

AP Physics 1 Summer Assignment - Math Review

1. Scientific Notation:

The following are ordinary physics problems. Write the answer in scientific notation and simplify the units ($\pi=3$).

a. $T_s = 2\pi \sqrt{\frac{4.5 \times 10^{-2} \text{ kg}}{2.0 \times 10^3 \text{ kg/s}^2}} =$ $s =$ _____

b. $F = \left(9.0 \times 10^9 \frac{\text{N} \cdot \text{m}^2}{\text{C}^2}\right) \frac{(3.2 \times 10^{-9} \text{ C})(9.6 \times 10^{-9} \text{ C})}{(0.32 \text{ m})^2}$ $F =$ _____

c. $\frac{1}{R_p} = \frac{1}{4.5 \times 10^2 \Omega} + \frac{1}{9.4 \times 10^2 \Omega}$ $R_p =$ _____

d. $K_{\max} = (6.63 \times 10^{-34} \text{ J} \cdot \text{s})(7.09 \times 10^{14} \text{ s}) - 2.17 \times 10^{-19} \text{ J}$ $K_{\max} =$ _____

e. $\gamma = \frac{1}{\sqrt{1 - \frac{2.25 \times 10^8 \text{ m/s}}{3.00 \times 10^8 \text{ m/s}}}}$ $\gamma =$ _____

f. $K = \frac{1}{2} (6.6 \times 10^2 \text{ kg}) (2.11 \times 10^4 \text{ m/s})^2 =$ $K =$ _____

g. $(1.33) \sin 25.0^\circ = (1.50) \sin \theta$ $\theta =$ _____

2. Solving Equations:

Often problems on the AP exam are done with variables only. Solve for the variable indicated. Don't let the different letters confuse you. Manipulate them algebraically as though they were numbers.

a. $K = \frac{1}{2}kx^2$, $x =$ _____

b. $T_p = 2\pi\sqrt{\frac{\ell}{g}}$, $g =$ _____

c. $F_g = G\frac{m_1m_2}{r^2}$, $r =$ _____

d. $mgh = \frac{1}{2}mv^2$, $v =$ _____

e. $x = x_o + v_o t + \frac{1}{2}at^2$, $t =$ _____

f. $B = \frac{\mu_o I}{2\pi r}$, $r =$ _____

g. $x_m = \frac{m\lambda L}{d}$, $d =$ _____

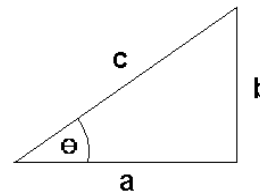
h. $pV = nRT$, $T =$ _____

i. $\sin\theta_c = \frac{n_1}{n_2}$, $\theta_c =$ _____

j. $qV = \frac{1}{2}mv^2$, $v =$ _____

3. Trigonometry

Using the generic triangle to the right, Right Triangle Trigonometry and Pythagorean Theorem solve the following. **Your calculator must be in degree mode.**



g. $\theta = 55^\circ$ and $c = 32 \text{ m}$, solve for a and b .

h. $\theta = 45^\circ$ and $a = 15 \text{ m/s}$, solve for b and c .

i. $b = 17.8 \text{ m}$ and $\theta = 65^\circ$, solve for a and c .

j. $a = 250 \text{ m}$ and $b = 180 \text{ m}$, solve for θ and c .

k. $a = 25 \text{ cm}$ and $c = 32 \text{ cm}$, solve for b and θ .

l. $b = 104 \text{ cm}$ and $c = 65 \text{ cm}$, solve for a and θ .

Part A: Express each of the following in standard form.

1. 5.2×10^3 _____

5. 3.6×10^1 _____

2. 9.65×10^{-4} _____

6. 6.452×10^2 _____

3. 8.5×10^{-2} _____

7. 8.77×10^{-1} _____

4. 2.71×10^4 _____

8. 6.4×10^{-3} _____

Part B: Express each of the following in scientific notation.

1. 78,000 _____

5. 16 _____

2. 0.00053 _____

6. 0.0043 _____

3. 250 _____

7. 0.875 _____

4. 2,687 _____

8. 0.012654 _____

Part C: Use your calculator to compute the following. Give ALL answers in scientific notation.

1. $(6.02 \times 10^{23})(8.65 \times 10^4)$ _____

5. $\frac{(5.4 \times 10^4)(2.2 \times 10^7)}{4.5 \times 10^5}$ _____

2. $(6.02 \times 10^{23})(9.63 \times 10^{-2})$ _____

6. $\frac{(6.02 \times 10^{23})(-1.42 \times 10^{-15})}{6.54 \times 10^{-6}}$ _____

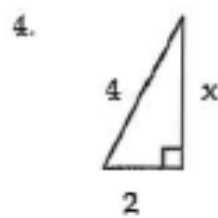
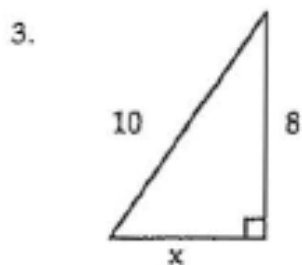
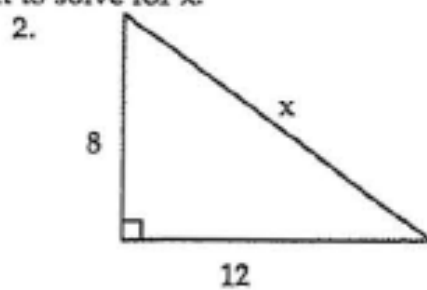
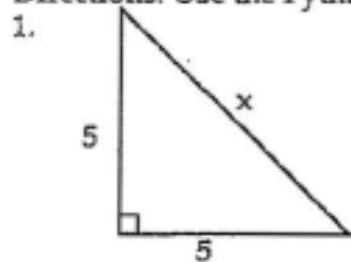
3. $\frac{5.6 \times 10^{-18}}{8.9 \times 10^8}$ _____

17. $\frac{(6.02 \times 10^{23})(-5.11 \times 10^{-27})}{-8.23 \times 10^5}$ _____

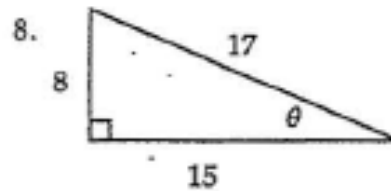
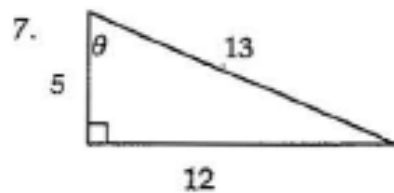
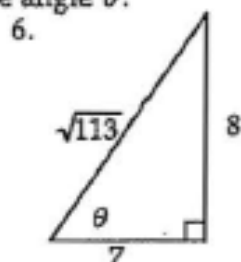
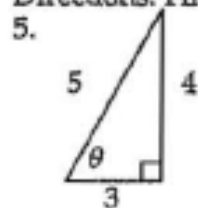
4. $(-4.12 \times 10^{-4})(7.33 \times 10^{12})$ _____

8. $\frac{(3.1 \times 10^{14})(4.4 \times 10^{-12})}{-6.6 \times 10^{-14}}$ _____

Directions: Use the Pythagorean Theorem to solve for x .



Directions: Find the sin, cos, and tan of the angle θ .



Unit Conversion Practice

Using the table of unit unit conversions on the back of this sheet, and your metric conversion line perform the following operations. **SHOW ALL OF YOUR WORK!!!!**

1. Convert 50 L to kiloliters.
2. Convert 200 cm to meters.
3. Convert 7000 mg to grams.
4. Convert 8900 mm to centimeters.
5. Convert 6 km to meters.
6. Convert 50 cg to milligrams.
7. Convert 42 feet to inches.
8. Convert 658 miles to kilometers.
9. Convert 100 cm to inches.
10. Convert 6 square feet to square meters.
11. Convert 25 lbs of force to newtons.
12. Convert 650 Newtons of force to lbs.
13. Convert 35,420 Watts of power to Horsepower (hp).
14. For an object on the earth, convert 180 lbs to kg.

Unit Conversions (Equivalents)

Giancoli, Douglas, Physics 5th ed. New York: Prentice Hall, 1998. P. inside front cover.

Length

1 in. = 2.54 cm
 1 cm = 0.394 in.
 1 ft = 30.5 cm
 1 m = 39.37 in. = 3.28 ft
 1 mi = 5280 ft = 1.61 km
 1 km = 0.621 mi
 1 nautical mile (U.S.) = 1.15 mi = 6076 ft = 1.852 km
 1 fermi = 1 femtometer (fm) = 10^{-15} m
 1 angstrom (Å) = 10^{-10} m
 1 light-year (ly) = 9.46×10^{15} m
 1 parsec = 3.26 ly = 3.09×10^{16} m

Volume

1 liter (L) = 1000 mL = $1000 \text{ cm}^3 = 1.0 \times 10^{-3} \text{ m}^3 =$
 1.057 quart (U.S.) = 61.02 in.³
 1 gallon (U.S.) = 4 qt (U.S.) = 231 in.³ = 3.79 L =
 0.83 gal (Imperial)
 1 m³ = 35.31 ft³

Angle

1 radian (rad) = $57.30^\circ = 57^\circ 18'$
 1° = 0.01745 rad
 1 rev/min (rpm) = 0.1047 rad/s

SI Derived Units and Their Abbreviations

Quantity	Unit	Abbreviation	In Terms of Base Units [†]
Force	newton	N	kg·m/s ²
Energy and work	joule	J	kg·m ² /s ²
Power	watt	W	kg·m ² /s ³
Pressure	pascal	Pa	kg/(m·s ²)
Frequency	hertz	Hz	s ⁻¹
Electric charge	coulomb	C	A·s
Electric potential	volt	V	kg·m ² /(A·s ³)
Electric resistance	ohm	Ω	kg·m ² /(A ² ·s ³)
Capacitance	farad	F	A ² ·s ² /(kg·m ²)
Magnetic field	tesla	T	kg/(A·s ²)
Magnetic flux	weber	Wb	kg·m ² /(A·s ²)
Inductance	henry	H	kg·m ² /(s ² ·A ²)

[†]kg = kilogram (mass), m = meter (length), s = second (time), A = ampere (electric current).

Time

1 day = 8.64×10^4 s
 1 year = 3.156×10^7 s

Mass

1 atomic mass unit (u) = 1.6605×10^{-27} kg
 1 kg = 0.0685 slug
 [1 kg has a weight of 2.20 lb where $g = 9.81 \text{ m/s}^2$.]

Force

1 lb = 4.45 N
 1 N = 10^5 dyne = 0.225 lb

Energy and Work

1 J = 10^7 ergs = 0.738 ft·lb
 1 ft·lb = 1.36 J = 1.29×10^{-3} Btu = 3.24×10^{-4} kcal
 1 kcal = 4.186×10^3 J = 3.97 Btu
 1 eV = 1.602×10^{-19} J
 1 kWh = 3.60×10^6 J = 860 kcal

Power

1 W = 1 J/s = 0.738 ft·lb/s = 3.42 Btu/h
 1 hp = 550 ft·lb/s = 746 W

Pressure

1 atm = 1.013 bar = $1.013 \times 10^5 \text{ N/m}^2$
 = 14.7 lb/in.² = 760 torr
 1 lb/in.² = $6.90 \times 10^3 \text{ N/m}^2$
 1 Pa = 1 N/m² = 1.45×10^{-4} lb/in.²

Metric (SI) Multipliers

Prefix	Abbreviation	Value
exa	E	10^{18}
peta	P	10^{15}
tera	T	10^{12}
giga	G	10^9
mega	M	10^6
kilo	k	10^3
hecto	h	10^2
deka	da	10^1
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}
femto	f	10^{-15}
atto	a	10^{-18}