# Plainview-Old Bethpage John F. Kennedy High School

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Excellence

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Date: June 2024

To: 2024-2025 AP Physics 1 Students

From: Ms. Barditch and Mrs. Wetzler

Re: AP Physics 1 Summer Assignment

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It is our pleasure to welcome you to AP Physics 1 for the 2024-2025 school year. Physics is the most fundamental of all sciences. Physics studies matter, energy, and their interactions.We will ask fundamental questions and try to answer them through experimentation and observation. Math is the language we will use to study motion, forces, energy, electricity and magnetism. We are confident that you will find this course to be rewarding, as well as challenging.

In an effort to review material that was previously covered in earlier science and math classes, all students are required to complete a summer assignment. This assignment will also be used as a diagnostic tool in order to identify material that will need to be reinforced in remedial.

This assignment is due on **Thursday, September 5, 2024.** It will be collected in class and graded. The assignment will count as two homework grades and late submissions will be penalized. Please write in pen, unless otherwise noted, hand write your answers and show all work as indicated when answering in order to receive full credit. Do not use whiteout. If a correction is needed simply strike a line through the incorrect answer.

To complete this summer assignment, please read the attached AP Physics 1 Summer Assignment Note Packet and complete the questions on the practice pages as directed.

A copy of this assignment can also be found on both Mrs. Wetzler's or Ms. Barditch's website, and it is accessible from the Science Department's webpage.

We look forward to meeting all of you in September! Have a great summer!

Ms. Barditch and Mrs. Wetzler

Name: ____________________________ Date:__________

Physics: AP 1 Summer Assignments Note Packet

**Instructions:** In order to best prepare you for the challenge of AP Physics 1, a base of common background knowledge must be established. The following summer assignment reviews science and math concepts that have already been taught in previous classes. This material will **not** be covered during class time. Read each topic, follow the example, which shows all required work, and complete the assigned questions for practice. Pages 13-22 (the practice section) of this packet will be collected in class on Thursday, September 5, 2024. The practice will be graded and returned. It is expected that reading the notes and completing the practice will take approximately 3 hours. You will only be submitting the practice portion, so it is not a requirement to print the note packet unless it will be helpful to you.

**I. Problem Solving:**

In physics equations from the reference table will be used to solve problems. The equations may need to be rearranged using algebraic manipulation (opposite operations). This MUST be done on every problem in order to receive full credit. In the course, many solutions will be literal (only in variables).

Use the following steps to solve algebraically for the variable identified.

1. Write the equation
2. Identify what is attached to the variable and how it is attached.
3. Perform the opposite operation on both sides of the equation to isolate the variable.
4. A number divided by itself equals 1, cancel.
5. Repeat steps 3 and 4 as needed.
6. Rewrite and box the answer.

EXAMPLE:

Given a = bc, solve for b.

$a = bc$

$\frac{a}{c} = \frac{bc}{c}$

$b = \frac{a}{c}$

**<u>Complete question 1 of the practice.</u>**

**II. Units and Scientific Notation**

Units are required in all values. <u>Fundamental</u> units are defined by physical constants.
In Physics, SI (System International) Fundamental Units are used. This system is also known as the MKS system.

The following are some of the fundamental units in the SI system:

Length – Meter

Mass – Kilogram

Time – Second

Derived units are made up of a combination of fundamental units.
*Example: m/s*
Combinations of fundamental units may be given another name.
*Example: 1 Joule = 1 kg· m²/s²*

**Scientific Notation**
Scientific Notation uses powers of ten to express very large and very small numbers.

$$M \times 10^{E}$$

M – Mantissa, $1.0 \geq M > 10$
E – Exponent, positive for large numbers, negative for small numbers

Expanded Notation → Scientific Notation
Move the decimal point until only one digit is to the left of it.
Write " x 10" then the number of times you moved the decimal point in step one. If you move the decimal to the right, the exponent is negative.

EXAMPLE:

0.00013 → 4 places right $1.3 \times 10^{-4}$

3000 → 3 places left $3.0 \times 10^{3}$

**Complete question 2 of the practice.**

**III. The Factor Label Method**
In physics, use the Factor Label Method to convert between units. It relies on conversion factors set up in order for units to "cancel out".

$$\text{original quantity}\left(\frac{\text{converting to}}{\text{converting from}}\right) = \text{converted quantity}$$

* In Chemistry this method was called dimensional analysis

EXAMPLE:

Convert 4.86 eV to Joules

(1 eV = $1.6 \times 10^{-19}$ J)

$$4.86\ \text{eV}\left(\frac{1.6\times10^{-19}\ \text{J}}{1\ \text{eV}}\right) = 7.78\times10^{-19}\ \text{J}$$

The Factor Label Method can be used to convert from prefix notation to base units.

1. Use the chart to find the prefix and power of ten.
2. Factor: 1 *prefix* unit = *power of ten* base units
3. Set up the conversion factor for units to "cancel out"

| PREFIXES | | |
|---|---|---|
| Factor | Prefix | Symbol |
| $10^{12}$ | tera | T |
| $10^{9}$ | giga | G |
| $10^{6}$ | mega | M |
| $10^{3}$ | kilo | k |
| $10^{-2}$ | centi | c |
| $10^{-3}$ | milli | m |
| $10^{-6}$ | micro | μ |
| $10^{-9}$ | nano | n |
| $10^{-12}$ | pico | p |

EXAMPLE:

Convert 750 g into the base unit for mass in the SI system

$750\,g \left(\frac{1\,Kg}{10^{3}\,g}\right) = 0.75\ Kg$

**Complete questions 3 and 4 of the practice.**

**IV. Graphs**
Graphs are used in physics to show relationships and to calculate physical constants.

All graphs require the following:

1. Title ("The Relationship between Variable X and Variable Y")
2. Labels on axes with units
3. An appropriate scale starting at 0. (NO BREAKS!) To determine the scale, look at the greatest data value and select a maximum value slightly greater. Estimate the number of gridlines to the nearest 10. Divide the maximum value by the estimated number of gridlines. Round the dividend to the nearest value that is easy to multiply (for example 2, 5, or 10).
4. Data Points (Mark with visible dots.)

Types of Variables

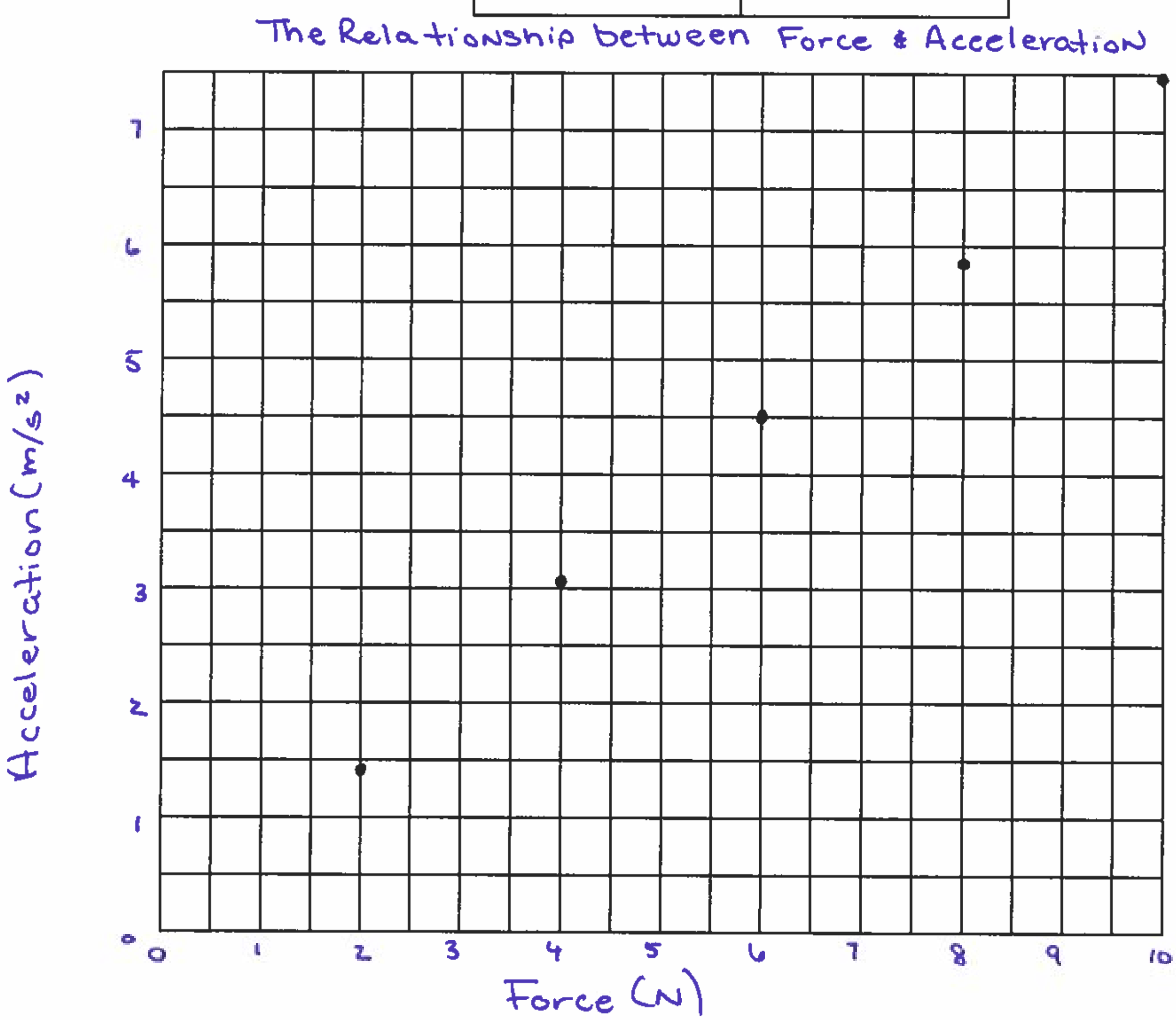
The independent variable is the variable that the experimenter changes, and is usually graphed on the x-axis. The dependent variable is the variable that changes as a result of changes in the independent variable, and is usually graphed on the y-axis. A control variable is held consistent throughout the experiment.

Exception: Time is always on the x-axis.

EXAMPLE:

A) A class has investigated the relationship between force and acceleration by varying the force applied to an object and then measuring the acceleration of the object.

| Force (N) | Acceleration ($m/s^2$) |
|---|---|
| 2.0 | 1.4 |
| 4.0 | 3.1 |
| 6.0 | 4.5 |
| 8.0 | 5.8 |
| 10. | 7.4 |

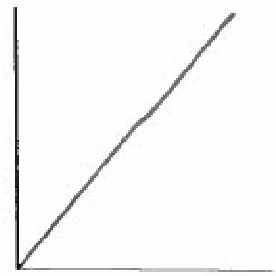



**Complete question 5 of the assignment.**

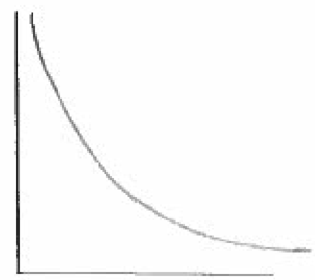
The shape of a graph is based on the relationship between the variables. This is expressed mathematically by the equation of the line. Therefore, the anticipated relationship between variables can be predicted from the equations on the reference table. Listed below are the equations of lines and how they are expressed graphically.

Types of relationships:

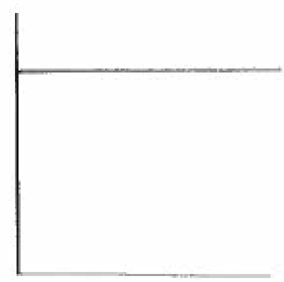
Direct proportion - An increase in one variable causes an increase in the other. This relationship results in a line. The equation is of the form $y = mx$.



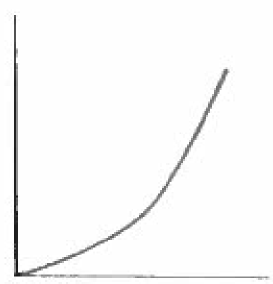
Inverse Proportion - An increase in one variable causes a decrease in the other. This relationship results in a hyperbola. The equation is of the form $y = 1/x$.



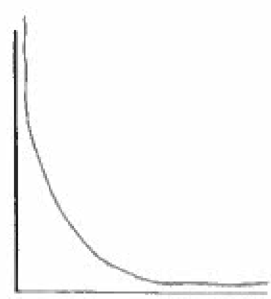
Constant relationship - An increase in one variable causes no change in the other. This relationship results in a horizontal line with slope = 0. The equation is of the form $y = C$.



Direct squared proportion - An increase in one variable causes a squared increase in the other. This relationship results in parabola. The equation is of the form $y = x^2$.



Inverse Square Proportion - An increase in one variable causes a squared decrease in the other. This relationship results in a hyperbola. The equation is of the form $y = 1/x^2$.



Note: Students will not be required to distinguish between inverse and inverse squared relationships without additional information.

**Complete question 6 of the practice.**

**V. Data Analysis**

Rules for Determining the Number of Significant Figures

- Nonzero digits are significant.
- Final zeros after a decimal point are significant.
- Zeros between two significant digits are significant.
- Zeros used only as placeholders are not significant.

Exact numbers have an infinite number of significant figures, for example 2 electrons. Constants and exact conversions also have infinite significant figures.

When using scientific notation, the number of digits in the mantissa is the number of significant figures.

**Complete question 7 of the practice.**

Significant Figures in Calculations and Rounding

On a test, as a general rule, the number of significant figures given in a problem will be consistent. When in doubt, **use 3** significant figures. A question assessing your understanding of sig figs will be clearly identified. The number on your calculator may need to be rounded to 3 significant figures. If the $4^{th}$ digit is greater than or equal to 5, increase the $3^{rd}$ digit by one. If the $4^{th}$ digit is less than 5, do not change the $3^{rd}$ digit.

When adding and subtracting, round the answer to the least number of places after the decimal point. When multiplying and dividing, round the answer to the same number of significant figures as the value with the least number of significant figures.

**Complete question 8 of the practice.**

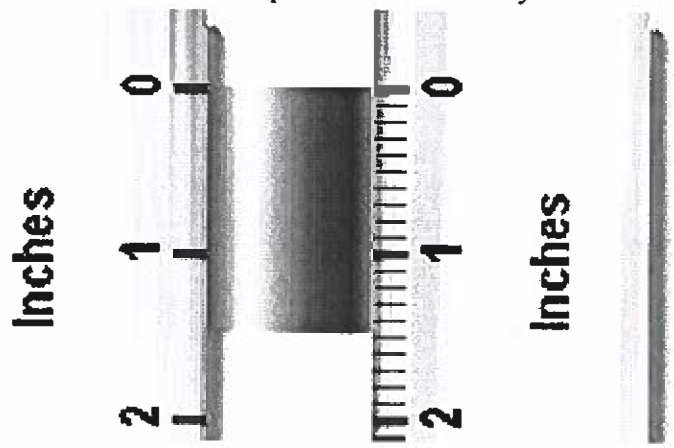
Errors

Uncertainty in measurement can be described in two manners. Accuracy is the closeness of a measurement to the accepted value. Precision in the closeness of multiple measurements to each other. Experimental errors arise from the accuracy or precision of the equipment. The goal of a scientist is to be both accurate and precise.

Systematic errors can arise from failure to tare or calibrate equipment. Systematic errors are also due to faulty procedures or incorrect assumptions. Systematic errors affect the results of a given experiment the same way each time and therefore can be avoided or accounted for.

Random errors which are due to equipment malfunctions or experimenter mistakes. One way to reduce the effect of random errors is to average multiple trials of the same data point. To determine the average, add the data values and divide by the number of values. If one of the trials is very far from the average, recollect the data.

When measuring with an analog tool, something with a scale or dial to read, first calculate the mean. Then report the uncertainty as ± half the smallest increment of the scale using one significant figure. When measuring with a digital tool, something that displays numbers, calculates the mean and reports the uncertainty as is ± 1 of the smallest increment displayed.




EXAMPLE

What is the correct measurement of the bar as measured by each of the rulers above?

Left: 1.5 inches (Uncertainty: 0.5)

Right: 1.45 inches (Uncertainty: 0.05)

For events that are periodic, recording multiple cycles at once not only reduces effects of random error, but uncertainty as well. The uncertainty is divided by the number of cycles recorded. In the case where an event is not repeatable, only one trial is performed, but multiple recordings of that trial should occur.

EXAMPLE

Students measured the time required for a mass on a spring to complete 10 oscillations. The measuring device is accurate to 1 second. Data is shown below:

| Time (s) |
|---|
| 22 |
| 25 |
| 26 |
| 21 |
| 23 |

The mean time for 1 cycle should be reported as:

A) 2.29 to 2.39 s

(B) 2.2 to 2.4 s (circled)

C) 2 to 3 s

D) 2.33 to 2.35 s

Average:
22
25
26
21
+ 23
117/5 = 23.4 s / 10 osc = 2.34 s/osc

Uncertainty:
1 sec / 10 osc = 0.1

**Complete question 9 of the practice.**

Percent Error and Percent Difference

Percent error is calculated when there is a given value to compare an experimental value with. Percent difference is calculated when comparing two experimental values. To calculate percent error or percent difference, first write the appropriate equation

$$\frac{|\text{Actual} - \text{Determined}|}{\text{Actual}} \times 100 = \%\ \text{Err} \qquad \frac{|\text{Value 1 -2}|}{\frac{1}{2}(\text{Value 1 +2})} \times 100 = \%\ \text{Diff}$$

Then, substitute with units. Perform the calculation and write your answer as a percent.

EXAMPLE:

Bill and James both experimentally determined the index of refraction of an unknown substance. Bill found the index of refraction to be 1.40 and James found it to be 1.46. What is the percent difference between the two indices of refraction?

$$\%\ \text{Diff} = \frac{|\text{Value 1-2}|}{\frac{1}{2}(\text{Value 1+2})} \times 100\% = \frac{|1.40 - 1.46|}{\frac{1}{2}(1.40 + 1.46)} \times 100\% = 4.20\%$$

**Complete question 10 of the practice.**

**VI. Math Concepts**

Trigonometry

Right triangles are three sided shapes with a $90^0$, angle. The side that is the longest, which is across from the $90^0$, angle, is the hypotenuse. The identifying of the other two sides is based on the location of the reference angle theta,θ. The side opposite the reference angle is the opposite side and the side next to the reference angle is the adjacent side. Angles are measured to the nearest degree,$^0$, $\pm 2^0$.
Working with rights triangles allows for the use of the basic trigonometric functions, Sine, Cosine, and Tangent. The use of Secant, Cosecant, and Cotangent is not necessary. To solve for unknown angles, the inverse trig functions are used. In addition to trigonometric function, the Pythagorean theorem may also be used.

Equations:

$$\sin\theta = \frac{opp}{hyp} \qquad \sin^{-1}\left(\frac{opp}{hyp}\right) = \theta \qquad \tan\theta = \frac{\sin\theta}{\cos\theta}$$

$$\cos\theta = \frac{adj}{hyp} \qquad \cos^{-1}\left(\frac{adj}{hyp}\right) = \theta \qquad \sin 2\theta = 2\sin\theta\cos\theta$$

$$\tan\theta = \frac{opp}{adj} \qquad \tan^{-1}\left(\frac{opp}{adj}\right) = \theta \qquad \sin^2\theta + \cos^2\theta = 1$$

$$X^2 + Y^2 = R^2$$

To solve:

- Draw the triangle.
- Label the sides.
- Write the equation.
- Solve algebraically for the variable identified (See **I. Problem Solving**)
- Substitute with units.
- Solve. (Make sure your calculator is in degree mode.)
- Write and box the computed (decimal) answer with units. Do not leave in terms of $\pi$, radical or fractional form.

EXAMPLE

Mrs. Wetzler, an avid kite flier, purchases a new 325 meter string for her favorite SpongeBob kite. How high from the ground does SpongeBob soar when all of the string is used and the string makes a $25^0$ angle with the ground?


$$h = \sin\theta\,(hyp)$$
$$h = \sin 25^\circ\,(325\text{m})$$
$$h = 137\text{ m}$$

**<u>Complete question 11 of the practice.</u>**

Area and Circumference

| | |
|---|---|
| Area of a rectangle | $A = b \times h$ |
| Area of a triangle | $A = \frac{1}{2}(b \times h)$ |
| Area of a circle | $A = \pi r^2$ |
| Circumference of a circle | $C = 2\pi r$ |

Do not leave values in terms of $\pi$.

To solve:

- Write the equation.
- Solve algebraically for the variable identified (See **I. Problem Solving**)
- Substitute with units.
- Solve.
- Write and box the computed (decimal) answer with units. Do not leave in terms of $\pi$, radical or fractional form.

Rotational Conversions

When dealing with rotation, measurements may be in either radians or degrees. A full circle is 360° or $2\pi$ radians. To convert between radians and degrees, set up a proportion.

Conversion factor: $180° = \pi$ rad

Rotations per minute, rpm, is a convenient unit for measuring the rate of rotation but it will need to be converted into radians per second to be used in calculations. 1 rotation per minute is equivalent to $2\pi$ radians in 60 seconds.

Conversion factor: 1 rpm = $\pi$ rad/30 s

Translational, or linear, distances, d, are measured in m. Rotational distances, $\theta$, are measured in radians. A fixed point on a rotating rigid object moves both translationally and rotationally. It may be necessary to convert between these two frames of reference.

Equation

$d = \theta r$

**Complete questions 12 & 13 of the practice.**

**VII. Speed**

Speed is the rate at which an object changes position.

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$v = \frac{d}{t}$$

EXAMPLE

The distance to the moon was determined by shooting a laser at a reflective plate left on the moon by an astronaut. The laser took 2.56 s to go from the Earth to the moon and back. Light travels at 3.00 x $10^8$ m/s. How far away is the moon?

$$d = \frac{vt}{2} = \frac{(3.00 \times 10^8 \text{ m/s})(2.56 \text{ s})}{2}$$

$$d = 3.84 \times 10^8 \text{ m}$$

**Complete question 14 of the practice.**

## VIII. Vectors

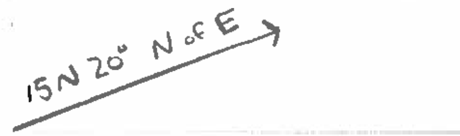
Many measurable quantities are clearly defined by a numerical value with units, for example 1.0 kg or 500 s. These quantities are *scalar*. Time and mass are two examples of scalar quantities. Certain measurable quantities require both magnitude, a numerical value with units, and direction to be clear. For example, hiking directions might say "Travel 5 km East"; without the direction the hiker would be lost. These quantities are *vector*. Vector quantities can be represented graphically to scale with an arrow. Direction will be given in terms of an angle out of 360°. Due East is 0° and lies on the positive x-axis. North is 90° and lies on the positive y-axis.

1. Using a straight edge, draw a coordinate axis. (a small plus sign with a horizontal and vertical line)
2. Use a proportion to convert the vector to scale including <u>units</u>.
3. Use a <u>protractor</u> to measure the appropriate angle.
4. Use a <u>ruler</u> to draw a line to scale at the appropriate angle.
5. Draw an arrow <u>on the tip</u> to indicate direction.
6. Label the vector with magnitude, units, and angle.

EXAMPLE:

A 15 N force is applied to an object at an angle of 20° North of East. Using a scale of 1.0 cm = 4 N, draw a scaled vector to represent this force vector.

15N = 3.75 cm




**<u>Complete question 15 of the practice.</u>**

A given vector may be broken apart into components. A component is a vector itself, that when added to other components will yield the original vector. While the number of components that could be used to represent a vector is infinite, primarily a vector is resolved into two perpendicular components, one parallel to the x-axis and one parallel to the y-axis. These horizontal and vertical, or x and y, components are found using trigonometry. To determine a vector component, first identify the reference angle, label the sides based on the reference angle and use the appropriate trigonometric function. Show all work by writing the equation solved for the component, substituting with units, and writing the final answer with units.

EXAMPLE:

A tension of 20 N acts on a ball at an angle of 15° with the vertical. Determine the vertical component of the tension.


$T_y = \cos\theta \cdot hyp$

$T_y = (\cos 15°)(20N)$

$T_y = 19.3\ N$

**<u>Complete question 16 of the practice.</u>**


θ = 15°

T = 20N

## XI. Lab Procedures

Following lab procedures and analyzing data is a skill that will be utilized throughout AP Physics 1. You should read the steps to a procedure fully before starting and follow the instructions carefully, as written. Often you will need to analyzc data collected in these lab activities. This practice question will apply both of these skills by asking you to perform a very simple experiment from which you will collect and graph data.

**Complete question 17 of the practice.**

## X. Writing for Physics

An often unexpected part of AP Physics 1 is the frequency in which you are asked to explain in words a physical phenomenon. This class is not just a "plug & chug" kind of class. This is a skill we will practice throughout the year.

### Video Analysis

Physics will be unlike any subject you have ever taken before. As teachers, we have discovered that students who develop an interest in Physics will come into the class with lots of physics questions like, "Why is the sky blue?" These students often do the best in the class.

Below are the URLs for three YouTube channels. From the following list of sites, watch at least 3 of the videos that compel your interests, and write a paragraph or two (Question 18) about what you learned from each (why did you choose this video, what surprised you, what new ideas or questions does it make you think of, etc). Of course, feel free to watch more than three!

Name & YouTube Description

Vertiasium: An element of truth - videos about science, education, and anything else interesting.
https://www.youtube.com/user/1veritasium

Smarter Every Day: Explore the world using science. That's pretty much all there is to it.
https://www.youtube.com/user/destinws2

Minute Physics: Simply put: cool physics and other sweet science.
https://www.youtube.com/user/minutephysics

**Complete question 18 of the practice.**

Name: ________________ Date: ________

AP Physics 1: Summer Assignment Practice

**Instructions:** Read the attached note packet, and if needed use online resources, to complete the following work **in pen,** unless otherwise noted. **Do not use white out.** If a correction is needed simply strike a line through the incorrect answer.This packet will be collected in class on Thursday, September 5, 2024. The practice will be graded and returned. The material will not be covered during class time. The assignment will count as a double homework grade for Quarter 1. This material will be referred to throughout the year. Additional practice for any of the included topics will be provided at remedial.

1. Solve algebraically for the indicated variable.

A) Given $P = W/t$, solve for t.

B) Given $ab = c/b$, solve for a.

C) Given $a^2 + b^2 = c^2$, solve for b.

2. Change the following from expanded form to scientific notation:

A) 6230000000

B) 0.00245

3. Change the following values from prefix notation to base units in scientific notation:

A) 5.02 micrometers to meters

B) $9.31 \times 10^2$ MeV to eV

4. Change the following values from base units to prefix notation:

A) 0.025 amps to milliamps

B) 55 grams to kilograms

5. For each of the following data sets:

a. Write a title for the graph.
b. Label both axes with units.
c. Write a scale that starts from 0 for both axes.
d. Plot the points. **Do not draw a line or connect the points.**

All graphs may be done in pencil.

A) Shannon performed an experiment to determine the relationship between the elongation of her slinky and the force applied to her slinky causing it to stretch.

| Force (N) | Elongation (m) |
|---|---|
| 0.5 | 0.11 |
| 1.0 | 0.20 |
| 1.5 | 0.28 |
| 2.0 | 0.42 |
| 2.5 | 0.51 |

B) Mr. Barditch strapped on his ACME constant velocity rocket skates and lit the fuse. I timed his progress as he sped down the street. The total distance he traveled after each second is listed in the data table below.

| Time (s) | Distance (m) |
|---|---|
| 0.0 | 0.0 |
| 1.0 | 9.0 |
| 2.0 | 22 |
| 3.0 | 31 |
| 4.0 | 42 |

C) Erin foolishly jumped off a cliff next to Niagara Falls. Luckily, I had my stopwatch with me and was able to record data as she fell freely for 4.0 seconds before hitting the river below. The total distance she traveled after each second is listed in the data table below.

| Time (s) | Distance (m) |
|---|---|
| 0.0 | 0.0 |
| 1.0 | 8.0 |
| 2.0 | 20 |
| 3.0 | 52 |
| 4.0 | 78 |

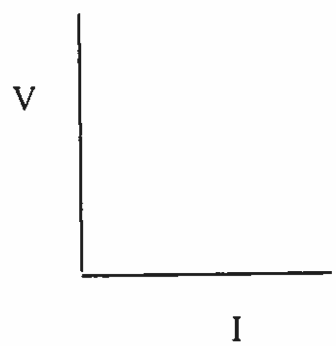
D) A photo-emissive metal was illuminated successively by photons of various frequencies. The maximum kinetic energies of the emitted photoelectrons were measured and recorded in the data table below.

| Frequency ( x $10^{14}$ Hz) | Maximum Kinetic Energy ( x $10^{-19}$ J) |
|---|---|
| 4.6 | 0.01 |
| 5.3 | 0.58 |
| 6.0 | 1.08 |
| 6.9 | 1.73 |
| 7.6 | 2.08 |

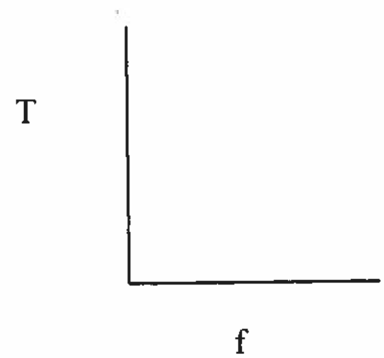
6. On each graph, sketch the relationship described by the given equation.

All graphs may be done in pencil.

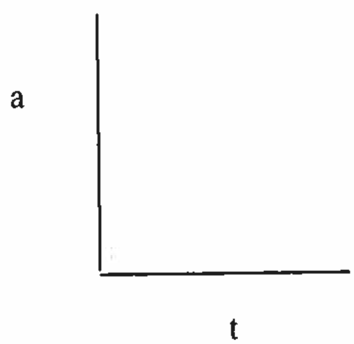
A) $V = IR$



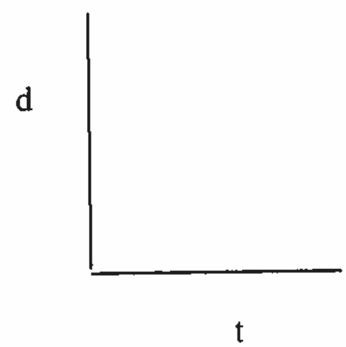

B) $T = 1/f$




C) $a = 9.81$




D) $d = \frac{1}{2} at^2$




7. How many Sig Figs?

A) 5.0 g

B) $3.31 \times 10^2$ m/s

C) 5.06 s

D) 0.0060 mm

8. Calculate to the correct number of significant figures.

A) 2.3 + 0.023

B) 5.625 – 1.2

C) 15.5/ 70

D) 6.00 x 1.5

9. Prior to May 20, 2019, 1 kg, the fundamental SI unit for mass, was defined by the mass of a platinum alloy cylinder that was stored in a secure location near Paris. This definition makes the 1 kg mass an exact measurement (an infinite number of significant figures). The volume of the cylinder was measured to be 46.60 $cm^3$, 46.57 $cm^3$, and 46.59 $cm^3$ using 3 different methods each with an uncertainty of $\pm$ 0.01 $cm^3$.

The mean density of the platinum alloy should be reported as

A) 2.1 – 2.2 x $10^{-2}$ kg/$cm^3$

B) 2.13 – 2.15 x $10^{-2}$ kg/$cm^3$

C) 2.14 -2.15 x $10^{-2}$ kg/$cm^3$

D) 2.146 -2.147 x $10^{-2}$ kg/$cm^3$

Show all work in addition to circling an answer.

10. Answer the following questions, showing all work.

Isabelle and Jack each performed an experiment to determine g, the acceleration due to gravity, in Plainview. The results are given in the table below. Determine the percent difference between their values and the percent error of the average of their result.

| Value 1 ($m/s^2$) | Value 2 ($m/s^2$) | g ($m/s^2$) |
|---|---|---|
| 9.85 | 9.80 | 9.81 |

11. Answer the following questions, showing all work.

A) While Ms. Barditch is sailing, she uses a laser pointer directed at a 35.0$^0$ angle to illuminate a lighthouse at the top of a cliff. She determines the distance from the pointer to the lighthouse is 250. meters. Assuming the cliff is perpendicular to the water, how far is the pointer from the base of the cliff?

B) Erin's shadow is 1.3 m long when the sun is at an angle of 50.$^0$ with respect to the ground. How tall is Erin?

C) Shelly the hermit crab walked 14 cm east and 7.2 cm south as she explored her tank. How far is she from her starting point?

D) Mr. Wetzler uses an 11 meter long ladder to reach an 8.5 meter high window on his house. What angle does the ladder make with respect to the ground?

12. Convert: 5 revolutions to both radians and degrees.

13. Calculate the translational distance for a rotating body with a radius of 0.50 meters and 5 revolutions.

14. Answer the following question, showing all work.

A tortoise moves along steadily covering a distance of 5.0 meters in 20. seconds.
What is the speed of the tortoise?

15. A 28 N force is applied to an object at an angle of 30° North of East. Using a scale of 1.0 cm = 5 N, draw a scaled vector to represent this force vector. Note: Vectors may be drawn in pencil.

16. A tension of 30. N acts on a ball at an angle of $55^0$ with the vertical. Determine the horizontal component of the tension.

17. Students decide to have some fun (physics style) when setting up for a summer BBQ. They stack cups as shown (to the right) and decide to graphically determine the relationship between height and number of cups.

a) What type of relationship would you expect between the number of cups and their height?
b) Is (0,0) an appropriate date point for this experiment?

You will now perform this experiment along with them. (You will need a metric ruler and 5 cups (any size) that you can stack.)

1) Place a cup, open side down on a flat surface and using a ruler, measure the height of the single cup.
2) Stack an identical cup directly on top of the first cup and measure the height of the 2 cups.
3) Repeat step 2 three more times.
4) Based on information found in this packet and your knowledge of graphing, plot the data collected appropriately.

| # of Cups | Height of Cups (cm) |
|---|---|
| | |
| | |
| | |
| | |
| | |

18.

Video 1: YouTube Channel:______________________________

Video Title: ______________________________________________

Video 2: YouTube Channel:______________________________

Video Title: ______________________________________________

Video 3: YouTube Channel:______________________________

Video Title: ______________________________________________