To **solve an inequality in one variable**, first change it to an equation (a mathematical sentence with an “=” sign) and then solve. Place the solution, called a “boundary point,” on a number line. This point separates the number line into two regions. The boundary point is included in the solution for situations that involve ≥ or ≤, and excluded from situations that involve strictly > or <. On the number line boundary points that are included in the solutions are shown with a solid filled-in circle and excluded solutions are shown with an open circle. Next, choose a number from within each region separated by the boundary point, and check if the number is true or false in the original inequality. If it is true, then every number in that region is a solution to the inequality. If it is false, then no number in that region is a solution to the inequality.

For additional information, see the Math Notes boxes in Lessons 9.1.1 and 9.1.3.

**Example 1**

Solve: $3x - (x + 2) \geq 0$

Change to an equation and solve.

Place the solution (boundary point) on the number line. Because $x = 1$ is also a solution to the inequality ($\geq$), we use a filled-in dot.

Test a number on each side of the boundary point in the original inequality. Highlight the region containing numbers that make the inequality true.

The solution is $x \geq 1$.

**Example 2**

Solve: $-x + 6 > x + 2$

Change to an equation and solve.

Place the solution (boundary point) on the number line. Because $x = 2$ is not a solution to the original inequality ($>$), we use an open dot.

Test a number on each side of the boundary point in the original inequality. Highlight the region containing numbers that make the inequality true.

The solution is $x < 2$.
Problems

Solve each inequality.

1. \(4x - 1 \geq 7\)
2. \(2(x - 5) \leq 8\)
3. \(3 - 2x < x + 6\)
4. \(\frac{1}{2}x > 5\)
5. \(3(x + 4) > 12\)
6. \(2x - 7 \leq 5 - 4x\)
7. \(3x + 2 < 11\)
8. \(4(x - 6) \geq 20\)
9. \(\frac{1}{3}x < 2\)
10. \(12 - 3x > 2x + 1\)
11. \(\frac{x - 5}{7} \leq -3\)
12. \(3(5 - x) \geq 7x - 1\)
13. \(3y - (2y + 2) \leq 7\)
14. \(\frac{m + 2}{5} < \frac{2m}{3}\)
15. \(\frac{m - 2}{3} > \frac{2m + 1}{7}\)

Answers

1. \(x \geq 2\)
2. \(x \leq 9\)
3. \(x > -1\)
4. \(x > 10\)
5. \(x > 0\)
6. \(x \leq 2\)
7. \(x < 3\)
8. \(x \geq 11\)
9. \(x < 8\)
10. \(x < \frac{11}{5}\)
11. \(x \leq -16\)
12. \(x \leq 1.6\)
13. \(y \leq 9\)
14. \(m > \frac{6}{7}\)
15. \(m \geq 17\)