Unit 1: Intro. to Physics

I. Unit Conversion

Use your reference tables and these conversion scales to complete the following problems:

1 mile = 5280 ft | 1 hr = 60 minutes = 3600 seconds | 1 mile = 1609 m

1 gallon = 3.79 L | 1 pound = 4.45 Newtons | 1 m = 3.3 ft

1. Convert 2422 ft to meters:
2. Convert 52 miles to meters:
3. Convert 17 meters to centimeters:
4. Convert 12 centimeters to meters:
5. Convert 27 pounds to Newtons:
6. 4500 g to kg:
7. 5000 mm to m:
8. 32 ML to L:
9. Convert 20 meters/second to miles/hour:

II. Significant Figures and Scientific Notation

A. Write the corresponding value for each number using only three sig. figs.

	Normal	Scientific Notation		Normal	Scientific Notation
1.	4612	_____	4.	_____	4.620×10^{3}
2.	345,008	_____	5.	_____	1.6533×10^{-5}
3.	0.0000403	_____	6.	0.003972	_____

B. Perform the following operations (Answer in scientific notation with only 3 sig. figs.):

1. $\frac{8.8 \times 10^{16}}{2.2 \times 10^{4}}$ = _____

2. $\frac{(3.5 \times 10^{5})(3.72 \times 10^{-2})}{2.89 \times 10^{2}}$ = _____

3. $\frac{(5.33)(7.1)}{(7.5 \times 10^{3})}$ = _____

4. $\frac{(3.2^{2} - 1.7^{2})}{(2)(9.81)}$ _____

5. $\frac{(6.67x10^{-11})(7.35x10^{22})(2.22x10^{25})}{(5.98x10^{11})^{2}}$ _____

III. Equation Manipulation

1) Solve for *d*: $v_{ave} \quad \frac{d}{t}$

2) Solve for *m*: $a_1 \quad \frac{F_1}{m}$

3) Solve for v_f: $v_{ave} \quad \frac{(v_f - v_i)}{2}$

4) Solve for *a*: $d \quad vt + \frac{1}{2}at^2$

5) Solve for *t*: $v_f \quad v_i + at$

6) Solve for *I*: $W \quad I^2Rt$

7) Solve for m_1: $F_g \quad \frac{Gm_1m_2}{r^2}$

8) Solve for *v*: $d \quad vt + \frac{1}{2}at^2$

9) Solve for *r*:

$a \quad \frac{Gm_2}{r^2}$

10) Solve for *d*:

$v_f^{\,2} \quad v_i^{\,2} + 2ad$

IV. Dimensional Analysis

What would be the units for each variable? Reduce the units to find the final simplest unit for the variable.

1. a $\frac{F}{m}$, if F units are kg * m/s^2 and m units are kg

2. a_c $\frac{v^2}{r}$, if v units are m/s and r units are m

3. P $\frac{Fd}{t}$, if F units are kg*m/s^2, d units are m, and t units are s

4. R $\frac{\rho L}{A}$, if ρ units are Ω*m, L units are m, and A units are m^2

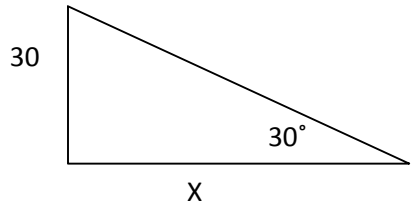
5. PE_s $\frac{1}{2}kx^2$, if k units are N/m and x units are m

6. F_g $\frac{Gm_1m_2}{r^2}$, if G units are N*m^2/kg^2, m_1 and m_2 are kg, and r units are m.

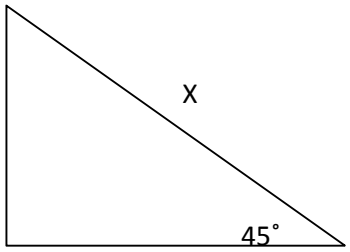
V. Trigonometry

Find the value of the sides marked X.

1.)

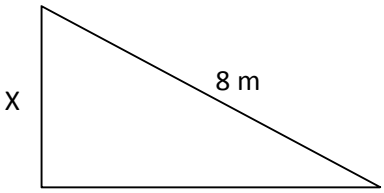


2.)



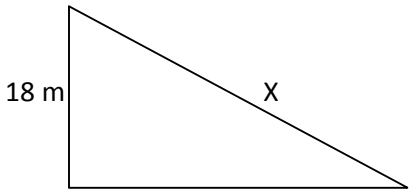
120 m

3.)



4 m

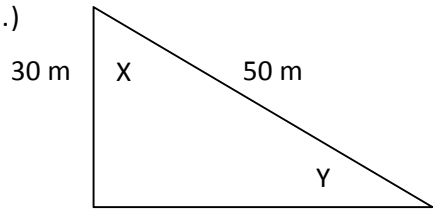
4.)



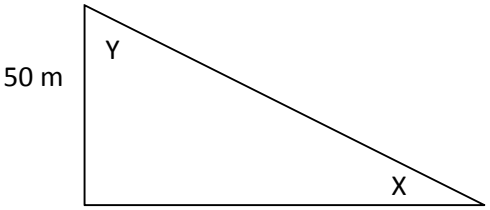
24 m

Find the value of the Y and X.

5.)



6.)

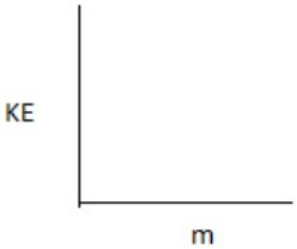


87 m

VI. Graphing/Mathematical Models

For the following equations, sketch the corresponding graphical relationship for the given variables on the axis. Identify the type of relationship, as well.

1. $KE = \frac{1}{2} mv^2$



Type of Relationship: _____

Type of Relationship: _____

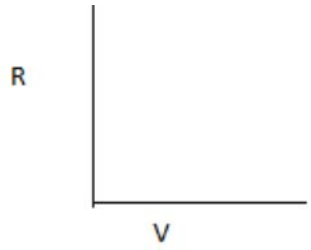
2. $$F_g = \frac{Gm_1m_2}{r^2}$$

Type of Relationship: _____

Type of Relationship: _____

3. $$R = \frac{V}{I}$$

Type of Relationship: _____



Type of Relationship: _____

VII. Graphing

Based on the data below, plot a Force (y-axis) vs. Mass (x-axis) graph. Draw a best fit line and calculate the slope of the line. Be sure to fully label your graph.

Mass (kg)	Force (N)
2	18.1 N
4	40.2 N
5	48.5 N
8	80.4 N
9	86.1 N

Calculation for slope:

VIII. Vectors

1. A box is pulled by two forces. The first force is 50 N west and the second force is 20 N east.
   a. Find the resultant force.

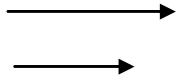
   b. Find the equilibrant force.

2. Two forces are able to act on an object in any direction. The two forces are 40 N and 20 N.
   a. At what angle will the resultant force be the largest and what is the magnitude of this force.

   b. At what angle will the resultant force be the smallest and what is the magnitude of this force.

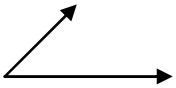
3. A person walks 4 m East and 3 m North. Find the displacement (resultant vector) of the person. (include the angle)

4. Draw the resultant force of the following vectors.

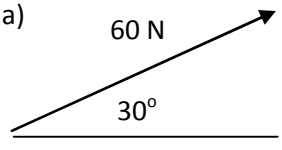
a. 

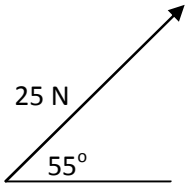
b. 

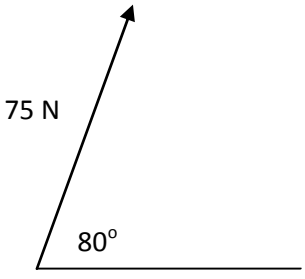
c. 

d. 

5. Find the x- and y- components of the following forces.

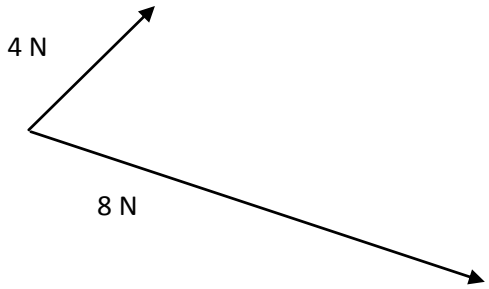
a) 

b) 

c) 

IX. Vector Resolution

1. Answer questions A-C based on the vector scale diagram below:



A. Create a scale for the diagram: 1 cm = _____ N
B. Draw the resultant of the two vectors.
C. What is the magnitude of the resultant?

2. Create a scale and draw a vector map for a person that walks the listed directions.

1. Walks 5 m North
2. Walks 2 m West
3. Walks 10 m South
4. Walks 6 m East

A. Determine the total distance the person travels.
B. Draw the displacement (resultant) of the person after he travels all the listed directions.
C. Determine the total displacement (resultant with direction and magnitude))