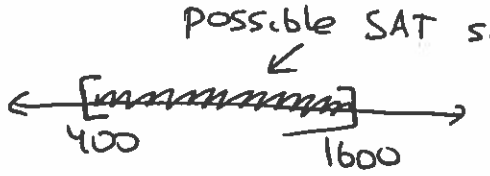
11.2 Compound Inequalities

Ex How do you communicate the fact that SAT scores go from 400 to 1600.?

Visually:



Interval notation: $[400, 1600]$

Using a compound inequality:

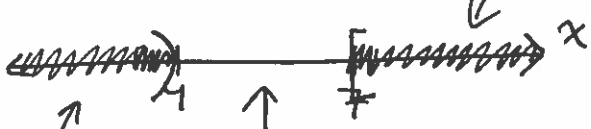
$$400 \leq x \leq 1600$$

$(400 \leq x$ and also $x \leq 1600)$

a compound inequality

Ex Solve: $x < 4$ or $x \geq 7$

Visually:



like 8... "$8 \overset{?}{<} 4$ or $8 \overset{?}{\geq} 7$" Yes!

a number here, like 3, has "$3 \overset{?}{<} 4$ or $3 \overset{?}{\geq} 7$" Yes! No!

here, like 5, doesn't satisfy either...

$\Rightarrow$ overall answer is yes!

In interval notation: $(-\infty, 4) \cup [7, \infty)$

Ex Solve "$3-5x > -7$ or $2-x \leq -3$"

Moving toward an answer in interval notation since this is an inequality.

Solve these individually

$-5x > -10$

$\frac{-5x}{-5} < \frac{-10}{-5}$

flip direction when you divide or multiply by a neg #.

$x < 2$

$-x \leq -5$

$(-1)(-x) \geq (-1)(-5)$

$x \geq 5$

"$x < 2$ or $x \geq 5$"

$(-\infty, 2) \cup [5, \infty)$

Ex Solve $\frac{3}{4}t + 2 \leq \frac{5}{2}$ or $\frac{-1}{2}(t-3) < -2$

least common denominator is 4

$4\left(\frac{3}{4}t + 2\right) \leq 4\left(\frac{5}{2}\right)$ ($\frac{4}{1}\cdot\frac{5}{2} = \frac{2}{1}\cdot\frac{5}{1}$)

$3t + 8 \leq 10$

$3t \leq 2$

$t \leq \frac{2}{3}$ or

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

$t - 3 > 4$

$t > 7$

$(-\infty, \frac{2}{3}] \cup (7, \infty)$

Three-Part Inequalities

Consider $1 \leq 2 < 3$ versus $1 \leq 3 > 2$

Always avoid different directions!

$1 \leq 3$

$3 > 2$

$1 \leq 2$

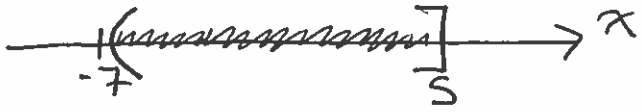
$1 > 2$

False!

Ex Solve $-7 < x \leq 5$

find all x that make this true...

$-7 < x$ and $x \leq 5$



Solution: $(-7, 5]$.

EX Solve $4 \leq 9x + 13 < 20$

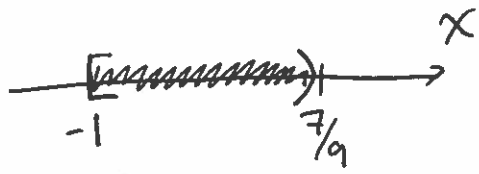
Steer toward interval notation, since it's an inequality.

$4 - 13 \leq 9x + 13 - 13 < 20 - 13$

$-9 \leq 9x < 7$

$\frac{-9}{9} \leq \frac{9x}{9} < \frac{7}{9}$

$-1 \leq x < \frac{7}{9}$



Solution is $[-1, 7/9)$

Ex Solve $-13 < 7 - \frac{4}{3}x \leq 15$

Maybe obliterate fraction denominators

$$3(-13) < 3\left(7 - \frac{4}{3}x\right) \leq 3(15)$$

$$-39 < 21 - 4x \leq 45$$

↑!!

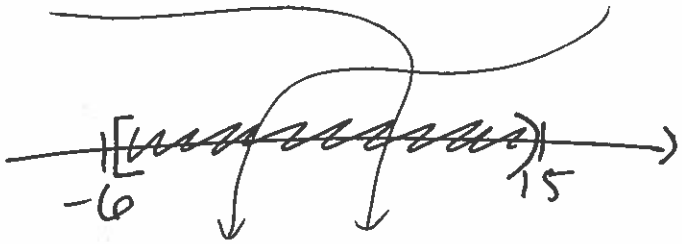
$$-39-21 < 21 - 4x - 21 \leq 45 - 21$$

$$-60 < -4x \leq 24$$

switch direction!

$$\frac{-60}{-4} > \frac{-4x}{-4} \geq \frac{24}{-4}$$

$$15 > x \geq -6$$



$$[-6, 15)$$