Section 4.4

1. c and d are complete solutions. This is a system of two equations in two variables, so we need an \( x \) and \( y \) value as the solution.

3. a. We need both an \( x \)- and \( y \)-values to be a solution of a system of two equations.
   
b. Substitute \( -1 \) for \( x \) into the equation, \( y = -4x - 1 \), to find the value of \( y \).
   
   \[
   y = -4 \cdot (-1) - 1
   \]
   
   \[
   y = 4 - 1
   \]
   
   \[
   y = 3
   \]
   
The solution is \((1, 3)\).
5. \[ 3y = x + \frac{6}{5} \]
\[ 4y + 15y = -12 \]
\[ y = \frac{1}{3}x + \frac{2}{5} \] Put the first equation in slope-intercept form
\[ 4x + 15\left(\frac{1}{3}x + \frac{2}{5}\right) = -12 \]
\[ 4x + 5x + 6 = -12 \]
\[ 9x + 6 = -12 \]
\[ 9x = -18 \]
\[ x = -2 \]
\[ y = \frac{1}{3}(\cdot2) + \frac{2}{5} \]
\[ y = \frac{2}{3} \cdot \frac{1}{5} = \frac{2}{15} \]
\[ y = \frac{10}{15} \]
\[ y = \frac{4}{15} \]
Solution: \( (-2, \frac{4}{15}) \)

7. a. Multiplying the second equation by 3 led to a "y" term when the equations were added. We want to eliminate the "y"-term from the resulting equation.

b. Multiply by \( -3 \) on both sides of the equation,
\[ 3x - y = 14, \]
\[ 4x - 3y = 22 \rightarrow 4x - 3y = 22 \]
\[ -3(2x - y) = -3(14) \rightarrow -9x + 3y = -42 \]
\[ -5x = 20 \]
\[ x = 4 \]
\[ 3 \cdot 4 - y = 14 \]
\[ 12 - y = 14 \]
\[ -y = 2 \]
\[ y = -2 \]
Solution: \( (4, -2) \)

9. Multiply on both sides of the 2nd equation by \( -2 \).
\[ 2x + 5y = 24 \rightarrow 2x + 5y = 24 \]
\[ -2(x - 3y) = -2(1) \rightarrow -2x + 6y = -2 \]
\[ 11x = 22 \]
\[ x = 2 \]
\[ 2x + 5 \cdot 2 = 24 \]
\[ 2x + 10 = 24 \]
\[ 2x = 14 \]
\[ x = 7 \]
Solution: \( (7, 2) \)

11. a. Elimination is easier because the equations are in standard form. Multiply on both sides of either equation by \( -1 \), then add the equations.

b. \[ 7x - 3y = 4 \]
\[ 1(-2x - 3y) = 1(4) \rightarrow \]
\[ 2x + 3y = -4 \]
\[ 9x = 0 \]
\[ x = 0 \]
\[ 7 \cdot 0 - 3y = 4 \]
\[ -y = \frac{4}{3} \]
Solution: \( \left(0, \frac{4}{3}\right) \)

13. We could solve this system of equations by either substitution or elimination. The "x"-term in the first equation is the opposite of the "x"-term in the second equation so we chose elimination. Put the second equation in standard form and add the equations.
\[ x + 2y = 4 \]
\[ x = y + 3 \]
\[ x = y + 3 \]
\[ x = 10 \]
Solution: \( (10, 7) \)

Check the solution in both equations.

<table>
<thead>
<tr>
<th>First Equation</th>
<th>Second Equation</th>
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</thead>
<tbody>
<tr>
<td>( x + 2y = 4 )</td>
<td>( x = y + 3 )</td>
</tr>
<tr>
<td>( 10 + 2 \cdot 7 = 4 )</td>
<td>( (10) = 7 + 3 )</td>
</tr>
<tr>
<td>( 10 + 14 = 4 )</td>
<td>( 10 = 10 )</td>
</tr>
<tr>
<td>( 4 = 4 )</td>
<td></td>
</tr>
</tbody>
</table>

The solution \( (10, 7) \) checks.
15. Use substitution because an equation is in slope-intercept form.

\[ y = 2x - 1 \]
\[ 4x + 2y = 5 \]

Substitute \(2x - 1\) for \(y\) into \(4x + 2y = 5\).

\[ 4x + 4x - 2 = 5 \]
Solve for \(x\).

\[ 2x = 5 \]
Impossible because \(2 \neq 5\).

Stop here and confirm that there is no solution with your grapher.

Put both equations in slope-intercept form to enter into the \(Y=\) menu.

\(Y_1 = 2x - 1\), \(Y_2 = 2x - 5/2\).

Note: \(Y_1\) and \(Y_2\) have the same slope with different \(y\)-intercepts, indicating parallel lines.

Use a Zoom Decimal window and graph \(Y_1\) and \(Y_2\).

There is no solution (inconsistent system), the graphs form parallel lines.

Note: sometimes lines that appear parallel actually do intersect outside the calculator window, see the caution in the solution to Exercise 7 of Section 4.3.

Skills and Review 4.4

17. \(Y_1 = 21X + 5.3\), \(Y_2 = -2X + 6.4\)

Intersection
\[ X = 1.182957\]
\[ Y = 5.540387\]

Solution = (1.18, 5.55)

19. To find the \(x\)-intercept substitute 0 for \(y\) and solve for \(x\).

\[ 2x - 3y = 6 \]
\[ 2x - 3*0 = 6 \]
\[ 2x = 6 \]
\[ x = 3 \]

The \(x\)-intercept is (3, 0).

To find the \(y\)-intercept substitute 0 for \(x\) and solve for \(y\).

\[ 2x - 3y = 6 \]
\[ 2*0 - 3y = 6 \]
\[ -3y = 6 \]
\[ y = -2 \]

The \(y\)-intercept is (0, -2).

21. \(5^2\); the larger the absolute value of the slope the steeper the road.

23. a. \((x_1, y_1) = (-4, 3), (x_2, y_2) = (2, 1)\)

\[ \text{run} = x_2 - x_1 = 2 - (-4) = 6, \]
\[ \text{rise} = y_2 - y_1 = 1 - 3 = -2 \]
\[ \text{distance} = \sqrt{\text{run}^2 + \text{rise}^2} = \sqrt{6^2 + (-2)^2} = \sqrt{36 + 16} = \sqrt{52} \]

b. \(52\) is between the perfect squares 49 and 64, but closer to 49. A good estimate for \(\sqrt{52}\) is 7.2.

25. a. \(2^1 = 2\)

b. \(2^0 = 1\); any nonzero number raised to the zeroth power is 1

c. \(2^{-1} = \frac{1}{2}\)

d. \((4)^{-1} = \frac{1}{4}\)

e. \(1.5*10^{-1} = .15\)