AP Physics 1 Summer Assignment 2022

Inns Brodsky ibrodsky@torahacademy.org

This packet is for you to practice for quizzes that will occur within the first week of school.

Signed Safety Contract - due Day 1 of school

This Booklet:
Part 1: Quiz on Day 2 of school

- **Prefixes**
- **Significant Figures & Scientific Notation**
- **Conversion Factors**
- **Algebraic Manipulation**

Part 2: Collected on Day 1 of school; Quiz on Day 6 of school

- **Geometric Shapes**
- **Angles**
- **Right Angle Trigonometry**
- **Experimentation & Graphing**

Read Textbook - Knight's College Physics:3E AP Edition
Chapter 1.1-1.3 due Day 3 of school

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Part 1: There will be a quiz on this material on the second day of school. We will not be reviewing any of this information in class.

Complete this section without a calculator. (You will not have a calculator for the quiz.)
The answers to this section are at the end of this section.

Although you will have full use of a calculator during the AP exam you have limited time. Being able to do some math in your head more quickly is more efficient.

Note: Try to not write commas in numbers as they may be seen as decimals.

A. Prefixes

Memorize the following prefixes. (Although you will get them on the AP exam you will not have time to waste looking up prefixes.) Section C uses these prefixes in conversions between units.

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

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B. Significant Figures & Scientific Notation

Review Rules for Counting, Rounding and Calculating with Significant Figures

Note about Significant Figures: While significant figures are important for weekly homework and laboratory assignments, the current accepted practice on the AP exam is to round final answers to no more than 3 significant figures. Do not round in the middle of problems.

Determine the number of significant figures for each number

1) 0.05980

2) 3062

3) 4.12

4) 67.100

5) 600

6) 0.090

Round the answer to the correct significant figures and predict the unit.

7) 55.43 m + 44.333 m + 5.31 m + 9.2 m = 114.273 __

8) 890.019 g + 890.1234 g + 890.88788 g = 2671.03028 __

9) 69.99999 cm – 69.44444444 cm = 0.55554556 __

10) 343.4 cm^2/ 34.337 cm = 10.00087369 __

11) 0.000000003 m x 30.03030 m = 9.00909 x 10^{-8} __

12) 17.12 m + 30.123 m = 37.243 __

13) 35.010 m / 1.23 s = 28.46341463 __

14) 1000.00 mg – 62.50 mg = 937.5 __

15) 1715.00 cm x 1700. cm x 1700 cm = 4956350000 __

16) 1500 cm + 0.0044 cm + 12.34 cm = 1512.3444 __

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Express the following the numbers in scientific notation. Keep the same unit as provided. ALL answers in physics need their appropriate unit to be correct.

17) 7 640 000 kg

18) 0.000000003 m

19) 8327.2 s

20) 0.00930 km/s

Often times multiple numbers in a problem contain scientific notation and will need to be reduced quickly by hand. Before you practice, remember the rules for exponents.

- When scientific notation numbers are multiplied together, you add the exponents on the base 10 and multiply the coefficients.
- When scientific notation numbers are divided, you subtract the exponents on the base 10 and divide the coefficients.
- When a scientific notation number is raised to another exponent, you multiply the exponents and raise the base by that exponent.

Using the three rules from above, simplify the following numbers in proper scientific notation:

21) $(3\ 10^{6})\cdot(2\ 10^{4} \times \times\ ) =$

22) $(4\ 10^{8})\cdot(5\ 10^{-3} \times \times\ ) =$

23) $(8\ 10^{3}) / (2\ 10^{5} \times \times\ ) =$

24) $(1.2\ 10^{4}) / (6\ 10^{-2} \times \times\ ) =$

25) $(7\ 10^{3})^{2} \times =$

26) $(2\ 10^{-3})^{3} \times =$

Note: It is important that you know how to use your TI -83 calculator for scientific notation. The easiest method is to use the “EE” button.

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C. Conversion Factors

The important part is showing the work using conversion factors (without a calculator). Approximate an answer without a calculator. Then plug into a calculator. (1 meter = 39.3701 inches, 1 pound = 453.592 grams, 1 quart = 32 oz)

27) 452 inches to millimeters

28) 212 millimeters to inches

29) 517 millimeters to meters

30) 149 grams to pounds

31) 4900 seconds to hours

32) 319 ounces to quarts

33) 20 m/s to km/hr

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How to quickly convert using prefixes:

This is a trick that will help you do conversions with prefixes quickly.

If you want to remove a prefix, such as milligram to gram – replace the milli- with the appropriate base ten exponent. Example: 5 mg = 5 10^{-3} g (The milli- was replaced with $10^{-3} \times$)

If you want to add a prefix, such as gram to kilogram – you need to add in the inverse base ten exponent in addition to the prefix that you add. Example: 6 g = 6 $10^{-3} \times$ kg. This works because the kilo- represents 10^{3} and the 10^{-3} that you added kept the amount of mass the same.

Remember if there is an exponent on the unit, such as cm^2, the conversion should be raised to the same exponent as well.

Convert the following numbers into the specified unit.

34) 24 g = _____ kg

35) 94.1 MHz = _____ Hz

36) 6 Gb = _____ kb

37) 640 nm = _____ m

38) 3.2 m^2 = _____ cm^2

39) 40 mm^3 = _____ m^3

40) 1 g/cm^3 = _____ kg/m^3

Example: Given $V = IR$, solve for I.

$\frac{V}{R} = \frac{IR}{R} \rightarrow I = \frac{V}{R}$

ıted variable. Some variables have a subscript, such as v_0.
ed as one variable.

Given $v = v_0 + at$, solve for a.

Given $F_f = \mu F_N$, solve for μ.

Given $F = ma$, solve for a.

Given $K = \frac{1}{2}mv^2$, solve for v.

41) Given $v = v_0 + a\,t$ solve for a_x

42) Given $F_f = \mu\, F_n$ solve for μ

43) Given $F = m\,a$ solve for a

44) Given $K = \frac{1}{2}\, m\, v^2$ solve for v

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Answers to Part I:

1) 4 2) 4 3) 3 4) 5 5) 1 6) 2 7) 114.3 m
8) 2671.030 g
9) 0.55555 cm
10) 10.00 cm
11) 9 x 10^{-8} m^2
12) 37.24 m
13) 28.5 m/s
14) 937.50 gm
15) 5.0 x 10^{9} cm^3
16) 1500 cm
17) 7.64 10^{6} × kg
18) 3 10^{-9} × m
19) 8.3272 10^{3} × s
20) 9.30 10^{-3} × km/s
21) 6 10^{10} ×
22) 20 10^{5} ×
23) 4 10^{-2} ×
24) .2 10^{2} or 2 10^{1} × ×
25) 49 10^{6} or 4.9 10^{7} × ×
26) 8 10^{-9} ×
27)-33)

$\left(\frac{452\ \text{in}}{1}\right)\left(\frac{1\ \text{ft}}{39.3701\ \text{in}}\right)\left(\frac{10^3\ \text{mm}}{1\ \text{pr}}\right) = \frac{452\times10^3}{39.3701} = 11480.79\ \text{(s.n. \& 3 s.f.)} = \boxed{1.15\times10^4\ \text{mm}}$

$\left(\frac{212\ \text{mm}}{1}\right)\left(\frac{1\ \text{pr}}{10^3\ \text{mm}}\right)\left(\frac{39.3701\ \text{in}}{1\ \text{pr}}\right) = 8346.46\times10^{-3}\ \text{(s.n. \& 3 s.f.)} = \boxed{8.35\ \text{in}}$

$\left(\frac{517\ \text{pm}}{1}\right)\left(\frac{1\ \text{m}}{10^{12}\ \text{mm}}\right) = 517\times10^{-3}\ \text{(s.n. \& 3 s.f.)} = \boxed{5.17\times10^{-1}\ \text{m}}$

$\left(\frac{149\ g}{1}\right)\left(\frac{1\ \text{lb}}{453.592\ g}\right) = 0.328489\ \text{lb (s.n. \& 3 s.f.)} = \boxed{3.28\times10^{-1}\ \text{lb}}$

$\left(\frac{4600\ s}{1}\right)\left(\frac{1\ \text{min}}{60\ s}\right)\left(\frac{1\ \text{hr}}{60\ \text{min}}\right) = 1.277777\ \text{(2 s.f.)} = \boxed{1.3\ \text{hr}}$

$\left(\frac{319\ \text{oz}}{1}\right)\left(\frac{1\ \text{qt}}{32\ \text{oz}}\right) = 9.96875\ \text{(3 s.f.)} = \boxed{9.97\ \text{qt}}$

$\frac{20\ m}{3600\ s}\frac{1\ km}{} = 7\ \frac{}{hr}$ $\frac{km}{} = 7$

( )( )(-) 2-(1 *s.f.*) 0 *km/hr*

$^{3}\ 1\ hr\ 10\ m$ *s*

34) 24 x 10^{-3} kg
35) 94.1 x 10^{6} Hz
36) 6 x 10^{9} x 10^{-3} kb = 6 x 10^{6} kb
37) 640 x 10^{-9} m
38) 3.2 x$(10^{2})^{2}$ cm^2 = 3.2 x 10^{4} cm^2
39) 40 x $(10^{-3})^{3}$ = 40 x $10^{-9}m^3$
40) 1 x $10^{-3}/(10^{-2})^{3}$ = 1 x 10^{3} kg/m^3
41)-44)

1) $a = \frac{v-v_0}{t}$ 2) $\mu = \frac{F_f}{F_N}$ 3) $a = \frac{F}{m}$ 4) $v = \sqrt{\frac{2K}{m}}$

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Part 2: This section will be collected on the first day of school to see if the work was completed – you must SHOW ALL YOUR WORK!

Complete this section with a calculator.

Reference Charts:

GEOMETRY AND TRIGONOMETRY

Rectangle
$A = bh$

Triangle
$A = \frac{1}{2}bh$

Circle
$A = \pi r^2$
$C = 2\pi r$

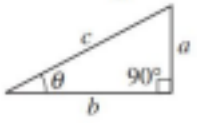
Rectangular solid
$V = \ell wh$

Cylinder
$V = \pi r^2 \ell$
$S = 2\pi r\ell + 2\pi r^2$

Sphere
$V = \frac{4}{3}\pi r^3$
$S = 4\pi r^2$

A = area
C = circumference
V = volume
S = surface area
b = base
h = height
ℓ = length
w = width
r = radius

Right triangle
$c^2 = a^2 + b^2$
$\sin\theta = \frac{a}{c}$
$\cos\theta = \frac{b}{c}$
$\tan\theta = \frac{a}{b}$



VALUES OF TRIGONOMETRIC FUNCTIONS FOR COMMON ANGLES							
θ	0°	30°	37°	45°	53°	60°	90°
$\sin\theta$	0	1/2	3/5	$\sqrt{2}/2$	4/5	$\sqrt{3}/2$	1
$\cos\theta$	1	$\sqrt{3}/2$	4/5	$\sqrt{2}/2$	3/5	1/2	0
$\tan\theta$	0	$\sqrt{3}/3$	3/4	1	4/3	$\sqrt{3}$	∞

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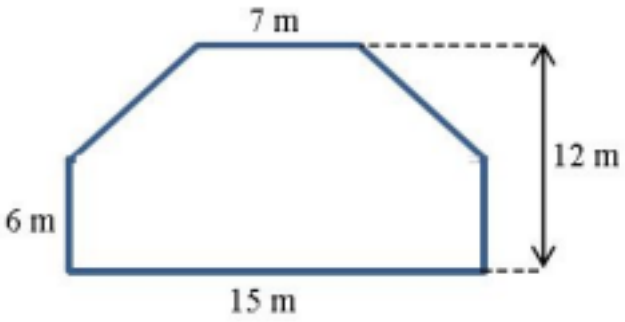
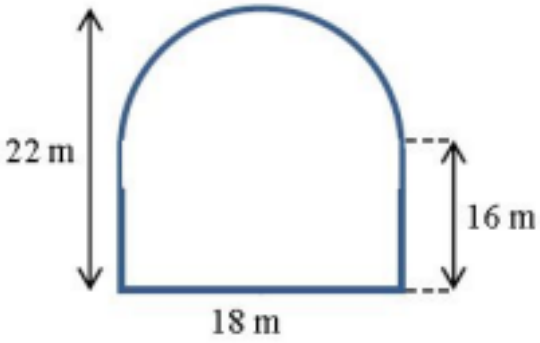
A. Geometric Shapes - Area, Volume, Surface Area

NOTE: It may be necessary to break up the figure into common shapes.

Find the area of the following 2 shapes:





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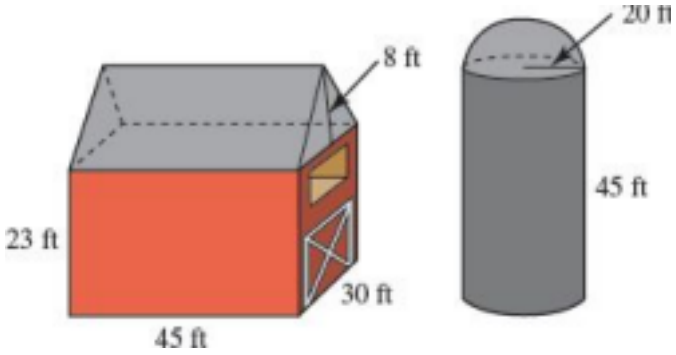
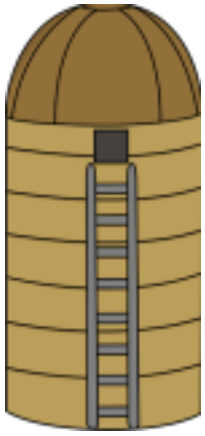
Find the surface area of the barn to estimate the amount of paint required to paint the entire outside of the barn and roof.



Find the volume of the silo (cylinder with hemisphere on top). The height (h) to the top is four times the radius of the hemisphere (r). Your answer should be an expression in terms of h.



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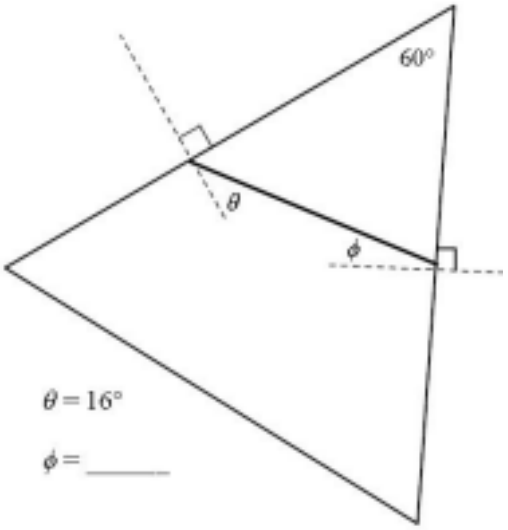
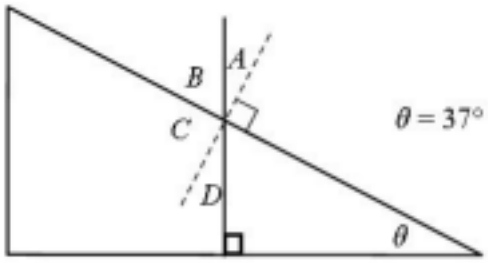
B. Angles

Calculate the unknown angle values.





$A =$ _____ $B =$ _____

$C =$ _____ $D =$ _____

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C. Right Angle Trigonometry

1. At what angle is sine at a maximum?

2. At what angle is sine at a minimum?

3. At what angle is cosine at a minimum?

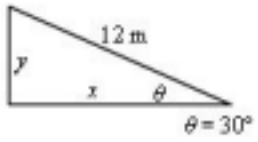
4. At what angle is cosine at a maximum?

5. At what angle are the sine and cosine equivalent?

6. As the angle increases in the first quadrant, what happens to the cosine of the angle?

7. As the angle increases in the first quadrant, what happens to the sine of the angle?

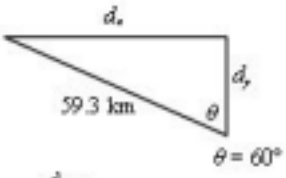
1.



$y =$ _____

$x =$ _____

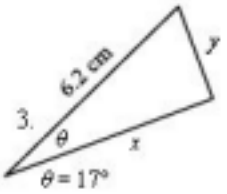
2.



$d_x =$ _____

$d_y =$ _____

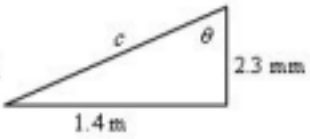
3.



$x =$ _____

$y =$ _____

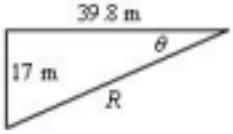
4.



$c =$ _____

$\theta =$ _____

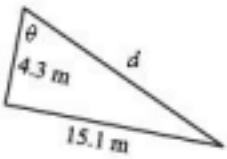
5.



$R =$ _____

$\theta =$ _____

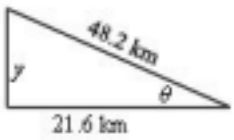
6.



$d =$ _____

$\theta =$ _____

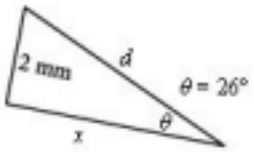
7.



$y =$ _____

$\theta =$ _____

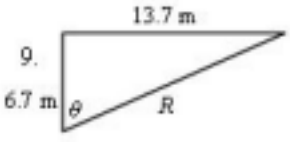
8.



$x =$ _____

$d =$ _____

9.



$R =$ _____

$\theta =$ _____

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D. Experimentation & Graphing

1) A student performed an experiment with a metal sphere. The student shot the sphere from a slingshot and measured its maximum height. The sphere was shot six times at six different angles above the horizon.

a. What is the relationship being studied?

b. What is the independent variable in this experiment?

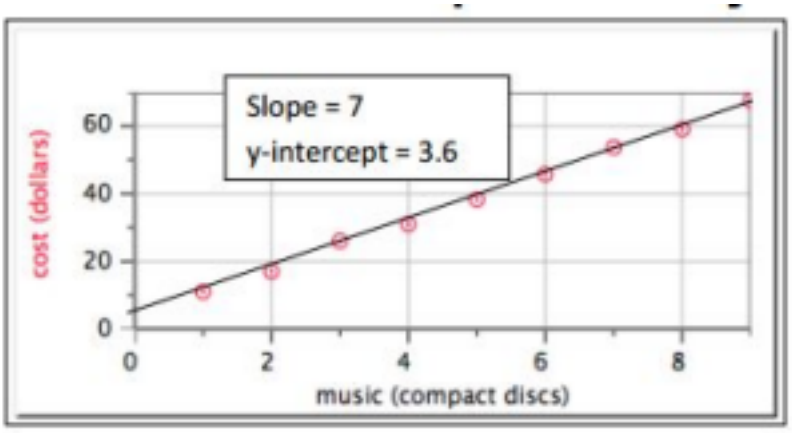
c. What is the dependent variable in this experiment?

d. What variables must be held constant throughout this experiment?

Graphs are an important data analysis tool. We will be analyzing many graphs and learning how to extract the most information from graphs. It is important to understand that in science many aspects of graphs have practical meaning.

For the equation of a straight line, ***y= mx + b*** *m = slope = rise/run; b=y-intercept*

2) A friend prepares to place an online order for CD's.



a. What are the units for the slope of this graph?

b. What does the slope of the graph tell you in this situation?

c. Write an equation that describes the graph.

d. Provide an interpretation for what the y-intercept could mean in this situation.

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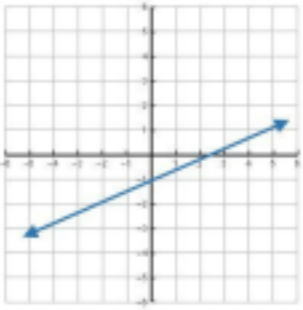
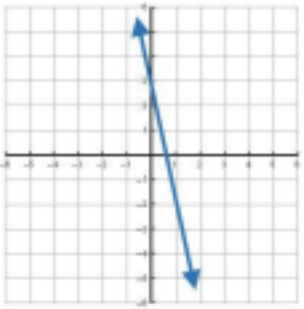
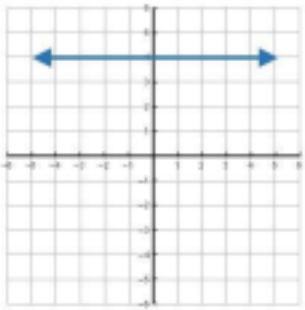
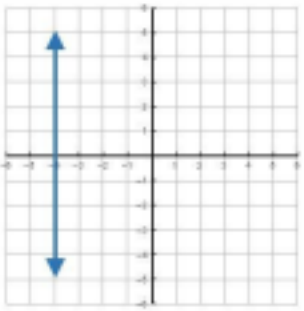
Review Slopes for Linear Graphs:

3) Solve for the slope below.

Lines with Positive, Negative, Zero, and Undefined Slopes

Positive Slope	Negative Slope	Zero Slope	Undefined Slope
			
The line goes "up hill" as you go from left to right.	The line goes "down hill" as you go from left to right.	The line is horizontal. $m = \frac{rise = 0}{run}$	The line is vertical. $m = \frac{rise}{run = 0}$