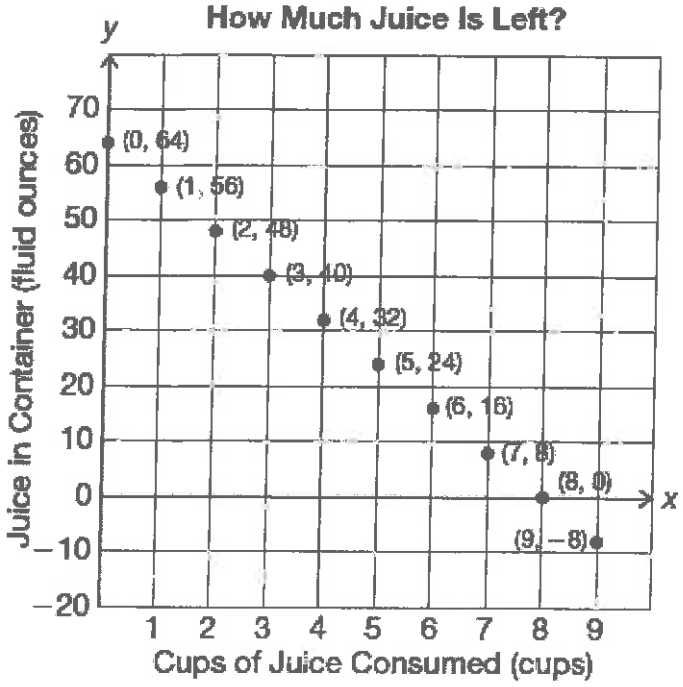
Algebra 1R
Unit 3 ~ Day 3

Name_____

Warm – Up

Use the graph to answer each question.



1. Describe the scenario to fit the graph.
   The more cups of juice you drink, the less juice there is left in the container

2. What is the independent variable?
   cups of juice consumed

3. What is the dependent variable?
   juice in the container

4. Is the relation a function? Explain your reasoning.
   yes. it passes the vertical line test

5. Is the graph continuous or discrete?
   discrete

SOLVING LINEAR EQUATIONS

Our goal in solving equations is to isolate the variable. To do this we want to use opposite operations (or inverses) to "undo" what was already done.

Examples:

1. $7x + 2 = -12$

$-2 \quad -2$

$7x = -14$

$x = -2$

2. $4(x - 7) + 12 = 20$

$4x - 28 + 12 = 20$

$4x - 16 = 20$

$+16 \quad +16$

$\frac{4x}{4} = \frac{36}{4}$

$x = 9$

3. $14x - 13 = 9x + 1$

$-9x \quad -9x$

$5x - 13 = 1$

$+13 \quad +13$

$5x = 14$

$x = \frac{14}{5}$

4. $\frac{x+2}{6} = \frac{2}{5}$

$5(x+2) = 12$

$5x + 10 = 12$

$-10 \quad -10$

$5x = 2$

$x = \frac{2}{5}$

5. $5x - 7 = -10x + 8$

$+10x \quad +10x$

$15x - 7 = 8$

$+7 \quad +7$

$15x = 15$

$x = 1$

6. $-5(3x - 2) + 6(2 - 2x) = 3x$

$-15x + 10 + 12 - 12x = 3x$

$-27x + 22 = 3x$

$+27x \quad +27x$

$22 = 30x$

$\frac{22}{30} = x$

$\frac{11}{15} = x$

Now that we have reviewed how to solve linear equations involving variables on both sides, it is time to take it to another level. The Common Core asks us not only to know the how but also the why. Generally, we justify the steps we take in solving linear equations using the commutative, associative, and distributive properties of real numbers along with the following two **properties of equality**.

PROPERTIES OF EQUALITY

(1) **ADDITIVE PROPERTY OF EQUALITY**: If $a=b$ then $a+c=b+c$ (you can add or subtract the same quantity from both sides and retain the equality).

(2) **MULTIPLICATIVE PROPERTY OF EQUALITY**: If $a=b$ then $c\cdot a=c\cdot b$ (you can multiply or divide by the same quantity on both sides and retain the equality).

***Exercise* #1:** Consider the equation $2x+9=21$. The steps in solving the equation are shown below. Justify each step.

Step 1: $2x+9-9=21-9$ Justification: add prop of equality

Step 2: $\frac{1}{2}\cdot 2x=\frac{1}{2}\cdot 12$ Justification: mult prop of equality

$x=6$

***Exercise* #2:** Consider the equation $3(x+2)-2(x+7)=4x+7$. As in the last problem, each step of the solution is shown. Justify each with either a property of equality or a property of real numbers.

Step 1: $3x+6-2x-14=4x+7$ Justification: distributive prop

Step 2: $3x+-2x+6+-14=4x+7$ Justification: comm prop of add

Step 3: $x(3-2)+-8=4x+7$ Justification: simplify

$x-8=4x+7$

Step 4: $x-8-4x+8=4x+7-4x+8$ Justification: add prop of eq.

Step 5: $x-4x-8+8=4x-4x+7+8$ Justification: comm prop of add

Step 6: $x(1-4)=15$ Justification: Simplify

$-3x=15$

Step 7: $\frac{-3x}{-3}=\frac{15}{-3}$ Justification: mult prop of eq

$x=-5$