Section 9.2

Solving Single Step Inequalities

Day 2

Learning Targets (day 2):

1. Verifying an algebraic solution to a linear inequality.
2. Verifying a graphical solution to a linear inequality.
3. Solving a double inequality.

How to verify the ALGEBRAIC solution to a linear inequality:

Step 1: Verify the boundary point.

a) Change the inequality to an equation by trading the inequality symbol for an equals sign.

b) Substitute the boundary point into the equation.

c) If the left side equals the right side, the boundary point is correct.

d) If the boundary point is shown to be incorrect (left side and right side are different) you need to find your error in your solving steps to find the correct boundary point.

Once you have verified the boundary point, you now must verify the inequality.

Step 2: Verify the inequality – is the inequality symbol the right one?

a) Choose a number (*but not the boundary point*) that makes the algebraic solution true - sometimes called a "specific solution".

b) Substitute the number you chose into the original inequality and simplify.

c) If it simplifies to a true statement, then the inequality is correct.

d) If it does not simplify to a true statement, then you need to change the inequality symbol in the algebraic solution.

When the boundary point is correct but the inequality is incorrect, it means you have the wrong inequality symbol in the algebraic solution. This often results from forgetting to switch the inequality symbol when multiplying or dividing by a negative value.

Example

Verify the solution for each inequality.
If incorrect, what is the solution?

a) For the inequality $x - 12 \leq 20$, the solution is $x \leq 32$.

31, 30, 29, etc.

Boundary:

$32 - 12 = 20$

$20 = 20$ ✓

Inequality: choose $x = 30$

$30 - 12 \leq 20$

$18 \leq 20$

True

$\therefore x \leq 32$ is the correct solution for $x - 12 \leq 20$

Example

Verify the solution for each inequality.
If incorrect, what is the solution?

b) For the inequality $-5x < 30$, the solution is $x < -6$.

-1, -8, -9 etc.

Boundary:

$-5(-6) = 30$

$30 = 30$

✓

Inequality: choose $x = -7$

$-5(-7) < 30$

$35 < 30$

False

∴ The correct solution is $x > -6$

You Try:

Verify the solution shown below is the correct solution for the inequality. If it is not correct, find the correct solution.

$$-70 \geq k - 33, \quad k \leq -103$$

Boundary:

$-70 = -103 - 33$

$-70 \neq -136$

$-70 \overset{+33}{\geq} k - 33 \overset{+33}{}$

$-37 \geq k$

The correct boundary is -37

Inequality: choose $k = -40$

$-70 \geq -40 - 33$

$-70 \geq -73$

True

$\therefore$ The correct solution is $-37 \geq k$ or $k \leq -37$

How to verify the NUMBER LINE solution to a linear inequality:

Step 1: Verify the boundary point.

a) Check to make sure that the circle at the boundary point (open or closed) is the right kind based on the inequality symbol used in the problem.

b) Change the inequality to an equation by trading the inequality symbol for an equals sign.

c) Substitute the boundary point value into the equation.

d) If the left side equals the right side, the boundary point is correct.

e) If the boundary point is shown to be incorrect (left side and right side are different) you need to find your error in your solving steps to find the correct boundary point.

Once you have verified the boundary point, you now must verify the inequality.

Step 2: Verify the inequality – has the shading been done in the right direction?

a) Choose a number (*but not the boundary point*) from the shaded area of the number line - the "specific solution".

b) Substitute the number you chose into the original inequality and simplify.

c) If it simplifies to a true statement, then the shading of the number line is correct.

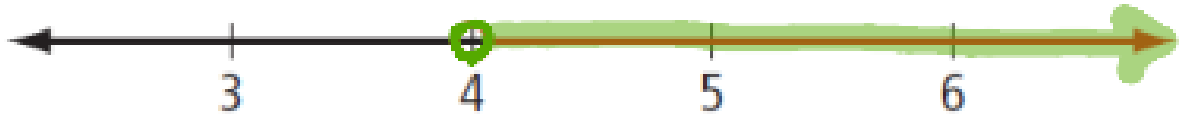
d) If it does not simplify to a true statement, then you need to erase the shading and shade in the opposite direction.

When the boundary point is correct but the inequality is incorrect, it means you shaded in the wrong direction on the number line. This can result from forgetting to switch the inequality symbol when multiplying or dividing by a negative value, or you may have misinterpreted the inequality symbol when shading the solution.

Example

Verify that the solution shown on each number line is correct.

a) $x + 10 > 14$



Boundary = 4

$4 + 10 = 14$

$14 = 14$

✓

Inequality: choose $x = 5$

$5 + 10 > 14$

$15 > 14$

True

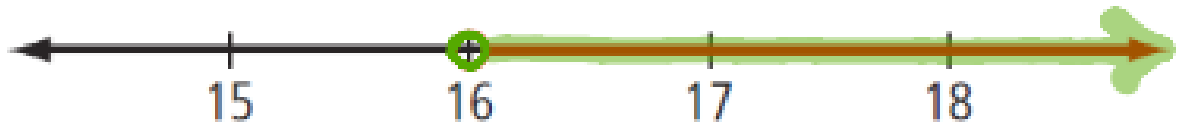
∴ The solution shown is correct.

Example

Verify that the solution shown on each number line is correct.

b) $(-3.2)^5 < \left(\frac{x}{5}\right)^5 \Rightarrow -16 < x$

The correct boundary is -16



Boundary $x = 16$

$-3.2 = \frac{16}{5}$

$-3.2 \neq 3.2$

Inequality: choose $x = 17$

$-3.2 < \frac{17}{5}$

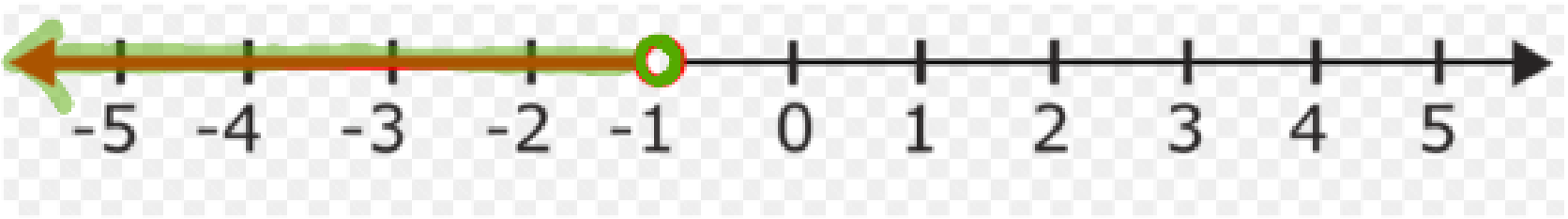
$-3.2 < 3.4$

∴ The boundary point of the solution was incorrect but was shaded in the right direction

You Try:

Verify the solution shown on the number line below is the correct solution for the inequality

$45 < 44 + m$ $\Rightarrow$ $1 < m$



Boundary $m = -1$

$45 = 44 + (-1)$

$45 \neq 43$

Inequality choose $m = -3$

$45 < 44 + (-3)$

$45 < 41$

False

∴ The solution shown is incorrect. The boundary pt should be at 1 and it should be shaded to the right.

Solving a double inequality

If $4x > -12$ and $x - 7 \leq -1$, determine the possible values of x that satisfy both inequalities.
Show the solution on a number line.

$\frac{4x}{4} > \frac{-12}{4}$

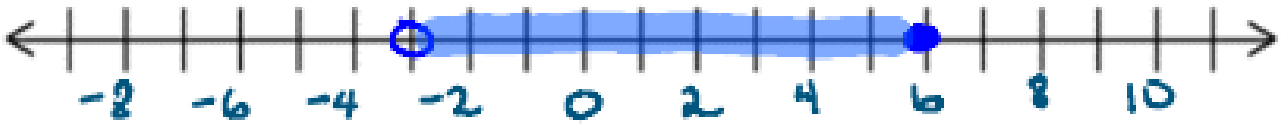
$x > -3$

$x - 7 \leq -1$

$+7 \quad +7$

$x \leq 6$

$\rightarrow \quad -3 < x \leq 6$



Check your understanding:

Pg. 357-359 #9, 10, 11, 13, 24, 25, 28