PSCI101 – Problem Solving Method

*For every word problem in which you are asked to calculate something, follow these steps to make the process as painless as possible with the best chance of getting the correct result.*

Step 1: Read the problem and identify the information that is given and what you are being asked to find. Write these down as the beginning of your solution.

Step 2: Identify the variables (what is given and what you are asked to find) in terms of the quantities we have learned about and their symbols (e.g., velocity, v). Write this down as part of your solution. You may want to make a sketch for some problems.

Step 3: Search the available equations to find one that relates the given quantities and what you are asked to find. Write this down as part of your solution. Don’t plug in numbers just yet – write the equation in symbolic form first.

Step 4: Solve it! This can consist of a few parts. Each part should be written out as part of your solution.

* Rearrange the equation if needed to solve for the quantity you are asked to find.
* Plug in values ***with units***. At this point, look at the units. Are there unit prefixes being used? What about derived units? Check to see if any unit conversions are needed for the units to come out correctly.
* Go to the calculator and crunch the numbers.
* Round the result to the correct number of significant figures.
* Report the result with units.
* Look at your result – does it make sense? If not, go back over your solution to see if you made a mistake somewhere. (This is the “gut check”.)

Example

The question: Marta is training for a fun run. As part of her practice, she sprints down a straight track for 75 meters and then turns and jogs back to the start. Her friend times her taking 12.1 seconds for the outgoing trip and 38.7 seconds for the return trip. What was her average speed for the outgoing trip? For the round trip?

The solution:

Given: straight track 75 m in length

 time for outgoing trip = 12.1 s

 time for return trip = 38.7 s

Find: average speed for outgoing trip

 average speed for round trip

Solution:

For outgoing trip: distance, d = 75 m time, t = 12.1 s

Average speed:

$$\overbar{v}= \frac{d}{t}= \frac{75 m}{12.1 s}=6.2 {m}/{s}$$

For the round trip: d = 75 m + 75 m = 150 m t = 12.1 s + 38.7 s = 50.8 s

$$\overbar{v}= \frac{d}{t}= \frac{150 m}{50.8 s}=3.0 {m}/{s}$$

[For the gut check, think: a meter is about one yard – do these numbers seem reasonable? What if you had calculated an average speed of 0.23 m/s? Or 47 m/s? Do those numbers seem reasonable for a running human?]