Intro to college math: Chapter 2.7
Linear inequalities in one variable

* Less than is $<$
* Greater than is $>$
* Less than or equal to is $\leq$
* Greater than or equal to is $\geq$

* Addition Property of Inequalities — adding the same same number to both sides of an inequality will not change the solution set.

$A < B$

$A + C < B + C$

ex.) $5 < 6$

$5 + 2 < 6 + 2$

* Multiplication Property of Inequalities —multiplying both sides of an inequality by the same positive number will not change the solution set.

$A > B$

$A \cdot C > B \cdot C$

ex.) $5 > 2$

$5 \cdot 3 > 2 \cdot 3$

** If you divide both sides by a negative number, you must flip the sign. **

ex.) $-2x < 6$

$\frac{-2x}{-2} < \frac{6}{-2}$ ← flip because divided by (-)

$x > -3$

ex.) $2x < 6$

$\frac{2x}{2} < \frac{6}{2}$ ← Don't flip because didn't divide by (-).

$x < 3$

* Goal: to get $x$ on left side & everything else on right of inequality sign.

1. Solve the following inequality, and then graph: $x - 3 < 1$.

$x - 3 < 1$

$+3 \quad +3$

$x < 4$

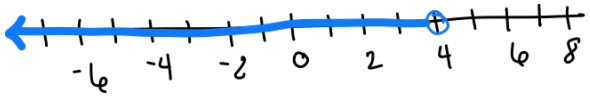
* Move the number on the left to the right by adding or subtracting.

Helpful Hint:

* To type inequality sign into computer:
  * Use your keyboard
  —or—
  * when you click in the answer box, another box will appear. Click on the purple "Inequality", then click on your sign.

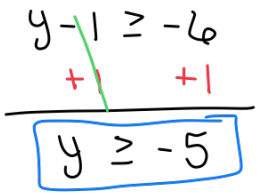
To Graph:

1) Since there is no equal sign, click on the open circle ○ Below the graph.
2) Then click the number on the graph that was your answer.
3) Then click on the arrow box. →
4) Then click on your circle on the graph and holding mouse click down drag the arrow all the way to the end (will see the arrow appear)




* Hint: arrow will point same direction as inequality sign.

2. Solve the following inequality, and then graph: y - 1 ≥ - 6.

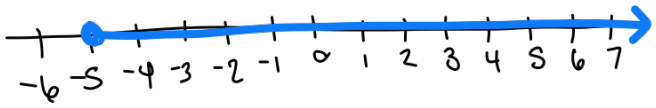



* Move the number on the left to the right by adding or subtracting.

* To type inequality sign into computer:
  * when you click in the answer box, another box will appear. Click on the purple "Inequality", then click on your sign.

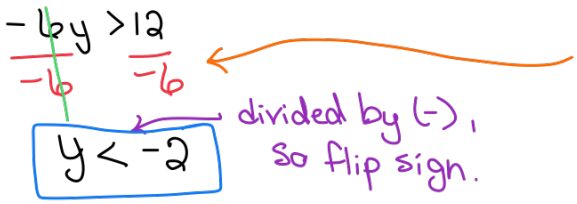
To Graph:

1) Since there is an equal sign with the inequality, click on the closed circle Below the graph.
2) Then click the number on the graph that was your answer.
3) Then click on the arrow box.
4) Then click on your circle on the graph and holding mouse click down drag the arrow all the way to the end (will see the arrow appear)




* Hint: arrow will point same direction as inequality sign.

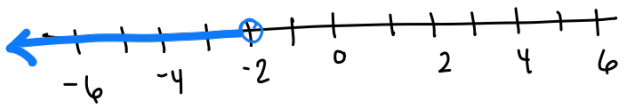
3. Solve the following inequality, and then graph: $-6y > 12$



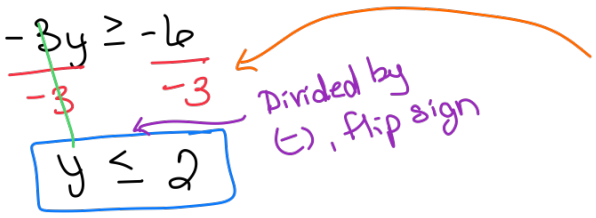

* since we want y by itself on the left, we divide both sides by the number in front of y.

To Graph:

1) Since there is no equal sign, click on the open circle Below the graph.
2) Then click the number on the graph that was your answer.
3) Then click on the arrow box.
4) Then click on your circle on the graph and holding mouse click down drag the arrow all the way to the end (will see the arrow appear)



4. Solve the following inequality, and then graph: $-3y \geq -6$

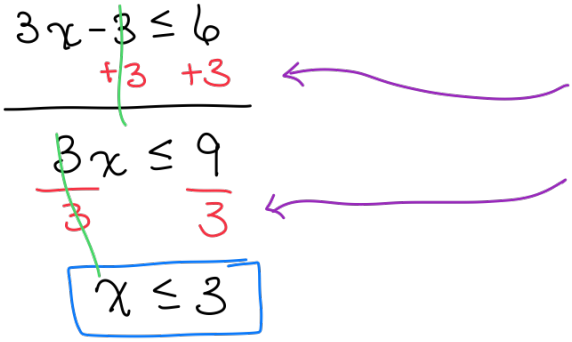



* since we want y by itself on the left, we divide both sides by the number in front of y.

To Graph:

1) Since there is an equal sign with the inequality, click on the closed circle Below the graph.
2) Then click the number on the graph that was your answer.
3) Then click on the arrow box.
4) Then click on your circle on the graph and holding mouse click down drag the arrow all the way to the end (will see the arrow appear)


5. Solve the following inequality, and then graph: $3x - 3 \leq 6$

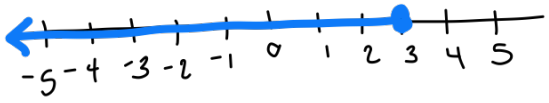



* First move the number on the left to the right by adding or subtracting.

* Then, to get x by itself on the left, divide both sides by the number in front of x.

To Graph:

1) Since there is an equal sign with the inequality, click on the closed circle Below the graph.
2) Then click the number on the graph that was your answer.
3) Then click on the arrow box.
4) Then click on your circle on the graph and holding mouse click down drag the arrow all the way to the end (will see the arrow appear)



6. Solve the following inequality, and then graph the solution set: $-7.9b + 0.4 \leq -39.1$

$-7.9b + 0.4 \leq -39.1$

$-0.4 \quad -0.4$

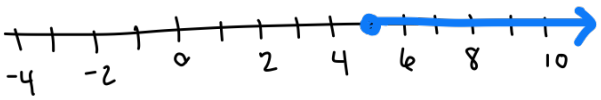
$-7.9b \leq -39.5$

$\frac{-7.9b}{-7.9} \leq \frac{-39.5}{-7.9}$

Divided by (-) so flip sign

$b \geq 5$

* First move the number on the left to the right by adding or subtracting.
* Then, to get b by itself on the left, divide both sides by the number in front of b.




7. Solve the following inequality, and then graph the solution set: $0.2(x-3) > 0.4$

$0.2(x-3) > 0.4$

$0.2x - 0.6 > 0.4$

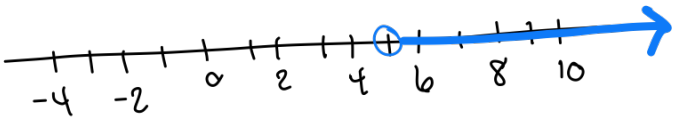
$+0.6 \quad +0.6$

$0.2x > 1$

$\frac{0.2x}{0.2} > \frac{1}{0.2}$

$x > 5$

* Use the distributive property to get rid of the ( ).
* Then, move the number on the left to the right by adding or subtracting.
* Then, to get x by itself on the left, divide both sides by the number in front of x.



8. Solve the following inequality, and then graph the solution set: $3(3-2b) \geq 12$

$3(3-2b) \geq 12$

$9 - 6b \geq 12$

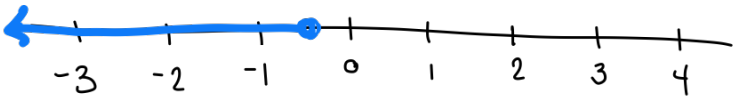
$-9 \quad -9$

$-6b \geq 3$

$\frac{-6b}{-6} \geq \frac{3}{-6}$

Divided by (-) so flip sign

$b \leq -\frac{1}{2}$




* Use the distributive property to get rid of the ( ).
* Then, move the number on the left to the right by adding or subtracting.
* Then, to get b by itself on the left, divide both sides by the number in front of b.

9. Solve the following inequality, and then graph the solution set: $8y - 6 > 2y$

$8y - 6 > 2y$

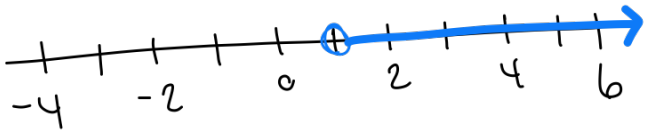
$+6 \quad +6$

$8y > 2y + 6$

$-2y \quad -2y$

$\frac{6y}{6} > \frac{6}{6}$

$y > 1$




* First, move the number on the left to the right by adding or subtracting.
* Then move the variable on the right to the left by adding or subtracting.
* Then, to get y by itself on the left, divide both sides by the number in front of y.

10. Solve the following inequality, and then graph the solution set: $7-5(b-3) \leq -8b+10$

$7-5(b-3) \leq -8b+10$

$7-5b+15 \leq -8b+10$

$22-5b \leq -8b+10$

$-22 \quad -22$

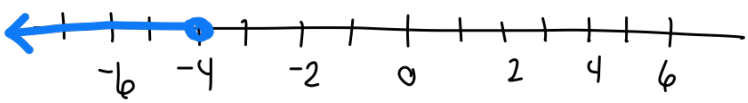
$-5b \leq -8b-12$

$+8b \quad +8b$

$\frac{3b}{3} \leq \frac{-12}{3}$

$b \leq -4$

* First, use the distributive property to get rid of the ( ).
* Then combine like terms on each side OT the equal sign,
* Next, move the number on the left to the right by adding or subtracting.
* Then move the variable on the right to the left by adding or subtracting.
* Then, to get y by itself on the left, divide both sides by the number in front of y.




11. Solve the following continued inequalities. Use both a line graph and interval notation to write each solution set. $-5 < a+2 < 5$

* Goal: to get variable alone in the center.

$-5 < a+2 < 5$

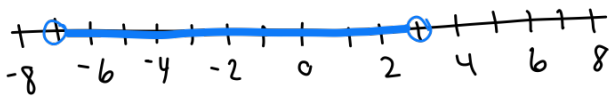
$-2 \quad -2 \quad -2$

$-7 < a < 3$

$(-7, 3)$

* Starting in the middle, move the number to all 3 columns by adding or subtracting.

*Now to write interval notation:
* write down the two numbers separated by a comma.
* Then if there is no equal sign associated with the inequality sign, use a ( or ). if there is an equal sign associated with inequality sign, use [ or ].

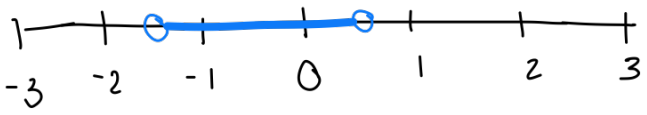



To Graph:
1) Since there is no equal sign, click on the open circle ⊙ Below the graph.
2) Then click the 2 numbers on the graph that was your answer.
3) Then click on the arrow box. ⇒
4) Then click on one of the circles on the graph and holding mouse click down drag the arrow all the way to the other circle.

12. Solve the following continued inequalities. Use both a line graph and interval notation to write each solution set. $-40 < 40x + 20 < 40$

$$-40 < 40x + 20 < 40$$
$$-20 \quad\quad -20 \quad\quad -20$$
$$-60 < 40x < 20$$
$$\frac{}{40} \quad\quad \frac{}{40} \quad\quad \frac{}{40}$$
$$-\frac{3}{2} < x < \frac{1}{2}$$

$$\left(-\frac{3}{2}, \frac{1}{2}\right)$$




* Starting in the middle, move the number to all 3 columns by adding or subtracting.

* Then to get x alone in the middle, divide all 3 columns by the number in front of x.

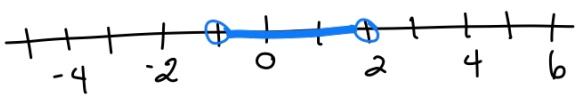
*Now to write interval notation:
  * write down the two numbers separated by a comma.
  * Then if there is no equal sign associated with the inequality sign, use a ( or ). if there is an equal sign associated with inequality sign, use [ or ].

To Graph:
1) Since there is no equal sign, click on the open circle [o] Below the graph.
2) Then click the 2 numbers on the graph that was your answer.
3) Then click on the arrow box. [→]
4) Then click on one of the circles on the graph and holding mouse click down drag the arrow all the way to the other circle.

13. Solve the following continued inequalities. Use both a line graph and interval notation to write each solution set. $-0.2 < 0.3x + 0.1 < 0.7$

$$-0.2 < 0.3x + 0.1 < 0.7$$
$$-0.1 \quad\quad -0.1 \quad\quad -0.1$$
$$-0.3 < 0.3x < 0.6$$
$$\frac{}{0.3} \quad\quad \frac{}{0.3} \quad\quad \frac{}{0.3}$$
$$-1 < x < 2$$

$$(-1, 2)$$




* Starting in the middle, move the number to all 3 columns by adding or subtracting.

* Then to get x alone in the middle, divide all 3 columns by the number in front of x.

*Now to write interval notation:
  * write down the two numbers separated by a comma.
  * Then if there is no equal sign associated with the inequality sign, use a ( or ). if there is an equal sign associated with inequality sign, use [ or ].

14. Solve the following continued inequalities. Use both a line graph and interval notation to write each solution set.

$$-\frac{5}{2} \le \frac{3x-1}{2} \le 0$$

$2 \cdot -\frac{5}{2} \le 2 \cdot \frac{3x-1}{2} \le 0 \cdot 2$

$-5 \le 3x-1 \le 0$

$+1 \quad +1 \quad +1$

$-4 \le 3x \le 1$

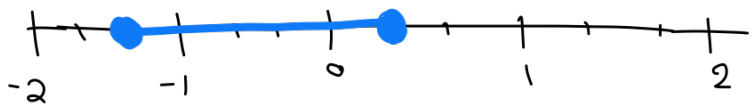
$\frac{-4}{3} \le \frac{3x}{3} \le \frac{1}{3}$

$-\frac{4}{3} \le x \le \frac{1}{3}$

$\left[-\frac{4}{3}, \frac{1}{3}\right]$

* To get rid of the fraction in the middle, we will multiply all 3 columns by the denominator of the fraction in the middle.
* Now starting in the middle, move the number to all 3 columns by adding or subtracting.
* Then to get x alone in the middle, divide all 3 columns by the number in front of x.

*Now to write interval notation:
  * write down the two numbers separated by a comma.
  * Then if there is no equal sign associated with the inequality sign, use a ( or ). if there is an equal sign associated with inequality sign, use [ or ].




To Graph:
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