Translate each sentence into an equation.
1. The sum of six and four times \( d \) is the same as \( d \) minus nine.

**SOLUTION:**
Rewrite the verbal sentence so it is easier to translate. \textit{The sum of six and four times } \( d \) \textit{is the same as } \( d \) \textit{minus nine} \textit{is the same as } \( 6 + 4 \times d \text{ equals } d \text{ minus } 9 \).

\[
6 + 4 \cdot d = d - 9
\]

The equation is \( 6 + 4d = d - 9 \).

2. Three times the difference of two times \( m \) and five is equal to eight times \( m \) to the second power increased by four.

**SOLUTION:**
Rewrite the verbal sentence so it is easier to translate. \textit{Three times the difference of two } \( m \text{ and five} \text{ is equal to eight times } m \text{ to the second power increased by four} \text{ is the same as } 3 \text{ times two } m \text{ minus 5 equals 8 times } m \text{ squared plus 4}.

\[
3 \cdot (2m - 5) = 8 \cdot m^2 + 4
\]

The equation is \( 3(2m - 5) = 8m^2 + 4 \).

Solve each equation. Check your solutions.
3. \( x - 5 = -11 \)

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

Check:
\[
x - 5 = -11
\]
\[
-6 - 5 = -11
\]
\[
-11 = -11
\]
4. \( \frac{2}{3} = w + \frac{1}{4} \)

**SOLUTION:**

\[
\frac{2}{3} = w + \frac{1}{4} \\
\frac{2}{3} - \frac{1}{4} = w + \frac{1}{4} - \frac{1}{4} \quad \text{Subtract } \frac{1}{4} \\
\frac{2}{3} - \frac{1}{4} = w \quad \text{Simplify} \\
\frac{8}{12} - \frac{3}{12} = w \quad \text{UseLCD.} \\
\frac{5}{12} = w \quad \text{Simplify} \\
\]

Check:

\[
\frac{2}{3} = w + \frac{1}{4} \\
\frac{2}{3} = \frac{5}{12} + \frac{1}{4} \\
\frac{2}{3} = \frac{8}{12} \\
\frac{2}{3} = \frac{2}{3} \\
\]

5. \( \frac{t}{6} = -3 \)

**SOLUTION:**

\[ \frac{t}{6} = -3 \quad \text{Original equation} \]

\[ 6 \left( \frac{t}{6} \right) = 6 \left( -3 \right) \quad \text{Multiply each side by 6} \]

\[ t = -18 \quad \text{Simplify.} \]

Check:

\[
\frac{t}{6} = -3 \\
\frac{-18}{6} = -3 \\
-3 = -3 \\
\]

...
Solve each equation. Check your solution.

6. \(2a - 5 = 13\)

**SOLUTION:**

\[
2a - 5 = 13 \quad \text{Original equation}
\]

\[
2a - 5 + 5 = 13 + 5 \quad \text{Add 5 to each side.}
\]

\[
a = 18 \quad \text{Simplify.}
\]

\[
\frac{2a}{2} = \frac{18}{2} \quad \text{Divide each side by 2.}
\]

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

Check:

\[
2a - 5 = 13
\]

\[
2(9) - 5 = 13
\]

\[
18 - 5 = 13
\]

\[
13 = 13
\]

7. \(\frac{p}{4} - 3 = 9\)

**SOLUTION:**

\[
\frac{p}{4} - 3 = 9 \quad \text{Original equation}
\]

\[
\frac{p}{4} - 3 + 3 = 9 + 3 \quad \text{Add 3 to each side.}
\]

\[
\frac{p}{4} = 12 \quad \text{Simplify.}
\]

\[
4\left(\frac{p}{4}\right) = 4(12) \quad \text{Multiply each side by 4.}
\]

\[
p = 48 \quad \text{Simplify.}
\]

Check:

\[
\frac{p}{4} - 3 = 9
\]

\[
\frac{48}{4} - 3 = 9
\]

\[
12 - 3 = 9
\]

\[
9 = 9
\]
8. **MULTIPLE CHOICE** At Mama Mia Pizza, the price of a large pizza is determined by \( P = 9 + 1.5x \), where \( x \) represents the number of toppings added to a cheese pizza. Daniel spent $13.50 on a large pizza. How many toppings did he get?

- A 0
- B 1
- C 3
- D 5

**SOLUTION:**

\[
13.50 = 9 + 1.5x
\]

\[
13.50 - 9 = 9 - 9 + 1.5x \quad \text{Subtract 9.}
\]

\[
4.50 = 1.5x \quad \text{Simplify.}
\]

\[
4.50 \div 1.5 = 1.5x \quad \text{Divide by 1.5.}
\]

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

Daniel had 3 toppings on his pizza. Choice C is correct.

**Solve each equation. Check your solution.**

9. \( 5y - 4 = 9y + 8 \)

**SOLUTION:**

\[
5y - 4 = 9y + 8
\]

\[
5y - 5y - 4 = 9y - 5y + 8 \quad \text{Subtract 5y.}
\]

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

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

\[
-12 = 4y \quad \text{Simplify.}
\]

\[
-12 \div 4 = 4y \quad \text{Divide by 4.}
\]

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

Check:

\[
5y - 4 = 9y + 8
\]

\[
5(-3) - 4 = 9(-3) + 8
\]

\[
-15 - 4 = -27 + 8
\]

\[
-19 = -19
\]
10. \(3(2k - 2) = -2(4k - 11)\)

**SOLUTION:**

\[
3(2k - 2) = -2(4k - 11)
\]

\[
6k - 6 = -8k + 22 \quad \text{Distribute.}
\]

\[
14k - 6 = 22 \quad \text{Add } 8k.
\]

\[
14k - 6 + 6 = 22 + 6 \quad \text{Add } 6.
\]

\[
14k = 28 \quad \text{Simplify.}
\]

\[
\frac{14k}{14} = \frac{28}{14} \quad \text{Divide by } 14.
\]

\[
k = 2 \quad \text{Simplify.}
\]

Check:

\[
3(2k - 2) = -2(4k - 11)
\]

\[
3(2(2) - 2) = -2(4(2) - 11)
\]

\[
3(4 - 2) = -2(8 - 11)
\]

\[
3(2) = -2(-3)
\]

\[
6 = 6
\]

11. **GEOMETRY** Find the value of \(x\) so that the figures have the same perimeter.

![Rectangle Diagram]

**SOLUTION:**

Write an equation to find the perimeter of each rectangle.

\(P_1 = 2(x) + 2(x + 3)\)

\(P_2 = 2(14) + 2(x - 4)\)

Set these equations equal to each other and solve for \(x\).

\[2x + 2(x + 3) = 2(14) + 2(x - 4)\]

\[4x + 6 = 20 + 2x \quad \text{Simplify.}\]

\[4x + 6 - 2x = 20 + 2x - 2x \quad \text{Subtract.}\]

\[2x + 6 = 20 \quad \text{Simplify.}\]

\[2x + 6 - 6 = 20 - 6 \quad \text{Subtract.}\]

\[2x = 14 \quad \text{Simplify.}\]

\[\frac{2x}{2} = \frac{14}{2} \quad \text{Divide.}\]

\[x = 7 \quad \text{Simplify.}\]

When \(x = 7\), the figures have the same perimeter.
12. Evaluate the expression $|3t - 2u| + 5v$ if $t = 2$, $u = -5$, and $v = -3$.

**SOLUTION:**
Replace $t$ with 2, $u$ with $-5$, and $v$ with $-3$.

\[
|3t - 2u| + 5v \\
= |3(2) - 2(-5)| + 5(-3) \quad \text{Substitute.} \\
= |6 + 10| - 15 \quad \text{Multiply.} \\
= |16| - 15 \quad \text{Simplify.} \\
= 16 - 15 \quad |16| \text{ is } 16. \\
= 1 \quad \text{Simplify.}
\]

**Solve each equation. Then graph the solution set.**

13. $|p - 4| = 6$

**SOLUTION:**
Case 1:
$p - 4 = 6 \quad \text{Original equation}$
$p - 4 + 4 = 6 + 4 \quad \text{Add 4 to each side.}$
$p = 10 \quad \text{Simplify.}$

Case 2:
$p - 4 = -6 \quad \text{Original equation}$
$p - 4 + 4 = -6 + 4 \quad \text{Add 4 to each side.}$
$p = -2 \quad \text{Simplify.}$

The solution set is {2, 10}.
14. \(|2b + 5| = 9\)

**SOLUTION:**

Case 1:

\[
2b + 5 = 9 \quad \text{Original equation}
\]
\[
2b + 5 - 5 = 9 - 5 \quad \text{Subtract 5.}
\]
\[
2b = 4 \quad \text{Simplify.}
\]
\[
\frac{2b}{2} = \frac{4}{2} \quad \text{Divide by 2.}
\]
\[
b = 2 \quad \text{Simplify.}
\]

Case 2:

\[
2b + 5 = -9 \quad \text{Original equation}
\]
\[
2b + 5 - 5 = -9 - 5 \quad \text{Subtract 5.}
\]
\[
2b = -14 \quad \text{Simplify.}
\]
\[
\frac{2b}{2} = \frac{-14}{2} \quad \text{Divide by 2.}
\]
\[
b = -7 \quad \text{Simplify.}
\]

The solution set is \{-7, 2\}.

---

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

15. \(\frac{a}{3} = \frac{16}{24}\)

**SOLUTION:**

\[
\frac{a}{3} = \frac{16}{24} \quad \text{Original equation}
\]
\[
24(a) = 16(3) \quad \text{Find the cross products.}
\]
\[
24a = 48 \quad \text{Simplify.}
\]
\[
\frac{24a}{24} = \frac{48}{24} \quad \text{Divide each side by 24.}
\]
\[
a = 2 \quad \text{Simplify.}
\]
16. \( \frac{9}{k+3} = \frac{3}{5} \)

**SOLUTION:**

\[
\frac{9}{k+3} = \frac{3}{5}
\]

\[
5(9) = 3(k + 3) \quad \text{cross products}
\]

\[
45 = 3k + 9 \quad \text{Simplify.}
\]

\[
45 - 9 = 3k + 9 - 9 \quad \text{Subtract 9.}
\]

\[
36 = 3k \quad \text{Simplify.}
\]

\[
\frac{36}{3} = \frac{3k}{3} \quad \text{Divide by 3.}
\]

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

17. **MULTIPLE CHOICE** Akiko uses 2 feet of thread for every three squares that she sews for her quilt. How many squares can she sew if she has 38 feet of thread?

- **F** 19
- **G** 57
- **H** 76
- **J** 228

**SOLUTION:**

Let \( s \) represent the number of squares she can sew.

\[
\frac{2}{3} = \frac{38}{5} \quad \text{Original equation}
\]

\[
2(s) = 3(38) \quad \text{Find the cross products.}
\]

\[
2s = 114 \quad \text{Simplify.}
\]

\[
\frac{2s}{2} = \frac{114}{2} \quad \text{Divide each side by 2.}
\]

\[
s = 57 \quad \text{Simplify.}
\]

Akiko can sew 57 squares for her quilt. Choice G is correct.
18. State whether the percent of change is a percent of increase or a percent of decrease. Then find the percent of change. Round to the nearest whole percent.

original: 54 new: 45

**SOLUTION:**
Since the new amount is less than the original amount, this is a percent of decrease. Subtract the original from the new to find the change: $45 - 54 = -9$. Substitute $-9$ for change and $54$ for the original amount in the percent proportion.

\[
\frac{\text{change}}{\text{original amount}} = \frac{r}{100}
\]

\[
\frac{-9}{54} = \frac{r}{100}
\]

Substitute.

\[-9(100) = 54r \quad \text{cross products}
\]

\[-900 = 54r \quad \text{Simplify}
\]

\[
\frac{-900}{54} = \frac{54r}{54}
\]

Divide by $54$.

\[-17 \approx r \quad \text{Simplify}
\]

This is a percent of decrease of $17\%$.

19. Find the total price of a sweatshirt that is priced at $48 and taxed at $6.5\%$.

**SOLUTION:**
Find the tax.

\[0.065 \times 48 = 3.12\]

Add the tax and original amount to find the total cost.

\[$3.12 + $48 = $51.12\]

The total cost of the sweatshirt is $51.12$.

20. **SHOPPING** Kirk wants to purchase a wide-screen TV. He sees an advertisement for a TV that was originally priced at $3200 and is $20\%$ off. Find the discounted price of the TV.

**SOLUTION:**
Find the discount.

\[0.2 \times 3200 = 640\]

Subtract the discount from the original price.

\[$3200 - $640 = $2560\]

The discounted price of the TV is $2560$. 
Practice Test - Chapter 2

21. Solve $5x - 3y = 9$ for $y$.

**SOLUTION:**

\[
5x - 3y = 9
\]

\[
5x - 5x - 3y = 9 - 5x \\
-3y = 9 - 5x \\
\frac{-3y}{-3} = \frac{9 - 5x}{-3} \\
y = \frac{9 - 5x}{-3} \\
y = \frac{9}{-3} + \frac{-5x}{-3} \\
y = -3 + \frac{5}{3}x \\
y = \frac{5}{3}x - 3
\]

22. Solve $A = \frac{1}{2}bh$ for $h$.

**SOLUTION:**

\[
A = \frac{1}{2}bh \\
2(A) = 2\left(\frac{1}{2}bh\right) \\
2A = bh \\
\frac{2A}{b} = \frac{bh}{b} \\
\frac{2A}{b} = h
\]
23. **CHEMISTRY** Deon has 12 milliliters of a 5% solution. He also has a solution that has a concentration of 30%. How many milliliters of the 30% solution does Deon need to add to the 5% solution to obtain a 20% solution?

**SOLUTION:**
Let $x$ represent the amount of 30% solution added.

<table>
<thead>
<tr>
<th>Solution Type</th>
<th>mL of Solution</th>
<th>% of Solution</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>5% solution</td>
<td>12</td>
<td>0.05</td>
<td>0.05(12)</td>
</tr>
<tr>
<td>30% solution</td>
<td>$x$</td>
<td>0.3</td>
<td>0.3$x$</td>
</tr>
<tr>
<td>20% solution</td>
<td>$12 + x$</td>
<td>0.2</td>
<td>$0.2(12 + x)$</td>
</tr>
</tbody>
</table>

\[
12(0.05) + 0.3x = 0.2(12 + x) \\
0.6 + 0.3x = 2.4 + 0.2x \quad \text{Distribute} \\
0.6 - 0.6 + 0.3x = 2.4 + 0.2x - 0.6 \quad \text{Subtract} \\
0.3x = 1.8 + 0.2x \quad \text{Simplify} \\
0.3x - 0.2x = 1.8 + 0.2x - 0.2x \quad \text{Subtract} \\
0.1x = 1.8 \quad \text{Simplify} \\
\frac{0.1x}{0.1} = \frac{1.8}{0.1} \quad \text{Divide} \\
x = 18 \quad \text{Simplify}
\]

18 milliliters of the 30% solution must be added.

24. **BICYCLING** Shanee bikes 5 miles to the park in 30 minutes and 3 miles to the library in 45 minutes. What was her average speed?

**SOLUTION:**
The average speed is the total distance traveled divided by the total time. First, convert the minutes to hours.

\[
\begin{align*}
30 \div 60 &= 0.5 \\
45 \div 60 &= 0.75 \\
\frac{5 + 3}{0.5 + 0.75} &= \frac{8}{1.25} \\
&= 6.4
\end{align*}
\]
Shanee’s average speed is 6.4 miles per hour.
25. **MAPS** On a map of North Carolina, the distance between Charlotte and Wilmington is 14.75 inches. If 2 inches equals 24 miles, what is the approximate distance between the two cities?

**SOLUTION:**
Let \( d \) represent the distance between the two cities.

\[
\frac{\text{in}}{\text{mi}} = \frac{\frac{2}{24}}{\frac{d}{24}} = \frac{14.75}{d}
\]

\[2(d) = 24(14.75) \quad \text{cross products}
\]

\[2d = 354 \quad \text{Simplify}
\]

\[\frac{2d}{2} = \frac{354}{2} \quad \text{Divide by 2.}
\]

\[d = 177 \quad \text{Simplify}
\]

The distance between Charlotte and Wilmington is 177 miles.