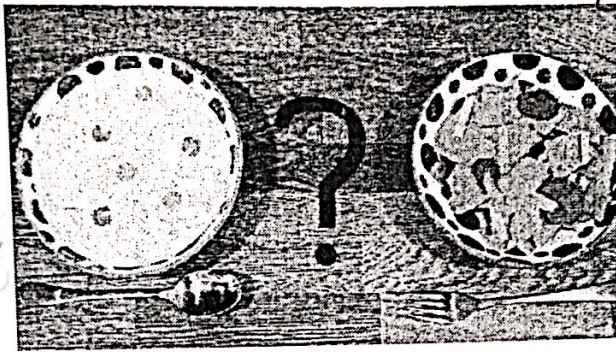


Lesson 3: Solving Compound Inequalities

SOUP

OR What does this mean?

SALAD



A CHOICE OF ONE OR THE OTHER WITH YOUR ENTREE.

Your mom says you can go out tonight if you clean your room and take out the trash.

What does this mean?

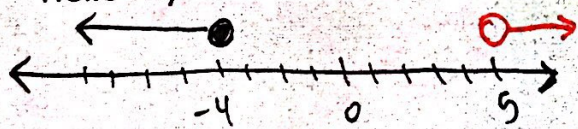
IN ORDER TO GO OUT, YOU MUST DO BOTH CHOSES.

What if she said: if you clean your room or take out the trash?

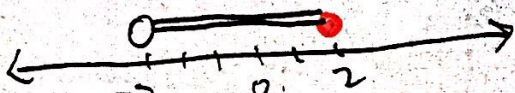


COMPOUND INEQUALITIES: 2 INEQUALITIES JOINED BY THE WORDS AND OR OR

Hello My name is... Are you a solution?



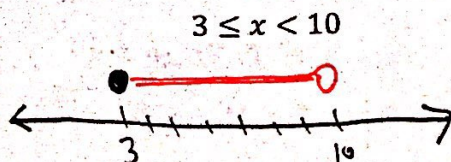
$x \leq -4$ or $x > 5$ all the numbers less than or equal to -4 OR greater than 5



$-3 < x \leq 2$ all the numbers greater than -3 AND less than or equal to 2



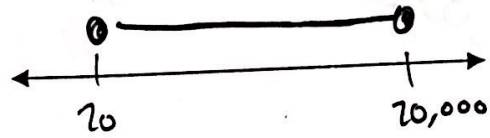
$x \leq 2$ or $x > 8$ all the numbers less than or equal to 2 OR greater than 8



$3 \leq x < 10$ all the numbers greater or equal to 3 AND less than 10

The human ear can hear sounds between the frequencies 20 hertz and 20,000 hertz. Use a number line to show the frequency of sounds humans CAN hear.

$h =$ frequency in hertz of sounds



How can the above be written as an inequality?

$$\{h \mid h \geq 20 \text{ AND } h \leq 20,000\} \rightarrow \{h \mid 20 \leq h \leq 20,000\}$$

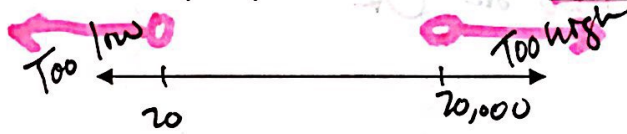
What humans hear:

$$h \geq 20 \quad \text{and} \quad h \leq 20,000$$

A rabbit can hear sounds as high as 42,000 hertz. Can humans hear that? NO.		$42,000 \not\leq 20,000$ Not True
The lowest sound a cow can hear is 23 hertz. Can humans hear that? YES	$23 \geq 20$ ✓	$23 \leq 20,000$ ✓

In order to be a solution, BOTH inequalities must be TRUE when the value is substituted INTO AND COMPOUND INEQUALITY

Make a number line to show all the frequency of sounds that humans CAN NOT hear.



How can the above be written as an inequality?

$$\{h \mid h < 20 \text{ OR } h > 20,000\}$$

What humans can NOT hear:

$$h < 20 \quad \text{or} \quad h > 20,000$$

A ferret can hear sounds as high as 44,000 hertz. Is that outside the range of humans? Yes - its a solution	$44,000 < 20$ <u>NOT TRUE</u>	Too high $44,000 > 20,000$ <u>True!</u> We cannot hear it
A mouse can hear as low as 1,000 hertz. Is that outside the range of humans? We can hear that	<u>NOT TRUE</u> $1,000 < 20$ <u>NOT A SOLUTION</u>	<u>NOT TRUE</u> $1,000 > 20,000$ <u>NOT A SOLUTION</u>

In order to be a solution, ONE inequality must be TRUE when the value is substituted INTO OR COMPOUND INEQUALITIES



(1) "AND" Compound Inequalities:

A SOLUTION SATISFIES (MAKES BOTH TRUE) BOTH INEQUALITIES WHEN SUBSTITUTED

(2) "OR" Compound Inequalities:

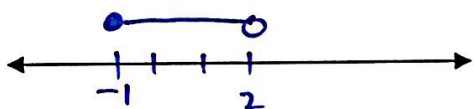
A SOLUTION SATISFIES ONLY ONE INEQUALITY WHEN SUBSTITUTED

Ex1: Solve the compound inequalities. Graph the solution set, and express in set notation.

k. $-3 \leq 7c + 4 < 18$

$$\begin{array}{r} -4 \quad -4 \quad -4 \\ \frac{-7}{7} \leq \frac{7c}{7} < \frac{14}{7} \\ -1 \leq c < 2 \end{array}$$

$$\{c \mid -1 \leq c < 2\}$$



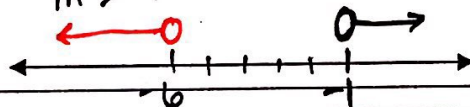
l. $10m - 7 < 17m$ or $-6m + 3 > 39$

$$\begin{array}{r} -10m \quad -10m \\ -7 < 7m \\ \frac{-7}{7} < \frac{7m}{7} \\ -1 < m \end{array}$$

$$\begin{array}{r} -3 \quad -3 \\ -6m > 36 \\ \frac{-6m}{-6} > \frac{36}{-6} \\ m < -6 \end{array}$$

$$-1 < m$$

$$m > -1$$

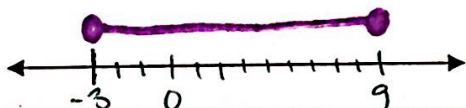


Ex2: Solve the linear inequality. Graph the solution set, and express in set notation.

m. $-11 \leq 2h - 5 \leq 13$

$$\begin{array}{r} +5 \quad +5 \quad +5 \\ -6 \leq 2h \leq 18 \\ \frac{-6}{2} \leq \frac{2h}{2} \leq \frac{18}{2} \end{array}$$

$$\{h \mid -3 \leq h \leq 9\}$$



n. $3x + 2 \leq 11$ or $5x - 8 > 22$

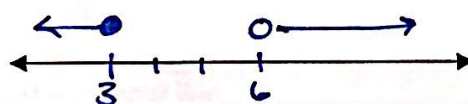
$$\begin{array}{r} -2 \quad -2 \\ 3x \leq 9 \\ \frac{3x}{3} \leq \frac{9}{3} \end{array}$$

$$x \leq 3$$

$$\begin{array}{r} +8 \quad +8 \\ 5x > 30 \\ \frac{5x}{5} > \frac{30}{5} \end{array}$$

$$x > 6$$

$$\{x \mid x \leq 3 \text{ or } x > 6\}$$



o. $3y - 2 > -5$ and $7y + 4 < -17$

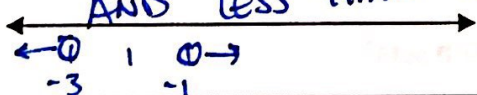
$$\begin{array}{r} +2 \quad +2 \\ 3y > -3 \\ \frac{3y}{3} > \frac{-3}{3} \end{array}$$

$$y > -1$$

$$\begin{array}{r} -4 \quad -4 \\ 7y < -21 \\ \frac{7y}{7} < \frac{-21}{7} \end{array}$$

$$y < -3$$

No Solution - VALUES CAN'T BE GREATER THAN -1 AND LESS THAN -3



p. $2p + 3 \leq 7$ or $3p + 5 > 26$

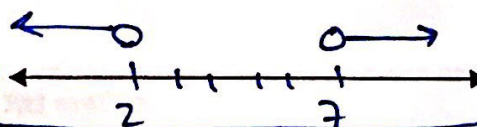
$$\begin{array}{r} -3 \quad -3 \\ 2p \leq 4 \\ \frac{2p}{2} \leq \frac{4}{2} \end{array}$$

$$p \leq 2$$

$$\begin{array}{r} -5 \quad -5 \\ 3p > 21 \\ \frac{3p}{3} > \frac{21}{3} \end{array}$$

$$p > 7$$

$$\{p \mid p \leq 2 \text{ or } p > 7\}$$



Exit ticket: What is the difference of Solution Sets between the two types of Compound Inequalities?