

1-9-19

Aim: SWBAT solve and check inequalities.

HW: Packet Pages 10 - 15 (Classwork for Thursday & Friday)

Review Sheet due next Thursday

Quiz Monday (Packet Pages 1 - 15)

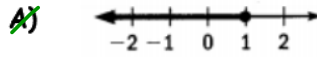
Test Next Friday

Do Now: Top of Packet Page 6

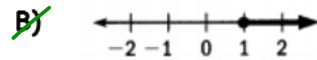
Homework

Match the inequality with its graph:

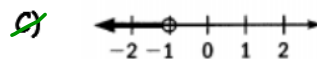
1) $x < -1$ C



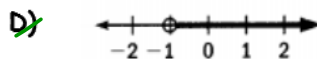
2) $x \leq 1$ A



3) $x \geq 1$ B



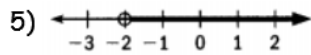
4) $x > -1$ D



Write the inequality and the verbal phrase represent by each graph.

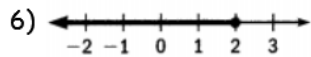
Represent each inequality in interval notation.

-2 < x } *Equivalent Inequalities*
x > -2 } Interval Notation: *(-2, ∞)*



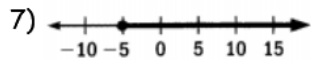
Inequality: $x > -2$ Interval Notation: $(-2, \infty)$

Verbal Phrase: *All real numbers greater than -2.*



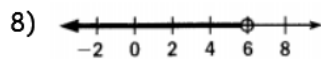
Inequality: $x \leq 2$ Interval Notation: $(-\infty, 2]$

Verbal Phrase: *All real numbers less than or equal to 2.*



Inequality: $x \geq -5$ Interval Notation: $[-5, \infty)$

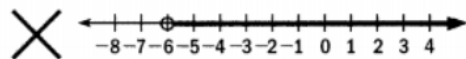
Verbal Phrase: *All real numbers greater than or equal to -5.*



Inequality: $x < 6$ Interval Notation: $(-\infty, 6)$

Verbal Phrase: *All real numbers less than 6.*

9) Describe and correct the error in graphing $x \geq -6$.



The circle should be closed.

10) Are the inequalities $x < 12$ and $12 > x$ equivalent? Explain.

Yes. They have the same solution set.

11) The frequency, f , of the human singing voice is at least 81 hertz and not more than 1100 hertz. Which statement is NOT true about f ? *81 ≤ f ≤ 1100*

A) $f \geq 81$

B) $f \leq 1100$

C) $81 \leq f$

D) $f \geq 1100$

AIM: SWBAT solve and graph one step inequalities by using the addition/ subtraction/ multiplication/ division properties for inequalities.

"DO NOW"

Solve for n:

$$2n - 5 = 17$$

$$\begin{array}{r} +5 \quad +5 \\ \hline 2n = 22 \\ \hline n = 11 \end{array}$$

one solution

How would we solve it if it were an inequality:

$$2n - 5 > 17$$

$$\begin{array}{r} +5 \quad +5 \\ \hline 2n > 22 \\ \hline n > 11 \end{array}$$

Infinite solutions.

To solve INEQUALITIES we use the same process we use to solve equations.

Addition & Subtraction Properties of Inequalities

Whatever you add/subtract on one side of an inequality with you must do the SAME thing to the other side of the inequality.

Multiplication and Division Properties of Inequalities

Whatever you multiply/divide one side of an inequality with you must do the SAME thing to the other side of the inequality. BEWARE of multiplying/dividing by negative numbers!

When we multiply/divide BOTH SIDES of an inequality by a negative number we have to remember to FLIP THE SIGN!

reverse the symbol

Look at the Examples below to see WHY we need to flip the symbol:

$6 > 4$ Now multiply both sides by 2 $2 \cdot 6 > 2 \cdot 4$ $12 > 8$	$6 > 4$ Now multiply both sides by -2 $-2 \cdot 6 > -2 \cdot 4$ $-12 > -8$ False This is not true. -12 is not greater than -8 FLIP THE SIGN! $-12 < -8$	$6 > 4$ Now divide both sides by -2 $\frac{6}{-2} > \frac{4}{-2}$ $-3 > -2$ False This is not true. -3 is not greater than -2 FLIP THE SIGN! $-3 < -2$
$6 > 4$ Now divide both sides by 2 $\frac{6}{2} > \frac{4}{2}$ $3 > 2$		

Examples

$$\frac{-4x}{-4} > \frac{16}{-4}$$

$$5y < -50$$

$$\frac{f}{12} \leq -21$$

$$\frac{-9}{1} \cdot \frac{v}{-9} \geq 5 \cdot \frac{-9}{1}$$

Solve: $\frac{x+5}{-2} < 20 \quad -2$

$$\begin{array}{r} x+5 > -40 \\ -5 & -5 \\ \hline x > -45 \end{array}$$

To Flip or Not to Flip . . .

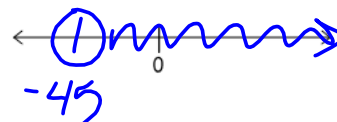
You need to divide both sides by -4, so you reverse the sign

You need to divide both sides by 5, so you keep the sign

You need to multiply both sides by 12, so you keep the sign

You need to multiply both sides by -9, so you reverse the sign

Graph your solution on the number line below



Use interval notation to represent your answer:

$$(-45, \infty)$$

To check an inequality, use the same 3-step check. Choose ANY number that is a solution to the inequality to substitute for the variable and simplify both sides. The final inequality should be a TRUE statement.

CHECK #1 test 20

Step 1: $2n - 5 > 17$

Step 2: $2 \cdot 20 - 5 > 17$
 $40 - 5 > 17$

Step 3: $35 > 17$
 True

CHECK #2 test 0

Step 1: $\frac{x+5}{-2} < 20$

Step 2: $\frac{0+5}{-2} < 20$

Step 3: $-\frac{5}{2} < 20$ True

Practice: Solve the inequality, graph its solution on a number line and represent the solution using interval notation.

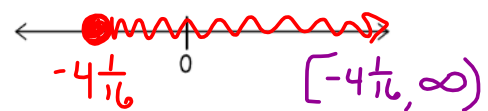
$$1) \quad n + 2.48 < -5.21$$

$$\begin{array}{r} -2.48 \quad -2.48 \\ \hline n < -7.69 \end{array}$$



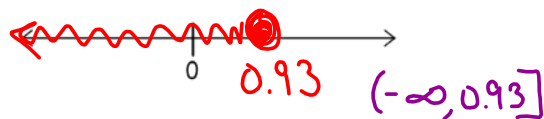
$$2) \quad -7\frac{5}{8} \leq a - 3\frac{9}{16}$$

$$\begin{array}{r} +3\frac{9}{16} \quad +3\frac{9}{16} \\ \hline -4\frac{1}{16} \leq a \\ a \geq -4\frac{1}{16} \end{array}$$



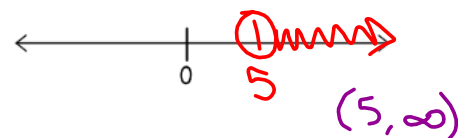
$$3) \quad 1.45 \geq 5m - 3.2$$

$$\begin{array}{r} +3.2 \quad +3.2 \\ \hline 4.65 \geq 5m \\ \frac{4.65}{5} \geq \frac{5m}{5} \\ 0.93 \geq m \\ m \leq 0.93 \end{array}$$



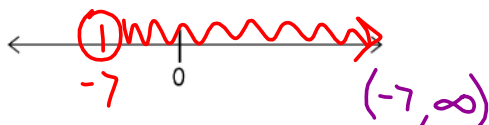
$$4) \quad 2x + 8 > 18$$

$$\begin{array}{r} -8 \quad -8 \\ \hline 2x > 10 \\ \frac{2x}{2} > \frac{10}{2} \\ x > 5 \end{array}$$



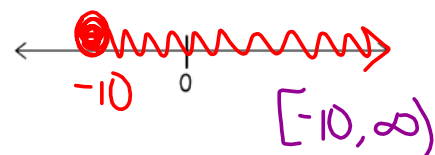
$$5) \quad -9n + 11 < 74$$

$$\begin{array}{r} -11 \quad -11 \\ \hline -9n < 63 \\ \frac{-9n}{-9} < \frac{63}{-9} \\ n > -7 \end{array}$$



$$6) \quad \frac{y}{-5} - 11 \leq -9$$

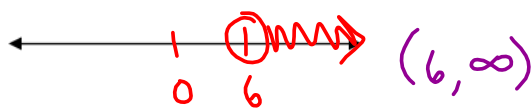
$$\begin{array}{r} +11 \quad +11 \\ \hline \frac{y}{-5} \leq 2 \\ \frac{y}{-5} \cdot \frac{-5}{-5} \leq 2 \cdot \frac{-5}{-5} \\ y \geq -10 \end{array}$$



CLASSWORK: Solve each inequality algebraically, graph your solution on the number line and then represent your solution by using interval notation.

$$1) \quad 5x + 7 > 37$$

$$\quad \quad \quad \begin{array}{r} \cancel{7} \quad \cancel{-7} \\ \hline 5x > 30 \\ \cancel{5} \quad \quad \cancel{5} \\ \hline x > 6 \end{array}$$



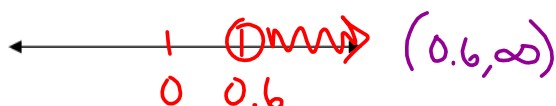
$$2) \quad \frac{x}{5} + 36 \geq 51$$

$$\quad \quad \quad \begin{array}{r} \cancel{-36} \quad \cancel{-36} \\ \hline \frac{x}{5} \geq 15 \\ \cancel{1} \cdot \frac{x}{5} \geq 15 \cdot \cancel{5} \\ \hline x \geq 75 \end{array}$$



$$3) \quad -2x + 0.5 < 1.7$$

$$\quad \quad \quad \begin{array}{r} \cancel{-0.5} \quad \cancel{-0.5} \\ \hline -2x < 1.2 \\ \cancel{-2} \quad \quad \cancel{-2} \\ \hline x > 0.6 \end{array}$$



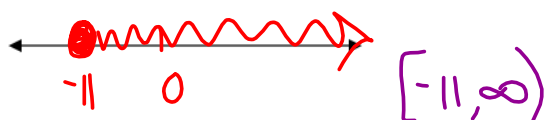
$$4) \quad \frac{x}{-5} - 3.25 \geq 4.62$$

$$\quad \quad \quad \begin{array}{r} \cancel{+3.25} \quad \cancel{+3.25} \\ \hline \frac{x}{-5} \geq 7.87 \\ \cancel{1} \cdot \frac{x}{-5} \geq 7.87 \cdot \cancel{-5} \\ \hline x \leq -39.35 \end{array}$$



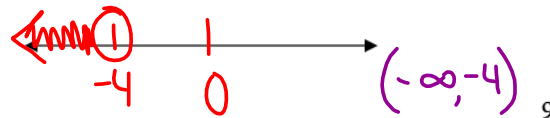
$$5) \quad -64 \leq 5y - 9$$

$$\quad \quad \quad \begin{array}{r} \cancel{+9} \quad \quad \quad \cancel{+9} \\ \hline -55 \leq 5y \\ \cancel{5} \quad \quad \quad \cancel{5} \\ \hline -11 \leq y \\ y \geq -11 \end{array}$$



$$6) \quad -3(m - 2) > 18$$

$$\quad \quad \quad \begin{array}{r} \cancel{-6} \quad \quad \quad \cancel{-6} \\ \hline -3m + 6 > 18 \\ \cancel{-6} \quad \quad \quad \cancel{-6} \\ \hline -3m > 12 \\ \cancel{-3} \quad \quad \quad \cancel{-3} \\ \hline m < -4 \end{array}$$



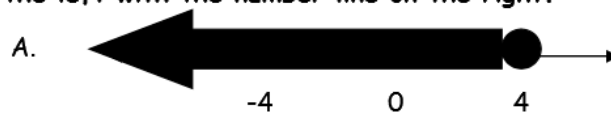
HW: Inequalities

Circle TRUE or FALSE for each of the following.

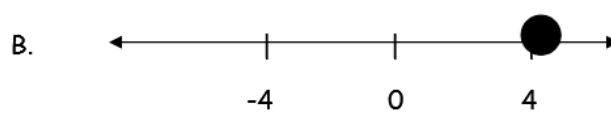
- | | | |
|------------------------------------|------|-------|
| 1. $x + 3 \geq 9$, if $x = 6$ | TRUE | FALSE |
| 2. $7 - x < -4$, if $x = -11$ | TRUE | FALSE |
| 3. $13 \leq -3x + 1$, if $x = -4$ | TRUE | FALSE |
| 4. $3(x - 4) > -21$, if $x = -3$ | TRUE | FALSE |

Match the equation or inequality on the left with the number line on the right.

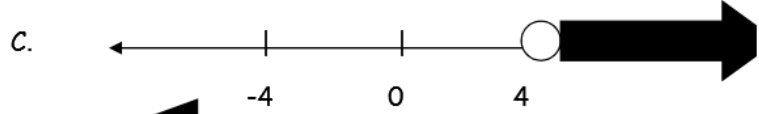
_____ 5. $x \leq 4$



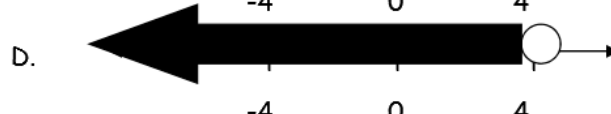
_____ 6. $x > 4$



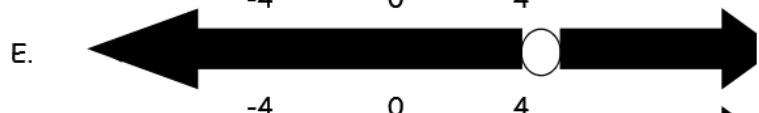
_____ 7. $x \neq 4$



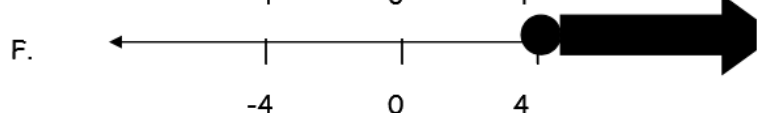
_____ 8. $4 \leq x$



_____ 9. $4 = x$



_____ 10. $x < 4$



Solve the following inequalities. Represent each solution using interval notation.

11) $4x > -2.4$

12) $x + 9\frac{1}{6} < 4\frac{5}{9}$

13) $-0.7x \geq -35$

14) $-\frac{2}{5}x \leq 10$

Solve and **GRAPH** the solution to the following inequalities.

15) $-1.2 + 4x \leq 5.36$

16) $\frac{2}{3}(6 + x) \geq 28$



17) $-5\frac{7}{8} + \frac{3}{4}x < 2\frac{1}{6}$

18) $12.65 + \frac{x}{-7} > 8.14$



AIM: SWBAT solve and graph multi-step inequalities.

DO NOW: Solve and graph your solution on a number line.

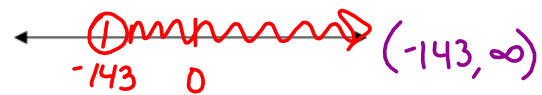
$$1) \frac{1}{4}z - 5 \leq -\frac{1}{5}z$$

$$\begin{array}{r} -\frac{1}{4}z \\ \hline -\frac{20}{9} \cdot -5 \leq -\frac{1}{5}z \cdot -\frac{20}{9} \\ 11\frac{1}{9} \geq z \\ z \leq 11\frac{1}{9} \end{array}$$

$$2) \frac{4}{11}c - \frac{5}{13}c < 3$$

$$\frac{-143}{3} \cdot \frac{-3}{143} c < 3 \cdot \frac{-143}{3}$$

$$c > -143$$



Solving Multi-step Inequalities

Goal: Get variable by itself. Get variable terms on one side and constant terms on the opposite side. Use opposite operations!

OR

When solving multi-step equations we can use PEMDAS BACKWARDS to help us decide which operation to undo first.

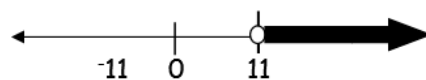
When solving multi-step inequalities we do the same thing. Use PEMDAS BACKWARDS!

EXAMPLE:

$$5n - 3n - 5 > 17 \quad (\text{Simplify First!})$$

$$2n - 5 > 17 \quad (\text{undo addition/subtraction before multiplication/division})$$

$$\begin{array}{r} +5 +5 \\ \hline 2n > 22 \\ \hline 2 \quad 2 \\ \hline n > 11 \end{array}$$



Remember: To check the equality you must choose ANY number greater than 11.

Check:

- 1) $5n - 3n - 5 > 17$?
- 2) $5(20) - 3(20) - 5 > 17$
- 3) $100 - 60 - 5 > 17$
- 4) $35 > 17$ True

Practice Problems. Solve and graph your solution on a number line.
Use interval notation to represent your solution.

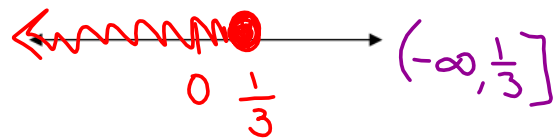
1) $9b - 3b + 34 < 2b - 10$

$$\begin{array}{r} 6b + 34 < 2b - 10 \\ -2b \quad -2b \\ \hline 4b + 34 < -10 \\ -34 \quad -34 \\ \hline 4b < -44 \\ \frac{4}{4} \quad \frac{4}{4} \\ b < -11 \end{array}$$



2) $1.2c + 1.2 \geq 5.2c - 0.4c$

$$\begin{array}{r} 1.2c + 1.2 \geq 4.8c \\ -1.2c \quad -1.2c \\ \hline 1.2 \geq 3.6c \\ \frac{1.2}{3.6} \geq \frac{3.6c}{3.6} \\ \frac{1}{3} \geq c \\ c \leq \frac{1}{3} \end{array}$$



3) $10a > -5(a + 6)$



4) $9(c - 3) < 29 + 2c$



Homework - Solving Multi-Step Inequalities

Solve each inequality and graph your solution on a number line. Use interval notation to represent the solution

1) $2(5 + n) \leq 6$

2) $5 - 4z > 17 - z$



3) $2(5x - 4) \leq 8(x + 1)$

4) $\frac{1}{3}m - \frac{1}{2}m > -4$



5) $3.7z \leq 33.32 - 3.1z$

6) $-0.6y - 3.79 < 5.2y + 19.67$



7) $4(6k - 4) \geq 7k - (2k - 3)$

8) $2.3x - 52.46 > -0.9(x - 117)$

