to be two solutions, 1 and \(\frac{5}{3}\).

Check: Substitute the values in the original equation.
\[2|3x - 4| + 8 = 6\]
\[2|3(1) - 4| + 8 = 6\]
\[2|3(\frac{5}{3}) - 4| + 8 = 6\]
\[2|3 - 4| + 8 = 6\]
\[2|5 - 4| + 8 = 6\]
\[2|-1| + 8 = 6\]
\[2|1| + 8 = 6\]
\[2(1) + 8 = 6\]
\[2(1) + 8 = 6\]
\[2 + 8 = 6\]
\[2 + 8 = 6\]
\[10 \neq 6\]
\[10 \neq 6\]

Since \(10 \neq 6\), the solution set is \(\emptyset\).
32. \[ 4|7y + 2| - 8 = -7 \]

\[ 4|7y + 2| - 8 + 8 = -7 + 8 \]

\[ 4|7y + 2| = 1 \]

\[ \frac{4|7y + 2|}{4} = \frac{1}{4} \]

\[ |7y + 2| = \frac{1}{4} \]

**Case 1:**

\[ 7y + 2 = \frac{1}{4} \]

\[ 7y + 2 = -\frac{1}{4} \]

\[ 7y + 2 - 2 = \frac{1}{4} - 2 \]

\[ 7y + 2 - 2 = -\frac{1}{4} - 2 \]

\[ 7y = \frac{1 - 2(4)}{4} \]

\[ 7y = -\frac{1 - 2(4)}{4} \]

\[ 7y = \frac{1 - 8}{4} \]

\[ 7y = -\frac{1 - 8}{4} \]

\[ 7y = -\frac{7}{4} \]

\[ 7y = -\frac{9}{4} \]

\[ \frac{7y}{7} = \frac{7}{4} \]

\[ \frac{7y}{7} = \frac{9}{4} \]

\[ y = \frac{1}{4} \]

\[ y = -\frac{9}{28} \]

There appear to be two solutions, \( -\frac{1}{4} \) and \( -\frac{9}{28} \).

**Check:** Substitute each value in the original equation.

\[ 4|7y + 2| - 8 = -7 \]

\[ 4|7\left(\frac{-1}{4}\right) + 2| - 8 = -7 \]

\[ 4\left|\frac{7}{4} + 2\right| - 8 = -7 \]

\[ 4\left|\frac{7}{4} + 2\right| - 8 = -7 \]

\[ 4\left|\frac{7}{4} + 8\right| - 8 = -7 \]

\[ 4\left|\frac{9}{4} + 2\right| - 8 = -7 \]

\[ 4\left|\frac{1}{4} - 8\right| - 8 = -7 \]

\[ 4\left|\frac{1}{4} - 8\right| - 8 = -7 \]

\[ 1 - 8 = -7 \]

\[ -7 = -7 \]

\[ -7 = -7 \]

The solution set is \( \left\{-\frac{1}{4}, -\frac{9}{28}\right\} \).
33. 
\[-3|3t - 2| - 12 = -6\]
\[-3|3t - 2| + 12 = -6 + 12\]
\[-3|3t - 2| = 6\]
\[-\frac{3|3t - 2|}{-3} = \frac{6}{-3}\]
\[|3t - 2| = -2\]

**Case 1:**
3t - 2 = -2
3t - 2 + 2 = 2
3t = 0
\[\frac{3t}{3} = \frac{0}{3}\]
\[t = 0\]

**Case 2:**
3t - 2 = -(-2)
3t - 2 + 2 = 2 + 2
3t = 4
\[\frac{3t}{3} = \frac{4}{3}\]
\[t = \frac{4}{3}\]

There appear to be two solutions, 0 and \(\frac{4}{3}\).

**Check:** Substitute the values in the original equation.
\[-3|3t - 2| - 12 = -6\]
\[-3|3(0) - 2| - 12 = -6\]
\[-3|0 - 2| - 12 = -6\]
\[-3|-2| - 12 = -6\]
\[-3|-2| - 12 + 12 = -6 + 12\]
\[-3|-2| = 6\]
\[-3(2) = 6\]
\[-6 \neq 6\]

Since \(-6 \neq 6\), the solution set is \(\emptyset\).
34. \[ -5|3z + 8| - 5 = -20 \]
\[ -5|3z + 8| - 5 + 5 = -20 + 5 \]
\[ -5|3z + 8| = -15 \]
\[ -5|3z + 8| = -15 \]
\[ -5 = -5 \]
\[ |3z + 8| = 3 \]

Case 1: \[ 3z + 8 = 3 \]
\[ 3z + 8 = -3 \]
\[ 3z + 8 - 8 = 3 - 8 \]
\[ 3z + 8 - 8 = -3 - 8 \]
\[ 3z = -5 \]
\[ 3z = -11 \]
\[ 3z = -5 \]
\[ 3z = -11 \]
\[ \frac{3z}{3} = -\frac{5}{3} \]
\[ \frac{3z}{3} = -\frac{11}{3} \]
\[ z = -\frac{5}{3} \]
\[ z = -\frac{11}{3} \]

There appear to be two solutions, \( -\frac{5}{3} \) and \( -\frac{11}{3} \).

Check: Substitute the values in the original equation.

\[ -5|3z + 8| - 5 = -20 \]
\[ -5|3z + 8| - 5 + 5 = -20 \]
\[ -5\left|\frac{-5}{3}\right| + 8 = -5 \]
\[ -5\left|-\frac{11}{3}\right| + 8 = -5 \]
\[ -5|5 + 8| - 5 = -20 \]
\[ -5|-11 + 8| - 5 = -20 \]
\[ -5|3| - 5 = -20 \]
\[ -5|-3| - 5 = -20 \]
\[ -5|3| - 5 + 5 = -20 + 5 \]
\[ -5|-3| - 5 + 5 = -20 + 5 \]
\[ -5|3| = -15 \]
\[ -5|-3| = -15 \]
\[ -5(3) = -15 \]
\[ -5(3) = -15 \]
\[ -15 = -15 \]

The solution set is \( \left\{ -\frac{5}{3}, -\frac{11}{3} \right\} \).

35. Substitute \( c = 5.67 \) and \( r = 0.02 \) in the equation \(|x - c| = r\).
\n\[ |x - 5.67| = 0.02 \]

Solve the equation \(|x - 5.67| = 0.02\).

Case 1: \[ x - 5.67 = 0.02 \]
\[ x - 5.67 = -0.02 \]
\[ x - 5.67 + 5.67 = 0.02 + 5.67 \]
\[ x - 5.67 + 5.67 = -0.02 + 5.67 \]
\[ x = 5.69 \]
\[ x = 5.65 \]

So, the heaviest quarters the machine will approve are those weighing 5.69 grams. The lightest quarters the machine will approve is 5.65 grams.

Evaluate each expression if \( q = -8 \), \( r = -6 \), and \( t = 3 \).
36. \[12 - 3\left|3r + 2\right| = 12 - 3\left|3(-6) + 2\right|
   = 12 - 3\left|-18 + 2\right|
   = 12 - 3\left|-16\right|
   = 12 - 3(16)
   = 12 - 48
   = -36\]

37. \[2q + \left|2rt + q\right| = 2(-8) + \left|2(-6)(3) + (-8)\right|
   = -16 + \left|-36 - 8\right|
   = -16 + 44
   = 28\]

38. \[-5t - q\left|8r - t\right| = -5(3) - (-8)\left|8(-6) - 3\right|
   = -15 + 8\left|-48 - 3\right|
   = -15 + 8\left|-51\right|
   = -15 + 8(51)
   = -15 + 408
   = 393\]

Solve each equation. Check your solutions.
39. \( 8x = 2|6x - 2| \)
\[
\begin{align*}
8x &= 2|6x - 2| \\
\frac{8x}{2} &= \frac{2|6x - 2|}{2} \\
4x &= |6x - 2| \\
\text{Case 1:} & \quad \text{Case 2:} \\
6x - 2 &= 4x & 6x - 2 &= -4x \\
6x - 2 + 2 &= 4x + 2 & 6x - 2 + 2 &= -4x + 2 \\
6x &= 4x + 2 & 6x &= -4x + 2 \\
6x - 4x &= 4x + 2 - 4x & 6x + 4x &= -4x + 2 + 4x \\
2x &= 2 & 10x &= 2 \\
\frac{2x}{2} &= \frac{2}{2} & \frac{10x}{10} &= \frac{2}{10} \\
x &= 1 & x &= \frac{2}{10} \\
& \quad x &= \frac{1}{5}
\end{align*}
\]

There appear to be two solutions, 1 and \( \frac{1}{5} \).

Check: Substitute the values in the original equation.
\[
\begin{align*}
8x &= 2|6x - 2| \\
8(1) &= 2|6(1) - 2| \\
8 &= 2|6 - 2| \\
\frac{8}{5} &= 2\left|\frac{6}{5} - \frac{2}{5}\right| \\
8 &= 2|4| \\
\frac{8}{5} &= 2\left|\frac{6 - 2(5)}{5}\right| \\
8 &= 2(4) \\
\frac{8}{5} &= 2\left|\frac{6 - 10}{5}\right| \\
8 &= 8\sqrt{\frac{4}{5}} \\
\frac{8}{5} &= 2\left(-\frac{4}{5}\right) \\
\frac{8}{5} &= 2\left(\frac{4}{5}\right) \\
\frac{8}{5} &= \frac{8}{5}
\end{align*}
\]

The solution set is \( \left\{1, \frac{1}{5}\right\} \).
40. Case 1:  
\[
4y + 12 = -6y + 4 \\
4y + 12 + 6y = -6y + 4 + 6y \\
10y + 12 = 4 \\
10y + 12 - 12 = 4 - 12 \\
10y = -8 \\
\frac{10y}{10} = \frac{-8}{10} \\
y = \frac{-8}{10} \\
y = \frac{-4}{5}
\]

Case 2:  
\[
4y + 12 = -(6y + 4) \\
4y + 12 = 6y - 4 \\
10y + 12 = 6y - 4 - 6y \\
10y + 12 - 12 = 6y - 4 - 12 \\
-2y + 12 - 12 = -4 - 12 \\
-2y = -16 \\
\frac{-2y}{-2} = \frac{-16}{-2} \\
y = 8
\]

There appear to be two solutions, \(-\frac{4}{5}\) and 8.

Check: Substitute the values in the original equation.
\[
-6y + 4 = |4y + 12| \\
-6(\frac{4}{5}) + 4 = 4(\frac{4}{5}) + 12 \\
-6\left(\frac{4}{5}\right) + 4 = |4\left(\frac{4}{5}\right) + 12| \\
\frac{-24}{5} + 4 = \frac{16}{5} + 12 \\
\frac{24}{5} + 4 = \frac{16}{5} + 12 \\
\frac{24 + 4(5)}{5} = \frac{-16 + 12(5)}{5} \\
\frac{24 + 20}{5} = \frac{-16 + 60}{5} \\
-44 = 60 \\
\frac{-44}{5} = \frac{60}{5} \\
\frac{44}{5} = \frac{-44}{5}
\]

Since \(-44 \neq 60\), \(y = 8\) is an extraneous solution. The solution set is \(\left\{-\frac{4}{5}\right\}\).
41. \[-|2z + 4| = 8z + 20\]
\[|2z + 4| = -(8z + 20)\]
\[|2z + 4| = -8z - 20\]

Case 1:
\[2z + 4 = -8z - 20\]
\[2z + 4 + 8z = -8z - 20 + 8z\]
\[10z + 4 = -20\]
\[10z + 4 - 4 = -20 - 4\]
\[10z = -24\]
\[\frac{10z}{10} = \frac{-24}{10}\]
\[z = -\frac{12}{5}\]
\[\frac{-6z}{6} = \frac{16}{6}\]
\[z = -\frac{8}{3}\]

Case 2:
\[2z + 4 = -(8z - 20)\]
\[2z + 4 = 8z - 20\]
\[2z + 4 - 8z = 8z - 20 - 8z\]
\[10z + 4 - 4 = 20 - 4\]
\[10z = 24\]
\[\frac{10z}{10} = \frac{24}{10}\]
\[z = \frac{12}{5}\]
\[\frac{-6z}{6} = \frac{16}{6}\]
\[z = \frac{8}{3}\]

There appear to be two solutions, \(-\frac{12}{5}\) and \(-\frac{8}{3}\).

Check: Substitute the values in the original equation.
\[8z + 20 = -|2z + 4|\]
\[8 \left( -\frac{12}{5} \right) + 20 = -\left( 2 \left( -\frac{12}{5} \right) + 4 \right)\]
\[-\frac{96}{5} + 20 = -\frac{24}{5} + 4\]
\[-\frac{96 + 20(5)}{5} = -\frac{24 + 5(4)}{5}\]
\[-\frac{-96 + 100}{5} = -\frac{-24 + 20}{5}\]
\[\frac{4}{5} = -\frac{4}{5}\]
\[\frac{4}{5} = \left( \frac{4}{5} \right)\]
\[\frac{4}{5} \neq -\frac{4}{5}\]

Since \(\frac{4}{5} \neq -\frac{4}{5}\), \(y = -\frac{12}{5}\) is an extraneous solution. The solution set is \(\left\{ -\frac{8}{3} \right\}\).
42. Case 1: 
\[ 6y + 25 = -3y - 2 \]
\[ 6y + 25 + 3y = -3y - 2 + 3y \]
\[ 9y + 25 = -2 \]
\[ 9y + 25 - 25 = -2 - 25 \]
\[ 9y = -27 \]
\[ \frac{9y}{9} = -\frac{27}{9} \]
\[ y = -3 \]

Case 2: 
\[ 6y + 25 = -(-3y - 2) \]
\[ 6y + 25 = 3y + 2 \]
\[ 6y + 25 - 3y = 3y + 2 - 3y \]
\[ 3y + 25 = 2 \]
\[ 3y + 25 - 25 = 2 - 25 \]
\[ 3y = -23 \]
\[ \frac{3y}{3} = -\frac{23}{3} \]
\[ y = -\frac{23}{3} \]

There appear to be two solutions, \(-3\) and \(-\frac{23}{3}\).

Check: Substitute the values in the original equation.
\[ -3y - 2 = |6y + 25| \]
\[ -3(-3) - 2 = |6(-3) + 25| \]
\[ -3\left(-\frac{23}{3}\right) - 2 = |6\left(-\frac{23}{3}\right) + 25| \]
\[ 9 - 2 = |-18 + 25| \]
\[ 23 - 2 = |-46 + 25| \]
\[ \frac{7}{7} = 7 \]
\[ 21 = 21 \]

The solution set is \(\{-3, -\frac{23}{3}\}\).

43. Substitute \(c = 100\) and \(r = 245\) in the equation \(|x - c| = r\).
\[ |x - 100| = 245 \]

Solve the equation \(|x - 100| = 245\).
Case 1: 
\[ x - 100 = 245 \]
\[ x - 100 + 100 = 245 + 100 \]
\[ x = 345 \]

Case 2: 
\[ x - 100 = -245 \]
\[ x - 100 + 100 = -245 + 100 \]
\[ x = -145 \]

So, the maximum sea level for Florida is 345 ft above sea level and the minimum is \(-145\) ft below sea level. No, the maximum is reasonable but the minimum is not. Florida’s lowest point should be at sea level where Florida meets the Atlantic Ocean and the Gulf of Mexico.
44. a. Sample answer:

```
A B C D F
-3 -2 -1 0 1 2 3
```

b.

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<tbody>
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<td>B + D ≥ A + D</td>
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<tr>
<td>B + F ≥ A + F</td>
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</tr>
</tbody>
</table>

c. Sample answer: If $A$ is less than $B$, then any number added to or subtracted from $A$ will be less than the same number added to or subtracted from $B$. If $B$ is greater than $A$, then any number added to or subtracted from $B$ is greater than the same number added to or subtracted from $A$.

d. If $A < B$, then $A + x < B + x$. If $A < B$, then $A - x < B - x$.
If $B > A$, then $B + x > A + x$. If $B > A$, then $B - x > A - x$.

45. Ling: Ana included an extraneous solution. She would have caught this error if she had checked to see if her answers were correct by substituting the values into the original equation.

46. The 4 potential solutions are:
1. $(2x - 1) \geq 0$ and $(5 - x) \geq 0$
2. $(2x - 1) \geq 0$ and $(5 - x) < 0$
3. $(2x - 1) < 0$ and $(5 - x) \geq 0$
4. $(2x - 1) < 0$ and $(5 - x) < 0$

The resulting equations corresponding to these cases are:
1. $2x - 1 + 3 = 5 - x : x = 1$
2. $2x - 1 + 3 = x - 5 : x = -7$
3. $1 - 2x + 3 = 5 - x : x = -1$
4. $1 - 2x + 3 = x - 5 : x = 3$

The solutions from case 1 and case 3 work. The others are extraneous. The solution set is $\{-1, 1\}$.

**REASONING** If $a, x,$ and $y$ are real numbers, determine whether each statement is sometimes, always, or never true. Explain your reasoning.

47. Sometimes; this is only true for certain values of $a$. For example, it is true for $a = 8$; if $8 > 7$, then $11 > 10$.
However it is not true for $a = -8$; if $8 > 7$, then $5 \not> 10$.

48. Always; if $|x| < 3$, then $x$ is between $-3$ or $3$. Adding $3$ to the absolute value of any of the numbers in this set will produce a positive number.

49. Always; starting with numbers between $1$ and $5$ and subtracting $3$ will produce numbers between $-2$ and $2$.
These all have an absolute value less than or equal to $2$.

50. Sample answer:

$$|2x + 1| = x - 3,$$ or $$|3x + 10| = x - 5,$$ or $$|x - 1| = \frac{1}{2}x - 4$$
51. Sample answer: First, isolate the absolute value symbol by subtracting c from both sides, and then dividing each side by a. You then have \(|x - b|\) equals a mathematical expression. Take away the absolute value symbol, and form two new equations by setting \(x - b\) equal to both the positive and negative values of the expression. Solve each equation for x. Then substitute each solution into the original equation, and confirm whether they are correct.

\[
4x - y = 3 \\
4x - y + y = 3 + y \\
4x = y + 3 \\
2(2x) = y + 3 \\
2x = \frac{y + 3}{2}
\]

Substitute \(2x = \frac{y + 3}{2}\) in the equation \(2x + 3y = 19\).

\[
2x + 3y = 19 \\
\frac{y + 3}{2} + 3y = 19 \\
\frac{y + 3 + (3y)(2)}{2} = 19 \\
\frac{y + 3 + 6y}{2} = 19 \\
\frac{7y + 3}{2} = 19 \\
2\left(\frac{7y + 3}{2}\right) = 2(19) \\
7y + 3 = 38 \\
7y + 3 - 3 = 38 - 3 \\
7y = 35 \\
\frac{7y}{7} = \frac{35}{7} \\
y = 5
\]

So, the correct choice is D.

52. 

53. The total number of students in the Student Council is \(4 + 4 + 4 + 4\) or 16.

\[
P(11\text{th grader or male}) = \frac{4}{16} + \frac{8}{16} - \frac{2}{16} \\
= \frac{4 + 8 - 2}{16} \\
= \frac{10}{16} \\
= \frac{5}{8}
\]
54. \[4(9 - 3x) = 7 - 2(6 - 5x)\]
\[36 - 12x = 7 - 2(6) + (-2)(-5x)\]
\[36 - 12x = 7 - 12 + 10x\]
\[36 - 12x = -5 + 10x\]
\[36 - 12x - 36 = -5 + 10x - 36\]
\[-12x = 10x - 41\]
\[-12x - 10x = 10x - 41 - 10x\]
\[-22x = -41\]
\[-(-22x) = -(-41)\]
\[22x = 41\]
Therefore, \(22x = 41\) is equivalent to \(4(9 - 3x) = 7 - 2(6 - 5x)\).
So, the correct choice is G.

55. Let \(d\) be the length of the diagonal of the square. Use the Pythagorean Theorem.
\[d^2 = 4^2 + 4^2\]
\[d^2 = 16 + 16\]
\[d^2 = 32\]
\[d = \sqrt{32}\]
Find the distance between the points \((1, 2)\) and \((-3, -2)\).
\[d = \sqrt{(1 + 3)^2 + (2 + 2)^2}\]
\[= \sqrt{4^2 + 4^2}\]
\[= \sqrt{16 + 16}\]
\[= \sqrt{32}\]
So, the point \((-3, -2)\) could be diagonally opposite to \((1, 2)\).
Consider the point \((-3, 6)\).
Find the distance between the points \((1, 2)\) and \((-3, 6)\).
\[d = \sqrt{(1 + 3)^2 + (2 - 6)^2}\]
\[= \sqrt{4^2 + (-4)^2}\]
\[= \sqrt{16 + 16}\]
\[= \sqrt{32}\]
So, the point \((-3, 6)\) could be diagonally opposite to \((1, 2)\).
Consider the point \((5, -3)\).
Find the distance between the points \((1, 2)\) and \((5, -3)\).
\[d = \sqrt{(1 - 5)^2 + (2 + 3)^2}\]
\[= \sqrt{(-4)^2 + 5^2}\]
\[= \sqrt{16 + 25}\]
\[= \sqrt{41}\]
So, the point \((5, -3)\) cannot be diagonally opposite to the vertex \((1, 2)\). The correct choice is C.

Solve each equation. Check your solution.
56. \[ 4x + 6 = 30 \]
\[ 4x + 6 - 6 = 30 - 6 \]
\[ 4x = 24 \]
\[ \frac{4x}{4} = \frac{24}{4} \]
\[ x = 6 \]
Check: Substitute \( x = 6 \) in the original equation.
\[ 4x + 6 = 30 \]
\[ 4(6) + 6 = 30 \]
\[ 24 + 6 = 30 \]
\[ 30 = 30 \checkmark \]
The solution is \( x = 6 \).

57. \[ 5p - 10 = 4(7 + 6p) \]
\[ 5p - 10 = 4(7) + 4(6p) \]
\[ 5p - 10 = 28 + 24p \]
\[ 5p - 10 - 24p = 28 + 24p - 24p \]
\[ -19p - 10 = 28 \]
\[-19p - 10 + 10 = 28 + 10 \]
\[-19p = 38 \]
\[ \frac{-19p}{-19} = \frac{38}{-19} \]
\[ p = -2 \]
Check: Substitute \( p = -2 \) in the original equation.
\[ 5p - 10 = 4(7 + 6p) \]
\[ 5(-2) - 10 = 4(7 + 6(-2)) \]
\[ -10 - 10 = 4(7 - 12) \]
\[ -20 = 4(-5) \]
\[ -20 = -20 \checkmark \]
The solution is \( p = -2 \).
58. \[ \frac{3}{5}y - 7 = \frac{2}{5}y + 3 \]

\[ \frac{3}{5}y - 7 + 7 = \frac{2}{5}y + 3 + 7 \]

\[ \frac{3}{5}y = \frac{2}{5}y + 10 \]

\[ \frac{3}{5}y - \frac{2}{5}y = \frac{2}{5}y + 10 - \frac{2}{5}y \]

\[ \left( \frac{3}{5} - \frac{2}{5} \right)y = 10 \]

\[ \left( \frac{1}{5} \right)y = 10 \]

\[ 5 \left( \frac{1}{5}y \right) = 5(10) \]

\[ y = 50 \]

Check: Substitute \( y = 50 \) in the original equation.

\[ \frac{3}{5}y - 7 = \frac{2}{5}y + 3 \]

\[ \frac{3}{5}(50) - 7 = \frac{2}{5}(50) + 3 \]

\[ 3(10) - 7 = 2(10) + 3 \]

\[ 30 - 7 = 20 + 3 \]

\[ 23 = 23 \checkmark \]

The solution is \( y = 50 \).
59. a. Let $x$ (in dollars) be the price of the car.

$$\left(\frac{3}{4}x - 80\right) + \left(\frac{1}{5}x + 50\right) = x - 370$$

$$\frac{3}{4}x - 80 + \frac{1}{5}x + 50 + 370 = x - 370 + 370$$

$$\frac{3}{4}x + \frac{1}{5}x + 340 = x$$

$$\frac{3}{4}x + \frac{1}{5}x + 340 - 340 = x - 340$$

$$\frac{3}{4}x + \frac{1}{5}x = x - 340$$

$$\frac{3}{4}x + \frac{1}{5}x - x = x - 340 - x$$

$$\frac{3}{4}x + \frac{1}{5}x - x = -340$$

$$\frac{3(5)x + x(4) - x(20)}{20} = -340$$

$$\frac{15x + 4x - 20x}{20} = -340$$

$$\frac{-x}{20} = -340$$

$$-20\left(\frac{-x}{20}\right) = -20(-340)$$

$$x = 6800$$

The price of the car is $6800.

b. $6800 - $370 = $6430

So, Nhu saved $6430 in 12 months.

$6430 \approx $535.83

The average amount of money Nhu saved each month is about $535.83.

c. Since $6430 + $535.83 > $6800, he will be able to afford the car in 1 month.

Name the property illustrated by each equation.

60. Commutative Property of Addition

61. Distributive Property

Simplify each expression.

62. $7a + 3b - 4a - 5b = 7a - 4a + 3b - 5b$

$= (7 - 4)a + (3 - 5)b$

$= 3a - 2b$

63. $3x + 5y + 7x - 3y = 3x + 7x + 5y - 3y$

$= (3 + 7)x + (5 - 3)y$

$= 10x + 2y$
Name:

64. \[3(15x - 9y) + 5(4y - x) = 3(15x) + 3(-9y) + 5(4y) + 5(-x)\]
\[= 45x - 27y + 20y - 5x\]
\[= 45x - 5x - 27y + 20y\]
\[= (45 - 5)x + (-27 + 20)y\]
\[= 40x - 7y\]

65. \[2(10m - 7a) + 3(8a - 3m) = 2(10m) + 2(-7a) + 3(8a) + 3(-3m)\]
\[= 20m - 14a + 24a - 9m\]
\[= 20m - 9m - 14a + 24a\]
\[= (20 - 9)m + (-14 + 24)a\]
\[= 11m + 10a\]

66. \[8(r + 7t) - 4(13t + 5r) = 8(r) + 8(7t) + (-4)(13t) + (-4)(5r)\]
\[= 8r + 56t - 52t - 20r\]
\[= 8r - 20r + 56t - 52t\]
\[= (8 - 20)r + (56 - 52)t\]
\[= -12r + 4t\]

67. \[4(14c - 10d) - 6(d + 4c) = 4(14c) + 4(-10d) + (-6)(d) + (-6)(4c)\]
\[= 56c - 40d - 6d - 24c\]
\[= 56c - 24c - 40d - 6d\]
\[= (56 - 24)c + (-40 - 6)d\]
\[= 32c - 46d\]

68. Substitute \(1 = 12, \ w = 5, \ \text{and} \ h = 7 \ \text{in the formula} \ SA = 2lw + 2lh + 2wh.\)

\[SA = 2(12)(5) + 2(12)(7) + 2(5)(7)\]
\[= 120 + 168 + 70\]
\[= 358\]

The surface area of the rectangular prism is 358 square inches.

Solve each equation.

69. \[15x + 5 = 35\]
\[15x + 5 - 5 = 35 - 5\]
\[15x = 30\]
\[\frac{15x}{15} = \frac{30}{15}\]
\[x = 2\]

70. \[2.4y + 4.6 = 20\]
\[2.4y + 4.6 - 4.6 = 20 - 4.6\]
\[2.4y = 15.4\]
\[\frac{2.4y}{2.4} = \frac{15.4}{2.4}\]
\[y \approx 6.417\]
Name:

71. \[ 8a + 9 = 6a - 7 \]
\[ 8a + 9 - 9 = 6a - 7 - 9 \]
\[ 8a = 6a - 16 \]
\[ 8a - 6a = 6a - 16 - 6a \]
\[ 2a = -16 \]
\[ \frac{2a}{2} = \frac{-16}{2} \]
\[ a = -8 \]

72. \[ 3(w - 1) = 2w - 6 \]
\[ 3w - 3 = 2w - 6 \]
\[ 3w - 3 + 3 = 2w - 6 + 3 \]
\[ 3w = 2w - 3 \]
\[ 3w - 2w = 2w - 3 - 2w \]
\[ w = -3 \]

73. \[ \frac{1}{2}(2b - 4) = 2 + 8b \]
\[ \frac{1}{2}(2b) + \frac{1}{2}(-4) = 2 + 8b \]
\[ b - 2 = 2 + 8b \]
\[ b - 2 + 2 = 2 + 8b + 2 \]
\[ b = 4 + 8b \]
\[ b - 8b = 4 + 8b - 8b \]
\[ -7b = 4 \]
\[ \frac{-7b}{-7} = \frac{4}{-7} \]
\[ b = -\frac{4}{7} \]

74. \[ \frac{1}{3}(6p - 24) = 18 + 3p \]
\[ \frac{1}{3}(6p) + \frac{1}{3}(-24) = 18 + 3p \]
\[ 2p - 8 = 18 + 3p \]
\[ 2p - 8 + 8 = 18 + 3p + 8 \]
\[ 2p = 26 + 3p \]
\[ 2p - 3p = 26 + 3p - 3p \]
\[ -p = 26 \]
\[ \frac{-p}{-1} = \frac{26}{-1} \]
\[ p = -26 \]
1-5 Solving Inequalities - Check Your Understanding

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

1. \(b + 6 < 14\)
   \[b + 6 - 6 < 14 - 6\]
   \[b < 8\]

2. \(12 - d > -8\)
   \[12 - d - 12 > -8 - 12\]
   \[-d > -20\]
   \[d < 20\]

3. \(18 \leq -3x\)
   \[\frac{18}{-3} \geq \frac{-3x}{-3}\]
   \[-6 \geq x\]
   \[x \leq -6\]

4. \(-5y \geq -35\)
   \[\frac{-5y}{-5} \leq \frac{-35}{-5}\]
   \[y \leq 7\]

5. \(-4w - 13 > -21\)
   \[-4w - 13 + 13 > -21 + 13\]
   \[-4w > -8\]
   \[\frac{-4w}{-4} < \frac{-8}{-4}\]
   \[w < 2\]
6. \[ 8z - 9 \geq -15 \]
\[ 8z - 9 + 9 \geq -15 + 9 \]
\[ 8z \geq -6 \]
\[ \frac{8z}{8} \geq \frac{-6}{8} \]
\[ z \geq -\frac{3}{4} \]

7. \[ g \geq \frac{s + 6}{5} \]
\[ 5s \geq 5 \left( \frac{s + 6}{5} \right) \]
\[ 5s \geq s + 6 \]
\[ 5s - s \geq s - s + 6 \]
\[ 4s \geq 6 \]
\[ \frac{4s}{4} \geq \frac{6}{4} \]
\[ s \geq \frac{3}{2} \]

8. \[ \frac{2x - 9}{4} \leq x + 2 \]
\[ 4 \left( \frac{2x - 9}{4} \right) \leq 4(x + 2) \]
\[ 2x - 9 \leq 4x + 8 \]
\[ 2x - 9 - 4x \leq 4x + 8 - 4x \]
\[ -2x - 9 \leq 8 \]
\[ -2x - 9 + 9 \leq 8 + 9 \]
\[ -2x \leq 17 \]
\[ \frac{-2x}{-2} \geq \frac{17}{-2} \]
\[ x \geq -8.5 \]
9. Let $x$ be the number of bags of mulch.

\[ 48x + 65 \leq 2000 \]
\[ 48x + 65 - 65 \leq 2000 - 65 \]
\[ 48x \leq 1935 \]
\[ \frac{48x}{48} \leq \frac{1935}{48} \]
\[ x \leq 40.3125 \]

So, Tara can safely take 40 bags of mulch on each trip.

1-5 Solving Inequalities - Practice and Problem Solving

Solve each inequality. Then graph the solution set on a number line.
10. \[ m - 8 > -12 \]
   \[ m - 8 + 8 > -12 + 8 \]
   \[ m > -4 \]

11. \[ n + 6 \leq 3 \]
   \[ n + 6 - 6 \leq 3 - 6 \]
   \[ n \leq -3 \]

12. \[ 6r < -36 \]
   \[ \frac{6r}{6} < \frac{-36}{6} \]
   \[ r < -6 \]

13. \[ -12t \geq -6 \]
   \[ -12 \frac{t}{-12} \leq -6 \]
   \[ t \leq \frac{1}{2} \]

14. \[ -\frac{w}{4} \leq -7 \]
   \[ 4 \left( -\frac{w}{4} \right) \leq -7 \times 4 \]
   \[ -w \leq -28 \]
   \[ -\frac{w}{-1} \geq \frac{-28}{-1} \]
   \[ w \geq 28 \]
15. \[\frac{k}{3} - 14 < -5\]
\[\frac{k}{3} - 14 + 14 < -5 + 14\]
\[\frac{k}{3} < 9\]
\[3 \left( \frac{k}{3} \right) < 3 \times 9\]
\[k < 27\]

16. \[4x - 15 \leq 21\]
\[4x - 15 + 15 \leq 21 + 15\]
\[4x \leq 36\]
\[\frac{4x}{4} \leq \frac{36}{4}\]
\[x \leq 9\]

17. \[-6z - 14 > -32\]
\[-6z - 14 + 14 > -32 + 14\]
\[-6z > -18\]
\[\frac{-6z}{-6} < \frac{-18}{-6}\]
\[z < 3\]

18. \[-16 \geq 5(2z - 11)\]
\[-16 \geq 5(2z) + 5(-11)\]
\[-16 \geq 10z - 55\]
\[-16 + 55 \geq 10z + 55 - 55\]
\[39 \geq 10z\]
\[10z \leq 39\]
\[\frac{10z}{10} \leq \frac{39}{10}\]
\[z \leq 3.9\]
19.  
\[ 12 < -4(3c - 6) \]
\[ 12 < -4(3c) + (-4)(-6) \]
\[ 12 < -12c + 24 \]
\[ 12 - 24 < -12c + 24 - 24 \]
\[ -12 < -12c \]
\[ -12c > -12 \]
\[ -12c \leq -12 \]
\[ -\frac{12c}{-12} \leq -\frac{12}{-12} \]
\[ c < 1 \]

20.  
\[ \frac{3y - 4}{0.2} - 8 > 12 \]
\[ 3y - 4 \]
\[ 8 + 8 > 12 + 8 \]
\[ \frac{3y - 4}{0.2} > 20 \]
\[ (0.2)\left(\frac{3y - 4}{0.2}\right) > (0.2)(20) \]
\[ 3y - 4 > 4 \]
\[ 3y - 4 + 4 > 4 + 4 \]
\[ 3y > 8 \]
\[ \frac{3y}{3} > \frac{8}{3} \]
\[ y > \frac{8}{3} \]

21.  
\[ \frac{9z + 5}{4} + 18 < 26 \]
\[ \frac{9z + 5}{4} + 18 - 18 < 26 - 18 \]
\[ \frac{9z + 5}{4} < 8 \]
\[ 4\left(\frac{9z + 5}{4}\right) < 4(8) \]
\[ 9z + 5 < 32 \]
\[ 9z + 5 - 5 < 32 - 5 \]
\[ 9z < 27 \]
\[ \frac{9z}{9} < \frac{27}{9} \]
\[ z < 3 \]
22. Let $x$ be the artistic score of the gymnast.

\[ 0.75(7.6) + 0.25(x) \geq 8 \]
\[ 5.7 + 0.25x \geq 8 \]
\[ 5.7 + 0.25x - 5.7 \geq 8 - 5.7 \]
\[ 0.25x \geq 2.3 \]
\[ \frac{0.25x}{0.25} \geq \frac{2.3}{0.25} \]
\[ x \geq 9.2 \]
So, the gymnast needs to have 9.2 of artistic score to have a final score of at least 8.0.

Define a variable and write an inequality for each problem. Then solve.

23. Let $x$ be the unknown number.

\[ 3x - 12 < 21 \]
\[ 3x - 12 + 12 < 21 + 12 \]
\[ 3x < 33 \]
\[ \frac{3x}{3} < \frac{33}{3} \]
\[ x < 11 \]

24. Let $x$ be the unknown number.

\[ \frac{3x}{4} \geq -16 \]
\[ 4 \left( \frac{3x}{4} \right) \geq 4(-16) \]
\[ 3x \geq -64 \]
\[ \frac{3x}{3} \geq \frac{-64}{3} \]
\[ x \geq -\frac{64}{3} \]

25. Let $x$ be the unknown number.

\[ 5x - 6 > x \]
\[ 5x - 6 + 6 > x + 6 \]
\[ 5x > x + 6 \]
\[ 5x - x > x + 6 - x \]
\[ 4x > 6 \]
\[ \frac{4x}{4} > \frac{6}{4} \]
\[ x > \frac{3}{2} \]
\[ x > 1.5 \]
26. Let $x$ be the unknown number.
\[
\frac{x + 3}{6} < -2
\]
\[
6 \left( \frac{x + 3}{6} \right) < 6(-2)
\]
\[
x + 3 < -12
\]
\[
x + 3 - 3 < -12 - 3
\]
\[
x < -15
\]

27. \[3(x - 2) \geq 18\]
\[
\frac{3(x - 2)}{3} \geq \frac{18}{3}
\]
\[
x - 2 \geq 6
\]
\[
x - 2 + 2 \geq 6 + 2
\]
\[
x \geq 8
\]
So, Danielle has to hike for at least 8 hours.

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

28. \[18 - 3x < 12\]
\[18 - 3x - 18 < 12 - 18\]
\[-3x < -6\]
\[-3x > \frac{-6}{-3}\]
\[
x > 2
\]

29. \[-8(4x + 6) < -24\]
\[-8(4x) + (-8)(6) < -24\]
\[-32x - 48 < -24\]
\[-32x - 48 + 48 < -24 + 48\]
\[-32x < 24\]
\[-\frac{32x}{-32} > \frac{24}{-32}\]
\[
x > -\frac{3}{4}
\]
30. \[
\frac{1}{4} n + 12 \geq \frac{3}{4} n - 4
\]
\[
\frac{1}{4} n + 12 - 12 \geq \frac{3}{4} n - 4 - 12
\]
\[
\frac{1}{4} n \geq \frac{3}{4} n - 16
\]
\[
\frac{1}{4} n - \frac{3}{4} n \geq \frac{3}{4} n - \frac{3}{4} n - 16
\]
\[
\left(\frac{1}{4} \frac{-3}{4}\right) n \geq -16
\]
\[
\left(\frac{1-3}{4}\right) n \geq -16
\]
\[
\left(-\frac{2}{4}\right) n \geq -16
\]
\[
\frac{-1}{2} n \geq -16
\]
\[
-2 \left(\frac{-1}{2} n\right) \leq -2(-16)
\]
\[
n \leq 32
\]

31. \[
0.24 y - 0.64 > 3.86
\]
\[
0.24 y - 0.64 + 0.64 > 3.86 + 0.64
\]
\[
0.24 y > 4.5
\]
\[
\frac{0.24 y}{0.24} > \frac{4.5}{0.24}
\]
\[
y > 18.75
\]

32. \[
10x - 6 \leq 4x + 42
\]
\[
10x - 6 + 6 \leq 4x + 42 + 6
\]
\[
10x \leq 4x + 48
\]
\[
10x - 4x \leq 4x + 48 - 4x
\]
\[
6x \leq 48
\]
\[
\frac{6x}{6} \leq \frac{48}{6}
\]
\[
x \leq 8
\]
33. \(-6v + 8 > -14v - 28\)
\(-6v + 8 - 8 > -14v - 28 - 8\)
\(-6v > -14v - 36\)
\(-6v + 14v > -14v - 36 + 14v\)
\(8v > -36\)
\(\frac{8v}{8} > \frac{-36}{8}\)
\(v > -4.5\)

34. \(n > \frac{-3n - 15}{8}\)
\(8n > 8 \left( \frac{-3n - 15}{8} \right)\)
\(8n > -3n - 15\)
\(8n + 3n > -3n - 15 + 3n\)
\(11n > -15\)
\(\frac{11n}{11} > \frac{-15}{11}\)
\(n > \frac{-15}{11}\)

35. \(-2r < \frac{6 - 2r}{5}\)
\(5(-2r) < 5 \left( \frac{6 - 2r}{5} \right)\)
\(-10r < 6 - 2r\)
\(-10r + 2r < 6 - 2r + 2r\)
\(-8r < 6\)
\(\frac{-8r}{-8} > \frac{6}{-8}\)
\(r > \frac{-6}{8}\)
\(r > -\frac{3}{4}\)
36. \[
\frac{9z - 4}{5} \leq \frac{7z + 2}{4}
\]
\[
20 \left( \frac{9z - 4}{5} \right) \leq 20 \left( \frac{7z + 2}{4} \right)
\]
\[
4(9z - 4) \leq 5(7z + 2)
\]
\[
36z - 16 \leq 35z + 10
\]
\[
36z - 35z - 16 \leq 35z + 10 - 35z
\]
\[
z - 16 \leq 10
\]
\[
z - 16 + 16 \leq 10 + 16
\]
\[
z \leq 26
\]

37. a. \[250 + 0.03(500a) \geq 700\]
b. \[250 + 0.03(500a) \geq 700\]
\[250 + 0.03(500a) - 250 \geq 700 - 250\]
\[0.03(500a) \geq 450\]
\[15a \geq 450\]
\[
\frac{15a}{15} \geq \frac{450}{15}
\]
\[a \geq 30\]

So, he must sell at least 30 advertisements to make a salary of at least $700 that week.

Define a variable and write an inequality for each problem. Then solve.
38. Let \( n \) be the unknown number.

The words *one third of the sum of 5 times a number and 3* represent the expression \( \frac{5n+3}{3} \).

The words *one fourth the sum of six times that number and 5* represent the expression \( \frac{6n+5}{4} \).

So, the inequality is \( \frac{5n+3}{3} < \frac{6n+5}{4} \).

\[
\begin{align*}
12 \left( \frac{5n+3}{3} \right) &< 12 \left( \frac{6n+5}{4} \right) \\
4(5n+3) &< 3(6n+5) \\
20n+12 &< 18n+15 \\
20n+12-18n &< 18n+15-18n \\
2n+12 &< 15 \\
2n+12-12 &< 15-12 \\
2n &< 3 \\
\frac{2n}{2} &< \frac{3}{2} \\
n &< 1.5
\end{align*}
\]

39. Let \( x \) be a variable.

The words *the sum of one third a number* represent the expression \( \frac{x}{3} + 4 \).

The words *the sum of twice that number and 12* represent the expression \( 2x + 12 \).

So, the inequality is \( \frac{x}{3} + 4 \leq 2x + 12 \).

\[
\begin{align*}
\frac{x}{3} + 4 &\leq 2x + 12 \\
\frac{x}{3} + 4 - 4 &\leq 2x + 12 - 4 \\
\frac{x}{3} &\leq 2x + 8 \\
3 \left( \frac{x}{3} \right) &\leq 3(2x+8) \\
x &\leq 6x + 24 \\
x - 6x &\leq 6x + 24 - 6x \\
-5x &\leq 24 \\
\frac{-5x}{-5} &\geq \frac{24}{-5} \\
x &\geq -\frac{24}{5}
\end{align*}
\]
40. Let $x$ be the side length of the square $ABCD$. 
So, the perimeter of the square is $4x$.
Therefore, the length of the rectangle is $(x + 10)$ and the width of the rectangle is $(x + 8)$. So, the perimeter of the rectangle is $2(x + 10) + 2(x + 8)$.
Since the perimeter of the rectangle is at least twice the perimeter of the square, the inequality is $2(x + 10) + 2(x + 8) \geq 2(4x)$.
Solve the inequality $2(x + 10) + 2(x + 8) \geq 2(4x)$.
$$
2(x + 10) + 2(x + 8) \geq 2(4x) \\
2x + 20 + 2x + 16 \geq 8x \\
4x + 36 \geq 8x \\
4x + 36 - 36 \geq 8x - 36 \\
4x \geq 8x - 36 \\
4x - 8x \geq 8x - 36 - 8x \\
-4x \geq -36 \\
-\frac{4x}{-4} \leq -\frac{-36}{-4} \\
x \leq 9
$$
Therefore, the maximum length of the side of square $ABCD$ is 9 inches.

41. a. $3(5 + d) \geq 26.2$

b. $3(5 + d) \geq 26.2$

$3(5) + 3(d) \geq 26.2$

$15 + 3d \geq 26.2$

$15 + 3d - 15 \geq 26.2 - 15$

$3d \geq 11.2$

$\frac{3d}{3} \geq \frac{11.2}{3}$

$d \geq 3.73$

In order to have enough endurance to run a marathon, Jamie should increase the distance of her average daily run by at least 3.73 miles.

42. $38 + 0.1x > 42 + 0.05x$

$38 + 0.1x - 38 > 42 + 0.05x - 38$

$0.1x > 4 + 0.05x$

$0.1x - 0.05x > 4 + 0.05x - 0.05x$

$0.05x > 4$

$\frac{0.05x}{0.05} > \frac{4}{0.05}$

$x > 80$

Basic has the better deal as long as you are traveling more than 80 miles. Yes, this is the correct inequality to use.
Sample explanation: It works because the inequality finds the mileage at which Ace’s charge is greater than Basic’s charge.
43. a. Sample answer:

<table>
<thead>
<tr>
<th>Point</th>
<th>Resulting Statement</th>
<th>True or False</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0, 0)</td>
<td>0 ≥ 3</td>
<td>False</td>
</tr>
<tr>
<td>(1, 1)</td>
<td>1 ≥ (\frac{5}{2})</td>
<td>False</td>
</tr>
<tr>
<td>(2, 2)</td>
<td>2 ≥ 2</td>
<td>True</td>
</tr>
<tr>
<td>(3, 3)</td>
<td>3 ≥ (\frac{3}{2})</td>
<td>True</td>
</tr>
<tr>
<td>(4, 4)</td>
<td>4 ≥ 1</td>
<td>True</td>
</tr>
</tbody>
</table>

b. Sample answer:

![Graph image]

c. **Sample answer:** The points on or above the line result in true statements, and the points below the line result in false statements. This is true for all points on the coordinate plane.

44. 

\[
\begin{align*}
\frac{x}{y} &< b \\
y_a < y &\left(\frac{x}{y}\right) < y_b \\
y_a < x &< y_b \\
\end{align*}
\]

Since -4 < x < 5, y_a = -4 and y_b = 5.
\[
y_a + y_b = -4 + 5
\]
\[
y(a + b) = 1
\]
\[
(a + b)0.25 < (a + b)y < (a + b)4
\]
\[
(a + b)0.25 < 1 < (a + b)4
\]
\[
\begin{align*}
\frac{(a + b)0.25}{0.25} &< \frac{1}{0.25} < \frac{(a + b)4}{0.25} \\
(a + b) &< 4 < 16(a + b)
\end{align*}
\]

Therefore, (a + b) < 4.

45. No; sample answer: Madlynn reversed the inequality sign when she added 1 to each side. Emilie did not reverse the inequality sign at all.

46. **Sample answer:** Always, the opposite of the absolute value of a negative number will always be a negative value, while the opposite of a negative number will always be a positive value. A negative value will always be less than a positive value.
47. Using the Triangle Inequality Theorem, we know that the sum of the lengths of any 2 sides of a triangle must be greater than the length of the remaining side. This generates 3 inequalities to examine.

\[3x + 4 + 2x + 5 > 4x\]
\[5x + 9 > 4x\]
\[5x + 9 - 4x > 4x - 4x\]
\[x + 9 > 0\]
\[x + 9 - 9 > 0 - 9\]
\[x > -9\]
\[2x + 5 + 4x > 3x + 4\]
\[6x + 5 > 3x + 4\]
\[6x + 5 - 3x > 3x + 4 - 3x\]
\[3x + 5 > 4\]
\[3x + 5 - 5 > 4 - 5\]
\[3x > -1\]
\[\frac{3x}{3} > \frac{-1}{3}\]
\[x > -\frac{1}{3}\]
\[3x + 4 + 4x > 2x + 5\]
\[7x + 4 > 2x + 5\]
\[7x + 4 - 2x > 2x + 5 - 2x\]
\[5x + 4 > 5\]
\[5x + 4 - 4 > 5 - 4\]
\[5x > 1\]
\[\frac{5x}{5} > \frac{1}{5}\]
\[x > \frac{1}{5}\]

In order for all 3 conditions to be true, \(x\) must be greater than 0.2.

48. Sample answer: \(4x + 5 > 4(x + 1)\); This has a solution set of all real numbers because it simplifies to \(4x + 5 > 4x + 4\), or \(5 > 4\). This indicates that for any real value of \(x\) the inequality is equivalent to \(1 > 0\), that is the left side will always be 1 greater than the right side.

49. Sample answer: When one number is greater than another number, it is either more positive or less negative than that number. When these numbers are multiplied by a negative value, their roles are reversed. That is, the number that was more positive is now more negative than the other number. Thus, it is now less than that number and the inequality symbol needs to be reversed.
50. Let \( x \) be the cups of sugar needed for 6 cups of flour.

\[
\begin{align*}
\frac{x}{\left( \frac{3}{4} \right)} &= \frac{6}{2} \\
\frac{x}{\frac{3}{4}} &= \frac{6}{2} \\
x &= \frac{6 \cdot \frac{3}{4}}{2} \\
x &= \frac{18}{8} \\
x &= \frac{2 \frac{2}{8}}{} \\
x &= \frac{2 \frac{1}{4}}{}
\end{align*}
\]

So, \( 2 \frac{1}{4} \) cups of sugar would be needed for 6 cups of flour.

51. Let \( x \) be the sum of the scores of first six algebra quizzes.

\[
\begin{align*}
\frac{x}{6} &= 88 \\
6 \left( \frac{x}{6} \right) &= 6(88) \\
x &= 528 \\
x + 95 &= \frac{528 + 95}{7} \\
\frac{x + 95}{7} &= \frac{623}{7} \\
 &= \frac{89}{7} 
\end{align*}
\]

So, the correct choice is A.
52. Let $x$ be the sum of the five numbers.

\[
\frac{x}{5} = 9
\]

\[5\left(\frac{x}{5}\right) = 5(9)
\]

\[x = 45
\]

Let $y$ be the sum of the 7 other numbers.

\[
\frac{y}{7} = 8
\]

\[7\left(\frac{y}{7}\right) = 7(8)
\]

\[y = 56
\]

\[
x + y = \frac{45 + 56}{12}
\]

\[= \frac{101}{12}
\]

\[= \frac{8}{12}
\]

Therefore, the average of all 12 numbers is $\frac{5}{12}$. So, the correct choice is F.

53. **Case 1:**

\[
8 - 4x = 40 \quad 8 - 4x = -40
\]

\[
8 - 4x - 8 = 40 - 8 \quad 8 - 4x - 8 = -40 - 8
\]

\[-4x = 32 \quad -4x = -48
\]

\[\frac{-4x}{-4} = \frac{32}{-4} \quad \frac{-4x}{-4} = \frac{-48}{-4}
\]

\[x = -8 \quad x = 12
\]

**Check:**

\[
|8 - 4x| = 40 \quad |8 - 4x| = 40
\]

\[
|8 - 4(-8)| = 40 \quad |8 - 4(12)| = 40
\]

\[
|8 + 32| = 40 \quad |8 - 48| = 40
\]

\[
|40| = 40 \quad |-40| = 40
\]

\[40 = 40 \checkmark \quad 40 = 40 \checkmark
\]

The solution set is \{-8, 12\}.

So, the correct choice is D.

Solve each equation. Check your solutions.
54. **Case 1:**
\[x - 5 = 12\]
\[x - 5 + 5 = 12 + 5\]
\[x = 17\]

**Case 2:**
\[x - 5 = -12\]
\[x - 5 + 5 = -12 + 5\]
\[x = -7\]

There appear to be two solutions, 17 and -7.

**Check:** Substitute the values in the original equation.
\[|x - 5| = 12\]  \[|x - 5| = 12\]
\[|17 - 5| = 12\]  \[|-7 - 5| = 12\]
\[|12| = 12\]  \[|-12| = 12\]
\[12 = 12\checkmark\]  \[12 = 12\checkmark\]

The solution set is \(\{17, -7\}\).

55. \[
\frac{7|3y - 4|}{7} = \frac{35}{7}
\]
\[|3y - 4| = 5\]

**Case 1:**
\[3y - 4 = 5\]
\[3y = 9\]
\[y = 3\]

**Case 2:**
\[3y - 4 = -5\]
\[3y = -1\]
\[y = -\frac{1}{3}\]

There appear to be two solutions, 3 and \(-\frac{1}{3}\).

**Check:** Substitute the values in the original equation.
\[7|3y - 4| = 35\]  \[7|3y - 4| = 35\]
\[7|3(3) - 4| = 35\]  \[7\left|\frac{-1}{3} - 4\right| = 35\]
\[7|9 - 4| = 35\]  \[7|-1 - 4| = 35\]
\[7|5| = 35\]  \[7|-5| = 35\]
\[7\left|\frac{1}{3}\right| = 35\]
\[35 = 35\checkmark\]  \[35 = 35\checkmark\]

The solution set is \(\left\{3, -\frac{1}{3}\right\}\).

56. Since the absolute value of the sum of 6 and a number never equal to the number, the solution set is \(\emptyset\).
57. Maximum distance – Minimum distance = 4539 – 2756
   \[ r = \frac{1783}{2} \]
   \[ = 891.5 \]
   The value of \( c \) is 4539 – 891.5 or 3647.5.
   Substitute \( r = 891.5 \) and \( c = 3647.5 \) in the equation \(|t - c| = r\).
   \(|t - 3647.5| = 891.5\)

58. a. Since the population is decreased by an average of 715 people per year, the decrease in population for 5 years is 5(715) or 3575.
   \[ 19,611 - 3,575 = 16,036 \]
   The population in 2010 was 16,036.
   b. To find the decrease in population in 20 years, multiply 20 and 715.
   \[ 20 \times 715 = 14,300 \]
   So in 2025, the population would be 19,611 – 14,300 or 5,311.

59. a.
   \[ 2\pi r^2 = 2 \cdot \pi \cdot r \cdot r \]
   \[ 2\pi rh = 2 \cdot \pi \cdot r \cdot h \]
   The GCF of the two terms is \( 2\pi r \).
   \[ SA = 2\pi r (r) + 2\pi r (h) \]
   \[ = 2\pi r (r + h) \]
   b. Substitute \( r = 3 \) and \( h = 10 \) in the formula \( SA = 2\pi r^2 + 2\pi rh \).
   \[ SA = 2\pi r^2 + 2\pi rh \]
   \[ = 2\pi (3)^2 + 2\pi (3)(10) \]
   \[ = 18\pi + 60\pi \]
   \[ = 78\pi \]
   \[ SA = 2\pi (3)(3+10) \]
   Substitute \( r = 3 \) and \( h = 10 \) in the formula \( = 2\pi (3)(13) \)
   \[ = 78\pi \]
   Therefore, the surface area of the cylinder is \( 78\pi \) cm\(^2\).
   c. Sample answer: The formula in part b is quicker.

60. \[ 26 \cdot 28 = 26(20 + 8) \]
    \[ = 520 + 208 \]
    \[ = 728 \]

Solve each equation. Check your solutions.

61. Case 1: Case 2:
   \[ x = 9 \quad x = -9 \]
   The solution set is \( \{-9, 9\} \).
62. **Case 1:** \( x + 3 = 10 \quad x + 3 = -10 \)
   \( x + 3 - 3 = 10 - 3 \quad x + 3 - 3 = -10 - 3 \)
   \( x = 7 \quad x = -13 \)

There appear to be two solutions, 7 and -13.

**Check:** Substitute the values in the original equation.

\[
\begin{align*}
\|x + 3\| &= 10 & \|x + 3\| &= 10 \\
\|7 + 3\| &= 10 & \|-13 + 3\| &= 10 \\
\|10\| &= 10 & \|-10\| &= 10 \\
10 &= 10 \checkmark & 10 &= 10 \checkmark
\end{align*}
\]

The solution set is \( \{-13, 7\} \).

63. **Case 1:** \( 4y - 15 = 13 \quad 4y - 15 = -13 \)
   \( 4y - 15 + 15 = 13 + 15 \quad 4y - 15 + 15 = -13 + 15 \)
   \( 4y = 28 \quad 4y = 2 \)
   \( \frac{4y}{4} = \frac{28}{4} \quad \frac{4y}{4} = \frac{2}{4} \)
   \( y = 7 \quad y = \frac{1}{2} \)

There appear to be two solutions, \( \frac{1}{2} \) and 7.

**Check:** Substitute the values in the original equation.

\[
\begin{align*}
\|4y - 15\| &= 13 & \|4y - 15\| &= 13 \\
\|4\left(\frac{1}{2}\right) - 15\| &= 13 & \|4(7) - 15\| &= 13 \\
\|2 - 15\| &= 13 & \|28 - 15\| &= 13 \\
\|-13\| &= 13 & \|13\| &= 13 \\
13 &= 13 \checkmark & 13 &= 13 \checkmark
\end{align*}
\]

The solution set is \( \left\{ \frac{1}{2}, 7 \right\} \).
64. Case 1:  
\[3x - 9 = 18\]  
\[3x - 9 + 9 = 18 + 9\]  
\[3x = 27\]  
\[x = 9\]

Case 2:  
\[3x - 9 = -18\]  
\[3x - 9 + 9 = -18 + 9\]  
\[3x = 27\]  
\[x = -3\]

There appear to be two solutions, –3 and 9.

Check: Substitute the values in the original equation.

\[18 = |3x - 9|\]  
\[18 = |3(-3) - 9|\]  
\[18 = |3(-9) - 9|\]  
\[18 = |-9 - 9|\]  
\[18 = |27 - 9|\]  
\[18 = |-18|\]  
\[18 = |18|\]  
\[18 = 18\]

The solution set is \{–3, 9\}.

65. \[16 = 4|w + 2|\]  
\[\frac{16}{4} = \frac{4|w + 2|}{4}\]  
\[4 = |w + 2|\]

Case 1:  
\[w + 2 = 4\]  
\[w + 2 = -4\]  
\[w = 2\]  
\[w = -6\]

Case 2:  
\[w + 2 = 4\]  
\[w + 2 = -4\]  
\[w = 2\]  
\[w = -6\]

There appear to be two solutions, –6 and 2.

Check: Substitute the values in the original equation.

\[16 = 4|w + 2|\]  
\[16 = 4|w + 2|\]  
\[16 = 4(-6 + 2)|\]  
\[16 = 4|2 + 2|\]  
\[16 = 4|-4|\]  
\[16 = 4|4|\]  
\[16 = 4(4)\]  
\[16 = 4(4)\]  
\[16 = 16\]

The solution set is \{–6, 2\}.
66. \[ |y + 3| + 4 = 20 \]
\[ |y + 3| + 4 - 4 = 20 - 4 \]
\[ |y + 3| = 16 \]

Case 1:  
\[ y + 3 = 16 \]
\[ y = 13 \]

Case 2:  
\[ y + 3 = -16 \]
\[ y = -19 \]

There appear to be two solutions, \(-19\) and \(13\).

\[ |y + 3| + 4 = 20 \quad |y + 3| + 4 = 20 \]
\[ |-19 + 3| + 4 = 20 \quad |13 + 3| + 4 = 20 \]
\[ |-16| + 4 = 20 \quad |16| + 4 = 20 \]
\[ 16 + 4 = 20 \quad 16 + 4 = 20 \]
\[ 20 = 20 \quad 20 = 20 \]

The solution set is \( \{-19, 13\} \).
Explore 1-6 Algebra Lab: Interval Notation - Exercises

Write each inequality using interval notation.

1. \((-\infty, -3]\)
2. \((-8, +\infty)\)
3. \((-\infty, 2) \cup [14, +\infty)\)
4. \((-\infty, -9] \cup (1, +\infty)\)
5. \((1, 3)\)
6. \((-\infty, -7] \cup [4, +\infty)\)
7. \([0, +\infty)\)
8. \((-3, 4)\)
9. \((-\infty, -1) \cup (1, +\infty)\)
10. \([-5, 5]\)
11. \((-8, 8)\)
12. \((-\infty, -1.5] \cup [1.5, +\infty)\)
13. \((-\infty, 11]\)
14. \((-\infty, -5) \cup (25, +\infty)\)

Graph each solution set on a number line.

15. ![Number Line 1](image1)
16. ![Number Line 2](image2)
17. ![Number Line 3](image3)

18. All values less than 3, not including 3, are part of the solution set. All values greater than and including 10 are part of the solution set: \(x < 3\) or \(x \geq 10\).
1-6 Solving Compound and Absolute Value Inequalities - Check Your Understanding

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

1. \(-4 < g + 8 < 6\)
   \(-4 - 8 < g + 8 - 8 < 6 - 8\)
   \(-12 < g < -2\)
   The solution of the inequality is \(\{g \mid -12 < g < -2\}\).

2. \(-9 \leq 4y - 3 \leq 13\)
   \(-9 + 3 \leq 4y - 3 + 3 \leq 13 + 3\)
   \(-6 \leq 4y \leq 16\)
   \(-\frac{6}{4} \leq \frac{4y}{4} \leq \frac{16}{4}\)
   \(-1.5 \leq y \leq 4\)
   The solution of the inequality is \(\{y \mid -1.5 \leq y \leq 4\}\).

3. \(z + 6 > 3\) or \(2z < -12\)
   \(z + 6 - 6 > 3 - 6\) or \(\frac{2z}{2} < \frac{-12}{2}\)
   \(z > -3\) or \(z < -6\)
   The solution of the inequality is \(\{z \mid z > -3\ \text{or} \ z < -6\}\).

4. \(m - 7 \geq -3\) or \(-2m + 1 \geq 1\)
   \(m - 7 + 7 \geq -3 + 7\) or \(-2m + 1 - 1 \geq 11 - 1\)
   \(m \geq 4\) or \(-2m \geq 10\)
   \(m \geq 4\) or \(\frac{-2m}{-2} \leq \frac{10}{-2}\)
   \(m \geq 4\) or \(m \leq -5\)
   The solution of the inequality is \(\{m \mid m \geq 4\ \text{or} \ m \leq -5\}\).

5. \(|c| \geq 8\)
6. \(|q| \geq -1\)
   The absolute value of a number is always non-negative.
   So, the inequality is true for any value of \(q\).
   The solution of the absolute value inequality is \(\{q|\text{all real numbers}\}\).

7. \(|z|< 6\)
   \(-6 < z < 6\)
   The solution of the absolute value inequality is \(\{z|-6 < z < 6\}\).

8. The absolute value of a number is always non-negative.
   So, no value of \(x\) satisfies the inequality.
   The solution set is \(\emptyset\).

9. \(|3v+5|> 14\)
   \(3v+5 > 14 \quad \text{or} \quad 3v+5 < -14\)
   \(3v > 9 \quad \text{or} \quad 3v < -19\)
   \(v > 3 \quad \text{or} \quad v < -\frac{19}{3}\)
   The solution of the inequality is \(\{v|v > 3 \text{ or } v < -\frac{19}{3}\}\).

10. \(|4t-3| \leq 7\)
    \(-7 \leq 4t-3 \leq 7\)
    \(-7 + 3 \leq 4t-3 + 3 \leq 7 + 3\)
    \(-4 \leq 4t \leq 10\)
    \(-1 \leq t \leq 2.5\)
    The solution of the inequality is \(\{t|-1 \leq t \leq 2.5\}\).
11. Let $c$ represent the amount that Khalid could be spending to paint his bedroom. He requires a minimum of 2 gallons and a maximum of 3 gallons of paint. The cost of 2 gallons of the cheapest paint will be the minimum amount Khalid needs to spend. And, the cost 3 gallons of the costliest paint will be the maximum amount Khalid needs to spend. So:

\[
2(21.98) \leq c \leq 3(25.98)
\]

\[
43.96 \leq c \leq 77.94
\]

Khalid needs a minimum of $43.96 and a maximum of $77.96 to paints his bedroom.
1-6 Solving Compound and Absolute Value Inequalities - Practice and Problem Solving

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

12. \[ 8 < 2v - 4 < 16 \]
    \[ 8 + 4 < 2v - 4 + 4 < 16 + 4 \]
    \[ 12 < 2v < 20 \]
    \[ \frac{12}{2} < \frac{2v}{2} < \frac{20}{2} \]
    \[ 6 < v < 10 \]

The solution of the inequality is \( \{v | 6 < v < 10\} \).

13. \[ -7 \leq 4d - 3 \leq -1 \]
    \[ -7 + 3 \leq 4d - 3 + 3 \leq -1 + 3 \]
    \[ -4 \leq 4d \leq 2 \]
    \[ \frac{-4}{4} \leq \frac{4d}{4} \leq \frac{2}{4} \]
    \[ -1 \leq d \leq 0.5 \]

The solution of the inequality is \( \{d | -1 \leq d \leq 0.5\} \).

14. \[ 4r + 3 < -6 \quad \text{or} \quad 3r - 7 > 2 \]
    \[ 4r + 3 - 3 < -6 - 3 \quad \text{or} \quad 3r - 7 + 7 > 2 + 7 \]
    \[ 4r < -9 \quad \text{or} \quad 3r > 9 \]
    \[ \frac{4r}{4} < \frac{-9}{4} \quad \text{or} \quad \frac{3r}{3} > \frac{9}{3} \]
    \[ r < -\frac{9}{4} \quad \text{or} \quad r > 3 \]

The solution of the inequality is \( \{r | r < -\frac{9}{4} \text{ or } r > 3\} \).
Name:

15. \(6y - 3 < -27 \) or \(-4y + 2 < -26\)
\(6y - 3 + 3 < -27 + 3\) or \(-4y + 2 - 2 < -26 - 2\)
\(6y < -24\) or \(-4y < -28\)
\(\frac{6y}{6} < \frac{-24}{6}\) or \(\frac{-4y}{-4} < \frac{-28}{-4}\)
\(y < -4\) or \(y < 7\)
The solution of the inequality is \(\{y \mid y < -4 \text{ or } y > 7\}\).

16. \(|6h| < 12\)
\(-12 < 6h < 12\)
\(-\frac{12}{6} < \frac{6h}{6} < \frac{12}{6}\)
\(-2 < h < 2\)
The solution of the inequality is \(\{h \mid -2 < h < 2\}\).

17. \(|-4k| > 16\)
\(-4k < -16\) or \(-4k > 16\)
\(-\frac{4k}{-4} > \frac{-16}{-4}\) or \(-\frac{4k}{-4} < \frac{16}{-4}\)
\(k > 4\) or \(k < -4\)
The solution of the inequality is \(\{k \mid k < -4 \text{ or } k > 4\}\).

18. \(|3x - 4| > 10\)
\(3x - 4 < -10\) or \(3x - 4 > 10\)
\(3x - 4 + 4 < -10 + 4\) or \(3x - 4 + 4 > 10 + 4\)
\(3x < -6\) or \(3x > 14\)
\(\frac{3x}{3} < \frac{-6}{3}\) or \(\frac{3x}{3} > \frac{14}{3}\)
\(x < -2\) or \(x > \frac{14}{3}\)
The solution of the inequality is \(\{x \mid x > \frac{14}{3} \text{ or } x < -2\}\).
19. \[ |8t + 3| \leq 4 \]
\[ -4 \leq 8t + 3 \leq 4 \]
\[ -4 - 3 \leq 8t + 3 - 3 \leq 4 - 3 \]
\[ -7 \leq 8t \leq 1 \]
\[ -\frac{7}{8} \leq t \leq \frac{1}{8} \]

The solution of the inequality is
\[ \left\{ t \mid -\frac{7}{8} \leq t \leq \frac{1}{8} \right\} . \]

20. \[ |-9n - 3| < 6 \]
\[ -6 < -9n - 3 < 6 \]
\[ -6 + 3 < -9n - 3 + 3 < 6 + 3 \]
\[ -3 < -9n < 9 \]
\[ -\frac{3}{9} > -\frac{9n}{9} > -\frac{9}{9} \]
\[ -\frac{1}{3} > n > -1 \]

The solution of the inequality is
\[ \left\{ n \mid -1 < n < \frac{1}{3} \right\} . \]

21. \[ |-5j - 4| \geq 12 \]
\[ -5j - 4 \leq -12 \quad \text{or} \quad -5j - 4 \geq 12 \]
\[ -5j - 4 + 4 \leq -12 + 4 \quad \text{or} \quad -5j - 4 + 4 \geq 12 + 4 \]
\[ -5j \leq -8 \quad \text{or} \quad -5j \geq 16 \]
\[ -\frac{5j}{-5} \leq \frac{-8}{-5} \quad \text{or} \quad -\frac{5j}{-5} \geq \frac{16}{-5} \]
\[ j \geq \frac{8}{5} \quad \text{or} \quad j \leq -\frac{16}{5} \]

The solution of the inequality is
\[ \left\{ j \mid j \geq \frac{8}{5} \quad \text{or} \quad j \leq -\frac{16}{5} \right\} . \]
22. a. The margin of error is ±3 cm.
So:
\[-3 \leq 2.6f + 47.2 \leq 3\]
\[\Rightarrow |2.6f + 47.2| \leq 3\]

b. Substitute $f = 50$ in the equation $h = 2.6f + 47.2$.
\[h = 2.6(50) + 47.2 = 177.2\]
The margin of error is ±3 cm.
So:
\[|h - 177.2| < 3\]
\[-3 < h - 177.2 < 3\]
\[-3 + 177.2 < h < 3 + 177.2\]
\[174.2 < h < 180.2\]
The woman’s height ranges from 174.2 cm to 180.2 cm.

Write an absolute value inequality for each graph.

23. From the graph:
\[-4 \leq x \leq 6\]
\[-4 - 1 \leq x - 1 \leq 6 - 1\]
\[-5 \leq x - 1 \leq 5\]
This implies:
\[|x - 1| \leq 5\]

24. From the graph:
\[x \leq -4 \quad \text{or} \quad x \geq 6\]
\[x - 1 \leq -4 - 1 \quad \text{or} \quad x - 1 \geq 6 - 1\]
\[x \leq -5 \quad \text{or} \quad x \geq 5\]
This implies:
\[|x - 1| \geq 5\]

25. From the graph:
\[-12 \leq x \leq -6\]
\[-12 + 9 \leq x + 9 \leq -6 + 9\]
\[-3 \leq x \leq 3\]
This implies:
\[|x + 9| \leq 3\]

26. From the graph:
\[x < -1 \quad \text{or} \quad x > 3\]
\[x - 1 < -2 \quad \text{or} \quad x - 1 > 2\]
This implies:
\[|x - 1| > 2\]
27. From the graph:
   \[ x \leq -8 \quad \text{or} \quad x \geq 12 \]
   \[ x - 2 \leq -10 \quad \text{or} \quad x - 2 \geq 10 \]
   This implies:
   \[ |x - 2| \geq 10 \]

28. From the graph:
   \[ -2 < x < 10 \]
   \[ -2 - 4 < x - 4 < 10 - 4 \]
   \[ -6 < x - 4 < 6 \]
   This implies:
   \[ |x - 4| < 6 \]

29. From the graph:
   \[ x < -4 \quad \text{or} \quad x > -2 \]
   \[ x + 3 < -1 \quad \text{or} \quad x + 3 > 1 \]
   This implies:
   \[ |x + 3| > 1 \]

30. From the graph:
   \[ 2 \leq x \leq 8 \]
   \[ 2 - 5 \leq x - 5 \leq 8 - 5 \]
   \[ -3 \leq x - 5 \leq 3 \]
   This implies:
   \[ |x - 5| \leq 3 \]

31. Let \( w \) represent the weight of a female Labrador.
   The weight of a fully grown female Labrador ranges from 55 units to 77 units.
   So:
   \[ 55 \leq w \leq 70 \]

32. The angle 4 is the exterior angle, and 1 and 2 are its corresponding remote angles.
   By the Exterior Angle Inequality Theorem:
   \[ m\angle 4 > 1, \ m\angle 4 > 2 \]

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

33. \[ 28 > 6k + 4 > 16 \]
   \[ 28 - 4 > 6k + 4 - 4 > 16 - 4 \]
   \[ 24 > 6k > 12 \]
   \[ \frac{24}{6} > \frac{6k}{6} > \frac{12}{6} \]
   \[ 4 > k > 2 \]
   The solution set is:
   \[ \{k \mid 2 < k < 4\} \]
34. \( m - 7 > -12 \) or \( -3m + 2 > 38 \)
\[ m - 7 + 7 > -12 + 7 \quad \text{or} \quad -3m + 2 - 2 > 38 - 2 \]
\[ m > -5 \quad \text{or} \quad -3m > 36 \]
\[ m > -5 \quad \text{or} \quad m < -12 \]
The solution set is \( \{ m \mid m > -5 \text{ or } m < -12 \} \).

35. \( | -6h | > 90 \)
\[ -6h < -90 \quad \text{or} \quad -6h > 90 \]
\[ -6h < -90 \quad \text{or} \quad -6h > 90 \]
\[ -6 < -6 \quad \text{or} \quad -6 < -6 \]
\[ h > 15 \quad \text{or} \quad h < -15 \]
The solution set is: \( \{ h \mid h < -15 \text{ or } h > 15 \} \)

36. The absolute value of a number is always non-negative. So, no value of \( k \) satisfies the inequality. The solution set is \( \emptyset \).

37. \( 3|2z - 4| - 6 > 12 \)
\[ 3|2z - 4| - 6 + 6 > 12 + 6 \]
\[ 3|2z - 4| > 18 \]
\[ |2z - 4| > 6 \]
\[ 2z - 4 < -6 \quad \text{or} \quad 2z - 4 > 6 \]
\[ 2z < -2 \quad \text{or} \quad 2z > 10 \]
\[ z < -1 \quad \text{or} \quad z > 5 \]
The solution set is: \( \{ z \mid z < -1 \text{ or } z > 5 \} \)
38. \[6|4p + 2| - 8 < 34\]
\[6|4p + 2| < 42\]
\[|4p + 2| < 7\]
\[-7 < 4p + 2 < 7\]
\[-9 < 4p < 5\]
\[9 < p < 5\]
\[-\frac{9}{4} < p < \frac{5}{4}\]

The solution set is:
\[
\begin{cases}
p \in \left(\frac{9}{4}, \frac{5}{4}\right)
\end{cases}
\]

39. \[\left|\frac{5f - 2}{6}\right| > 4\]
\[|5f - 2| > 24\]
\[5f - 2 < -24 \quad \text{or} \quad 5f - 2 > 24\]
\[5f < -22 \quad \text{or} \quad 5f > 26\]
\[f < -\frac{22}{5} \quad \text{or} \quad f > \frac{26}{5}\]

The solution set is:
\[
\begin{cases}
f \in \left(-\infty, -\frac{22}{5}\right) \cup \left(\frac{26}{5}, \infty\right)
\end{cases}
\]

40. \[\left|\frac{2w + 8}{5}\right| \geq 3\]
\[|2w + 8| \geq 15\]
\[2w + 8 \leq -15 \quad \text{or} \quad 2w + 8 \geq 15\]
\[2w \leq -23 \quad \text{or} \quad 2w \geq 7\]
\[w \leq -\frac{23}{2} \quad \text{or} \quad w \geq \frac{7}{2}\]

The solution set is:
\[
\begin{cases}
w \in \left(-\infty, -\frac{23}{2}\right] \cup \left[\frac{7}{2}, \infty\right)
\end{cases}
\]

Write an algebraic expression to represent each verbal expression.
41. Let $x$ represent the numbers that are at least 4 units from $-5$.
   So:
   $$-9 \geq x \quad \text{or} \quad x \geq -1$$
   $$-4 \geq x + 5 \quad \text{or} \quad x + 5 \geq 4$$
   This implies:
   $$|x + 5| \geq 4$$

42. Let $x$ represent the numbers that are no more than $\frac{3}{8}$ unit from 1.
   So:
   $$1 - \frac{3}{8} \leq x \leq 1 + \frac{3}{8}$$
   $$-\frac{3}{8} \leq x - 1 \leq \frac{3}{8}$$
   $$|x - 1| \leq \frac{3}{8}$$

43. Let $x$ represent the numbers that are at least 6 units but no more than 10 units from 2.
   So:
   $$2 - 10 \leq x \leq 2 + 10$$
   $$|x - 2| \leq 10$$  \hspace{1cm} (1)
   $$x \geq 2 + 6 \quad \text{or} \quad x \leq 2 - 6$$
   $$|x - 2| \geq 6$$  \hspace{1cm} (2)
   By combining (1) and (2):
   $$6 \leq |x - 2| \leq 10$$
44. a. Let \( x \) represent the length for the part of a car.
Red:
\[-0.07 \leq x - 24.42 \leq 0.07\]
\[|x - 24.42| \leq 0.07\]
Blue:
\[-0.25 \leq x - 24.42 \leq 0.25\]
\[|x - 24.42| \leq 0.25\]
Green:
\[-0.5 \leq x - 24.42 \leq 0.5\]
\[|x - 24.42| \leq 0.5\]

b. The acceptable length for the part of the car if the template has red line color:
\[24.42 - 0.07 \leq x \leq 24.42 + 0.07\]
\[24.35 \leq x \leq 24.49\]
The acceptable length for the part of the car if the template has blue line color:
\[24.42 - 0.25 \leq x \leq 24.42 + 0.25\]
\[24.17 \leq x \leq 24.67\]
The acceptable length for the part of the car if the template has blue line color:
\[24.42 - 0.5 \leq x \leq 24.42 + 0.5\]
\[23.92 \leq x \leq 24.92\]

c. Red: \[24.35 \leq x \leq 24.49\]
Blue: \[24.17 \leq x \leq 24.67\]
Green: \[23.92 \leq x \leq 24.92\]

44. d. Red. The red line color has the smallest tolerance, \(0.07 < 0.25 < 0.5\). So, the other line colors would be well within their tolerances.

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

45. \[n + 6 > 2n + 5 > n - 2\]
\[n + 6 - n > 2n + 5 - n > n - 2 - n\]
\[6 > n + 5 > -2\]
\[6 - 5 > n + 5 - 5 > -2 - 5\]
\[1 > n > -7\]
The solution set is:
\[\{n | -7 < n < 1\}\]
46. \[ y + 7 < 2y + 2 < 0 \]
\[ \Rightarrow y + 7 < 2y + 2 \quad \text{and} \quad 2y + 2 < 0 \]
\[ y + 7 - y < 2y + 2 - y \quad \text{and} \quad 2y + 2 - 2 < 0 - 2 \]
\[ 7 < y + 2 \quad \text{and} \quad 2y < -2 \]
This implies:
\[ y > 5 \quad \text{and} \quad y < -1 \]
No value of \( y \) satisfies the compound inequality.
So the solution set is \( \emptyset \).

47. \[ 2x + 6 < 3(x - 1) \leq 2(x + 3) \]
\[ 2x + 6 < 3x - 3 \leq 2x + 6 \]
\[ 6 < x - 3 \leq 6 \]
\[ 9 < x \leq 9 \]
No value of \( x \) satisfies the compound inequality.
So the solution set is \( \emptyset \).

48. \[ a - 16 \leq 2(a - 4) < a + 2 \]
\[ a - 16 \leq 2a - 8 < a + 2 \]
\[ -16 \leq a - 8 < 2 \]
\[ -8 \leq a < 10 \]
The solution set is \( \{a| -8 \leq a < 10\} \).

49. \[ 4g + 8 \geq g + 6 \quad \text{or} \quad 7g - 14 \geq 2g - 4 \]
\[ 3g + 8 \geq 6 \quad \text{or} \quad 5g - 14 \geq -4 \]
\[ 3g \geq -2 \quad \text{or} \quad 5g \geq 10 \]
\[ g \geq -\frac{2}{3} \quad \text{or} \quad g \geq 2 \]
The union of the inequalities gives \( g \geq -\frac{2}{3} \).
So the solution set of the inequality is:
\[ \left\{ g \mid g \geq -\frac{2}{3} \right\} \]
50.  \[5t + 7 > 2t + 4 \quad \text{and} \quad 3t + 3 < 24 - 4t\]
\[3t + 7 > 4 \quad \text{and} \quad 7t + 3 < 24\]
\[3t > -3 \quad \text{and} \quad 7t < 21\]
\[t > -1 \quad \text{and} \quad t < 3\]
That is, \(-1 < t < 3\).
The solution set is \(\{t \mid -1 < t < 3\}\).

51. Let \(s\) represent the blood sugar levels that are considered dangerous.
\[s < 88 - 38 \quad \text{or} \quad s > 88 + 38\]
\[s - 88 < -38 \quad \text{or} \quad s - 88 > 38\]
This implies:
\[|s - 88| > 38\]
The solution set is \(\{s \mid s > 126 \text{ or } s < 50\}\).

52. a. Let \(x\) represent the weight of the bag.
There is no charge for the checked baggage if \(x \leq 50\).
To cost $25, \(x\) should lie between 50 and 70. That is, \(50 < x < 70\).
To cost 50, \(x\) should lie between 50 and 100. That is, \(70 < x < 100\).
If the baggage is not acceptable, then \(x\) should be greater than 100. That is, \(x > 100\).
b. \(x = 68\). So, the cost for the baggage would be $25.

53. Sample answer: David is correct, when Sarah converted the absolute value into two inequalities, she mistakenly switched the inequality symbols.
54. Use the Alternate Triangle Inequality \(|a - b| \geq |a| - |b|\).

\[
\begin{align*}
|x - 2 - (x + 2)| & \geq |x - 2| - |x + 2| > x \\
|x - 2 - x - 2| & \geq |x - 2| - |x + 2| > x \\
-4 & \geq |x - 2| - |x + 2| > x \\
4 & \geq |x - 2| - |x + 2| > x \\
\Rightarrow & \quad x < |x - 2| - |x + 2| \leq 4
\end{align*}
\]

Case 1: When \(x \geq 0\) and \(x \leq 4\):
Substitute the test value for \(x = 1\).
\(x < |x - 2| - |x + 2|\)
\(1 < |1 - 2| - |1 + 2|\)
\(1 < |1| - |3|\)
\(1 < (1) - (3)\)
\(1 < -2\)
Therefore, \(x\) cannot be positive.

Case 2: When \(x < 0\):
Substitute the test value for \(x = -1\).
\(x < |x - 2| - |x + 2|\)
\(-1 < |-1 - 2| - |-1 + 2|\)
\(-1 < |-3| - |1|\)
\(-1 < (3) - (1)\)
\(-1 < 2\)
So, the solution is \(x < 0\).

**REASONING** Determine whether each statement is true or false. If false, provide a counterexample.

55. False; sample answer: the graph of \(x > 2\) and \(x > 5\) is a ray bounded only on one end.

56. False; sample answer: the graph of \(x > 2\) or \(x < 3\) includes the entire number line.

57. True.

58. Sample answer: \(|x - c|\) represents the distance between some unknown value of the variable \(x\) and a point \(c\) on the number line. The solution set of the inequality is the set of all numbers such that the distance from the numbers to \(c\) is less than \(r\) units. Use a number line to find the numbers that are \(r\) units from \(c\) in either direction.

59. Sample answer: The graph on the left indicates a solution set from \(-3\) to \(5\). The graph on the right indicates a solution set of all numbers less than or equal to \(-3\) or greater than or equal to \(5\).
Name:

60. Sample answer:
\[ \left| x - \frac{a+b}{2} \right| \leq b - \frac{a+b}{2} \]

61. Each of these has a non-empty solution set except for \( x > 5 \) and \( x < 1 \). There are no values of \( x \) that are simultaneously greater than 5 and less than 1.

62. Sample answer: A compound inequality that contains \( \text{and} \) is true if and only if both individual inequalities are true, while an inequality containing \( \text{or} \) only needs one of the individual inequalities to be true.

63. The slopes of the lines are equal, so the lines are parallel. The correct choice is C.

64. \[
\left( \frac{3x^3}{y} \right)^3 = \frac{3^3 \cdot (x^3)^3}{y^3}
\]
\[= \frac{27x^9}{y^3}\]
The correct choice is J.

65. The volume of a rectangular prism is given by \( V = lwh \) where \( l \) is the length, \( w \) is the width, and \( h \) is the height.
Box:
\( l = 20 \, \text{cm}, \, w = 16 \, \text{cm}, \, \text{and} \, h = 12 \, \text{cm}. \)
Volume of the box:
\[ V_1 = 20 \times 16 \times 12 \]
\[= 3840 \, \text{cm}^3 \]
Volume of the cube:
\[ V_2 = 4 \times 4 \times 4 \]
\[= 64 \, \text{cm}^3 \]
The number of cubes that can be placed inside the box is give by \( \frac{V_1}{V_2} \).
Number of cubes = \( \frac{3840}{64} = 60 \)

66. \[
|3x - 6| + 8 \geq 17
\]
\[|3x - 6| \geq 9\]
\[3x - 6 \leq -9 \, \text{or} \, 3x - 6 \geq 9\]
\[x \leq -1 \, \text{or} \, x \geq 5\]
The correct choice is A.

67. a. Let \( x \) represent the intake of fat in Calories.
\[30\% (2500) \leq x \leq 30\% (3300)\]
\[750 \leq x \leq 990\]
b. The maximum fat intake is 990 Calories.
One gram of fat yields nine Calories.
So, the greatest fat intake for the person is 110 grams.
68. a. The cost of the food for one day is $f$.
   For 5 days, the cost of the food is $5f$.
   The plane ticket costs $375.
   For a 5-day stay in the hotel, it costs $425.
   Total cost for a 5-day trip = $5f + $375 + $425 = 800 + 5f$.
   Maggie wants to spend no more than $1000.
   Therefore:
   $$800 + 5f \leq 1000$$
   \[b._{\text{}}\]
   \[800 + 5f \leq 1000\]
   \[-5f \leq 200\]
   \[-f \leq 40\]
   That is, Maggie can spend no more than $40 per day on food.

Solve each equation. Check your solutions.

69. \[4|x - 5| = 20\]
   \[|x - 5| = 5\]
   \[x - 5 = 5 \quad \text{or} \quad -(x - 5) = 5\]
   \[x = 10 \quad \text{or} \quad x = 0\]
   Substitute the values in the equation:
   \[4|0 - 5| = 20\]
   \[4(5) = 20\]
   \[20 = 20 \checkmark\]
   \[4|10 - 5| = 20\]
   \[4(5) = 20\]
   \[20 = 20 \checkmark\]
   The solution set is \{0, 10\}. 
70. \[ |3y + 10| = 25 \]
\[ 3y + 10 = 25 \text{ or } - (3y + 10) = 25 \]
\[ 3y = 15 \text{ or } -3y = 35 \]
\[ y = 5 \text{ or } y = -\frac{35}{3} \]

Substitute the values in the equation.
\[ 3\left(\frac{-35}{3}\right) + 10 \]
\[ -35 + 10 = 25 \]
\[ 25 = 25 \checkmark \]

\[ 3(5) + 10 \]
\[ 15 + 10 \]
\[ 25 = 25 \checkmark \]

The solution set is \( \left\{ -\frac{35}{3}, 5 \right\} \).

71. The absolute value of a number cannot be negative. So there is no solution for the equation \( |7z + 8| = -9 \).
The solution set is \( \emptyset \).

Name the property illustrated by each statement.

72. Addition Property of Equality

73. Transitive Property

74. Associative Property of Addition
Study Guide and Review - Vocabulary Check - Chapter 1

State whether each sentence is true or false. If false, replace the underlined term to make a true sentence.

1. False; The absolute value of a number is always nonnegative.

2. False; $\sqrt{12}$ belongs to the set of irrational numbers.

3. True

4. False; A solution of an equation is a value that makes the equation true.

5. True

6. True

7. False; The graph of a compound inequality containing or is the union of the solution sets of the two inequalities.

8. True

9. True

10. True
Study Guide and Review - Lesson-by-Lesson Review - Chapter 1

Evaluate each expression.

11. \[
\frac{28 - (16 + 3)}{3} = \frac{28 - 19}{3} \\
= 9 \div 3 \\
= 3
\]

12. \[
\frac{2}{3} \left(3^3 + 12\right) = \frac{2}{3} \left(27 + 12\right) \\
= \frac{2}{3} \times 39 \\
= 2(13) \\
= 26
\]
Name:

13. \[
\frac{15(9-7)}{3} = \frac{15(2)}{3} \\
= \frac{30}{3} \\
= 10
\]

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

14. \[
4w - 8y = 4(0.2) - 8 \left( \frac{1}{2} \right) \\
= 0.8 - 4 \\
= -3.2
\]

15. \[
z^2 + xy = (-4)^2 + (10) \left( \frac{1}{2} \right) \\
= 16 + 5 \\
= 21
\]

16. \[
\frac{5w - y}{z} = \frac{5(0.2) - (10) \left( \frac{1}{2} \right)}{-4} \\
= \frac{1 - 5}{-4} \\
= \frac{-4}{-4} \\
= 1
\]

17. \[
\nu = \pi r^2 h \\
\nu = \pi (3)^2 (6) \\
= \pi (9)(6) \\
= 54\pi \\
\approx 169.65
\]
The volume of the cylinder is about 169.65 cubic inches.

Name the sets of numbers to which each value belongs.

18. Q, R

19. N, W, Z, Q, R

20. Q, R

Simplify each expression.
Name:

21. \[4x - 3y + 7x + 5y = 4x + 7x - 3y + 5y\]
   \[= (4 + 7)x + (-3 + 5)y\]
   \[= 11x + 2y\]

22. \[2(a + 3) - 4a + 8b = 2a + 2(3) - 4a + 8b\]
   \[= 2a + 6 - 4a + 8b\]
   \[= 2a - 4a + 8b + 6\]
   \[= (2 - 4)a + 8b + 6\]
   \[= -2a + 8b + 6\]

23. \[4(2m + 5n) - 3(m - 7n) = 4(2m) + 4(5n) + (-3)(m) + (-3)(-7n)\]
   \[= 8m + 20n - 3m + 21n\]
   \[= 8m - 3m + 20n + 21n\]
   \[= (8 - 3)m + (20 + 21)n\]
   \[= 5m + 41n\]

24. a. \[3(3.50 + 2.50)\] or \[3(3.50) + 3(2.50)\]

   b. \[3(3.50 + 2.50) = 3(3.50) + 3(2.50)\]
      \[= 10.50 + 7.50\]
      \[= 18\]

   Dion spent $18 on food and drinks.

Solve each equation. Check your solution.

25. \[8 + 5r = -27\]
   \[8 + 5r - 8 = -27 - 8\]
   \[5r = -35\]
   \[\frac{5r}{5} = \frac{-35}{5}\]
   \[r = -7\]

   Check:
   \[8 + 5(-7) = -27\]
   \[8 - 35 = -27\]
   \[-27 = -27\]

   So, the solution of the equation is \(r = -7\).
26. \[4w + 10 = 6w - 13\]
\[4w + 10 - 10 = 6w - 13 - 10\]
\[4w = 6w - 23\]
\[4w - 6w = 6w - 23 - 6w\]
\[-2w = -23\]
\[-2w \div -2 = -23 \div -2\]
\[w = \frac{23}{2}\]

Check:
\[4 \left( \frac{23}{2} \right) + 10 = 6 \left( \frac{23}{2} \right) - 13\]
\[2(23) + 10 = 3(23) - 13\]
\[46 + 10 = 69 - 13\]
\[56 = 56\]

So, the solution of the equation is \[w = \frac{23}{2}\]
27. \[
\frac{x}{6} + \frac{x}{3} = \frac{3}{4}
\]
\[
x + x(2) = \frac{3}{4}
\]
\[
\frac{3x}{6} = \frac{3}{4}
\]
\[
x = \frac{3}{2}
\]
\[
2\left(\frac{x}{2}\right) = 2\left(\frac{3}{4}\right)
\]
\[
x = \frac{3}{2}
\]

Check:
\[
\frac{\frac{3}{2}}{6} + \frac{\frac{3}{2}}{3} = \frac{3}{4}
\]
\[
\frac{3\left(\frac{1}{2}\right)}{2} + \frac{3\left(\frac{1}{3}\right)}{2} = \frac{3}{4}
\]
\[
\frac{1}{4} + \frac{1}{2} = \frac{3}{4}
\]
\[
\frac{1+1(2)}{3} = \frac{3}{4}
\]
\[
\frac{1+2}{4} = \frac{3}{4}
\]
\[
\frac{3}{4} = \frac{3}{4}
\]

So, the solution of the equation is \( x = \frac{3}{2} \).
28. \[6b - 5 = 3(b + 2)\]
\[6b - 5 = 3b + 6\]
\[6b = 3b + 11\]
\[3b = 11\]
\[\frac{3b}{3} = \frac{11}{3}\]
\[b = \frac{11}{3}\]

Check:
\[6\left(\frac{11}{3}\right) - 5 = 3\left(\frac{11}{3} + 2\right)\]
\[2(11) - 5 = 3\left(\frac{11 + 2(3)}{3}\right)\]
\[22 - 5 = 3\left(\frac{11 + 6}{3}\right)\]
\[17 = 3\left(\frac{17}{3}\right)\]
\[17 = 17\checkmark\]

So, the solution of the equation is \(b = \frac{11}{3}\).

29. \[14 - 3.50 - 2.50 = 14 - (3.50 + 2.50)\]
\[= 14 - (6)\]
\[= 8\]

The cost of the ticket was $8.

Solve each equation or formula for the specified variable.

30. \[2k - 3m = 16\]
\[2k - 3m + 3m = 16 + 3m\]
\[2k = 16 + 3m\]
\[\frac{2k}{2} = \frac{16 + 3m}{2}\]
\[k = \frac{16 + 3m}{2}\]
Name:

31. \[
\frac{r + 5}{mn} = p
\]
\[
mp = m \left( \frac{r + 5}{mn} \right)
\]
\[
\frac{r + 5}{n} = mp
\]
\[
\frac{\frac{r + 5}{n}}{p} = m
\]
\[
\frac{r + 5}{np} = m
\]

32. \[
A = \frac{1}{2} h(a + b)
\]
\[
2A = 2 \left[ \frac{1}{2} h(a + b) \right]
\]
\[
2A = h(a + b)
\]
\[
\frac{2A}{(a + b)} = h
\]
\[
\frac{2A}{(a + b)} = h
\]

33. Substitute \( r = 2 \), and \( V = 100.48 \) in the formula \( V = \pi r^2 h \).

\[
V = \pi r^2 h
\]
\[
100.48 = \pi (2)^2 h
\]
\[
100.48 = 4\pi h
\]
\[
\frac{100.48}{4\pi} = \frac{4\pi h}{4\pi}
\]
\[
h \approx 8
\]
The height of the bottle is about 8 inches.

Solve each equation. Check your solution.
34. Case 1:  
\[ r + 5 = 12 \quad r + 5 = -12 \]
\[ r + 5 - 5 = 12 - 5 \quad r + 5 - 5 = -12 - 5 \]
\[ r = 7 \quad r = -17 \]
There appear to be two solutions, 7 and -17.
Check: Substitute each value in the original equation.
\[ \left| r + 5 \right| = 12 \quad \left| r + 5 \right| = 12 \]
\[ \left| 7 + 5 \right| = 12 \quad \left| -17 + 5 \right| = 12 \]
\[ \left| 12 \right| = 12 \quad \left| -12 \right| = 12 \]
\[ 12 = 12 \checkmark \quad 12 = 12 \checkmark \]
The solution set is \( \{7, -17\} \).

35. \[ \frac{4|a - 6|}{4} = 16 \]
\[ 4|a - 6| = 16 \]
\[ |a - 6| = 4 \]
Case 1:  
\[ a - 6 = 4 \quad a - 6 = -4 \]
\[ a - 6 + 6 = 4 + 6 \quad a - 6 + 6 = -4 + 6 \]
\[ a = 10 \quad a = 2 \]
There appear to be two solutions, 2 and 10.
Check: Substitute each value in the original equation.
\[ 4|a - 6| = 16 \quad 4|a - 6| = 16 \]
\[ 4|10 - 6| = 16 \quad 4|2 - 6| = 16 \]
\[ 4|4| = 16 \quad 4|-4| = 16 \]
\[ 4(4) = 16 \quad 4(4) = 16 \]
\[ 16 = 16 \checkmark \quad 16 = 16 \checkmark \]
The solution set is \( \{2, 10\} \).
36. **Case 1:**

\[
\begin{align*}
3x + 7 &= -15 \\
3x + 7 - 7 &= -15 - 7 \\
3x &= -22 \\
\frac{3x}{3} &= \frac{-22}{3} \\
x &= \frac{-22}{3}
\end{align*}
\]

**Case 2:**

\[
\begin{align*}
3x + 7 &= 15 \\
3x + 7 - 7 &= 15 - 7 \\
3x &= 8 \\
\frac{3x}{3} &= \frac{8}{3} \\
x &= \frac{8}{3}
\end{align*}
\]

There appear to be two solutions, \(-\frac{22}{3}\) and \(\frac{8}{3}\).

**Check:** Substitute each value in the original equation.

\[
\begin{align*}
|3x + 7| &= -15, \quad |3x + 7| = -15 \\
\left|3\left(-\frac{22}{3}\right) + 7\right| &= -15, \quad \left|3\left(\frac{8}{3}\right) + 7\right| = -15 \\
\left|-22 + 7\right| &= -15, \quad \left|8 + 7\right| = -15 \\
\left|-15\right| &= -15, \quad \left|15\right| = -15 \\
15 &\neq -15, \quad 15 \neq -15
\end{align*}
\]

Because \(15 \neq -15\), the solution set is \(\emptyset\).
37. Case 1: 
\[
\begin{align*}
b + 5 &= 2b - 9 \\
b + 5 - 5 &= 2b - 9 - 5 \\
b &= 2b - 14 \\
b - 2b &= 2b - 14 - 2b \\
-b &= -14 \\
\frac{-b}{-1} &= \frac{-14}{-1} \\
b &= 14 \\
3b &= 4 \\
3\left(\frac{4}{3}\right) &= \frac{12}{3} \\
b &= \frac{4}{3}
\end{align*}
\]

There appear to be two solutions, 14 and \(\frac{4}{3}\).

Check: Substitute each value in the original equation.
\[
\begin{align*}
|b + 5| &= 2b - 9 \\
|14 + 5| &= 2(14) - 9 \\
|19| &= 28 - 9 \\
19 &= 19
\end{align*}
\]

Because \(\frac{19}{3} \neq -\frac{19}{3}\), \(b = \frac{4}{3}\) is an extraneous solution. So, the solution set is \(\{14\}\).

38. Let \(x\) be the length of the shortest and longest pieces of ribbon.
\[
\left|\frac{x - 3}{4}\right| = \frac{1}{16}
\]

Solve the equation \(\left|\frac{x - 3}{4}\right| = \frac{1}{16}\).

Case 1: 
\[
\begin{align*}
x - \frac{3}{4} &= \frac{1}{16} \\
x - \frac{3}{4} &= -\frac{1}{16} \\
\frac{x}{4} + \frac{3}{4} &= \frac{1}{16} + \frac{3}{4} \\
\frac{x}{4} + \frac{3}{4} &= -\frac{1}{16} + \frac{3}{4} \\
x &= \frac{1+4(3)}{16} \\
x &= \frac{16}{16}
\end{align*}
\]

Case 2: 
\[
\begin{align*}
x - \frac{3}{4} &= \frac{1}{16} \\
x - \frac{3}{4} &= -\frac{1}{16} \\
\frac{x}{4} + \frac{3}{4} &= \frac{1}{16} + \frac{3}{4} \\
\frac{x}{4} + \frac{3}{4} &= -\frac{1}{16} + \frac{3}{4} \\
x &= \frac{-1+3(4)}{16} \\
x &= \frac{16}{16}
\end{align*}
\]
Solve each inequality. Then graph the solution set on a number line.

39. \[-4a \leq 24\]
\[-4a \geq -24\]
\[\frac{-4a}{-4} \geq \frac{-24}{-4}\]
\[a \geq -6\]

40. \[\frac{r}{5} - 8 > 3\]
\[\frac{r}{5} - 8 + 8 > 3 + 8\]
\[\frac{r}{5} > 11\]
\[5 \left( \frac{r}{5} \right) > 5(11)\]
\[r > 55\]

41. \[4 - 7x \geq 2(x + 3)\]
\[4 - 7x \geq 2x + 6\]
\[4 - 7x - 4 \geq 2x + 6 - 4\]
\[4 - 7x \geq 2x + 2\]
\[-7x - 2x \geq 2x + 2 - 2x\]
\[-9x \geq 2\]
\[\frac{-9x}{-9} \leq \frac{2}{-9}\]
\[x \leq \frac{2}{-9}\]
42. \[-p - 13 < 3(5 + 4p) - 2\]
   \[-p - 13 < 3(5) + 3(4p) - 2\]
   \[-p - 13 < 15 + 12p - 2\]
   \[-p - 13 < 15 + 12p\]
   \[-p - 13 + 13 < 15 + 12p + 13\]
   \[-p < 12p + 26\]
   \[-p - 12p < 12p + 26 - 12p\]
   \[-13p < 26\]
   \[\frac{-13p}{-13} \leq \frac{26}{-13}\]
   \[p > -2\]

43. Let \(x\) be the number of slices can each student have.

   \[52(5 + 2x) \leq 572\]
   \[52(5) + 52(2x) \leq 572\]
   \[260 + 104x \leq 572\]
   \[260 + 104x - 260 \leq 572 - 260\]
   \[104x \leq 312\]
   \[\frac{104x}{104} \leq \frac{312}{104}\]
   \[x \leq 3\]

Therefore, each student can have 3 or fewer slices.

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

44. \[2m + 4 < 7\] or \[3x + 5 > 14\]
   \[2m + 4 - 4 < 7 - 4\] or \[3x + 5 - 5 > 14 - 5\]
   \[2m < 3\] or \[3x > 9\]
   \[\frac{2m}{2} < \frac{3}{2}\] or \[\frac{3x}{3} > \frac{9}{3}\]
   \[m < \frac{3}{2}\] or \[x > 3\]

The solution set is \(\{m \mid m < \frac{3}{2} \text{ or } m > 3\}\).
45. \[-5 < 4x + 3 < 19\]
   \[-5 - 3 < 4x + 3 - 3 < 19 - 3\]
   \[-8 < 4x < 16\]
   \[-\frac{8}{4} < \frac{4x}{4} < \frac{16}{4}\]
   \[-2 < x < 4\]
   The solution set is \(\{x | -2 < x < 4\}\).

46. \[6y - 1 > 17\] or \[8y - 6 \leq -10\]
   \[6y - 1 + 1 > 17 + 1\] or \[8y - 6 + 6 < -10 + 6\]
   \[6y > 18\] or \[8y < -4\]
   \[\frac{6y}{6} > \frac{18}{6}\] or \[\frac{8y}{8} < \frac{-4}{8}\]
   \[y > 3\] or \[y < -\frac{1}{2}\]
   The solution set is \(\{y | y \leq -\frac{1}{2} \text{ or } y > 3\}\).

47. \[-2 \leq 5(m - 3) < 9\]
   \[-2 \leq 5(m) + 5(-3) < 9\]
   \[-2 \leq 5m - 15 < 9\]
   \[-2 + 15 \leq 5m - 15 + 15 < 9 + 15\]
   \[13 \leq 5m < 24\]
   \[\frac{13}{5} \leq \frac{5m}{5} < \frac{24}{5}\]
   \[\frac{13}{5} \leq m < \frac{24}{5}\]
   The solution set is \(\{m | \frac{13}{5} \leq m < \frac{24}{5}\}\).

48. \[|a| + 2 < 15\]
   \[|a| + 2 - 2 < 15 - 2\]
   \[|a| < 13\]
   \[-13 < a < 13\]
   The solution set is \(\{a | -13 < a < 13\}\).
49. $|p - 14| \leq 19$
   
   $-19 \leq (p - 14) \leq 19$
   
   $-19 + 14 \leq p - 14 + 14 \leq 19 + 14$
   
   $-5 \leq p \leq 33$
   
   The solution set is $\{p | -5 \leq p \leq 33\}$. 

50. $|6k - 1| < 15$
   
   $-15 < (6k - 1) < 15$
   
   $-15 + 1 < 6k - 1 + 1 < 15 + 1$
   
   $-14 < 6k < 16$
   
   $\frac{-14}{6} < \frac{6k}{6} < \frac{16}{6}$
   
   $\frac{-7}{3} < k < \frac{8}{3}$
   
   The solution set is $\{k | \frac{-7}{3} < k < \frac{8}{3}\}$.

51. Since the absolute value of a number is always positive, the solution set of the inequality is $\varnothing$. 
52. \[
\frac{1}{3} |8q + 5| \geq 7
\]

\[
3 \left( \frac{1}{3} |8q + 5| \right) \geq 3(7)
\]

\[
|8q + 5| \geq 21
\]

\[
-|8q + 5| \leq -21
\]

\[
-21 \leq -(8q + 5) \leq -21
\]

\[
21 \leq -(8q + 5) \leq 21
\]

\[
-21 \geq 8q + 5 \geq 21
\]

\[
-21 - 5 \geq 8q + 5 - 5 \geq 21 - 5
\]

\[
-26 \geq 8q \geq 16
\]

\[
\frac{-26}{8} \geq \frac{8q}{8} \geq \frac{16}{8}
\]

\[
-\frac{13}{4} \geq q \geq 2
\]

\[
-\frac{13}{4} \geq q \quad \text{or} \quad q \geq 2
\]

\[
q \leq -\frac{13}{4} \quad \text{or} \quad q \geq 2
\]

The solution set is \( \left\{ q \mid q \leq -\frac{13}{4} \quad \text{or} \quad q \geq 2 \right\} \).

53. Let \( b \) represent the number of small beads she can buy to stay within the budget.

\[
20 \leq 3(2.50) + b(1.25) \leq 30
\]

Solve the compound inequality.

\[
20 \leq 3(2.50) + b(1.25) \leq 30
\]

\[
20 \leq 7.50 + 1.25b \leq 30
\]

\[
20 - 7.50 \leq 1.25b \leq 30 - 7.50
\]

\[
12.50 \leq 1.25b \leq 22.50
\]

\[
\frac{12.50}{1.25} \leq \frac{1.25b}{1.25} \leq \frac{22.50}{1.25}
\]

\[
10 \leq b \leq 18
\]

The range of number of possible beads is \( 10 \leq b \leq 18 \).
Chapter 1 - Equations and Inequalities - Practice Test

- Chapter 1

1. \[ x + y^2(2 + x) = 3 + (-1)^2(2 + 3) \]
   \[ = 3 + (1)(5) \]
   \[ = 3 + 5 \]
   \[ = 8 \]

2. \[-4(3a + b) - 2(a - 5b) = -4(3a + (-4)(b) + (-2)(a) + (-2)(-5b) \]
   \[ = -12a - 4b - 2a + 10b \]
   \[ = -12a - 2a - 4b + 10b \]
   \[ = (-12 - 2)a + (-4 + 10)b \]
   \[ = -14a + 6b \]

3. \[ 3m + 5 = 23 \]
   \[ 3m + 5 - 5 = 23 - 5 \]
   \[ 3m = 18 \]
   \[ \frac{3m}{3} = \frac{18}{3} \]
   \[ m = 6 \]

Substitute \( m = 6 \) in \( 2m - 3 \).

\[ 2m - 3 = 2(6) - 3 \]
\[ = 12 - 3 \]
\[ = 9 \]

So, the correct choice is B.

4. \[ r = \frac{1}{2} m^2 p \]
\[ 2r = 2 \left( \frac{1}{2} m^2 p \right) \]
\[ 2r = m^2 p \]
\[ \frac{2r}{m^2} = \frac{m^2 p}{m^2} \]
\[ \frac{2r}{m^2} = p \]

Write an algebraic expression to represent each verbal expression.

5. Let \( n \) be a number.
   The words \textit{twice the difference of a number and 11} represents the expressions \( 2(n - 11) \).

6. Let \( n \) be a number.
   The words \textit{the product of the square of a number and 5} represents the expression \( 5n^2 \).
7. Substitute $y = 2.5$ in the expression.

$$2|3y - 8| + y = 2|3(2.5) - 8| + 2.5$$

$$= 2|7.5 - 8| + 2.5$$

$$= 2|-0.5| + 2.5$$

$$= 2(0.5) + 2.5$$

$$= 1 + 2.5$$

$$= 3.5$$

8. 

$$-2b > \frac{18 - b}{5}$$

$$5(-2b) > 5 \left( \frac{18 - b}{5} \right)$$

$$-10b > 18 - b$$

$$-10b + b > 18 - b + b$$

$$-9b > 18$$

$$b < -2$$

9. Let $s$ represent the number of sodas he can buy.

$$35 \geq 25 + 2.50s$$

10. 

$$r - 3 < -5 \quad \text{or} \quad 4r + 1 > 15$$

$$r - 3 + 3 < -5 + 3 \quad \text{or} \quad 4r + 1 - 1 > 15 - 1$$

$$r < -2 \quad \text{or} \quad 4r > 14$$

$$r < -2 \quad \text{or} \quad \frac{4r}{4} > \frac{14}{4}$$

$$r < -2 \quad \text{or} \quad r > \frac{7}{2}$$

So, the solution of the inequalities is \( \{ r \mid r < -2 \text{ or } r > \frac{7}{2} \} \).

11. 

$$|p - 4| \leq 11$$

$$-11 \leq p - 4 \leq 11$$

$$-11 + 4 \leq p - 4 + 4 \leq 11 + 4$$

$$-7 \leq p \leq 15$$

The solution set is \( \{ p \mid -7 \leq p \leq 15 \} \).
12.  
\[4 < 6t + 1 \leq 43\]
\[4 - 1 < 6t + 1 - 1 \leq 43 - 1\]
\[3 < 6t \leq 42\]
\[\frac{3}{6} < \frac{6t}{6} \leq \frac{42}{6}\]
\[\frac{1}{2} < t \leq 7\]

The graph in the choice F represents the solution set \(\left\{t \mid \frac{1}{2} < t \leq 7\right\}\).
So, the correct choice is F.

13. Let \(p\) represents the actual price.

The absolute value inequality representing the situation is \(|p - 500| \leq 250\).

Solve the absolute value inequality.
\[|p - 500| \leq 250\]
\[-250 \leq p - 500 \leq 250\]
\[-250 + 500 \leq p - 500 + 500 \leq 250 + 500\]
\[250 \leq p \leq 750\]

14. The perimeter of each stone block = \((8 + 7 + 12 + 7)\) ft.

Therefore, perimeter of 3 stone blocks = \(3(8 + 7 + 12 + 7)\) ft.
\[3(8 + 7 + 12 + 7) = 3(8) + 3(7) + 3(12) + 3(7)\]
\[= 24 + 21 + 36 + 21\]
\[= 102\]

So, Andy will need 102 feet of stones.

15. Solve each equation.

Case 1:  
\[x + 4 = 3\]  
\[x + 4 = -3\]
\[x + 4 - 4 = 3 - 4\]  
\[x + 4 - 4 = -3 - 4\]
\[x = -1\]  
\[x = -7\]

There appear to be two solutions, \(-1\) and \(-7\).

Check: Substitute each value in the original equation.
\[|x + 4| = 3\]  
\[|x + 4| = 3\]
\[|-1 + 4| = 3\]  
\[|-7 + 4| = 3\]
\[|3| = 3\]  
\[|-3| = 3\]
\[3 = 3\]  
\[3 = 3\]

The solution set is \(\{-7, -1\}\).
16. Case 1:  
\[ 3m + 2 = 1 \]
\[ 3m + 2 = -1 \]
\[ 3m + 2 - 2 = 1 - 2 \]
\[ 3m + 2 - 2 = -1 - 2 \]
\[ 3m = -1 \]
\[ 3m = -3 \]
\[ \frac{3m}{3} = -1 \]
\[ \frac{3m}{3} = -3 \]
\[ m = -\frac{1}{3} \]
\[ m = -1 \]

There appear to be two solutions, \(-\frac{1}{3}\) and \(-1\).

Check: Substitute each value in the original equation.
\[ |3m + 2| = 1 \]
\[ |3(-\frac{1}{3}) + 2| = 1 \]
\[ |3(-1) + 2| = 1 \]
\[ |-1 + 2| = 1 \]
\[ |-3 + 2| = 1 \]
\[ |1| = 1 \]
\[ |-1| = 1 \]
\[ 1 = 1 \checkmark \]
\[ 1 = 1 \checkmark \]

The solution set is \(\left\{-1, -\frac{1}{3}\right\}\).

17. Since the absolute value of \(3a + 2\) can not be negative, the solution set is \(\emptyset\).

18. \[ |2t + 5| - 7 = 4 \]
\[ |2t + 5| - 7 + 7 = 4 + 7 \]
\[ |2t + 5| = 11 \]

Case 1:  

\[ 2t + 5 = 11 \]
\[ 2t + 5 = -11 \]
\[ 2t + 5 - 5 = 11 - 5 \]
\[ 2t + 5 - 5 = -11 - 5 \]
\[ 2t = 6 \]
\[ 2t = -16 \]
\[ \frac{2t}{2} = \frac{6}{2} \]
\[ \frac{2t}{2} = \frac{-16}{2} \]
\[ t = 3 \]
\[ t = -8 \]

There appear to be two solutions, 3 and \(-8\).

Check: Substitute each value in the original equation.
\[ |2t + 5| - 7 = 4 \]
\[ |2(3) + 5| - 7 = 4 \]
\[ |2(-8) + 5| - 7 = 4 \]
\[ |6 + 5| - 7 = 4 \]
\[ |-16 + 5| - 7 = 4 \]
\[ |11| - 7 = 4 \]
\[ |-11| - 7 = 4 \]
\[ 11 - 7 = 4 \]
\[ 11 - 7 = 4 \]
\[ 4 = 4 \checkmark \]
\[ 4 = 4 \checkmark \]

The solution set is \(\{3, -8\}\).
19. \[ |5n - 2| - 6 = -3 \]
\[ |5n - 2| - 6 + 6 = -3 + 6 \]
\[ |5n - 2| = 3 \]

Case 1: \[ 5n - 2 = 3 \]
\[ 5n = 5 \]
\[ n = 1 \]

Case 2: \[ 5n - 2 = -3 \]
\[ 5n = -1 \]
\[ n = -\frac{1}{5} \]

There appear to be two solutions, 1 and \(-\frac{1}{5}\).

Check: Substitute each value in the original equation.
\[ |5n - 2| - 6 = -3 \]
\[ |5(1) - 2| - 6 = -3 \]
\[ |5 - 2| - 6 = -3 \]
\[ |3| - 6 = -3 \]
\[ 3 - 6 = -3 \]
\[ -3 = -3 \checkmark \]

\[ |5n - 2| - 6 = -3 \]
\[ |5\left(-\frac{1}{5}\right) - 2| - 6 = -3 \]
\[ |5 - \frac{1}{5}| - 2 = -3 \]
\[ |3 - \frac{1}{5}| - 6 = -3 \]
\[ |\frac{14}{5}| - 6 = -3 \]
\[ \frac{14}{5} - 6 = -3 \]
\[ \frac{14}{5} - \frac{30}{5} = -3 \]
\[ \frac{-16}{5} = -3 \checkmark \]

The solution set is \( \left\{ -\frac{1}{5}, 1 \right\} \).

20. \[ |p + 6| + 9 = 8 \]
\[ |p + 6| + 9 - 9 = 8 - 9 \]
\[ |p + 6| = -1 \]

Since the absolute value of any number can not be negative, the solution set is \( \emptyset \).

21. Radius \( r \) of the cylinder is 6 cm.
Substitute \( r = 6 \), and \( h = 9 \) in the formula \( V = \pi r^2 h \).
\[ V = \pi r^2 h \]
\[ = \pi (6)^2 (9) \]
\[ = (36)(9)\pi \]
\[ = 324\pi \]
\[ \approx 1017.88 \]

The volume of the cylinder is about 1017.88 cubic centimeters.
22. \[
-3b - 5 \geq -6b - 13 \\
-3b - 5 + 5 \geq -6b - 13 + 5 \\
-3b \geq -6b - 8 \\
-3b + 6b \geq -6b - 8 + 6b \\
3b \geq -8 \\
\frac{3b}{3} \geq \frac{-8}{3} \\
b \geq \frac{-8}{3}
\]

23. \[
\frac{3(x + y)}{4xy^2} = \frac{3}{4} \left(\frac{\frac{2}{3} + (-2)}{\left(-2\right)^2}\right) \\
\frac{3}{4} \left(\frac{\frac{2}{3} - 2}{(-2)^2}\right) \\
= \frac{3}{4} \left(\frac{\frac{2}{3} - \frac{6}{3}}{4}\right) \\
= \frac{3}{4} \left(\frac{\frac{2 - 6}{3}}{4}\right) \\
= \frac{3}{4} \left(\frac{\frac{-4}{3}}{4}\right) \\
= \frac{3}{4} \left(\frac{-4}{3}\right) \\
= \frac{3}{4} \left(\frac{-32}{3}\right) \\
= \frac{3}{4} \left(-\frac{12}{3}\right) \\
= \frac{3}{4} \left(-\frac{32}{3}\right) \\
= \frac{3}{4} \left(-\frac{32}{3}\right) \\
= -\frac{3}{8}
\]

24. Q, R
25. 

\[ 15 + 3.25b < 20 + 2.5b \]
\[ 15 + 3.25b - 15 < 20 + 2.5b - 15 \]
\[ 3.25b < 2.5b + 5 \]
\[ 3.25b - 2.5b < 2.5b + 5 - 2.5b \]
\[ 0.75b < 5 \]
\[ \frac{0.75b}{0.75} < \frac{5}{0.75} \]
\[ b < 6.6 \]

When you buy 6 or fewer beads, The Accessory Store is a better deal.
Chapter 1 - Equations and Inequalities - Preparing for Standardized Tests - Chapter 1

Read each problem. Eliminate any unreasonable answers. Then use the information in the problem to solve.

1. The graph represents the inequality \( x \geq 2 \).
   Consider the inequality in choice A.
   \[
   8x - 9 \leq 5x - 3
   \]
   \[
   8x - 9 + 9 \leq 5x - 3 + 9
   \]
   \[
   8x \leq 5x + 6
   \]
   \[
   8x - 5x \leq 5x + 6 - 5x
   \]
   \[
   3x \leq 6
   \]
   \[
   \frac{3x}{3} \leq \frac{6}{3}
   \]
   \[
   x \leq 2
   \]
   Consider the inequality in choice B.
   \[
   8x - 9 < 5x - 3
   \]
   \[
   8x - 9 + 9 < 5x - 3 + 9
   \]
   \[
   8x < 5x + 6
   \]
   \[
   8x - 5x < 5x + 6 - 5x
   \]
   \[
   3x < 6
   \]
   \[
   \frac{3x}{3} < \frac{6}{3}
   \]
   \[
   x < 2
   \]
   Consider the inequality in choice C.
   \[
   8x - 9 \geq 5x - 3
   \]
   \[
   8x - 9 + 9 \geq 5x - 3 + 9
   \]
   \[
   8x \geq 5x + 6
   \]
   \[
   8x - 5x \geq 5x + 6 - 5x
   \]
   \[
   3x \geq 6
   \]
   \[
   \frac{3x}{3} \geq \frac{6}{3}
   \]
   \[
   x \geq 2
   \]
   Since the solution of the inequality in choice C is \( x \geq 2 \), the correct choice is C.

2. \[
E = mc^2
\]
\[
\frac{E}{c^2} = \frac{mc^2}{c^2}
\]
\[
\frac{E}{c^2} = m
\]
The correct choice is G.
3. Let $x$ be the perimeter of the larger rectangle.
\[
\frac{x}{30} = \frac{12}{8}
\]
\[30 \left( \frac{x}{30} \right) = 30 \left( \frac{12}{8} \right)
\]
\[x = \frac{30 \cdot 12}{8}
\]
\[= \frac{360}{8}
\]
\[= 45
\]
The perimeter of the larger rectangle is 45 inches.
So, the correct choice is B.

4. Let length = $l$, width = $w$, and height = $h$ of the prism. Then, the volume $V$ of the rectangular prism is
\[V = lwh = 82
\]
If the length, width, and height of the prism are all doubled, then the volume $V_1$ is $(2l)(2w)(2h)$ or $8lwh$.
Substitute 82 for $lwh$ in the formula $V_1 = 8lwh$.
\[V_1 = 8lwh
\]
\[= 8(82)
\]
\[= 656
\]
The volume of the prism is 656 cubic inches. So, the correct choice is J.

5. 
\[a + (b + 1)^2 = 3 + (2 + 1)^2
\]
\[\quad = 3 + (3)^2
\]
\[\quad = 3 + 9
\]
\[\quad = 12
\]
So, the correct choice is C.

6. 
\[P(\text{2 cats seen in a row}) = \frac{2}{6}
\]
\[\quad = \frac{1}{3}
\]
So, the correct choice is F.
Chapter 1 - Equations and Inequalities - Standardized Test Practice - Cumulative, Chapter 1

1. \[
\frac{m^2 + 2mn}{n^2 - 1} = \frac{(-3)^2 + 2(-3)(2)}{(2)^2 - 1} = \frac{9 + (-6)(2)}{4 - 1} = \frac{9 - 12}{3} = \frac{-3}{3} = -1
\]

2. \[
V = \frac{1}{3} \pi r^2 h
\]
The correct choice is F.

3. Symmetric Property

4. To find how much the temperature is over or under 81.5°F subtract 81.5 from T. Since whether it is over or under does not matter find the absolute value \(|T - 81.5|\). Because it needs to be less than or equal to 0.2 use \(\leq\).

\(|T - 81.5| \leq 0.2
\)
The correct solution is \(|T - 81.5| \leq 0.2
\)

5. \[2n - 3 \geq 5n - 6\]

6. \[2n - 3 \geq 5n - 6\]
\[-3 \geq 3n - 6\]
\[3 \geq 3n\]
\[1 \geq n\]

Or \(n \leq 1\)

Therefore, the correct choice is F.

7. More than means +
Product means multiplication
Number and 5 means 5n
Therefore, 5n + 2 is the correct answer.
8. \(|x - 3| - 2 = 0\)
   \(|x - 3| = 2\)

   **Case 1**
   \(x - 3 = 2\)
   \(x = 5\)

   **Case 2**
   \(x - 3 = -2\)
   \(x = 1\)

   **Check 1**
   \(|x - 3| - 2 = 0\)
   \(5 - 3 - 2 = 0\)
   \(0 = 0\)

   **Check 2**
   \(|x - 3| - 2 = 0\)
   \(1 - 3 - 2 = 0\)
   \(0 = 0\)

Therefore, \(x = 5\) or 0.

9. The medium drink is listed as 21 fluid ounces. Since there is a tolerance of 0.35, the drink could exceed 21 ounces by 0.35. Therefore, the maximum acceptable fill amount is 21.35 fluid ounces.

10. \(-4(3a - b) + 3(-2a + 5b)\)
    \(-12a + 4b - 6a + 15b\)
    \(-18a + 19b\)

11. a. To find how much the temperature is over or under 425°F subtract 425 from \(t\). Since whether it is over or under does not matter find the absolute value \(|t - 425|\). Because it needs to be less than or equal to 15 use \(\leq\).
    \[|t - 425| \leq 15\]
    \[\begin{align*}
    -15 &\leq t - 425 \leq 15 \\
    410 &\leq t \leq 440
    \end{align*}\]

b. 410 \(\leq t \leq 440\)

12. The laser range finder measured the distance to be 136 yards but can be off by 0.5 yards so 136 - 0.5 = 135.5. Therefore the minimum distance could be 135.5 yards.

13. a. In the second step below, Cindy missed the subtraction sign in the second step when working on \(-3(-4)\).
    \[\begin{align*}
    \frac{-5m - 3n}{-2p + r} &= \frac{-5(1) - 3(-4)}{-2(-3) + (-2)} \\
    &= \frac{-5 - 12}{6 - 2} = \frac{-17}{4} = -4\frac{1}{4}
    \end{align*}\]

b. The final answer is \(1\frac{3}{4}\).
14. a. Let $n$ be the score he must earn on Quiz 6.
\[
\frac{86 + 79 + 80 + 85 + 77 + n}{6} \geq 82
\]
\[
\frac{86 + 79 + 80 + 85 + 77 + n}{6} \geq 82
\]
\[
\frac{407 + n}{6} \geq 82
\]
b. 
\[
6 \left( \frac{407 + n}{6} \right) \geq 6(82)
\]
\[
407 + n \geq 492
\]
\[
407 + n - 407 \geq 492 - 407
\]
\[
n \geq 85
\]
c. Ricardo must score at least an 85 on his last quiz to earn a B.