Monday, November 10, 2014~Day 2

Aim:
YWBAT Review Solving Inequalities

Do Now:
Worksheet

HW:
Study for Wednesday's Test
Inequalities Review—Do Now

1) Given: \( f(x) = -3x + 12 \) and \( f(x) < 5 \)

Find the SMALLEST INTEGER value for \( x \).

\[
\frac{-3x + 12}{12} < \frac{5}{12} - \frac{12}{12} \]

\[
-3x < -3 \\
\frac{-3}{3}x < \frac{-3}{3} \\
x > 2.3
\]

Smallest integer value for \( x = 3 \).

2) Given \( f(x) = -5(x + 2) + 5 \) and \( g(x) = -3x - 2(x + 1) \)

Find all the values of \( x \) for which \( f(x) < g(x) \)

\[
-5(x + x) + 5 < -3x - 2(x + 1) \\
-5x - 10 + 5 < -3x - 2x - 2 \\
-5x - 5 < -5x - 2 \]

\[
+5 < 2 \]

Always True
All Real Numbers.
1. $(x < -2) \land (x \geq 1)$
2. $(x < -2) \lor (x \geq 1)$
3. $-2 < x \leq 1$
4. $(x > -2) \land (x \geq 1)$
5. $(x \leq 1) \lor (x < -2)$
6. $(x \leq 1) \land (x < -2)$
7. $(x > -2) \lor (x \leq 1)$
8. $(x > -2) \land (x \geq 1)$

No Solution
3) Jack is considering purchasing a gym membership. He is considering two gyms. The first club, Pumpin' Iron, charges $30 per month plus a registration fee of $300. The second gym, Muscle Mania, charges $50 per month, with no additional fees. For how many months would Jack have to retain his membership for Pumpin' Iron to be the better buy (based on cost)? Let \( x \) = number of months.

\[
Pumpin' Iron < Muscle Mania
\]

\[
30x + 300 < 50x
\]

\[
-30x
\]

\[
\frac{-300 \leq 20x}{20} \quad \frac{-20}{20} \quad 15 \leq x \quad or \quad x > 15
\]

Pumpin' Iron is a better buy if Jack is a number for more than 15 mos.

Practice Solving Compound Inequalities
(Give solutions on number line, in set-builder and in interval notation)

4) \( 3x + 2 \leq 5 \) OR \( 7x - 10 > 60 \)

\[
\begin{align*}
\frac{-2}{2} & \leq x & \frac{+10}{2} & \quad \frac{-7}{7} & \quad \frac{-100}{7} & \quad \frac{3x}{7} & \quad \frac{+4}{7} & \quad \frac{x > 10}{x < 10}
\end{align*}
\]

5) \( \left[ \frac{y}{2} - 0.25y > 2.5 \right] \quad 300 > -25y > 250 \)

\[
\begin{align*}
-25 & \quad \frac{300}{-25} & \quad \frac{-300}{-25} & \quad \frac{-25}{-25} & \quad \frac{+25}{+25} & \quad \frac{+75}{-75} & \quad \frac{+75}{-75}
\end{align*}
\]

\[
\begin{align*}
\left( -12 < y \right) \quad \left( y < 10 \right) & \quad (-12 < y < 10)
\end{align*}
\]

6) \( \frac{y}{2} - 5 \leq 3 \quad \frac{+5}{2} \quad \frac{y}{2} \geq 8 \quad \frac{y}{2} \leq 8 \)

\[
\begin{align*}
\frac{1 - 2y}{3} & \quad \frac{\leq 41}{2} & \quad \frac{3}{2} & \quad \frac{1}{2} & \quad \frac{\leq 2}{y} & \quad \frac{\geq 6}{y}
\end{align*}
\]

Set Builder: \( \left\{ y \mid (x < 1), y \in \mathbb{R} \right\} \) Interval: \( (-\infty, 1) \cup (10, \infty) \)

7) \( \left[ \frac{(y - 3)}{2} - \frac{5}{6} \right] \quad \left[ \frac{9}{2} \right] \quad \left[ \frac{W + 3}{2} \right] \quad \left[ \frac{-9}{2} \right] \quad \left[ \frac{10w - 3}{2} \right] \quad \left[ \frac{10W + 3}{2} \right] \quad \left[ \frac{10W - 3}{2} \right] \quad \left[ \frac{O.9}{2} \right] \quad \left[ \frac{O.9}{2} \right] \quad \left[ \frac{2.3}{2} \right]
\]

Set Builder: \( \left\{ y \mid (x < 1), y \in \mathbb{R} \right\} \) Interval: \( (-\infty, 1) \cup (10, \infty) \)

\[
\begin{align*}
\frac{10w - 3}{2} & \quad \frac{10W + 3}{2} & \quad \frac{10W - 3}{2} & \quad \frac{O.9}{2} & \quad \frac{O.9}{2} & \quad \frac{2.3}{2}
\end{align*}
\]

Set Builder: \( \left\{ y \mid (x < 1), y \in \mathbb{R} \right\} \) Interval: \( (-\infty, 1) \cup (10, \infty) \)
Review Sheet on Solving Inequalities

For each inequality
- draw a number line
- write the inequality using set builder
- write the inequality using interval notation

1. \( x > 5 \)  
   Set Builder: ________________  
   Interval: ________________

2. \( x \leq -4 \)  
   Set Builder: ________________  
   Interval: ________________

3. \( -2 \leq x \leq 4 \)  
   Set Builder: ________________  
   Interval: ________________

4. \((x>6) \lor (x \leq -2)\)  
   Set Builder: ________________  
   Interval: ________________

Solve each of the following for \( x \) in terms of the other variables.  
State any EXCLUDED VALUES (values that make the solution undefined).

5. \( x + 4c > 2b \)  
6. \( a (1-x) < 7 \)

Write ALWAYS~SOMETIMES~NEVER

7. If \( x < y \) then \( x - a > x - a \)
8. If \( x > y \) then \( -x < -y \)
9. If \( x < y \) then \( \frac{x}{a} < \frac{y}{a} \)
10. If \( xy < 0 \) then \( x < 0 \) and \( y < 0 \)
11. If \( f(x) = \frac{1}{2} x + 7 \) and \( x < 0 \), then \( f(x) < 0 \).
Review Sheet on Solving Inequalities

For each inequality
- draw a number line
- write the inequality using set builder
- write the inequality using interval notation

1. \( x > 5 \)
   
   Set Builder: \( \{ x \mid x > 5, x \in \mathbb{R} \} \)
   
   Interval: \( (5, \infty) \)

2. \( x < -4 \)
   
   Set Builder: \( \{ x \mid x < -4, x \in \mathbb{R} \} \)
   
   Interval: \( (-\infty, -4] \)

3. \(-2 < x \leq 4 \)
   
   Set Builder: \( \{ x \mid -2 < x \leq 4, x \in \mathbb{R} \} \)
   
   Interval: \( (-2, 4] \)

4. \((x+6) \cap (x \geq -2) \cup (x > 0), x \in \mathbb{R} \)
   
   Set Builder: \( \{ x \mid (x+6) \cap (x \geq -2) \cup (x > 0), x \in \mathbb{R} \} \)
   
   Interval: \( (-\infty, -6] \cup (-2, 0) \cup (0, \infty) \)

Solve each of the following for \( x \) in terms of the other variables.
State any EXCLUDED VALUES (values that make the solution undefined).

5. \( x + 4c > 2b \)
   
   \( x > 2b - 4c \)

6. \( \frac{a(l-x)}{a} < \frac{7}{a} \)
   
   OR \( \frac{-ax}{a} < \frac{7}{a} \)
   
   \( l - x < \frac{7}{a} \)
   
   \( -l < -\frac{7}{a} \)
   
   \( x > \frac{7}{a} - l \)

Write ALWAYS-SOMETIMES-NEVER

7. If \( x < y \) then \( x - a > x - a \) **Never**

8. If \( x > y \) then \( x - y \) **Always**

9. If \( x \neq y \) then \( \frac{x}{a} \neq \frac{y}{a} \) **Sometimes**

10. If \( xy < 0 \) then \( x < 0 \) and \( y < 0 \) **Never**

11. If \( f(x) = \frac{1}{2}x + 7 \) and \( x < 0 \), then \( f(x) < 0 \). **Sometimes**
Solve and graph your solution on a number line. Write your answer in interval notation.

12. \((2x - 4 \leq 8) \lor (-3x > 12)\) 

13. \(-8 \leq x - 2 < 9\)

\[\]

Interval: __________________________  Interval: __________________________

Solve each inequality and graph the solution on a number line. If the inequality gives you a contradiction or a statement that is always true you must explain what that means.

14. \(-3x > 15\)

15. \(\frac{x}{2} > 5\)

\[\]

16. \(-7y + 7 < 21\)

17. \(10y > 5(2y + 4)\)

\[\]
Solve and graph your solution on a number line. Write your answer in interval notation.

12. \((2x - 4 \leq 8) \lor (-3x > 12)\)
\[
\begin{align*}
+4 & = 14 \quad -3x \rightarrow -3 \\
\frac{2x \leq 12}{2} & \lor \frac{x \leq -4}{x \leq 6} \\
\end{align*}
\]
Interval: \((-\infty, 6]\)

13. \(-8 \leq x - 2 \land x - 2 \leq 9\)
\[
\begin{align*}
+2 & = +2 \quad +2 = +2 \\
-6 \leq x & \land (x \leq 11) \\
\end{align*}
\]
Interval: \([-6, 11]\)

Solve each inequality and graph the solution on a number line. If the inequality gives you a contradiction or a statement that is always true you must explain what that means.

14. \(-3x + 15\)
\[
\begin{align*}
-3 & = -3 \\
x & < -5 \\
\end{align*}
\]

15. \(\frac{x}{8} > 5 \cdot 2\)
\[
\begin{align*}
x & > 10 \\
\end{align*}
\]

16. \(-7y + 7 \leq 21\)
\[
\begin{align*}
-7 & = -7 \\
\frac{-7y \leq 14}{-7} & \lor \frac{y \geq -2}{y \geq -2} \\
\end{align*}
\]

17. \(10y > 5(2y + 4)\)
\[
\begin{align*}
10y & > 10y + 20 \\
-10y & = -10y \\
0 & > 20 \\
\text{Contradiction} \\
\end{align*}
\]
\[\text{No Solution}\]
18. \(5 - 4m + 8 + 2m > -17\)

19. \(3(3x + 2) > 7x - 2\)

20. \(\frac{7x - x}{10} \leq \frac{3}{2}\)

21. \(\frac{3x - 3}{5} \leq \frac{4x - 2}{6}\)

22. \(7 + 3y > 2(y + 3) - 2(-1 - y)\)

23. \(2y + 7(1 - y) < -8\)

24. Given \(3x + ax - 6 > -10\), determine the LARGEST INTEGER value of \(a\) when \(x = -2\).
18. $5 - 4m + 8 + 2m > -17
\quad -2m + 13 > 17
\quad -13 = -13
\quad -2m > -30
\quad m < 15$

19. $3(3x + 2) > 7x - 2
\quad 9y + 6 > 7x - 2
\quad -7y = -7x
\quad 2x + 6 > -2
\quad -6 = -6
\quad 2x > -\frac{8}{2}
\quad x > -4$

20. $(\frac{7x}{10} - \frac{x}{5} < \frac{3}{2})
\quad 7x - 2x < 15
\quad 5x < 15
\quad x < 3$

21. $3x - 3 \leq 5x - 5
\quad 4x - 2 \leq 20x - 10
\quad -16x = -16
\quad 2x = 10
\quad x \geq -4$

22. $7 + 3y + 2(1 - y) > -2(-1 - y)
\quad 7 + 3y > -2 + 2 + 2y
\quad 7 + 2y > 4y + 8
\quad -3y = -3
\quad y > 4 + \frac{8}{7}
\quad y > 4 + \frac{8}{7}$

23. $2y + 7(1 - y) < -8
\quad 2y + 7 - 7y < -5
\quad -5y + 7 < -8
\quad -5y = -7
\quad y > 3$

24. Given $3x + ax - 6 > -10$, determine the LARGEST INTEGER value of $a$ when $x = -2$.

$3(-2) + a(-2) - 6 > -10$
\quad -6 - 2a - 6 > -10
\quad -12 - 2a > -10
\quad +12 = +12
\quad -2a > 2
\quad -a > -1$

$\text{Answer: Largest Integer } a < -1$
Write an inequality that would be used to represent each of the following real life situations. Let \( x \) represent any unknown.

25. An Olympic wrestler is considered a welterweight if he weighs more than 68 kilograms but not more than 74 kilograms.

26. Danielle is shopping for boots. Her mom told her that she can spend at most $75 on the boots.

27 a) A teacher told the class that the test grades were BETWEEN 75 and 95.

b) A teacher told the class that the test grades were BETWEEN 75 and 95 INCLUSIVE

28. In order to go swimming the pool must be at least 70 degrees.

Word Problems – solve the following ALGEBRAICALLY.

29. If ten times an integer is increased by 9, the result is at most 59. Find the GREATEST possible integer.

30. The length of a rectangle is 8 less than 3 times the width; the perimeter is at least 80 cm. What is LEAST possible measurement for the length of the rectangle?
Write an inequality that would be used to represent each of the following real life situations. Let $x$ represent any unknown.

25. An Olympic wrestler is considered a welterweight if he weighs more than 68 kilograms but not more than 74 kilograms.
   
   \[ 68 < x \leq 74 \]

26. Danielle is shopping for boots. Her mom told her that she can spend at most $75 on the boots.
   
   \[ x \leq 75 \]

27 a) A teacher told the class that the test grades were BETWEEN 75 and 95.
   
   \[ 75 \leq x < 95 \]

   b) A teacher told the class that the test grades were BETWEEN 75 and 95 INCLUSIVE
   
   \[ 75 \leq x \leq 95 \]

28. In order to go swimming the pool must be at least 70 degrees.
   
   \[ x \geq 70 \]

**Word Problems - solve the following ALGEBRAICALLY.**

29. If ten times an integer is increased by 9, the result is at most 59. Find the GREATEST possible integer.

Let $x$ = integer

\[
\begin{align*}
10x + 9 & \leq 59 \\
-9 & = -9 \\
10x & \leq 50 \\
\frac{10x}{10} & \leq 5 \\
x & \leq 5
\end{align*}
\]

The greatest possible integer is 5.

30. The length of a rectangle is 8 less than 3 times the width; the perimeter is at least 80 cm. What is LEAST possible measurement for the length of the rectangle?

Let $x$ = width

\[
\begin{align*}
2(3x - 8 + y) & > 80 \\
2(4x - 8) & > 80 \\
8x - 16 & > 80 \\
8x & > 96 \\
x & > 12
\end{align*}
\]

The width must be greater than 12 cm and the length must be greater than 28 cm.
31. Zen Yoga charges $30 per month for membership and also charges $5 for every class a member attends. Yoga Lot charges $25 per month but its per class rate is $8. What is the fewest number of classes for which a membership at Zen Yoga is a better buy?

32. The cost of an international phone call is $10 for the first 5 minutes and $1.25 for each additional minute. What is the greatest number of minutes of a call that a person can make and not spend more than $35?

33. A babysitter charges $25 for the first 2 hours of babysitting and $3.00 for each additional 1/2 hour. The sitter earned AT MOST $46. What was the MAXIMUM time that he babysat?
31. Zen Yoga charges $30 per month for membership and also charges $5 for every class a member attends. Yoga Lot charges $25 per month but its per class rate is $8. What is the fewest number of classes for which a membership at Zen Yoga is a better buy?

Let \( x \) = number of classes

\[
\begin{align*}
\text{Zen} & < \text{Yoga Lot} \\
5x + 30 & < 8x + 25 \\
-5x & < -25 \\
\frac{5x}{5} & < \frac{-25}{5} \\
& < -5x \\
& < -5 < \frac{3x}{3} \\
& < -5 \text{ or } x > 1.6
\end{align*}
\]

Zen Yoga is a better buy when you take at least 2 classes.

32. The cost of an international phone call is $10 for the first 5 minutes and $1.25 for each additional minute. What is the greatest number of minutes of a call that a person can make and not spend more than $35?

Let \( m \) = number of additional minutes

\[
\begin{align*}
100(10 + 1.25m) & \leq 35 \\
1000 + 125m & \leq 3500 \\
-1000 & = -1000 \\
125m & = 2500 \\
\frac{125m}{125} & = \frac{2500}{125} \\
m & \leq 20
\end{align*}
\]

The call can be at most 25 minutes.

33. A babysitter charges $25 for the first 2 hours of babysitting and $3.00 for each additional \( \frac{1}{2} \) hour. The sitter earned at most $46. What was the maximum time that he babysat?

Let \( x \) = additional \( \frac{1}{2} \) hours

\[
\begin{align*}
25 + 3x & \leq 46 \\
-25 & = -25 \\
3x & \leq 21 \\
\frac{3x}{3} & = \frac{21}{3} \\
x & \leq 7
\end{align*}
\]

The babysitter sat for at most 5 \( \frac{1}{2} \) hours.