Name:

AP Physics 1 - Summer Packet

Directions: Please complete the following packet before the first day of class in September. See you in the fall!

Part 1: Mathematics Review

Directions: Manipulate/ rearrange the following equations algebraically. SHOW ALL WORK.

Example 1: Solve for Q. $U = \frac{kQ}{r^2}$

Step 1: Multiple both sides by r^2. →

$$r^2 \cdot U = \frac{kQ}{r^2} \cdot r^2$$

$$r^2 \cdot U = kQ$$

Step 2: Divide both sides by k. →

$$\frac{r^2 \cdot U}{k} = \frac{kQ}{k}$$

Final Answer

$$\frac{r^2 \cdot U}{k} = Q$$

Example 2: Solve for r. $U = \frac{kQ}{r^2}$

Step 1: Multiple both sides by r^2. →

$$r^2 \cdot U = \frac{kQ}{r^2} \cdot r^2$$

$$r^2 \cdot U = kQ$$

Step 2: Divide both sides by k. →

$$\frac{r^2 \cdot U}{U} = \frac{kQ}{U}$$

$$r^2 = \frac{kQ}{U}$$

Step 3: Find the square root of both sides. ↓

$$\sqrt{r^2} = \sqrt{\frac{kQ}{U}}$$

Final Answer

$$r = \sqrt{\frac{kQ}{U}}$$

1. *Solve for v* $mgh = \frac{1}{2}mv^2$	4. *Solve for t* $a = \frac{(v_f - v_i)}{t}$
2. *Solve for t* $pV = nRt$	5. *Solve for v_f* $a = \frac{(v_f - v_i)}{t}$
3. *Solve for Δx* $v = \sqrt{2a\Delta x}$	6. *Solve for r* $F = G\frac{m_1 m_2}{r^2}$

Part 2: Algebraic Manipulation

Directions: Solve for the given variable specified. SHOW ALL WORK.

1. *Find* v_f $\quad v_f = v_i + at$ Given that: $v_i = 0$ t = 4 a = 3.2	3. *Find* v_i $\quad x_f = x_i + v_i t + \frac{1}{2}at^2$ Given that: $x_i = 0$ $x_f = 25$ t = 2 a = 10
3. *Find* μ $\quad f = \mu N$ Given that: $f = mg \sin\theta$ $N = mg \cos\theta$ $\theta = 30°$	3. *Find t* $\quad x_{f1} = 5 - 2t$ $x_{f2} = -1 + \frac{1}{2}t$ Given that: $x_{f1} = x_{f2}$

Part 3: Operations with Units

Directions: Convert the following units.

1. How many centimeters are in 2 meters?
2. How many mm^2 are in a 4 m^2?
3. How many kilometers are in 6 meters?
4. How many liters are in a 8 milliliters?

Part 4: Significant figures

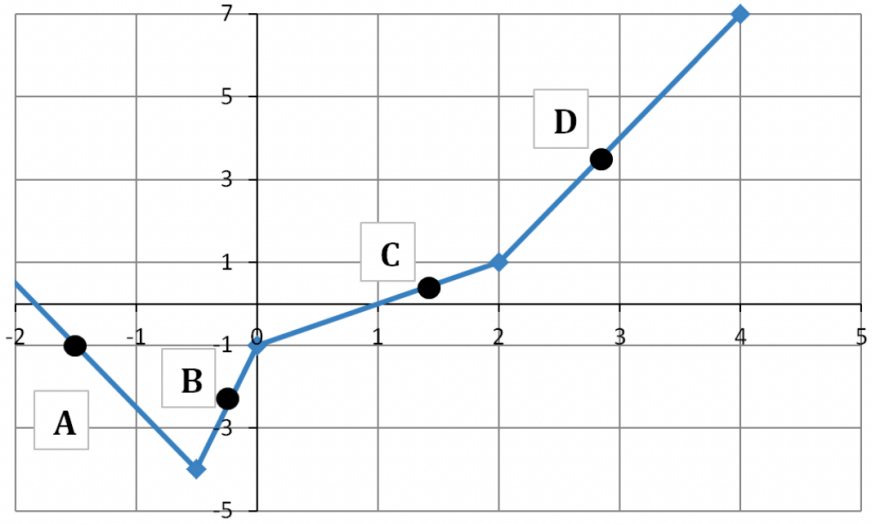
Rule	Examples
1. Zeros appearing between nonzero digits are significant.	a. 40.7 L has three significant figures. b. 87 009 km has five significant figures.
2. Zeros appearing in front of all nonzero digits are not significant.	a. 0.095 897 m has five significant figures. b. 0.0009 kg has one significant figure.
3. Zeros at the end of a number and to the right of a decimal point are significant.	a. 85.00 g has four significant figures. b. 9.000 000 000 mm has 10 significant figures.
4. Zeros at the end of a number but to the left of a decimal point may or may not be significant. If a zero has not been measured or estimated but is just a placeholder, it is not significant. A decimal point placed after zeros indicates that they are significant.	a. 2000 m may contain from one to four significant figures, depending on how many zeros are placeholders. **For measurements given in this text, assume that 2000 m has one significant figure.** b. 2000. m contains four significant figures, indicated by the presence of the decimal point.

Directions: After reviewing the guidelines given in the chart above, describe how many significant figures are in each value below.

1. 800 _____
2. 800. _____
3. 800.0 _____
4. 0.008 _____
5. 80.00 _____
6. 8080 _____

Part 5: Graphing Review

Directions: Rank the slopes of the curve at each of the labeled points in order from smallest to largest. Explain.



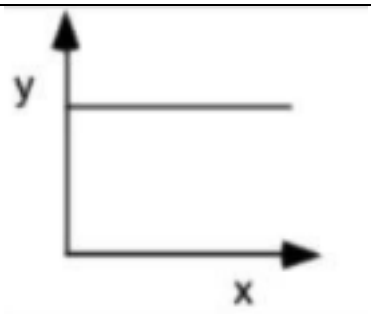
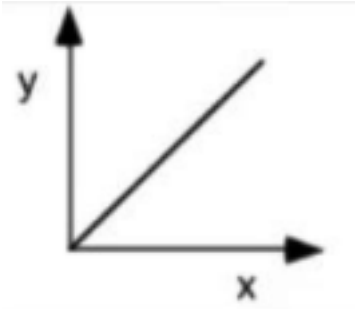
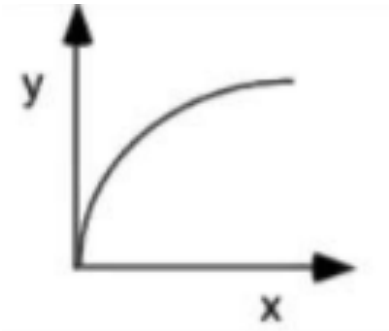
_____ _____ _____ _____

Smallest Slope *Largest Slope*

Explanation:

Part 5: (Continued) **Graphing Review**

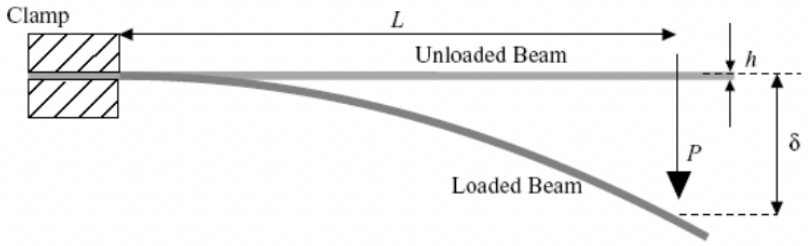
Directions: Fill in the following chart in order to discuss the relationships between x and y.

	Graph shape	Written relationship	Algebraic representation
1.		Example: *As x increases, y remains the same.* *There is no relationship between the variables.*	Example: y = b OR y is constant.
2.			
3.			$y = m\frac{1}{x} + b$
4.		y is proportional to the square of x.	
5.			

Part 6: Graphing Analysis – Activity #1

You are at an internship at a civil engineering contracting firm. Your project was to study different materials' response to various applied loads. Suppose you recorded the following data for one end-loaded cantilever beam.

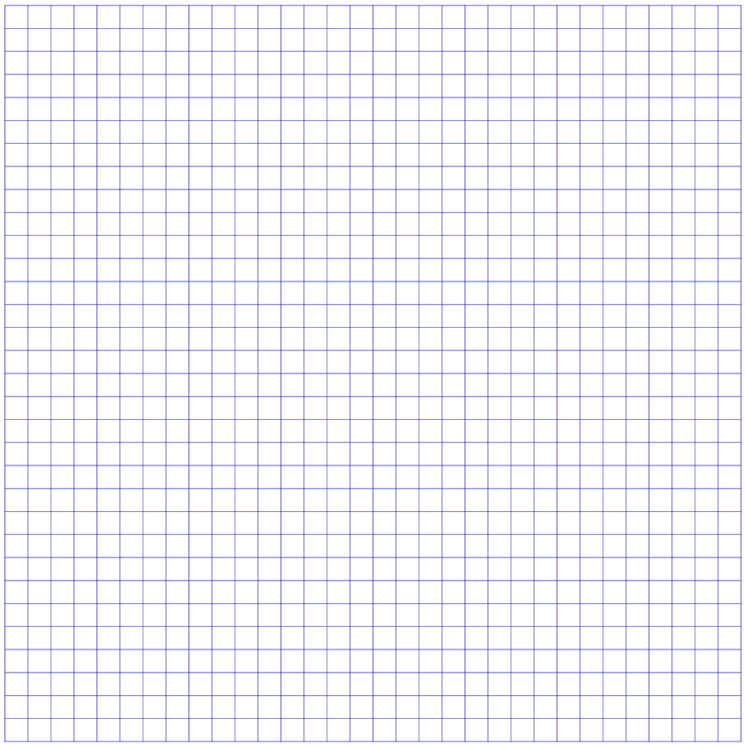
Directions: Answer the questions below in regards to this scenario.



1. What is the independent variable? What is the dependent variable?

2. Plot the data given below on the graph provided. Be sure to: ✓ Title the graph, ✓ Label the x & y axes

Applied Load (kg)	Beam Deflection (mm)
0.00	0
0.05	3
0.10	6.5
0.15	9
0.20	13
0.25	16
0.30	20



3. What type of function is this graph? (linear / quadratic / exponential)

4. What is the equation of this best-fit function?

5. What is the value of the elongation of the beam with a 0.13kg load applied?

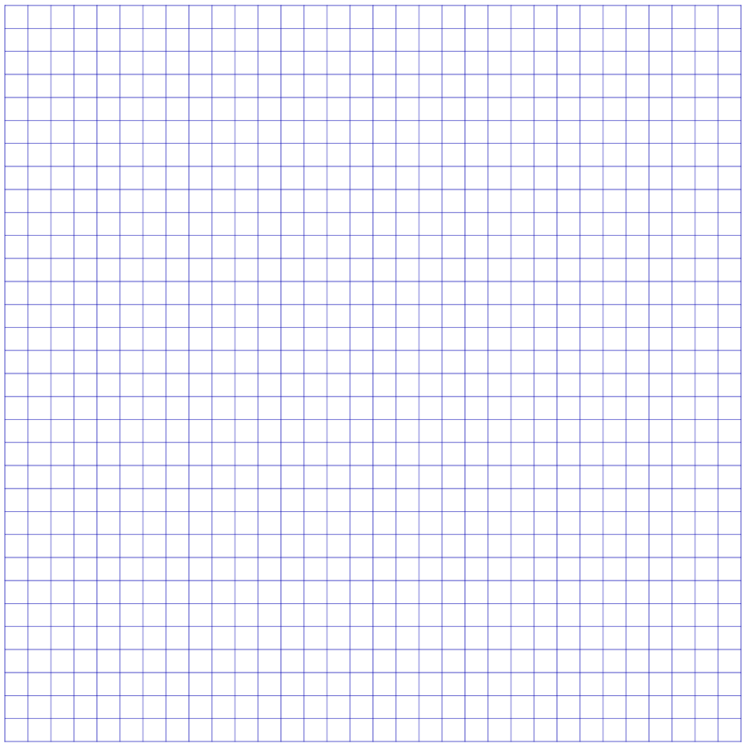
6. What would the estimated elongation of the beam with a 0.50kg load applied be?

Part 6: (Continued) **Graphing Analysis – Activity #2**

Evan and Anna are taking measurements of a toy car traveling across the classroom. Evan calls out each one second interval. Anna records the location of the car as Evan calls out each time interval.
Directions: Answer the questions below in regards to this scenario.

1. Plot the data given below on the graph provided. Be sure to: ✓ Title the graph, ✓ Label the x & y axes

Time (s)	Distance (m)
1	3
2	15
3	25
4	49
5	76
6	108
7	150
8	195



2. What type of function is this graph? (linear / quadratic / exponential)

3. What is the equation of this best-fit function?

4. Is the distance traveled greater between 0 – 1 seconds or 3 – 4 seconds? Explain.

5. Is the slope of the curve greater between 1 – 2 seconds or 3 – 4 seconds? Explain

Why did you sign up for AP Physics 1?	*What is your career goal?*