Unit 2 Test Study Guide

Solving Inequalities

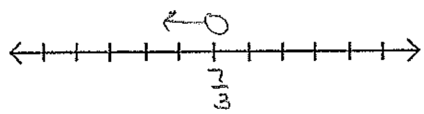
- Remember to switch the inequality symbol ONLY when dividing/multiplying by a negative
- Report the solution area in interval notation
  - ( ) → <, >, or infinity
  - [ ] → $\leq$ or $\geq$

Exercise 1 Find and graph the solution set of each of the following.

1) $5x + 4 < 11 - 2x$

$+2x \quad -4 \quad -4 \quad +2x$

$\frac{3x}{3} < \frac{7}{3} \qquad x < \frac{7}{3}$

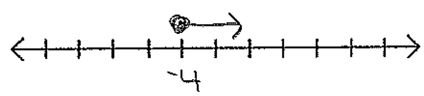


2) $2(2x - 8) - 8x \leq 0$

$4x - 16 - 8x \leq 0$

$-4x \leq 16$

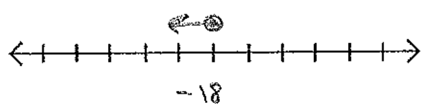
$x \geq -4$



3) $\frac{-2}{3}m \geq 12$

$-2m \geq 36$

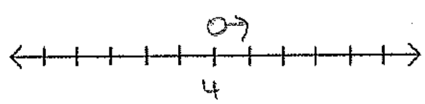
$m \leq -18$



4) $5x - 4 > 4 - 3x$

$+3x \quad +4 \quad +4 \quad +3x$

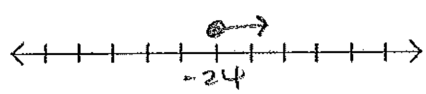
$2x > 8 \qquad x > 4$



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

$-\frac{x}{2} \quad +1 \quad -\frac{x}{2} \quad +1$

$-\frac{1}{6}x \leq 4 \qquad x \geq -24$



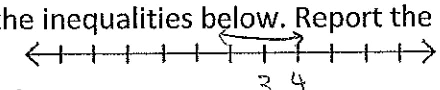
Compound Inequalities

- Conjunction: "and," solution areas meet in the middle, has 1 solution interval, usually looks like # < x < #
- Disjunction: "or," solution areas go opposite directions, has 2 solution intervals connected with U

Exercise 2: Solve and graph the inequalities below. Report the answers in interval notation.

1. $\frac{k}{4} \leq 1$ or $-\frac{k}{3} \leq -1$

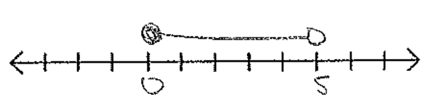
$k \leq 4$ or $k \geq 3$ $\quad \mathbb{R}$



2. $6 \leq x + 6 < 11$

$-6 \quad -6 \quad -6$

$0 \leq x < 5$



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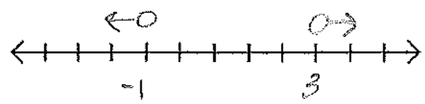
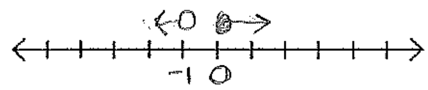
3. $9 + 2b < 7$ or $7 - 5b < -8$



$2b < -2$ $\quad$ $-5b < -15$

$b < -1$ $\quad$ $b > 3$

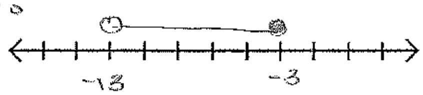
4. $4a + 8 > 11a + 15$ and $13 - 14a \leq 13 - 3a$



$-7a > 7$ $\quad$ $-11a \leq 0$

$a < -1$ $\quad$ $a \geq 0$

5. $5v + 10 \leq -4v - 17 < 9 - 2v$



$5v + 10 \leq -4v - 17$ $\quad$ $9v + 10 \leq -17$ $\quad$ $9v \leq -27$ $\quad$ $v \leq -3$

$-4v - 17 < 9 - 2v$ $\quad$ $-2v < 26$ $\quad$ $v > -13$

Inequalities Word Problems:

=	<	≤	>	≥
Is		At most		At least
		Look in Notes!		

Exercise 3: Write an inequality and solve the problem algebraically.

(1) Joan needed \$100 to buy a graphing calculator for her math class. Her neighbor will pay her \$5 per hour to babysit and her Father gave her \$10 for mowing the lawn. What is the minimum amount of hours she will need to babysit in order for her to buy her calculator?

$5x + 10 \geq 100$

$5x \geq 90$

$\boxed{x \geq 18}$

(2) Mrs. Scott decided that she would spend no more than \$120 to buy a jacket and a skirt. If the price of the jacket was \$20 more than 3 times the price of the skirt. Find the highest possible price of the skirt?

$j + s \leq 120$

$j = 3s + 20$

$3s + 20 + s \leq 120$

$4s + 20 \leq 120$

$4s \leq 100$

$\boxed{s \leq 25}$

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(3) Stephanie weighs 3 times as much as Rachel. Both weights are whole numbers and the sum of their weights is less than 160 pounds. Find the greatest possible weight for each girl.

r = Rachel
s = Stephanie

$s = 3r$
$r + 3r < 160$
$4r < 160$
$r < 40$
$3(40) = 120$

The greatest possible weights are that Rachel must weigh less than 40 & Stephanie less than 120 pounds

(4) Mr. Diaz wishes to save at least $1500 in 12 months. If she saved $300 during the first 4 months, what is the least possible average amount that she must save in each of the remaining 8 months?

$300 + x \geq 1500$
$-300 \quad -300$
$x \geq 1200$
$1200 \div 8 = 150$

She must save at least $150 for each of the remaining months

(5) Two consecutive even integers are such that their sum is greater than 98 decreased by twice the larger. Find the smallest possible values for the integers.

$x + x + 2 > 98 - 2(x+2)$
$2x + 2 > 98 - 2x - 4$
$2x + 2 > 94 - 2x$
$+2x \;\; -2 \quad -2 \;\; +2x$
$4x > 92$
$\frac{4x}{4} > \frac{92}{4}$
$x > 23$

even, so smallest possible is 24

Absolute Value Equations and Inequalities

- If you see absolute value bars, you MUST get them by themselves, then SPLIT it up into the positive and negative side!
  - For equations, report the values in {set} notation
- If it is an inequality, when you split it up ALSO flip the inequality symbol!
  - For inequalities, report the values in interval notation.

Exercise 4: Solve and graph the following. Report values appropriately.

1. $|2x+5| = 3$

$2x + 5 = 3$, $-5 \;\; -5$, $\frac{2x}{2} = \frac{-2}{2}$, $\boxed{x = -1}$

$2x + 5 = -3$, $-5 \;\; -5$, $\frac{2x}{2} = \frac{-8}{2}$, $\boxed{x = -4}$

2. $3|2x-2| + 8 = 23$

$-8 \quad -8$
$3|2x-2| = 15$
$|2x-2| = 5$

$2x - 2 = 5$, $+2 \;\; +2$, $2x = 7$, $\boxed{x = 7/2}$

$2x - 2 = -5$, $+2 \;\; +2$, $2x = -3$, $\boxed{x = -3/2}$

3. $|5 - (2x+3)| = |4x - 9|$

$|-2x + 2| = |4x - 9|$

$-2x + 2 = 4x - 9$, $+2x + 9 \quad +2x + 9$, $11 = 6x$, $\boxed{x = \frac{11}{6}}$

$-2x + 2 = -4x + 9$, $+4x - 2 \quad +4x - 2$, $2x = 7$, $\boxed{x = 7/2}$

4. $|2x - 3| \leq 5$

$2x - 3 \leq 5$, $+3 \;\; +3$, $2x \leq 8$, $x \leq 4$

$2x - 3 \geq -5$, $+3 \;\; +3$, $2x \geq -2$, $x \geq -1$

$[-1, 4]$

5. $-2|x+6| > -10$

$\div -2 \quad \div -2$
$|x + 6| < 5$

$x + 6 < 5$, $-6 \;\; -6$, $x < -1$

$x + 6 > -5$, $-6 \;\; -6$, $x > -11$

$(-11, -1)$

6. $|11 + 3x| + 6 > 10$

$-6 \quad -6$
$|11 + 3x| > 4$

$11 + 3x > 4$, $-11 \;\; -11$, $\frac{3x}{3} > \frac{-7}{3}$, $x > -7/3$

$11 + 3x < -4$, $-11 \;\; -11$, $3x < -15$, $x < -5$

$(-\infty, -5) \cup (-7/3, \infty)$

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Proofs

- Use the properties to prove that something is a solution
- Follow the same steps you would normally solve, just name them

Exercise 5: Prove the following.

1. Given: $3(5x + 1) = 13x + 5$
   Prove: ~~$x = 1$~~ $x = 1$

Statements	Reasons
$3(5x+1) = 13x+5$	Given
$15x+3 = 13x+5$	Distributive Prop. of Equality
$2x+3=5$	Subtraction
$2x=2$	Subtraction
$x=1$	Division