Advanced Algebra 3 Solving One-Variable Inequalities Name_____

1. How do you solve equations if they have parentheses? Write a description of how you remove the parentheses in each type of problem shown below.

a. $3(x+1) = -12$

$\frac{3}{3} \quad \frac{3}{3}$

$x + 1 = -4$

$-1 \quad -1$

$x = -5$

b. $5 - 2(x - 3) = 11$

$-5 \quad -5$

$\frac{-2(x-3)}{-2} = \frac{6}{-2}$

$x - 3 = -3$

$+3 \quad +3$

$x = 0$

c. $12 - (x + 4) = -20$

$-12 \quad -12$

$\frac{-(x+4)}{-1} = \frac{-32}{-1}$

$x + 4 = 32$

$-4 \quad -4$

$x = 28$

2. How do you solve equations if they have variables (x) in different locations in the equation? Write a description of how you combine variables in each type of problem shown below.

a. $3x - 7 = 5x + 21$

$-3x \quad -3x$

$-7 = 2x + 21$

$-21 \quad -21$

$\frac{-28}{2} = \frac{2x}{2}$

$-14 = x$

b. $4x - 2(x + 3) = -10$

$4x - 2x - 6 = -10$

$+6 \quad +6$

$\frac{2x}{2} = \frac{-4}{2}$

$x = -2$

c. $-2x + 5 = 3x - 25$

$+2x \quad +2x$

$5 = 5x - 25$

$+25 \quad +25$

$\frac{30}{5} = \frac{5x}{5}$

$6 = x$

3. Consider the inequality: $5x + 1 \geq -14$.

a. Show that $x = 4$ is a solution to the inequality.

$5(4) + 1 \geq -14 \rightarrow 20 + 1 \geq -14$ Yes!

b. Show that $x = -4$ is not a solution to the inequality.

$5(-4) + 1 \geq -14 \rightarrow -20 + 1 \geq -14$ No!

c. Solve the equation $5x + 1 = -14$ for x. Is this answer a solution to the inequality above? Explain why or why not.

$\frac{5x}{5} = \frac{-15}{5} \rightarrow x = -3$

d. Explain why the solution to part (c) is the SMALLEST possible solution to the inequality $5x + 1 \geq -14$.

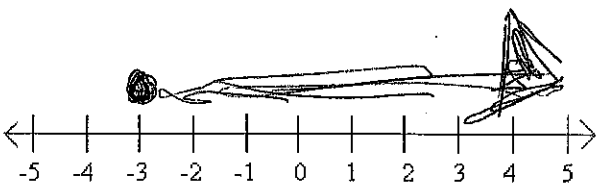
Any number smaller than -3 would not work.

e. Determine 3 three other solutions to the inequality $5x + 1 \geq -14$. Mark all of the solutions you have found so far on the number line below:

$5(0) + 1 = 1 \geq -14$

$5(100) + 1 \geq 501 \geq -14$

$5(-2) + 1 = -9 \geq -14$



f. Use your answer to parts (d) and (e) to show all of the solutions on the number line above. Write the solutions as an inequality.

$x \geq -3$

4. For each inequality below,
   i. Find the boundary point.
   ii. Choose and test a point.
   iii. Use the boundary point and your test point to shade the solutions on a number line.
   iv. Write the solution as an inequality (using <, >, ≤, ≥).

a. $10 - 3x \leq -20$

$-10 \quad -10$

$-3x \leq -30$

$\div -3 \quad \div -3$

$x \geq 10$

b. $4 - 2(x+1) > 6$

$-4 \quad -4$

$-2(x+1) > 2$

$\div -2 \quad \div -2$

$x + 1 < -1$

$-1 \quad -1$

$x < -2$

c. $-5x + 13 < 5(2 - x)$

$-5x + 13 < 10 - 5x$

$+5x \quad +5x$

$13 < 10$

No solution

d. $1 - (2x+3) > 8$

$1 - 2x - 3 > 8$

$-2x - 2 > 8$

$+2 \quad +2$

$-2x > 10$

$\div -2 \quad \div -2$

$x < -5$

e. $10x - 3 \geq 7x + 3(x-1)$

$10x - 3 \geq 7x + 3x - 3$

$10x - 3 \geq 10x - 3$

All solutions

3. Mason is working during April as a salesman at a computer retail store. He is paid a flat salary of $500 plus $12 for every computer he sells. He finds that he must earn at least $1500 to pay for his April expenses.
   a. Can Mason cover his monthly expenses if he sells 20 computers? If he sells 75 computers? Show how you found your answer.

$500 + 12(20) = 740 \rightarrow$ No

$500 + 12(75) = 1400 \rightarrow$ No

   b. Write and solve an inequality to represent Mason's situation.

$500 + 12x \geq 1500$

$-500 \quad -500$

$12x \geq 1000$

$x \geq 83.3$

   c. What does your solution tell you about Mason's job and how many computers he sells?

He needs to sell at least 84 computers to afford his April expenses.

4. **Challenge**: A model rocket is launched from the ground with an initial velocity of 200 feet per second. The function that describes the rocket's height over time (x) is $h(x) = -16x^2 + 200x$. The rocket will not be visible above 500 feet because of clouds.
   a. Draw a picture of the rocket's path. Include some nice fluffy clouds.
   b. Write an inequality to describe when the rocket cannot be seen.
   c. Solve the inequality and explain what this tells you about the rocket's path.

The rocket can't be seen from 3.455 to 9.045 seconds

$-16x^2 + 200x \geq 500$

$-16x^2 + 200x - 500 \geq 0$

$x = \frac{-200 \pm \sqrt{200^2 - 4(-16)(-500)}}{2(-16)}$

$= \frac{-200 \pm \sqrt{40000 - 8000}}{-32} = \frac{-200 \pm \sqrt{32000}}{-32}$

$\frac{-200 \pm 89.44}{-32}$

$= \frac{-200 \pm 178.89}{-32}$

3.455 9.045

oops.