

5.3 Solve Multi-Step Inequalities

The same steps used for solving multi-step equations can be applied to linear inequalities.

JUST REMEMBER that you have to **FLIP** the inequality sign if you **MULTIPLY** or **DIVIDE** by a **NEGATIVE** value!

Solve and graph.

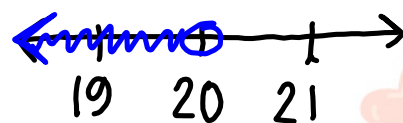
1. $-6y + 5 \leq -16$

$$\begin{array}{r} -6y + 5 \leq -16 \\ \underline{-5 \quad -5} \\ -6y \leq -21 \\ \underline{-6 \quad -6} \\ y \geq \frac{7}{2} \end{array}$$



2. $-\frac{1}{4}(p - 12) > -2$

$$\begin{array}{r} -\frac{1}{4}(p - 12) > -2 \\ \underline{-\frac{1}{4}p + 3 > -2} \\ \underline{+3 \quad -3} \\ -\frac{1}{4}p > -5 \\ \underline{-4 \cdot -4} \\ p < 20 \end{array}$$



Solve and graph.

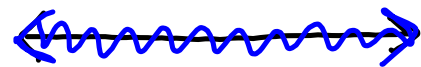
3. $6x + 6 \leq 9x + 21$

$$\begin{array}{r|l}
 \cancel{-6x} & \cancel{-6x} \\
 \hline
 6 & \leq 3x + 21 \\
 \cancel{-21} & \cancel{-21} \\
 \hline
 -15 & \leq 3x \\
 \frac{-15}{3} & \frac{3x}{3} \\
 -5 & \leq x \\
 & x \geq -5
 \end{array}$$



4. $12k - 1 > 6(2k - 1)$

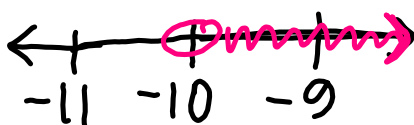
$$\begin{array}{r|l}
 \cancel{12k} - 1 & > \cancel{12k} - 6 \\
 \cancel{-12k} & \cancel{-12k} \\
 \hline
 -1 & > -6 \\
 & \text{true} \rightarrow \\
 & \text{all real numbers}
 \end{array}$$



Solve and graph.

5. $-\frac{2}{3}w - 2 < \frac{1}{3}w + 8$

$$\begin{array}{r|l}
 \cancel{-\frac{1}{3}w} & \cancel{-\frac{1}{3}w} \\
 \hline
 -w - 2 & < 8 \\
 \cancel{+2} & \cancel{+2} \\
 \hline
 -w & < 10 \\
 \frac{-w}{-1} & \frac{10}{-1} \\
 & w > -10
 \end{array}$$



Solve and graph.

6. $0.7(n - 3) \leq n - 0.6(n + 5)$

$$0.7n - 2.1 \leq n - 0.6n - 3$$

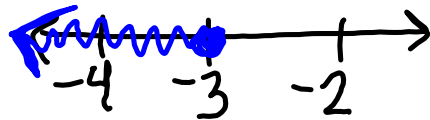
$$0.7n - 2.1 \leq 0.4n - 3$$

$$\begin{array}{r} 0.7n - 2.1 \leq 0.4n - 3 \\ -0.4n \quad -0.4n \end{array}$$

$$\begin{array}{r} 0.3n - 2.1 \leq -3.0 \\ +2.1 \quad +2.1 \end{array}$$

$$\begin{array}{r} 0.3n \leq -0.9 \\ 0.3 \quad 0.3 \end{array}$$

$$n \leq -3$$



Solve and graph.

7. $8g + 10 > 2(4g + 7) - 3$

$$8g + 10 > 8g + 14 - 3$$

$$\begin{array}{r} 8g + 10 > 8g + 11 \\ -8g \quad -8g \end{array}$$

$$10 > 11$$

false

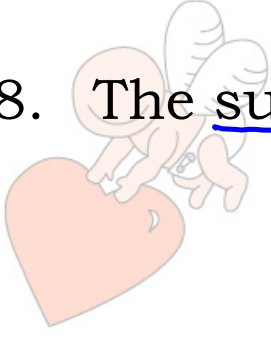
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no solution



Solve.

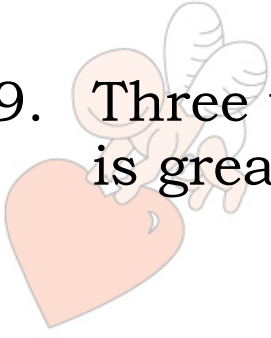

8. The sum of $4x$ and 7 is at most 39 .


$$\begin{array}{r} 4x + 7 \leq 39 \\ -7 \quad -7 \\ \hline 4x \leq 32 \\ \frac{4x}{4} \leq \frac{32}{4} \end{array}$$

$$x \leq 8$$


Solve.

9. Three times the difference of d and 2 is greater than -2 .


$$\begin{array}{r} 3(d-2) > -2 \\ 3d - 6 > -2 \\ +6 \quad +6 \\ \hline 3d > 4 \\ \frac{3d}{3} > \frac{4}{3} \\ d > \frac{4}{3} \end{array}$$


10. The band is raising money for new uniforms by making greeting cards.

Mr. Smith spends $\$60$ on supplies and plans to sell the cards for $\$2$ each.

- a) Write an inequality that gives the possible numbers c of cards needed to sell so the profit is positive (greater than 0)
- b) Solve the inequality.

$$\begin{array}{r}
 2c - 60 > 0 \\
 \hline
 2c > 60 \\
 \hline
 \frac{2c}{2} > \frac{60}{2} \\
 c > 30
 \end{array}$$

y-int = -60, slope = 2

11. Jon is saving money for a trip that costs $\$1800$. He's saved $\$500$ so far, & he has 14 more weeks to save $\$$.

- a) Write an inequality that gives the possible amount of money Jon needs to save per week so he'll have at least $\$1800$.
- b) How much will Jon need to save per week?

$$\begin{array}{r}
 500 + 14x \geq 1800 \\
 \hline
 -500 \quad -500 \\
 \hline
 14x \geq 1300 \\
 \hline
 14 \quad 14 \\
 x \geq \$92.86
 \end{array}$$

12. Jennifer has scores of 8, 5, and 7 on three 10-point quizzes. If she wants her average to be at least 7, what must her score be on the next quiz?

$$\frac{8 + 5 + 7 + x}{4} \geq 7$$

$$4 \cdot \frac{20 + x}{4} \geq 7 \cdot 4$$

$$\begin{array}{r} 20 + x \geq 28 \\ -20 \quad -20 \\ \hline x \geq 8 \end{array}$$

13. The sum of two consecutive even integers is greater than 75. Find the pair with the least sum.

let $x = 1^{\text{st}}$ cons. even int. $x+2 = 2^{\text{nd}}$ #

$$x + (x + 2) > 75$$

$$2x + 2 > 75$$

$$\begin{array}{r} 2x + 2 > 75 \\ -2 \quad -2 \\ \hline 2x > 73 \\ \frac{2x}{2} > \frac{73}{2} \end{array}$$

$$x > 36.5$$

$$\boxed{38 \ \& \ 40}$$