State whether each sentence is true or false. If false, replace the underlined term to make a true sentence.

1. In order to write an equation to solve a problem, identify the unknown for which you are looking and assign a(n) number to it.

   SOLUTION:
   False. In order to write an equation, identify the unknown for which you are looking and assign a variable to it. Variables are used for unknowns since the values are not known.

2. To solve an equation means to find the value of the variable that makes the equation true.

   SOLUTION:
   True

3. The numbers 10, 12, and 14 are an example of consecutive even integers.

   SOLUTION:
   True

4. The absolute value of any number is simply the distance the number is away from zero on a number line.

   SOLUTION:
   True

5. A(n) equation is a comparison of two numbers by division.

   SOLUTION:
   False. A ratio is a comparison of two numbers by division.

6. An equation stating that two ratios are equal is called a(n) proportion.

   SOLUTION:
   True

7. If the new number is less than the original number, the percent of change is a percent of increase.

   SOLUTION:
   False. If the new number is less than the original number, the percent of change is a percent of decrease.

8. The weighted average of a set of data is the sum of the product of the number of units and the value per unit divided by the sum of the number of units.

   SOLUTION:
   True
Translate each sentence into an equation.

9. The sum of five times a number $x$ and three is the same as fifteen.

**SOLUTION:**
Rearrange the verbal sentence so it is easier to translate. The sum of five times a number $x$ and three is the same as fifteen is the same as five times $x$ plus three equals fifteen.

\[
\begin{align*}
5 \cdot x & \quad + \quad 3 & \quad = & \quad 15 \\
\end{align*}
\]

The equation is $5x + 3 = 15$.

10. Four times the difference of $b$ and six is equal to $b$ squared.

**SOLUTION:**
Rearrange the verbal sentence so it is easier to translate. Four times the difference of $b$ and six is equal to $b$ squared is the same as four times $b$ minus six equals $b$ squared.

\[
\begin{align*}
4 \cdot (b - 6) & \quad = \quad b^2 \\
\end{align*}
\]

The equation is $4(b - 6) = b^2$.

11. One half of $m$ cubed is the same as four times $m$ minus nine.

**SOLUTION:**
Rearrange the verbal sentence so it is easier to translate. One half of $m$ cubed is the same as four times $m$ minus nine is the same as one half times $m$ cubed equals four times $m$ minus nine.

\[
\begin{align*}
\frac{1}{2} \cdot m^3 & \quad = \quad 4m \quad - \quad 9 \\
\end{align*}
\]

The equation is $\frac{1}{2}m^3 = 4m - 9$.

Translate each equation into a sentence.

12. $3p + 8 = 20$

**SOLUTION:**
Three times $p$ plus eight equals twenty can be rewritten as the sum of three times $p$ and eight is the same as twenty.

\[
\begin{align*}
3 \cdot p & \quad + \quad 8 & \quad = & \quad 20 \\
\end{align*}
\]
Study Guide and Review - Chapter 2

13. \(h^2 - 5h + 6 = 0\)

**SOLUTION:**

\[
\begin{align*}
h^2 & \quad - \quad 5h \quad + \quad 6 \quad = \quad 0 \\
\text{h squared} & \quad \text{minus} \quad \text{five times} \quad \frac{h}{h} \quad \text{plus} \quad 6 \quad \text{equals zero}
\end{align*}
\]

\(h\) squared minus five times \(h\) plus six is equal to zero.

14. \(\frac{3}{4}w^2 + \frac{2}{3}w - \frac{1}{5} = 2\)

**SOLUTION:**

\[
\begin{align*}
\frac{3}{4}w^2 & \quad + \quad \frac{2}{3}w \quad - \quad \frac{1}{5} \quad = \quad 2 \\
\text{three} \quad \text{fourths} \quad w \quad \text{squared} & \quad \text{plus} \quad \text{two thirds} \quad \frac{w}{w} \quad \text{minus} \quad \frac{1}{5} \quad \text{equals} \quad 2
\end{align*}
\]

Three-fourths \(w\) squared plus two-thirds \(w\) minus one-fifth is equal to two.

15. **FENCING** Adrienne wants to create an outdoor rectangular kennel. The length will be three feet more than twice the width. Write and use an equation to find the length and the width of the kennel if Adrienne has 54 feet of fencing.

**SOLUTION:**

To write the equation, let \(l\) stand for length and \(w\) stand for width. Write an equation for \(l\) based on \(w\): \(l = 2w + 3\). Then substitute \(2w + 3\) for \(l\) into the formula for perimeter.

\[P = 2l + 2w\] **Perimeter formula**

\[54 = 2(2w + 3) + 2w\] \(P = 54, \ l = 2w + 3\)

\[54 = 4w + 6 + 2w\] **Distribute.**

\[54 = 6w + 6\] **Simplify.**

\[48 = 6w\] **Subtract 6.**

\[48 = 6w\] **Simplify.**

\[48 = 6w\] **Divide by 6.**

\[8 = w\] **Simplify.**

Solve for \(l\) when \(w = 8\).

\[l = 2w + 3\]

\[= 2(8) + 3\]

\[= 16 + 3\]

\[= 19\]

The width is 8 feet and the length is 19 feet.
Solve each equation. Check your solution.

16. \( x - 9 = 4 \)

**SOLUTION:**

\[
\begin{align*}
x - 9 &= 4 & \text{Original equation} \\
x - 9 + 9 &= 4 + 9 & \text{Add 9 to each side.} \\
x &= 13 & \text{Simplify.}
\end{align*}
\]

Check:

\[
\begin{align*}
x - 9 &= 4 \\
13 - 9 &= 4 \\
4 &= 4
\end{align*}
\]

17. \(-6 + g = -11\)

**SOLUTION:**

\[
\begin{align*}
-6 + g &= -11 & \text{Original equation} \\
-6 + 6 + g &= -11 + 6 & \text{Add 6 to each side.} \\
g &= -5 & \text{Simplify.}
\end{align*}
\]

Check:

\[
\begin{align*}
-6 + g &= -11 \\
-6 + (-5) &= -11 \\
-11 &= -11
\end{align*}
\]

18. \(\frac{5}{9} + w = \frac{7}{9}\)

**SOLUTION:**

\[
\begin{align*}
\frac{5}{9} + w &= \frac{7}{9} & \text{Original equation} \\
\frac{5}{9} - \frac{5}{9} + w &= \frac{7}{9} - \frac{5}{9} & \text{Subtract \(\frac{5}{9}\).} \\
w &= \frac{2}{9} & \text{Simplify.}
\end{align*}
\]

Check:

\[
\begin{align*}
\frac{5}{9} + w &= \frac{7}{9} \\
\frac{5}{9} + \frac{2}{9} &= \frac{7}{9} \\
\frac{7}{9} &= \frac{7}{9}
\end{align*}
\]
19. \(3.8 = m + 1.7\)

**SOLUTION:**

\[
3.8 = m + 1.7 \\
3.8 - 1.7 = m + 1.7 - 1.7 \quad \text{Subtract 1.7.} \\
2.1 = m \quad \text{Simplify.}
\]

Check:

\[
3.8 = m + 1.7 \\
3.8 = 2.1 + 1.7 \\
3.8 = 3.8
\]

20. \(\frac{a}{12} = 5\)

**SOLUTION:**

\[
\frac{a}{12} = 5 \quad \text{Original equation} \\
12 \cdot \frac{a}{12} = 12 \cdot 5 \quad \text{Multiply each side by 12.} \\
a = 60 \quad \text{Simplify.}
\]

Check:

\[
\frac{a}{12} = 5 \\
60 \div 5 \\
12 \div 5 = 5
\]

21. \(8y = 48\)

**SOLUTION:**

\[
8y = 48 \quad \text{Original equation} \\
\frac{8y}{8} = \frac{48}{8} \quad \text{Divide each side by 8.} \\
y = 6 \quad \text{Simplify.}
\]

Check:

\[
8y = 48 \\
8(6) = 48 \\
48 = 48
\]
22. \( \frac{2}{5}b = -4 \)

**SOLUTION:**

\[
\frac{2}{5}b = -4 \quad \text{Original equation}
\]

\[
\frac{2}{5} \cdot \frac{2}{5}b = \frac{2}{5}(-4) \quad \text{Multiply each side by} \quad \frac{5}{2}
\]

\[
b = -\frac{20}{2} \quad \text{Simplify.}
\]

\[
b = -10 \quad \text{Simplify.}
\]

Check:

\[
\frac{2}{5}b = -4
\]

\[
\frac{2}{5}(-10) = -4
\]

\[
-4 = -4
\]

23. \( -\frac{t}{16} = -\frac{7}{8} \)

**SOLUTION:**

\[
-\frac{t}{16} = -\frac{7}{8}
\]

\[
-\frac{t}{16}(-16) = -\frac{7}{8}(-16) \quad \text{Multiply}
\]

\[
t = \frac{112}{8} \quad \text{Simplify}
\]

\[
t = 14 \quad \text{Simplify}
\]

Check:

\[
-\frac{t}{16} = -\frac{7}{8}
\]

\[
-\frac{14}{8} = -\frac{7}{8}
\]

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

24. **AGE** Max is four years younger than his sister Brenda. Max is 16 years old. Write and solve an equation to find Brenda’s age.

**SOLUTION:**

Let \( x \) be Brenda’s age. Since Max is 4 years younger, Max’s age is \( x - 4 = 16 \).

Using this equation we can solve for Brenda’s age: \( x = 16 + 4 = 20 \). Brenda is 20 years old.
25. Solve each equation. Check your solution.

\[ 2d - 4 = 8 \]

**SOLUTION:**

\[
\begin{align*}
2d - 4 &= 8 & \text{Original equation} \\
2d - 4 + 4 &= 8 + 4 & \text{Add 4 to each side.} \\
2d &= 12 & \text{Simplify.} \\
\frac{2d}{2} &= \frac{12}{2} & \text{Divide each side by 2.} \\
d &= 6 & \text{Simplify.}
\end{align*}
\]

Check:

\[
\begin{align*}
2d - 4 &= 8 \\
2(6) - 4 &= 8 \\
12 - 4 &= 8 \\
8 &= 8
\end{align*}
\]

26. \(-9 = 3t + 6\)

**SOLUTION:**

\[
\begin{align*}
-9 &= 3t + 6 & \text{Original equation} \\
-9 - 6 &= 3t + 6 - 6 & \text{Subtract 6.} \\
-15 &= 3t & \text{Simplify.} \\
\frac{-15}{3} &= \frac{3t}{3} & \text{Divide by 3.} \\
-5 &= t & \text{Simplify.}
\end{align*}
\]

Check:

\[
\begin{align*}
-9 &= 3t + 6 \\
-9 &= 3(-5) + 6 \\
-9 &= -15 + 6 \\
-9 &= -9
\end{align*}
\]
27. $14 = -8 - 2k$

**SOLUTION:**

\[
\begin{align*}
14 &= -8 - 2k & \text{Original equation} \\
14 + 8 &= -8 + 8 - 2k & \text{Add 8.} \\
22 &= -2k & \text{Simplify.} \\
\frac{22}{-2} &= \frac{-2k}{-2} & \text{Divide by } -2. \\
-11 &= k & \text{Simplify.}
\end{align*}
\]

Check:

\[
\begin{align*}
14 &= -8 - 2k \\
? &= -8 - 2(-11) \\
? &= -8 + 22 \\
14 &= 14
\end{align*}
\]

28. \[\frac{n}{4} - 7 = -2\]

**SOLUTION:**

\[
\begin{align*}
\frac{n}{4} - 7 &= -2 & \text{Original equation} \\
\frac{n}{4} - 7 + 7 &= -2 + 7 & \text{Add 7 to each side.} \\
\frac{n}{4} &= 5 & \text{Simplify.} \\
4 \cdot \frac{n}{4} &= 4 \cdot 5 & \text{Multiply each side by 4.} \\
\frac{n}{4} &= 20 & \text{Simplify.}
\end{align*}
\]

Check:

\[
\begin{align*}
\frac{n}{4} - 7 &= -2 \\
\frac{20}{4} - 7 &= -2 \\
5 - 7 &= -2 \\
-2 &= -2
\end{align*}
\]
29. \( \frac{r+4}{3} = 7 \)

**SOLUTION:**
\[
\frac{r+4}{3} = 7 \quad \text{Original equation}
\]
\[
3 \cdot \frac{r+4}{3} = 7 \cdot 3 \quad \text{Multiply each side by 3.}
\]
\[
r + 4 = 21 \quad \text{Simplify.}
\]
\[
r + 4 - 4 = 21 - 4 \quad \text{Subtract 4 from each side.}
\]
\[
r = 17 \quad \text{Simplify.}
\]

Check:
\[
\frac{r+4}{3} = 7
\]
\[
\frac{17 + 4}{3} = 7
\]
\[
\frac{21}{3} = 7
\]
\[
7 = 7
\]

30. \(-18 = \frac{9-a}{2}\)

**SOLUTION:**
\[-18 = \frac{9-a}{2} \quad \text{Original equation.}\]
\[
2 \cdot (-18) = 2 \cdot \frac{9-a}{2} \quad \text{Subtract 9 from each side.}
\]
\[-36 - 9 = 9 - 9 - a \quad \text{Simplify.}\]
\[-45 = -a \quad \text{Simplify.}\]
\[
\frac{-45}{-1} = \frac{-a}{-1} \quad \text{Divide each side by -1.}\]
\[
45 = a \quad \text{Simplify.}\]

Check:
\[-18 = \frac{9-a}{2}\]
\[-18 = \frac{9 - 45}{2}\]
\[-18 = \frac{9 - 36}{2}\]
\[-18 = -18\]
31. $6g - 3.5 = 8.5$

**SOLUTION:**

$6g - 3.5 = 8.5$  
Original equation

$6g - 3.5 + 3.5 = 8.5 + 3.5$  
Add 3.5 to each side.

$6g = 12$  
Simplify.

$\frac{6g}{6} = \frac{12}{6}$  
Divide each side by 6.

$g = 2$  
Simplify.

Check:

$6g - 3.5 = 8.5$

$6(2) - 3.5 = 8.5$

$12 - 3.5 = 8.5$

$8.5 = 8.5$

32. $0.2c + 4 = 6$

**SOLUTION:**

$0.2c + 4 = 6$  
Original equation

$0.2c + 4 - 4 = 6 - 4$  
Subtract 4 from each side

$0.2c = 2$  
Simplify.

$\frac{0.2c}{0.2} = \frac{2}{0.2}$  
Divide each side by 0.2.

$c = 10$  
Simplify.

Check:

$0.2c + 4 = 6$

$0.2(10) + 4 = 6$

$2 + 4 = 6$

$6 = 6$
33. \( \frac{f}{3} - 9.2 = 3.5 \)

**SOLUTION:**

\[
\frac{f}{3} - 9.2 = 3.5 \quad \text{Original equation}
\]

\[
\frac{f}{3} - 9.2 + 9.2 = 3.5 + 9.2 \quad \text{Add 9.2 to each side.}
\]

\[
\frac{f}{3} = 12.7 \quad \text{Simplify.}
\]

\[
3 \cdot \frac{f}{3} = 3 \cdot 12.7 \quad \text{Multiply each side by 3}
\]

\[
f = 38.1 \quad \text{Simplify.}
\]

Check:

\[
\frac{f}{3} - 9.2 = 3.5
\]

\[
38.1 \div 3 - 9.2 = 3.5
\]

\[
12.7 - 9.2 = 3.5
\]

\[
3.5 = 3.5
\]

34. \( 4 = \frac{-3u - (-7)}{-8} \)

**SOLUTION:**

\[
4 = \frac{-3u - (-7)}{-8}
\]

\[
-8 \cdot 4 = -8 \cdot \frac{-3u - (-7)}{-8} \quad \text{Multiply by -8}
\]

\[
-32 = -3u - (-7) \quad \text{Simplify.}
\]

\[
-32 - 7 = -3u + 7 - 7 \quad \text{Subtract 7.}
\]

\[
-39 = -3u \quad \text{Simplify.}
\]

\[
\frac{-39}{-3} = \frac{-3u}{-3} \quad \text{Divide by -3.}
\]

\[
13 = u \quad \text{Simplify.}
\]

Check:

\[
4 = \frac{-3(13) - (-7)}{-8}
\]

\[
\frac{-39 + 7}{-8}
\]

\[
\frac{-32}{-8}
\]

\[
4 = 4
\]
35. **CONSECUTIVE INTEGERS** Find three consecutive odd integers with a sum of 63.

**SOLUTION:**
To write an equation, let \( x, (x + 2), \) and \( (x + 4) \) represent the three consecutive odd integers. Then, set the sum of the integers equal to 63.

\[
x + (x + 2) + (x + 4) = 63
\]

\[
x + 3x + 6 = 63  \quad \text{Simplify.}
\]

\[
3x + 6 = 63
\]

\[
3x = 57 \quad \text{Subtract 6.}
\]

\[
\frac{3x}{3} = \frac{57}{3} \quad \text{Divide by 3.}
\]

\[
x = 19 \quad \text{Simplify.}
\]

\[
x + 2 = 21 \quad \text{Find } x + 2.
\]

\[
x + 4 = 23 \quad \text{Find } x + 4.
\]

The consecutive odd numbers are 19, 21, and 23.

36. **CONSECUTIVE INTEGERS** Find three consecutive integers with a sum of –39.

**SOLUTION:**
To write an equation, let \( x, (x + 1), \) and \( (x + 2) \) represent the three consecutive integers. Then, set the sum of the integers equal to –39.

\[
x + (x + 1) + (x + 2) = -39
\]

\[
x + 3x + 3 = -39  \quad \text{Simplify.}
\]

\[
3x + 3 = -39
\]

\[
3x = -42 \quad \text{Subtract 3.}
\]

\[
\frac{3x}{3} = \frac{-42}{3} \quad \text{Divide by 3.}
\]

\[
x = -14 \quad \text{Simplify.}
\]

\[
x + 1 = -13 \quad \text{Find } x + 1.
\]

\[
x + 2 = -12 \quad \text{Find } x + 2.
\]

The consecutive integers are –12, –13, and –14.
Solve each equation. Check your solution.

37. \(8m + 7 = 5m + 16\)

**SOLUTION:**

\[
\begin{align*}
8m + 7 &= 5m + 16 \\
8m - 5m + 7 &= 5m - 5m + 16 & \text{Subtract } 5m \\
3m + 7 &= 16 & \text{Simplify.} \\
3m + 7 - 7 &= 16 - 7 & \text{Subtract } 7. \\
3m &= 9 & \text{Simplify.} \\
\frac{3m}{3} &= \frac{9}{3} & \text{Divide by } 3. \\
m &= 3 & \text{Simplify.}
\end{align*}
\]

Check:

\[
\begin{align*}
8m + 7 &= 5m + 16 \\
8(3) + 7 &= 5(3) + 16 \\
24 + 7 &= 15 + 16 \\
31 &= 31
\end{align*}
\]

38. \(2h - 14 = -5h\)

**SOLUTION:**

\[
\begin{align*}
2h - 14 &= -5h & \text{Original equation} \\
2h + 5h - 14 &= -5h + 5h & \text{Add } 5h \text{ to each side.} \\
7h - 14 &= 0 & \text{Simplify.} \\
7h - 14 + 14 &= 0 + 14 & \text{Add } 14 \text{ to each side.} \\
7h &= 14 & \text{Simplify.} \\
\frac{7h}{7} &= \frac{14}{7} & \text{Divide each side by } 7. \\
h &= 2 & \text{Simplify.}
\end{align*}
\]

Check:

\[
\begin{align*}
2h - 14 &= -5h \\
2(2) - 14 &= -5(2) \\
4 - 14 &= -10 \\
-10 &= -10
\end{align*}
\]
39. \(21 + 3j = 9 - 3j\)

**SOLUTION:**

\[
\begin{align*}
21 + 3j & = 9 - 3j \\
21 - 21 + 3j & = 9 - 21 - 3j \\
3j & = -12 - 3j \\
3j + 3j & = -12 - 3j + 3j \\
6j & = -12 \\
\frac{6j}{6} & = \frac{-12}{6} \\
j & = -2
\end{align*}
\]

**Subtract 21.**

**Simplify.**

**Add 3j.**

**Simplify.**

**Divide by 6**

**Simplify.**

Check:

\[
\begin{align*}
21 + 3j & = 9 - 3j \\
21 + 3(2) & = 9 - 3(-2) \\
21 - 6 & = 9 + 6 \\
15 & = 15
\end{align*}
\]

40. \(\frac{x - 3}{4} = \frac{x}{2}\)

**SOLUTION:**

\[
\begin{align*}
\frac{x - 3}{4} & = \frac{x}{2} \\
2(x - 3) & = 4 \cdot x \\
2x - 6 & = 4x \\
2x - 2x - 6 & = 4x - 2x \\
-6 & = 2x \\
-\frac{6}{2} & = \frac{2x}{2} \\
-3 & = x
\end{align*}
\]

**Cross multiply.**

**Distribute.**

**Subtract 2x.**

**Simplify.**

**Divide by 2.**

**Simplify.**

Check:

\[
\begin{align*}
\frac{x - 3}{4} & = \frac{x}{2} \\
-\frac{3 - 3}{4} & = -\frac{3}{2} \\
-\frac{-6}{4} & = -\frac{-3}{2} \\
-\frac{3}{2} & = -\frac{3}{2}
\end{align*}
\]
41. \[
\frac{6r - 7}{10} = \frac{r}{4}
\]

**SOLUTION:**

\[
\frac{6r - 7}{10} = \frac{r}{4}
\]

\[
4(6r - 7) = 10 \cdot r
\]

Cross multiply.

\[
24r - 28 = 10r
\]

Distribute

\[
24r - 24r - 28 = 10r - 24r
\]

Subtract 24r.

\[
-28 = -14r
\]

Simplify.

\[
\frac{-28}{-14} = \frac{-14r}{-14}
\]

Divide by -14.

\[
2 = r
\]

Simplify.

Check:

\[
\frac{6r - 7}{10} = \frac{r}{4}
\]

\[
6(2) - 7 = 2
\]

\[
12 - 7 = 2
\]

\[
10 = 4
\]

\[
5 = 2
\]

\[
10 = 4
\]

\[
2 = 2
\]

42. \(3p + 4) = 33

**SOLUTION:**

\(3(p + 4) = 33
\)

\(3p + 12 = 33
\)

Distribute.

\(3p + 12 - 12 = 33 - 12
\)

Subtract 12.

\(3p = 21
\)

Simplify.

\(\frac{3p}{3} = \frac{21}{3}
\)

Divide by 3.

\(p = 7
\)

Simplify.

Check:

\(3(p + 4) = 33
\)

\(3(7 + 4) = 33
\)

\(3(11) = 33
\)

\(33 = 33
\)
43. $-2(b - 3) - 4 = 18$

**SOLUTION:**

$-2(b - 3) - 4 = 18$

Distribute.

$-2b + 6 - 4 = 18$

Simplify.

$-2b + 2 = 18$

Subtract 2.

$-2b = 16$

Simplify.

$\frac{-2b}{-2} = \frac{16}{-2}$

Divide by $-2$.

$b = -8$

Simplify.

Check:

$-2(b - 3) - 4 = 18$

$-2(-8 - 3) - 4 = 18$

$-2(-11) - 4 = 18$

$22 - 4 = 18$

$18 = 18$

44. $4(3w - 2) = 8(2w + 3)$

**SOLUTION:**

$4(3w - 2) = 8(2w + 3)$

Distribute.

$12w - 8 = 16w + 24$

Add 8.

$12w - 8 + 8 = 16w + 24 + 8$

Simplify.

$12w = 16w + 36$

Subtract $16w$.

$12w - 16w = 16w - 16w + 36$

Simplify.

$-4w = 36$

Divide by $-4$.

$\frac{-4w}{-4} = \frac{36}{-4}$

Check:

$4(3w - 2) = 8(2w + 3)$

$4(3(-8) - 2) = 8(2(-8) + 3)$

$4(-24 - 2) = 8(-16 + 3)$

$4(-26) = 8(-13)$

$-104 = -104$
Write an equation and solve each problem.

45. Find the sum of three consecutive odd integers if the sum of the first two integers is equal to twenty-four less than four times the third integer.

**SOLUTION:**
To write an equation, let \( x \), \( x + 2 \), and \( x + 4 \) represent the three consecutive odd integers. Then, set the sum of the first two integers equal to 24 less than 4 times the third integer.

\[
x + (x + 2) = 4(x + 4) - 24
\]

\[
2x + 2 = 4x + 16 - 24 \quad \text{Distribute.}
\]

\[
2x + 2 = 4x - 8 \quad \text{Simplify.}
\]

\[
2x - 2x + 2 = 4x - 2x - 8 \quad \text{Subtract } 2x.
\]

\[
2 = 2x - 8 \quad \text{Simplify.}
\]

\[
2 + 8 = 2x - 8 + 8 \quad \text{Add } 8.
\]

\[
10 = 2x \quad \text{Simplify.}
\]

\[
\frac{10}{2} = \frac{2x}{2} \quad \text{Divide by } 2.
\]

\[
x = 5 \quad \text{Simplify.}
\]

\[
x + 2 = 7 \quad \text{Find } x + 2.
\]

\[
x + 4 = 9 \quad \text{Find } x + 4.
\]

The three integers are 5, 7, and 9. Add the integers to find the sum: \( 5 + 7 + 9 = 21 \).

46. **TRAVEL** Mr. Jones drove 480 miles to a business meeting. His travel time to the meeting was 8 hours and from the meeting was 7.5 hours. Find his rate of travel for each leg of the trip.

**SOLUTION:**
To write the equation, let \( x \) represent the rate of travel.

\[
8x = 480 \quad \text{Original equation}
\]

\[
\frac{8x}{8} = \frac{480}{8} \quad \text{Divide each side by } 8.
\]

\[
x = 60 \quad \text{Simplify.}
\]

from meeting:

\[
7.5x = 480 \quad \text{Original equation}
\]

\[
\frac{7.5x}{7.5} = \frac{480}{7.5} \quad \text{Divide each side by } 7.5.
\]

\[
x = 64 \quad \text{Simplify}
\]

So, Mr. Jones traveled 60 miles per hour to the meeting and 64 miles per hour from the meeting.
Evaluate each expression if \( m = -8, n = 4, \) and \( p = -12. \)

47. \(|3m - n|\)

**SOLUTION:**
Replace \( m \) with \(-8\) and \( n \) with 4.

\[
|3m - n| \quad \text{Original expression} \\
= |3(-8) - 4| \quad \text{Substitute.} \\
= |-24 - 4| \quad \text{Multiply.} \\
= |-28| \quad \text{Simplify.} \\
= 28 \quad | -28| \text{ is } 28.
\]

48. \(|-2p + m| - 3n\)

**SOLUTION:**
Replace \( p \) with \(-12\), \( m \) with \(-8\), and \( n \) with 4.

\[
|-2p + m| - 3n \\
= |-2(-12) - 8| - 3(4) \\
= |24 - 8| - 12 \\
= |16| - 12 \\
= 16 - 12 \\
= 4
\]

49. \(-3|6n - 2p|\)

**SOLUTION:**
Replace \( p \) with \(-12\) and \( n \) with 4.

\[
-3|6n - 2p| \\
= -3|6(4) - 2(-12)| \quad \text{Substitute.} \\
= -3|24 + 24| \quad \text{Multiply.} \\
= -3|48| \quad \text{Simplify.} \\
= -3(48) \quad |48| \text{ is } 48. \\
= -144 \quad \text{Simplify.}
\]
50. $4|7m + 3p| + 4n$

**SOLUTION:**
Replace $m$ with $-8$, $n$ with 4, and $p$ with $-12$.

\[
4|7m + 3p| + 4n \\
= 4|7(-8) + 3(-12)| + 4(4) \quad \text{Substitute.} \\
= 4|-56 - 36| + 16 \quad \text{Multiply.} \\
= 4|-92| + 16 \quad \text{Simplify.} \\
= 4(92) + 16 \quad | - 92| \text{ is } 92. \\
= 368 + 16 \quad \text{Multiply.} \\
= 384 \quad \text{Simplify.}
\]

Solve each equation. Then graph the solution set.

51. $|x - 6| = 11$

**SOLUTION:**

Case 1:
\[
x - 6 = 11 \quad \text{Original equation} \\
x - 6 + 6 = 11 + 6 \quad \text{Add 6 to each side.} \\
x = 17 \quad \text{Simplify.}
\]

Case 2:
\[
x - 6 = -11 \quad \text{Original equation} \\
x - 6 + 6 = -11 + 6 \quad \text{Add 6 to each side.} \\
x = -5 \quad \text{Simplify.}
\]

The solution set is $\{-5, 17\}$. 
52. \(|-4w + 2| = 14\)

**SOLUTION:**

Case 1:

\[-4w + 2 = 14\]  \hspace{1cm} \text{Original equation.}

\[-4w + 2 - 2 = 14 - 2\]  \hspace{1cm} \text{Subtract 2 from each side}

\[-4w = 12\]  \hspace{1cm} \text{Simplify.}

\[\frac{-4w}{-4} = \frac{12}{-4}\]  \hspace{1cm} \text{Divide each side by \(-4\).}

\[w = -3\]  \hspace{1cm} \text{Simplify.}

Case 2:

\[-4w + 2 = -14\]  \hspace{1cm} \text{Original equation}

\[-4w + 2 - 2 = -14 - 2\]  \hspace{1cm} \text{Subtract 2 from each side}

\[-4w = -16\]  \hspace{1cm} \text{Simplify.}

\[\frac{-4w}{-4} = \frac{-16}{-4}\]  \hspace{1cm} \text{Divide each side by \(-4\).}

\[w = 4\]  \hspace{1cm} \text{Simplify.}

The solution set is \([-3, 4]\).
53. \(|\frac{1}{3}d - 6| = 15\)

**SOLUTION:**

Case 1:
\[ \frac{1}{3}d - 6 = 15 \quad \text{Original equation} \]
\[ \frac{1}{3}d - 6 + 6 = 15 + 6 \quad \text{Add 6 to each side.} \]
\[ \frac{1}{3}d = 21 \quad \text{Simplify.} \]
\[ 3 \cdot \frac{1}{3}d = 3 \cdot 21 \quad \text{Multiply each side by 3.} \]
\[ d = 63 \quad \text{Simplify.} \]

Case 2:
\[ \frac{1}{3}d - 6 = -15 \quad \text{Original equation} \]
\[ \frac{1}{3}d - 6 + 6 = -15 + 6 \quad \text{Add 6 to each side.} \]
\[ \frac{1}{3}d = -9 \quad \text{Simplify.} \]
\[ 3 \cdot \frac{1}{3}d = 3 \cdot -9 \quad \text{Multiply each side by 3.} \]
\[ d = -27 \quad \text{Simplify.} \]

The solution set is \{-27, 63\}. 

![Number Line Graph]
54. \[ \left| \frac{2b}{3} + 8 \right| = 20 \]

**SOLUTION:**

Case 1:
\[ \frac{2b}{3} + 8 = 20 \]
\[ \frac{2b}{3} + 8 - 8 = 20 - 8 \quad \text{Subtract 8.} \]
\[ \frac{2b}{3} = 12 \quad \text{Simplify.} \]
\[ \frac{3}{2} \left( \frac{2b}{3} \right) = \frac{3}{2} (12) \quad \text{Multiply by} \frac{3}{2} \]
\[ b = \frac{36}{2} \quad \text{Simplify.} \]
\[ b = 18 \]

Case 2:
\[ \frac{2b}{3} + 8 = -20 \]
\[ \frac{2b}{3} + 8 - 8 = -20 - 8 \]
\[ \frac{2b}{3} = -28 \]
\[ \frac{3}{2} \left( \frac{2b}{3} \right) = \frac{3}{2} (-28) \]
\[ b = -\frac{84}{2} \]
\[ b = -42 \]

The solution set is \{18, -42\}.

Determine whether each pair of ratios are equivalent ratios. Write yes or no.

55. \[ \frac{27}{45} \quad \frac{3}{5} \]

**SOLUTION:**

Simplify each ratio. \( \frac{3}{5} \) is already in simplest form.
\[ \frac{27}{45} = \frac{27 \div 9}{45 \div 9} \]
\[ = \frac{3}{5} \]
Yes, the ratios are equivalent.
56. \( \frac{18}{32}, \frac{3}{4} \)

**SOLUTION:**

Simplify each ratio. \( \frac{3}{4} \) is already in simplest form.

\[
\frac{18}{32} = \frac{18 + 2}{32 + 2} = \frac{9}{16}
\]

\( \frac{3}{4} \neq \frac{9}{16} \)

No, the ratios are not equivalent.

Solve each proportion. If necessary, round to the nearest hundredth.

57. \( \frac{4}{9} = \frac{a}{45} \)

**SOLUTION:**

\[
\frac{4}{9} = \frac{a}{45} \quad \text{Original equation}
\]

\[
4(45) = 9a \quad \text{Find the cross products.}
\]

\[
180 = 9a \quad \text{Simplify.}
\]

\[
\frac{180}{9} = \frac{9a}{9} \quad \text{Divide each side by 9.}
\]

\[
20 = a \quad \text{Simplify.}
\]

58. \( \frac{3}{8} = \frac{21}{t} \)

**SOLUTION:**

\[
\frac{3}{8} = \frac{21}{t} \quad \text{Original equation.}
\]

\[
3t = 8(21) \quad \text{Find the cross products.}
\]

\[
3t = 168 \quad \text{Simplify.}
\]

\[
\frac{3t}{3} = \frac{168}{3} \quad \text{Divide each side by 3.}
\]

\[
t = 56 \quad \text{Simplify.}
\]
59. \( \frac{9}{12} = \frac{g}{16} \)

**SOLUTION:**

\[
\frac{9}{12} = \frac{g}{16} \quad \text{Original equation}
\]

\[
9(16) = 12g \quad \text{Find the cross products.}
\]

\[
144 = 12g \quad \text{Simplify.}
\]

\[
\frac{144}{12} = \frac{12g}{12} \quad \text{Divide each side by 12.}
\]

\[
12 = g \quad \text{Simplify.}
\]

60. **CONSTRUCTION**

A new gym is being built at the Greenfield Middle School. The length of the gym on the blueprints is 12 inches. The scale is \( \frac{3}{4} \) inch = 5 feet. Find the actual length of the new gym.

**SOLUTION:**

To solve the problem, let \( x \) represent the length of the gym in feet. Write a proportion.

\[
\frac{3}{5} = \frac{12}{x} \quad \text{Original equation}
\]

\[
\frac{3}{4}x = 5(12) \quad \text{Find the cross products.}
\]

\[
\frac{3}{4}x = 60 \quad \text{Simplify.}
\]

\[
\frac{4}{3} \cdot \frac{3}{4}x = \frac{4}{3} \cdot 60 \quad \text{Multiply each side by} \frac{4}{3}
\]

\[
x = \frac{240}{3} \quad \text{Simplify.}
\]

\[
x = 80
\]

The actual length of the gym is 80 feet.
State whether each percent of change is a percent of increase of a percent of decrease. Then find the percent of change. Round to the nearest whole percent.

61. original: 40, new: 50

**SOLUTION:**
Since the new amount is greater than the original, this is a percent of increase. Subtract to find the amount of change: \(50 - 40 = 10\).

\[
\frac{10}{40} = \frac{r}{100} \quad \text{Percent proportion}
\]
\[
10(100) = r(40) \quad \text{Find the cross products}
\]
\[
1000 = 40r \quad \text{Simplify}
\]
\[
\frac{1000}{40} = \frac{40r}{40} \quad \text{Divide each side by 40.}
\]
\[
25 = r \quad \text{Simplify}
\]

The percent of increase is 25%.

62. original: 36, new: 24

**SOLUTION:**
Since the new amount is less than the original, this is a percent of decrease. Subtract to find the amount of change: \(24 - 36 = -12\).

\[
\frac{-12}{36} = \frac{r}{100} \quad \text{Percent proportion}
\]
\[
-12(100) = r(36) \quad \text{Find the cross products}
\]
\[
-1200 = 36r \quad \text{Simplify}
\]
\[
\frac{-1200}{36} = \frac{36r}{36} \quad \text{Divide each side by 36.}
\]
\[
-33\frac{1}{3} = r \quad \text{Simplify}
\]

The percent of decrease is about 33%.
63. original: $72, new: $60

**SOLUTION:**
Since the new amount is less than the original, this is a percent of decrease. Subtract to find the amount of change:
$60 – 72 = -12.$

\[
\frac{-12}{72} = \frac{r}{100} \quad \text{Percent proportion}
\]

\[-12(100) = r(72) \quad \text{Find the cross products.}
\]

\[-1200 = 72r \quad \text{Simplify}
\]

\[-\frac{1200}{72} = \frac{72r}{72} \quad \text{Divide each side by 72.}
\]

\[-16.67 = r \quad \text{Simplify.}
\]

The percent of decrease is about 17%.

**Find the total price of each item.**
64. boots: $64, tax: 7%

**SOLUTION:**
Find the tax.
$0.07 \times 64 = 4.48$

Add the tax and original amount to find the total cost.
$4.48 + 64 = 68.48$

The total cost of the boots is $68.48.

65. video game: $49, tax: 6.5%

**SOLUTION:**
Find the tax.
$0.065 \times 49 = 3.185$

 Rounded to the nearest cent, the tax is $3.19. Add the tax and original amount to find the total cost.
$3.19 + 49 = 52.19$

The total cost of the video game is $52.19.

66. hockey skates: $199, tax: 5.25%

**SOLUTION:**
Find the tax.
$0.0525 \times 199 = 10.4475$

 Rounded to the nearest cent, the tax is $10.45. Add the tax and original amount to find the total cost.
$10.45 + 199 = 209.45$

The total cost of the hockey skates is $209.45.
**Find the discounted price of each item.**

67. digital media player: $69, discount: 20%

**SOLUTION:**

Find the discount.
0.20 × 69 = 13.8
Subtract the discount from the original price.
$69 − $13.80 = $55.20
The discounted price of the digital media player is $55.20.

68. jacket: $129, discount: 15%

**SOLUTION:**

Find the discount.
0.15 × 129 = 19.35
Subtract the discount from the original price.
$129 − $19.35 = $109.65
The discounted price of the jacket is $109.65.

69. backpack: $45, discount: 25%

**SOLUTION:**

Find the discount.
0.25 × 45 = 11.25
Subtract the discount from the original price.
$45 − $11.25 = $33.75
The discounted price of the backpack is $33.75.

70. **ATTENDANCE** An amusement park recorded attendance of 825,000 one year. The next year, the attendance increased to 975,000. Determine the percent of increase in attendance.

**SOLUTION:**

To determine the percent of increase, subtract to find the amount of change: 975,000 − 825,000 = 150,000

\[
\frac{150,000}{825,000} = \frac{r}{100} \quad \text{Original equation}
\]

150,000(100) = r(825,000) \quad \text{cross products.}

15,000,000 = 825,000r \quad \text{Simplify.}

\[
\frac{15,000,000}{825,000} = \frac{825,000r}{825,000} \quad \text{Divide by 825,000}
\]

18.18 = r \quad \text{Simplify.}

The percent of increase in attendance is about 18.2%.
Solve each equation or formula for the variable indicated.
71. \(3x + 2y = 9\), for \(y\)

**SOLUTION:**

\[
3x + 2y = 9 \quad \text{Original equation}
\]
\[
3x - 3x + 2y = 9 - 3x \quad \text{Subtract 3x from each side}
\]
\[
2y = 9 - 3x \quad \text{Simplify.}
\]
\[
\frac{2y}{2} = \frac{9 - 3x}{2} \quad \text{Divide each side by 2.}
\]
\[
y = \frac{9 - 3x}{2} \quad \text{Simplify.}
\]

72. \(P = 2l + 2w\), for \(l\)

**SOLUTION:**

\[
P = 2l + 2w \quad \text{Original equation}
\]
\[
P - 2w = 2l \quad \text{Subtract 2w from each side.}
\]
\[
P - 2w = 2l \quad \text{Simplify.}
\]
\[
\frac{2l}{2} = \frac{P - 2w}{2} \quad \text{Divide each side by 2.}
\]
\[
l = \frac{P - 2w}{2} \quad \text{Simplify.}
\]

73. \(-5m + 9n = 15\), for \(m\)

**SOLUTION:**

\[-5m + 9n = 15\]
\[-5m + 9n - 9n = 15 - 9n \quad \text{Subtract } -9n\]
\[-5m = 15 - 9n \quad \text{Simplify.}\]
\[
\frac{-5m}{-5} = \frac{15 - 9n}{-5} \quad \text{Divide by } -5.
\]
\[
m = \frac{15 - 9n}{-5} \quad \text{Simplify.}
\]
74. \(14w + 15x = y - 21w\), for \(w\)

**SOLUTION:**
\[
14w + 15x = y - 21w
\]
\[
14w + 15x - 15x = y - 21w - 15x
\]
\[
14w = y - 21w - 15x
\]
Subtract 15x.
\[
14w + 21w = y - 15x - 21w + 21w
\]
Add 21w.
\[
35w = y - 15x
\]
Simplify.
\[
\frac{35w}{35} = \frac{y - 15x}{35}
\]
Divide by 35.
\[
w = \frac{y - 15x}{35}
\]
Simplify.

75. \(m = \frac{2}{5}y + n\), for \(y\)

**SOLUTION:**
\[
m = \frac{2}{5}y + n\] Original equation
\[
m - n = \frac{2}{5}y + n - n\] Subtract \(n\).
\[
m - n = \frac{2}{5}y\] Simplify.
\[
\frac{5}{2}(m - n) = \frac{5}{2} \cdot \frac{2}{5}y\] Multiply by \(\frac{5}{2}\).
\[
\frac{5}{2}(m - n) = y\] Simplify.

76. \(7d - 3c = f + 2d\), for \(d\)

**SOLUTION:**
\[
7d - 3c = f + 2d\]
\[
7d - 2d - 3c = f + 2d - 2d\] Subtract 2d.
\[
5d - 3c = f\] Simplify.
\[
5d - 3c + 3c = f + 3c\] Add 3c.
\[
5d = f + 3c\] Simplify.
\[
\frac{5d}{5} = \frac{f + 3c}{5}\] Divide by 5.
\[
d = \frac{f + 3c}{5}\] Simplify.
77. **GEOMETRY** The formula for the area of a trapezoid is \( A = \frac{1}{2} h(a + b) \), where \( h \) represents the height and \( a \) and \( b \) represent the lengths of the bases. Solve for \( h \).

**SOLUTION:**

\[
\frac{2A}{a+b} = \frac{h(a+b)}{(a+b)}
\]

Simplify.

\[
\frac{2A}{a+b} = h
\]

Simplify.

78. **CANDY** Michael is mixing two types of candy for a party. The chocolate pieces cost $0.40 per ounce, and the hard candy costs $0.20 per ounce. Michael purchases 20 ounces of the chocolate pieces, and the total cost of his candy was $11. How many ounces of hard candy did he purchase?

**SOLUTION:**

To write an equation, let \( x \) represent the number of ounces of hard candy purchased.

<table>
<thead>
<tr>
<th>Candy 1</th>
<th>Candy 2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>( x )</td>
<td>0.40</td>
</tr>
<tr>
<td>0.20</td>
<td>0.20</td>
<td>11</td>
</tr>
</tbody>
</table>

\[
20(0.4) + x(0.2) = 11
\]

\[
8 + 0.2x = 11
\]

Subtract 8.

\[
0.2x = 3
\]

Simplify.

\[
\frac{0.2x}{0.2} = \frac{3}{0.2}
\]

Divide by 0.2.

\[
x = 15
\]

Simplify.

Michael purchased 15 ounces of hard candy.

79. **TRAVEL** A car travels 100 miles east in 2 hours and 30 miles north in half an hour. What is the average speed of the car?

**SOLUTION:**

The average speed is the total distance traveled divided by the total time.

\[
\frac{100 + 30}{2 + 0.5} = \frac{130}{2.5}
\]

\[
= 52
\]

The car’s average speed is 52 miles per hour.
80. **FINANCIAL LITERACY** A candle supply store sells votive wax for $0.90 a pound and low-shrink wax for $1.04 a pound. How many pounds of low-shrink wax should be mixed with 8 pounds of votive wax to obtain a blend that sells for $0.98 a pound?

**SOLUTION:**
To write an equation, let \( w \) represent the amount of low-shrink wax.

<table>
<thead>
<tr>
<th></th>
<th>Pounds of Wax</th>
<th>Price per pound ($)</th>
<th>Total Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Votive Wax</td>
<td>8</td>
<td>0.90</td>
<td>0.90(8)</td>
</tr>
<tr>
<td>Low Shrink Wax</td>
<td>( w )</td>
<td>1.04</td>
<td>1.04( w )</td>
</tr>
<tr>
<td>Blend</td>
<td>( 8 + w )</td>
<td>0.98</td>
<td>0.98( 8 + w )</td>
</tr>
</tbody>
</table>

\[
0.90(8) + 1.04w = 0.98(8 + w)
\]
\[
7.2 + 1.04w = 7.84 + 0.98w
\]
\[
7.2 - 7.2 + 1.04w = 7.84 - 7.2 + 0.98w
\]
\[
1.04w = 0.64 + 0.98w
\]
\[
1.04w - 0.98w = 0.64 + 0.98w - 0.98w
\]
\[
0.06w = 0.64
\]
\[
\frac{0.06w}{0.06} = \frac{0.64}{0.06}
\]
\[
w = 10.6
\]
\[
w = 10\frac{2}{3}
\]

10 \( \frac{2}{3} \) pounds of low-shrink wax is needed.