



## PY105: Math/Physics Prep - Solutions

**Note on these solutions: If you are comfortable with what's in here, as well as Worksheet #1 on vectors you did in Class 1, then you are in good shape. If not, then you know this is an area you will need to focus on early on.**

Read Chapter 1 of Essential Physics by Professor Duffy. Link:

<http://physics.bu.edu/~duffy/EP/>

**Tip: Go through all the examples in that chapter**

### Solutions to End-of-Chapter Exercises:

1a. 1 mile is 1.6 km. So we already know that 1 mile is 1.6 km.

What is 1 km in miles?

$$[1 \text{ km}] [1 \text{ mile} / 1.6 \text{ km}] = [1 \text{ km}] [1 \text{ mile} / 1.6 \text{ km}] = 0.625 \text{ miles}$$

So 1 mile is a greater distance (than 1 km)

1b. How many miles in 32 km? Same process:

$$[32 \text{ km}] [1 \text{ mile} / 1.6 \text{ km}] = [32 \text{ km}] [1 \text{ mile} / 1.6 \text{ km}] = 20 \text{ miles}$$

Notice that the process involves making sure the units we want to convert from, cancel out. If we keep things clear, it makes it harder to make a mistake.

1c. How many km in 50 miles?

$$[50 \text{ miles}] [1.6 \text{ km} / 1 \text{ mile}] = [50 \text{ miles}] [1.6 \text{ km} / 1 \text{ mile}] = 80 \text{ km}$$

2. (a) How many significant figures in 0.040 kg? The last two are significant: so 2 (just follow the rules we listed in the math review packet)

2. (b) How many grams in 0.040 kg? Same process as above:

$$[0.040 \text{ kg}] [1000 \text{ g} / 1 \text{ kg}] = [0.040 \text{ kg}] [1000 \text{ g} / 1 \text{ kg}] = 40 \text{ grams}$$

3. This is a good page to check out:

<https://www.rpi.edu/dept/phys/Dept2/APPhys1/sigfigs/sigfig/node152.html>

248.0 cm (has 4 sig figs) and 8 cm (has 1). (a) sum:  $248.0 \text{ cm} + 8 \text{ cm} = 256 \text{ cm}$  (adding and subtracting, you round the final answer to the one with the least precision. Meaning there is no decimal after 256 cm). If we were adding measurements that were 1.521 cm and 1.1 cm, the final answer would be as precise as the least precise measurement: 2.6 cm. (b)  $248.0 \text{ cm} * 8 \text{ cm} = 1984 \text{ cm}^2$  (for multiplication and division the final answer is rounded to the smallest sig fig, which is 8 cm = 1 sig fig). So, our answer would be 2000  $\text{cm}^2$ .

4.  $\sin(\theta) = 8 / 17$   $\cos(\theta) = 15 / 17$   $\tan(\theta) = 8 / 15$

5. You agree on (a) and (b). Because you are both doing the same thing, but you are setting up a different coordinate system. Your x- and y-axes are not the same as your friend. This will become clear when we do some physics problems.

6.

$$A_x = -3 \quad A_y = +3 \quad B_x = +3 \quad B_y = +1 \quad C_x = -2 \quad C_y = 0$$

7.

$$A+B = ((a_x + b_x), (a_y + b_y)) = (0, +4). \text{ Magnitude} = 4, \text{ it's along the y direction only.}$$