Name: ______________________ Period: ______________

Instructor: Mr. Rodriguez

Course: Conceptual Physics A

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Math Practice 1

"Mathematics is the alphabet with which God has written the universe."

—Galileo Galilei

1 Single Variable Equations

In your algebra course, you have learned how to solve equations for a particular variable. For example, you have undoubtably encountered many problems of the form,

Example

Problem: *Solve the following equation for x:*

$$2x + 6 = 10.$$

Solution: How do we do it? Well, we may either stare at the equation long enough and guess the solution (Think: *"What number when doubled and added to six gives ten?"*), or we may fall back and the tried and true algebraic manipulations you have mastered in your math courses. The fundamental rule in solving any equation is, as always:

1. **All mathematical operations must be applied to both sides of the equation.**

To wit:

$$\begin{aligned} 2x + 6 &= 10 && \text{(write down the problem)} \\ 2x &= 4 && \text{(subtract 6 from both sides)} \\ \boxed{x = 2.} & && \text{(divide both sides by 2)} \end{aligned}$$

It is always good practice to box your final answers.

Now give it a try yourself:

1. Solve $2x - 4 = 2$ for x.

2. Solve $4x - 9 = 7$ for x.

3. Solve $6x - 3 = 3x + 9$ for x.

2 Double Variable Equations

Oftentimes in physics problems, there is more than one variable involved. If there are two — call them x and y — we might refer to them as *independent* and *dependent* variables, respectively. The naming convention reminds us that y depends on x; if we change x, we expect y to change as well.

In a science experiment, for example, x might represent the amount of water given each day to a plant in mL (milliliters), while y might represent the height of the plant in cm (centimeters).

Example

Problem: *Solve for y. Then interpret the physical meaning of the equation:*

$$2y - 10x = 20.$$

Solution:

$$\begin{aligned} 2y - 10x &= 20 && \text{(write down the problem)} \\ 2y &= 10x + 20 && \text{(add } 10x \text{ to both sides)} \\ \boxed{y = 5x + 10.} & && \text{(divide both sides by 2)} \end{aligned}$$

Because the equation takes the familiar $y = mx + b$ form, we could say that "y increases **linearly** with x." In the context of the scientific situation described above the example box, this equation might then be interpreted to be

$$\boxed{\text{(height of plant in cm)} = 5 \times \text{(water given to plant in mL)} + 10.}$$