

Advanced Physics Summer Work 2021

The exercises below are a review of the prerequisite math skills that you need to succeed in Advanced Physics. Make sure to read all directions throughout the packet. All work must be completed on the pages below in the area provided. Final answers can be in fractions and in terms of mathematical constants (π , e , i , etc.).

Your work must be legible and linear, and I must be able to follow it easily.

Mark your final answers by either circling or boxing them.

Your completed summer work is due on the first day of class.

Do not copy work from another student for your own integrity and for your own benefit. Use a math book or the internet for reference. No physics is needed for this packet. If you have difficulty, please do not hesitate to email me at tbartick@nya.org

The purpose of this packet is so that I can determine what math skills we will need to review at the beginning of the year. All I ask is that you attempt each problem, and take the solution as far as you can (even if you don't get an answer).

Significant Figures and Scientific Notation Review

1.) How many significant figures do the following numbers have?

a.) 6.001

b.) 0.0080

c.) 206,000

d.) 27.00

e.) π

Solve the following problems (can you do them without a calculator?). Final answers should be in scientific notation with the correct number of significant figures.

2.) $(5.0 \times 10^{-8})(2.9 \times 10^2)$

3.) $(3.25 \times 10^4 + 7.4 \times 10^3)$

4.) $(6.000 \times 10^{-11})(1.00 \times 10^{-26})/(2.00 \times 10^7)$

5.) $8400/(1.2 \times 10^7)$

Unit Conversions Review

6.) Finish the SI prefix table below. Follow the example of the centi- prefix. You will need to memorize these.

Symbol	Name	Numerical Equivalent
n		
μ		
m		
c	centi	10^{-2}
k		
M		
G		

7.) 16.7 kilograms is how many grams?

8.) 560 nm is how many meters?

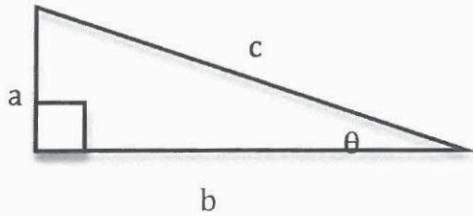
9.) 15 years is how many seconds?

10.) 8.99×10^9 seconds is how many years?

11.) 2.998×10^8 m/s is how many kilometers per hour?

Trigonometry Review

Directions: Use the figure below to answer problems 15-25. Simplify as much as you can.



12.) Find c if given a and b .

13.) Find a if given b and c .

14.) Find a if given c and θ .

15.) Find b if given a and θ .

16.) Find c if given b and θ .

17.) Find θ if given b and c .

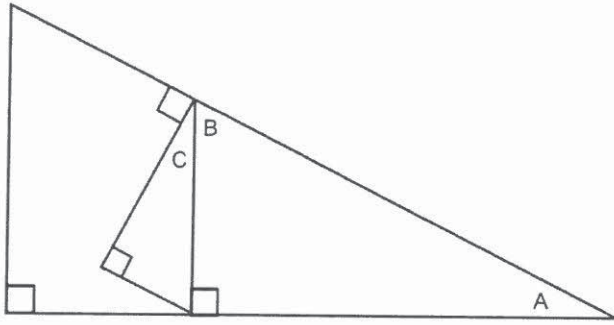
18.) Find θ if given a and b .

19.) If $a = 2.0$ and $c = 7.0$, what is b ?

20.) If $c = 10.0$ and $\theta = 60^\circ$, what is b ?

21.) If $a = 12.0$ and $\theta = 30^\circ$, what is b ?

22.) Using the properties of triangles, prove that $\angle A \cong \angle C$ in the drawing below.



Answer:

23.) For what angles (in degrees) does $\sin \theta \approx \theta$? Describe why mathematically.

24.) Complete the table below without using a calculator.

θ	0°	30°	45°	60°	90°
$\sin \theta$					
$\cos \theta$					
$\tan \theta$					

25.) 360 degrees = _____ radians.

26.) 4.5 revolutions = _____ radians.

27.) Find the length of an arc with a radius of 6.0 m swept across 2.5 radians.

28.) Find the length of an arc with a radius of 10.0 m swept across 100 degrees.

Algebra Review

Directions: Solve the following equations for the given variable and conditions. Simplify if needed.

Example: $2x + xy = z$. Solve for x .

$$x(2 + y) = z$$

$$x = \frac{z}{2 + y}$$

29.) $v_1 + v_2 = 0$. Solve for v_1 .

30.) $a = \frac{v}{t}$. Solve for t .

31.) $v_f^2 = v_i^2 + 2ad$

A.) Solve for v_i .

B.) Solve for d .

32.) $d_f = d_i + v_o t + \frac{1}{2} a t^2$

A.) Solve for v_o .

B.) Solve for t , if $v_o = 0$.

C.) Solve for t , if $d_i = d_f$.

$$33.) \quad F = m \frac{v_f - v_i}{t_f - t_i}$$

A.) Solve for v_f if $t_i = 0$.

B.) Solve for t_f if $v_f = 0$ and $t_i = 0$.

$$34.) \quad a_c = \frac{v^2}{r} \text{ Solve for } v.$$

$$35.) \quad mg \sin \theta = \mu mg \cos \theta. \text{ Solve for } \theta.$$

$$36.) \quad \frac{1}{2} m v_f^2 + m g h_f = \frac{1}{2} m v_i^2 + m g h_i$$

A.) Solve for h_f if $h_i = 0$ and $v_f = 0$.

B.) Solve for v_f if $h_f = 0$.

$$37.) \quad Ft = m v_f - m v_i. \text{ Solve for } v_f.$$

$$38.) \quad m_1 v_{i,1} + m_2 v_{i,2} = (m_1 + m_2) v_f. \text{ Solve for } v_{i,2}.$$

$$39.) \quad m_1 v_{i,1} + m_2 v_{i,2} = m_1 v_{f,1} + m_2 v_{f,2}. \text{ Solve for } v_{f,2} \text{ if } v_{i,1} = 0.$$

40.) $(F_1 \sin \theta)r_1 + (-F_2 \sin \phi)r_2 = 0$. Solve for r_2 .

41.) $-kx + m(-g) = 0$. Solve for m .

42.) $F_g = G \frac{m_1 m_2}{r^2}$. Solve for r .

43.) $L - L \cos \theta = \frac{v^2}{2}$ Solve for L .

44.) $\frac{mv^2}{R} = G \frac{Mm}{R^2}$. Solve for v .

45.) $T = 2\pi \sqrt{\frac{L}{g}}$. Solve for g .

46.) $\frac{1}{2}mv_f^2 + \frac{1}{2}kx^2 = \frac{1}{2}mv_i^2 + mgh_i$. Solve for x if $v_f = 0$.

47.) $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$. Solve for R_T .

Miscellaneous

Directions: Simplify without using a calculator. Remember to show all of your work.

48.) $\frac{1}{4} + \frac{1}{6}$

49.) $\frac{1}{3} + \frac{1}{18}$

50.) Consider $z = \frac{x}{y}$, $c = ab$, $l = m - n$, or $r = \frac{s^2}{t^2}$.

- a.) As x increases and y stays constant, z _____.
- b.) As y increases and x stays constant, z _____.
- c.) As x increases and z stays constant, y _____.
- d.) As a increases and c stays constant, b _____.
- e.) As c increases and b stays constant, a _____.
- f.) As b increases and a stays constant, c _____.
- g.) As n increases and m stays constant, l _____.
- h.) As l increases and n stays constant, m _____.
- i.) If s is tripled and t stays constant, r is multiplied by _____.
- j.) If t is doubled and s stays constant, r is multiplied by _____.