Sample Problems

Solve each of the following inequalities. Graph the solution set.

1. $-7 > -5x + 3$

2. $3(x - 2) \leq 2x + 1$

3. $5(4x - 1) - (x - 3) \geq -x - 2$

4. $\dfrac{m + 4}{2} - \dfrac{4m + 3}{5} > 2$

Practice Problems

Solve each of the following inequalities. Graph the solution set.

1. $x - 17 > -4x + 3$

2. $-3x + 5 \leq 12$

3. $5y + 3 < y - 7$

4. $-2x - (3x - 1) \geq 2(5 - 3x)$

5. $\dfrac{2}{3}x - 1 \geq x$

6. $5 - (3a - 2) < -2$

7. $5x - 2 > 3(x - 1) - 4x + 1$

8. $-3(x - 2) \leq -2x + 5$

9. $3x - 2(x - 1) < -2x - 1$

10. $-w + 13 \geq 2w + 1$

11. $2x + 5 > \dfrac{3x - 1}{2} - \dfrac{2x + 1}{3}$

12. $5(x - 1) - 3(x + 1) \geq 3x - 8$

13. $3(x - 4) + 5(x + 8) \leq 2(x - 1)$

14. $2x + 6 > \dfrac{3x - 1}{5} - \dfrac{7 - x}{3}$

15. $-\dfrac{2}{5}(x + 1) + \dfrac{1}{2}(x - 4) \geq \dfrac{3}{10}x$

16. $\dfrac{3x - 1}{4} + \dfrac{8 - 4x}{3} \leq -3 - x$

17. $\dfrac{x - 2}{5} - \dfrac{x}{2} < x - 16$
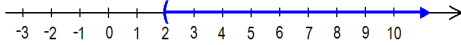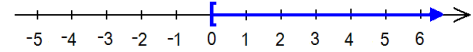
18. $\dfrac{2x + 1}{3} + 2 \geq x + \dfrac{3 - x}{2}$
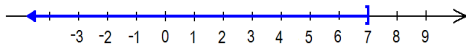
Answers - Sample Problems

1. set-builder notation: $\{x|x > 2\}$
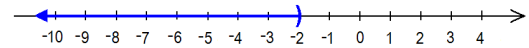   interval notation: $(2, \infty)$
   graph:

2. set-builder notation: $\{x|x \leq 7\}$
   interval notation: $(-\infty, 7]$
   graph:

3. set-builder notation: $\{x|x \geq 0\}$
   interval notation: $[0, \infty)$
   graph:

4. set-builder notation: $\{x|x < -2\}$
   interval notation: $(-\infty, -2)$
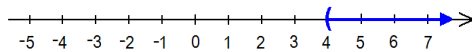   graph:
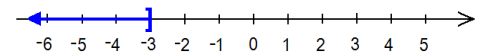

Answers - Practice Problems

1. set-builder notation: $\{x|x > 4\}$
   interval notation: $(4, \infty)$
   graph:

2. set-builder notation: $\left\{x|x \geq -\dfrac{7}{3}\right\}$
   interval notation: $\left[-\dfrac{7}{3}, \infty\right)$
   graph:

3. set-builder notation: $\left\{x|x < -\dfrac{5}{2}\right\}$
   interval notation: $\left(-\infty, -\dfrac{5}{2}\right)$
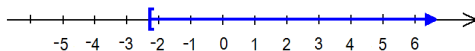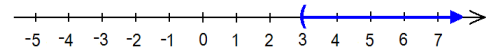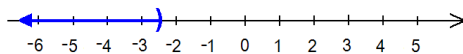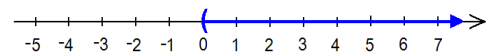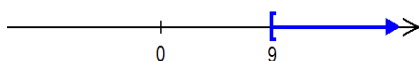   graph:

4. set-builder notation: $\{x|x \geq 9\}$
   interval notation: $[9, \infty)$
   graph:

5. set-builder notation: $\{x|x \leq -3\}$
   interval notation: $(-\infty, -3]$
   graph:

6. set-builder notation: $\{x|x > 3\}$
   interval notation: $(3, \infty)$
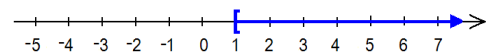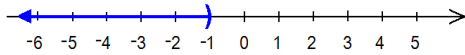   graph:

7. set-builder notation: $\{x|x > 0\}$
   interval notation: $(0, \infty)$
   graph:

8. set-builder notation: $\{x|x \geq 1\}$
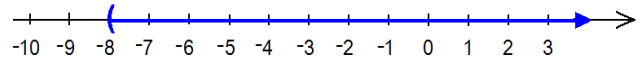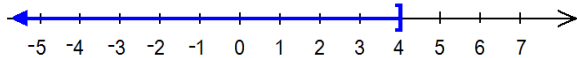   interval notation: $[1, \infty)$
   graph:

9. set-builder notation: $\{x|x < -1\}$
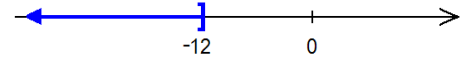   interval notation: $(-\infty, -1)$
   graph:

14. set-builder notation: $\{x|x > -8\}$
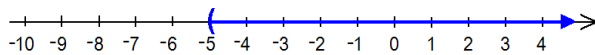   interval notation: $(-8, \infty)$
   graph:

10. set-builder notation: $\{x|x \le 4\}$
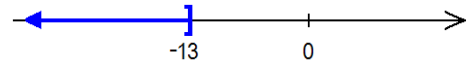   interval notation: $(-\infty, 4]$
   graph:

15. set-builder notation: $\{x|x \le -12\}$
   interval notation: $(-\infty, -12]$
   graph:

11. set-builder notation: $\{x|x > -5\}$
   interval notation: $(-5, \infty)$
   graph:

16. set-builder notation: $\{x|x \le -13\}$
   interval notation: $(-\infty, -13]$
   graph:

12. set-builder notation: $\{x|x \le 0\}$
   interval notation: $(-\infty, 0]$
   graph:
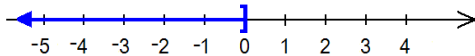
17. set-builder notation: $\{x|x > 12\}$
   interval notation: $(12, \infty)$
   graph:

13. set-builder notation: $\{x|x \le -5\}$
   interval notation: $(-\infty, -5]$
   graph:

18. set-builder notation: $\{x|x \ge -5\}$
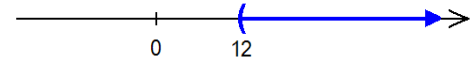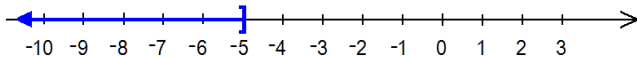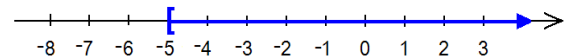   interval notation: $[-5, \infty)$
   graph:

Sample Problems - Solutions

1. $-7 > -5x + 3$

    Solution: Solving linear inequalities requires almost the same techniques as solving linear equations. There is only one difference: **when multiplying or dividing an inequality by a negative number, the inequality sign must be reversed**.

$$\begin{aligned} -7 &> -5x + 3 && \text{subtract } 3 \\ -10 &> -5x && \text{divide by } -5 \\ 2 &< x \end{aligned}$$

    When we divided both sides by -5, we reversed the inequality sign. The final answer is all real numbers greater than 2. This set of numbers can be presented in numerous ways:

    1) set-builder notation: $\{x \mid x > 2\}$

    2) interval notation: $(2, \infty)$

    3) graphing the solution set on the number line:
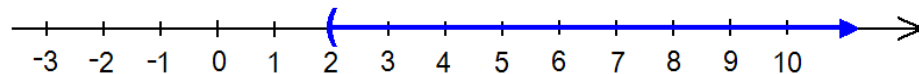
2. $3(x - 2) \le 2x + 1$

    Solution:

$$\begin{aligned} 3(x - 2) &\le 2x + 1 && \text{distribute} \\ 3x - 6 &\le 2x + 1 && \text{subtract } 2x \\ x - 6 &\le 1 && \text{add } 6 \\ x &\le 7 \end{aligned}$$

    The final answer is all real numbers less than or equal to 7. This set of numbers can be presented in numerous ways:

    1) set-builder notation: $\{x \mid x \le 7\}$

    2) interval notation: $(-\infty, 7]$

    3) graphing the solution set on the number line:

3. $5(4x - 1) - (x - 3) \geq -x - 2$

Solution:

$$
\begin{array}{rcll}
5(4x - 1) - (x - 3) & \geq & -x - 2 & \text{distribute} \\
20x - 5 - x + 3 & \geq & -x - 2 & \text{combine like terms} \\
19x - 2 & \geq & -x - 2 & \text{add 2} \\
19x & \geq & -x & \text{add } x \\
20x & \geq & 0 & \text{divide by 20} \\
x & \geq & 0 &
\end{array}
$$

The final answer is all real numbers greater than or equal to 0. This set of numbers can be presented in numerous ways: in set-builder notation: $\{x | x \geq 0\}$, in interval notation: $[0, \infty)$, or by graphing the solution set on the number line:
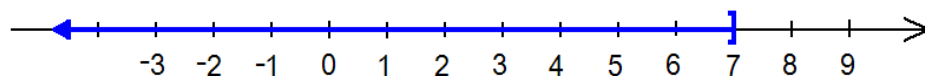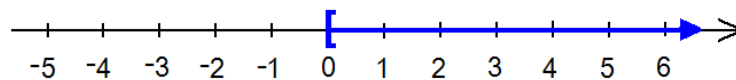

4. $\dfrac{m + 4}{2} - \dfrac{4m + 3}{5} > 2$

Solution:

$$
\begin{array}{rcll}
\dfrac{m + 4}{2} - \dfrac{4m + 3}{5} & > & 2 & \text{make everything a fraction} \\[2mm]
\dfrac{m + 4}{2} - \dfrac{4m + 3}{5} & > & \dfrac{2}{1} & \text{bring to common denominator} \\[2mm]
\dfrac{5(m + 4)}{10} - \dfrac{2(4m + 3)}{10} & > & \dfrac{20}{10} & \text{multiply by 15} \\[2mm]
5(m + 4) - 2(4m + 3) & > & 20 & \text{distribute} \\
5m + 20 - 8m - 6 & > & 20 & \text{combine like terms} \\
-3m + 14 & > & 20 & \text{subtract 14} \\
-3m & > & 6 & \text{divide by } -3 \\
m & < & -2 &
\end{array}
$$

When we divided both sides by -3, we reversed the inequality sign. The final answer is all real numbers less than -2. This set of numbers can be presented in numerous ways: in set-builder notation: $\{x | x < -2\}$, in interval notation: $(-\infty, -2)$, or by graphing the solution set on the number line:
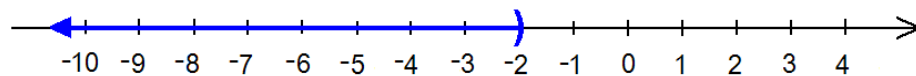
For more documents like this, visit our page at http://www.teaching.martahidegkuti.com and click on Lecture Notes. If you have any questions or comments, e-mail to mhidegkuti@ccc.edu.