

2.7: Linear Inequalities (cont'd)

Note Title

9/16/2015

Ex:

Solve.

$$3 - 4x < -14$$

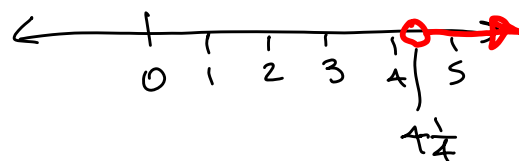
$$-4x < -14 - 3$$

$$-4x < -17$$

$$\frac{-4x}{-4} > \frac{-17}{-4}$$

$$x > \frac{17}{4}$$

$$x > 4\frac{1}{4}$$



Ex:

Solve.

$$2 \geq 6x + 32$$

$$2 - 32 \geq 6x$$

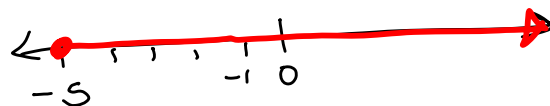
$$-30 \geq 6x$$

$$\frac{-30}{6} \leq \frac{6x}{6}$$

$$-5 \leq x$$

$$x \geq -5$$

[reverse the inequality]



Ex: Solve.

$$4(6 - 2x) < 3 - (3x + 1)$$

$$24 - 8x < 3 - 3x - 1$$

$$24 - 8x < 2 - 3x$$

$$24 - 5x < 2$$

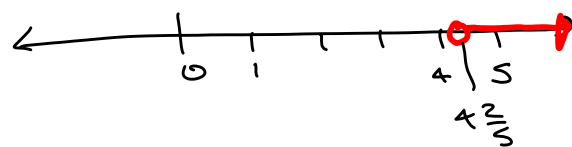
$$-5x < -22$$

[reverse the inequality sign]

$$\frac{-5x}{-5} > \frac{-22}{-5}$$

$$x > \frac{22}{5}$$

$$x > 4\frac{2}{5}$$



Ex: Solve.

(2)

$$\frac{2}{3}x + \frac{1}{4} < 5 - \frac{1}{2}x + \frac{3}{4}x + \frac{1}{5}$$

$$\frac{2}{3}x + \frac{1}{2}x - \frac{3}{4}x < 5 + \frac{1 \cdot 4}{5 \cdot 4} - \frac{1 \cdot 5}{4 \cdot 5}$$

$$\frac{8}{12}x + \frac{6}{12}x - \frac{9}{12}x < \frac{100}{20} + \frac{4}{20} - \frac{5}{20}$$

$$\frac{5}{12}x < \frac{99}{20}$$

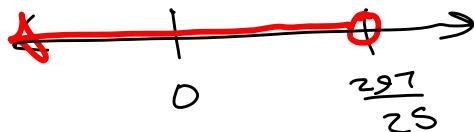
$$\left(\frac{12}{5}\right)\left(\frac{5}{12}x\right) < \frac{99}{20}\left(\frac{2}{5}\right)$$

$$x < \frac{297}{25}$$

$$x < 11 \frac{22}{25}$$

$$\begin{array}{r} 2 \\ 99 \\ \underline{3} \\ 297 \end{array}$$

$$\begin{array}{r} 11 \\ 25 \overline{) 297} \\ \underline{25} \\ 47 \\ \underline{25} \\ 22 \end{array}$$



Combined Inequalities: 2 inequalities are combined into 1 statement.

Ex: Solve.

$$x + 3 < -6 \quad \text{or} \quad 2x + 1 > 4$$

$$x < -6 - 3$$

$$x < -9$$

$$2x > 4 - 1$$

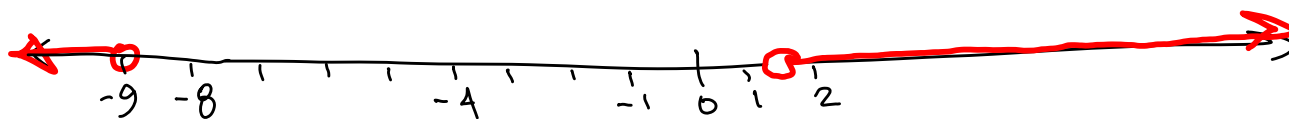
$$2x > 3$$

$$\frac{2x}{2} > \frac{3}{2}$$

$$x > 1 \frac{1}{2}$$

final answer:

$$x < -9 \quad \text{or} \quad x > 1 \frac{1}{2}$$



$$x < -9$$

$$x > 1 \frac{1}{2}$$

Ex:

Solve.

③

$$-6 \leq 2x+1 < 17$$

This means:

$$-6 \leq 2x+1 \quad \text{and} \quad 2x+1 < 17$$

$$-7 \leq 2x$$

$$2x < 16$$

$$-\frac{7}{2} \leq \frac{2x}{2}$$

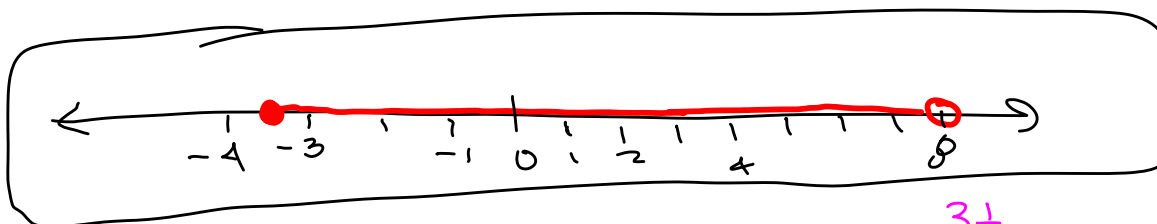
$$\frac{2x}{2} < \frac{16}{2}$$

$$-3\frac{1}{2} \leq x$$

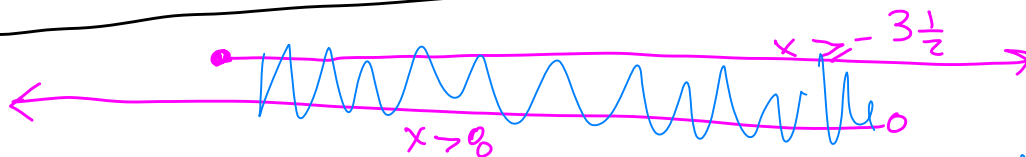
$$x \geq -3\frac{1}{2}$$

and

$$x < 8$$



final
number
line



we want the
values that
satisfy both
inequalities

Put $x \geq -3\frac{1}{2}$ and $x < 8$ back together

$$-3\frac{1}{2} \leq x$$

$$\boxed{-3\frac{1}{2} \leq x < 8} \quad \text{final answer}$$

We can work this problem a more compact way:

$$-6 \leq 2x+1 < 17$$

$$-7 \leq 2x < 16$$

$$\frac{-7}{2} \leq \frac{2x}{2} < \frac{16}{2}$$

$$\boxed{-3\frac{1}{2} \leq x < 8}$$

[subtract 1 from all
3 sides]

[Divide all 3 sides
by 2]



Ex.:

$$-3 < -x - 3 \leq 5$$

+3 +3 +3

④

$$0 < -x \leq 8$$

$$\frac{0}{-1} > \frac{-x}{-1} \geq \frac{8}{-1} \quad \left[\text{Reverse the inequality signs} \right]$$

$$0 > x \geq -8$$

$$\boxed{-8 \leq x < 0}$$

