3.7 Linear Inequalities in Two Variables

1. Checking the point \((0,0)\):
   \[2(0) - 3(0) = 0 - 0 < 6\] (true)
   Graphing the linear inequality:

5. Checking the point \((0,0)\):
   \[0 - 0 \leq 2\] (true)
   Graphing the linear inequality:

3. Checking the point \((0,0)\):
   \[0 - 2(0) = 0 - 0 \leq 4\] (true)
   Graphing the linear inequality:

7. Checking the point \((0,0)\):
   \[3(0) - 4(0) = 0 - 0 \geq 12\] (false)
   Graphing the linear inequality:
9. Checking the point \((0, 0)\):
   \[5(0) - 0 = 0 \leq 5\]  \(\text{(true)}\)
   Graphing the linear inequality:

11. Checking the point \((0, 0)\):
    \[2(0) + 6(0) = 0 + 0 \leq 12\]  \(\text{(true)}\)
    Graphing the linear inequality:

13. Graphing the linear inequality:

15. Graphing the linear inequality:

17. Graphing the linear inequality:
19. Checking the point \((0,0)\):

\[ 2(0) + 0 = 0 + 0 > 3 \quad \text{(false)} \]

Graphing the linear inequality:

21. Checking the point \((0,0)\):

\[ 0 \leq 3(0) - 1 \]
\[ 0 \leq -1 \quad \text{(false)} \]

Graphing the linear inequality:

23. Checking the point \((0,0)\):

\[ 0 \leq -\frac{1}{2}(0) + 2 \]
\[ 0 \leq 2 \quad \text{(true)} \]

Graphing the linear inequality:
25. a. Solving the inequality:
   \[
   4 + 3y < 12 \\
   3y < 8 \\
   y < \frac{8}{3}
   \]
   b. Solving the inequality:
   \[
   4 - 3y < 12 \\
   -3y < 8 \\
   y \geq -\frac{8}{3}
   \]
   c. Solving for \( y \):
   \[
   4x + 3y = 12 \\
   3y = -4x + 12 \\
   y = -\frac{4}{3}x + 4
   \]
   d. Graphing the inequality:

27. a. The slope is \( \frac{2}{5} \) and the \( y \)-intercept is 2, so the equation is \( y = \frac{2}{5}x + 2 \).
   
   b. Since the shading is below the line, the inequality is \( y < \frac{2}{5}x + 2 \).
   
   c. Since the shading is above the line, the inequality is \( y > \frac{2}{5}x + 2 \).

29. Simplifying the expression: \( 7 - 3(2x - 4) - 8 = 7 - 6x + 12 - 8 = -6x + 11 \)

31. Solving the equation:
   \[
   -\frac{3}{2}x = 12 \\
   -\frac{2}{3}\left(-\frac{3}{2}x\right) = -\frac{2}{3}(12) \\
   x = -8
   \]

33. Solving the equation:
   \[
   8 - 2(x + 7) = 2 \\
   8 - 2x - 14 = 2 \\
   -2x = -6 \\
   x = 3
   \]
35. Solving for \( w \):
\[
2l + 2w = P \\
2w = P - 2l \\
w = \frac{P - 2l}{2}
\]

37. Solving the inequality:
\[
3 - 2x > 5 \\
3 - 3 - 2x > 5 - 3 \\
-2x > 2 \\
-\frac{1}{2}(-2x) < -\frac{1}{2}(2) \\
x < -1
\]

Graphing the solution set:

41. Let \( w \) represent the width and \( 3w + 5 \) represent the length. Using the perimeter formula:
\[
2(w) + 2(3w + 5) = 26 \\
2w + 6w + 10 = 26 \\
8w + 10 = 26 \\
8w = 16 \\
w = 2 \\
3w + 5 = 3(2) + 5 = 11
\]
The width is 2 inches and the length is 11 inches.