Inequalities
Linear

$$\left[\begin{array}{c} \text{MATH by Wilson} \\ \text{Your Personal Mathematics Trainer} \\ \text{MathByWilson.com} \end{array} \right]$$

We consider two (2) types of linear inequalities:

1. One Inequality Symbol: $\{\leq;<;\geq;>\}$

Question 01: Solve for x: $4-3(2+\mathbf{x}) \leq \mathbf{x}+5(3-2\mathbf{x})$
Solution:

Step	Inequality	Reason
0	$4-3(2+\mathbf{x}) \leq \mathbf{x}+5(3-2\mathbf{x})$	
1	$4-6-3\mathbf{x} \leq \mathbf{x}+15-10\mathbf{x}$	
2	$-2-3\mathbf{x} \leq -9\mathbf{x}+15$	
3	$9\mathbf{x}-3\mathbf{x} \leq 15+2$	
4	$6\mathbf{x} \leq 17$	
5	$\mathbf{x} \leq \dfrac{17}{6}$	

Graph of the solution set:

$$/////////////////////|///////////// \, \overset{17/6}{]} \underline{\quad\quad\quad\quad}$$
$$\underset{0}{}$$

2. Two Inequality Symbols: $\{\le;<;\ge;>\}$ **- symbols pointing the same direction**

Question 02: Solve for x: $-4<1-3\mathbf{x}\le4$
Solution:

Note: The solution of $-4<1-3\mathbf{x}\le4$ **is actually the solution of two (2) inequalities**

$$-4<1-3\mathbf{x} \text{ and } 1-3\mathbf{x}\le4$$

but they can be written and solved as $-4<1-3\mathbf{x}\le4$ **since the inequality symbols are pointing in the same direction.**

Step	Inequality	Reason
0	$-4<1-3\mathbf{x}\le4$	
1	$-4-1<-3\mathbf{x}\le4-1$	
2	$-5<-3\mathbf{x}\le3$	
3	$\dfrac{-5}{-3}>\mathbf{x}\ge\dfrac{3}{-3}$	**Divide by a negative Change direction of inequality symbol**
4	$\dfrac{5}{3}>\mathbf{x}\ge-1$ $-1\le\mathbf{x}<\dfrac{5}{3}$	

Graph of the solution set: