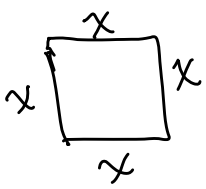
# 2.5: Homework Qs

Note Title 2/4/2016

**2.5 #21)** The perimeter of a square is 36 inches. Find the length of one side.

length of one side: $x$

It's a square, so all the other sides must also have length $x$.




Perimeter = 36

$36 = x + x + x + x$

$36 = 4x$

$\frac{36}{4} = \frac{4x}{4}$

$x = 9$

Each side is 9 inches long.

**2.5 #19)** Pat is 20 years older than Patrick. In 2 years, Pat will be twice as old as Patrick. How old are they now?

| | Age now | Age in 2 yrs |
|---|---|---|
| Pat | $x+20$ | $x+20+2 = x+22$ |
| Patrick | $x$ | $x+2$ |

Pat's age now compared to Patrick's age now

$x$

Pat's age in 2 yrs $= 2$ (Patrick's age in 2 years)

$x + 22 = 2(x + 2)$

See next page

Previous example cont'd:

$$x + 22 = 2(x+2)$$

$$x + 22 = 2x + 4$$

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

$$-x + 22 = 4$$

$$-x = 4 - 22$$

$$-x = -18$$

$$\frac{-x}{-1} = \frac{-18}{-1}$$

$$x = 18$$

Patrick's age now $= x = 18$

Pat's age now: $x + 20$

$x = 18 \Rightarrow 18 + 20 = 38$

Pat is 38 now, and Patrick is 18.

# 2.7: Linear Inequalities

## Inequality symbols

$<$ means "is less than"

$>$ means "is greater than"

} strict inequalities

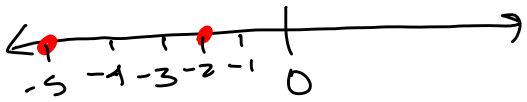
$\leqslant$ or $\leq$ means "is less than or equal to"

$\geqslant$ or $\geq$ means "is greater than or equal to"

**Example inequalities:** are these true or false?

$2 < 5$ True

$-2 < -5$ False




$3 \geqslant 2$ True

$2 \geqslant 2$ True

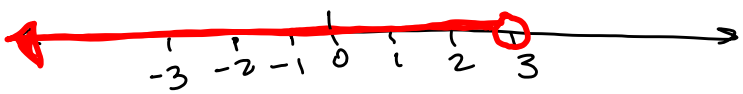
$2 > 2$ False

$2 > 0$ True

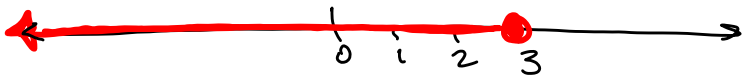
$3 < 2$ False

We can use number lines to represent inequalities that have variables in them. We shade the values that make the inequality true.

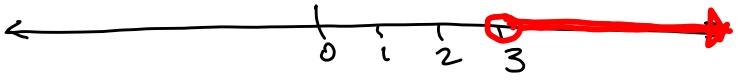
same as $3 > x \rightarrow x < 3$



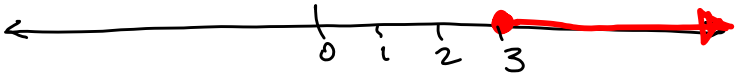

$x \leq 3$




same as $3 < x \rightarrow x > 3$




$x \geqslant 3$

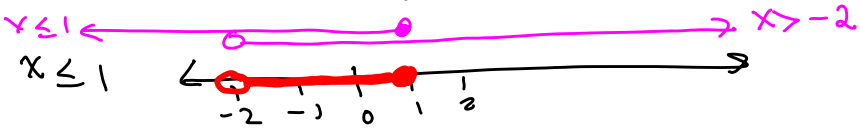



$x < -2$ OR $x \geqslant 1$


$-2 < x \leq 1$

This means $-2 < x$ and $x \leq 1$

$x > -2$



## Additive Property of Inequality

If $a < b$, then $a + c < b + c$.

This means we can add (or subtract) the same expression on both sides.

Two equations are equivalent if they have the same solution set.

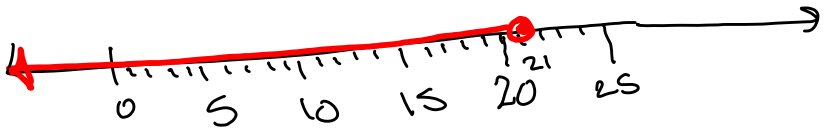
The same principle applies to inequalities:

Two inequalities are equivalent if they have the same solution set.

Example: Solve $x - 8 \leq 13$

$+8 \quad +8$

$x \leq 21$




OR

## Multiplicative Property of Inequality

If $a < b$ and $c > 0$, then $ac < bc$.

If $a < b$ and $c < 0$, then $ac > bc$.

This means:

We can multiply (or divide) both sides by the same positive number

We can multiply (or divide) both sides by the same negative number, if we reverse the inequality sign.

Why?

$1 < 2$ True

multiply both sides by 2: $1(2) < 2(2)$

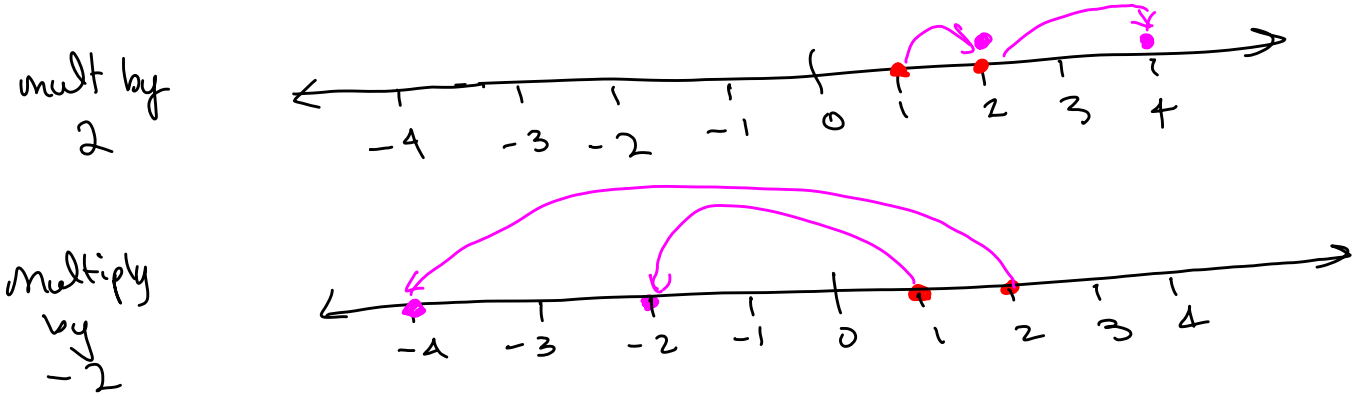
$2 < 4$ Still true

Start with $1 < 2$ again (It's still true):

multiply both sides by $-2$:

$(-2)(1) < 2(-2)$

$-2 < -4$ False

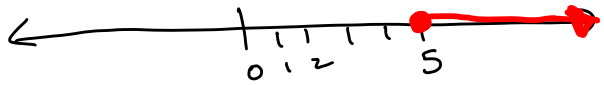


Ex: Solve.

$$4x \geq 20$$

$$\frac{4x}{4} \geq \frac{20}{4}$$

$$\boxed{x \geq 5}$$

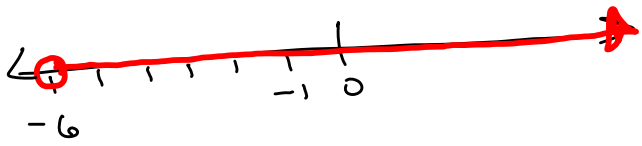



Ex: Solve.

$$-3x < 18$$

$$\frac{-3x}{-3} > \frac{18}{-3}$$ ← Reverse the inequality sign!

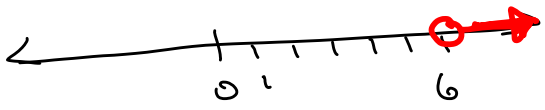
$$\boxed{x > -6}$$




Ex: Solve $-3x < -18$

$$\frac{-3x}{-3} > \frac{-18}{-3}$$ ← Reverse the inequality sign!

$$\boxed{x > 6}$$




Ex: $3x < -18$

$$\frac{3x}{3} < \frac{-18}{3}$$

$$\boxed{x < -6}$$

**Example:** Solve.

$$2x + 7 \leq 5x - 5$$

$$-5x \qquad -5x$$

$$2x - 5x + 7 \leq -5$$

$$-3x + 7 \leq -5$$

$$-7 \qquad -7$$

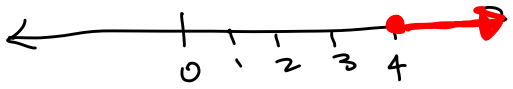
$$-3x \leq -5 - 7$$

$$-3x \leq -12$$

$$\frac{-3x}{-3} \geqslant \frac{-12}{-3}$$

[Reverse the inequality]

$$\boxed{x \geqslant 4}$$




Another approach:

$$2x + 7 \leq 5x - 5$$

$$7 \leq 5x - 2x - 5$$

$$7 \leq 3x - 5$$

$$7 + 5 \leq 3x$$

$$12 \leq 3x$$

$$\frac{12}{3} \leq \frac{3x}{3}$$

$$4 \leq x$$

Switch it around so the variable comes first:

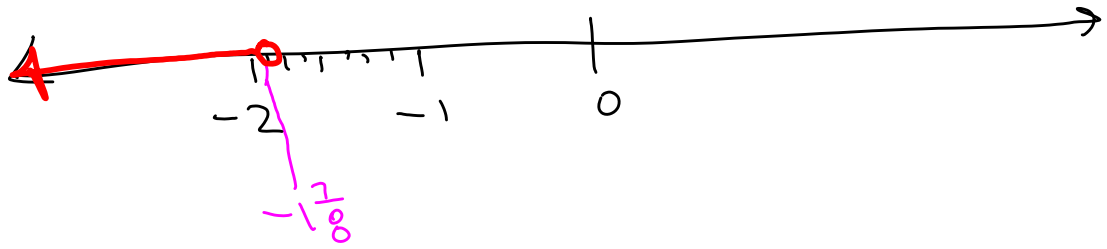
$$\boxed{x \geqslant 4}$$

Example: Solve: $\frac{2}{5}x < -\frac{3}{4}$

$\left(\frac{5}{2}\right)\frac{2}{5}x < -\frac{3}{4}\left(\frac{5}{2}\right)$

$x < -\frac{15}{8}$

$x < -1\frac{7}{8}$




Ex: Solve.

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

$\left(-\frac{3}{2}\right)\left(-\frac{2}{3}x\right) > \left(-\frac{4}{5}\right)\left(-\frac{3}{2}\right)$ ← Reverse the inequality

$x > +\frac{12}{10}$

$x > \frac{6}{5}$

Ex: $\frac{2}{3}x + \frac{2}{5} \leq 7 + \frac{1}{2}x$

$\frac{2}{3}x - \frac{1}{2}x \leq 7 - \frac{2}{5}$

$\frac{4}{6}x - \frac{3}{6}x \leq \frac{35}{5} - \frac{2}{5}$

$\frac{1}{6}x \leq \frac{33}{5}$

$\left(\frac{6}{1}\right)\frac{1}{6}x \leq \frac{33}{5}\left(\frac{6}{1}\right)$ ⇒

$x \leq \frac{198}{5}$

$x \leq 39\frac{3}{5}$

$5\overline{)198}$ → $39$, $15$, $48$, $45$, $3$

$33 \times 6 = 198$