AP Physics 1 Summer Work 2020

The exercises below are a review of the prerequisite math skills that you need to succeed in AP Physics 1. Make sure to read all directions throughout the packet. All work must be completed on the pages below in the area provided. Calculators **CAN** be used. Final answers can be in fractions, decimals, or in terms of mathematical constants (θ , *e*, *i*, x, y, a, t, etc.).

Your work must be legible and linear, and I must be able to follow it easily. Please no incoherent jumping around the page. Mark your final answers by either circling or boxing them. **Your completed summer work is due the first day of class.**

Do not copy work from another student for your own integrity and for your own benefit because all AP Physics 1 students will take a quiz with problems similar to (if not exactly like) those found on this review the first week of school. You are expected to score a 90% or better on the quiz. Use a math book or internet for reference. No physics is needed for this packet. If you have difficulty, please do not hesitate to email me at lacon.katie@lebanonschools.org

Unit Conversions Review

1. Given the SI prefix table below. Follow the example of the centi- prefix. You will need to use these for unit conversions.

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

2. 16.7 kilograms is how many grams?

3. 560 nm is how many meters?

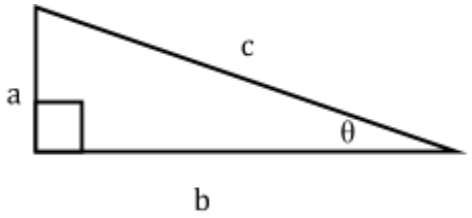
4. 15 years is how many seconds?

5. 8.99×10^9 seconds is how many years?

6. 2.998×10^8 m/s is how many kilometers per hour?

Trigonometry Review

Directions: Use the figure below to answer problems 7-16. Simplify as much as you can.



7. Find *c* if given *a* and *b*.

8. Find *a* if given *c* and θ.

9. Find *c* if given *b* and θ.

10. Find θ if given *a* and *b*.

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

12. Find *a* if given *b* and *c*.

13. Find *b* if given *a* and θ.

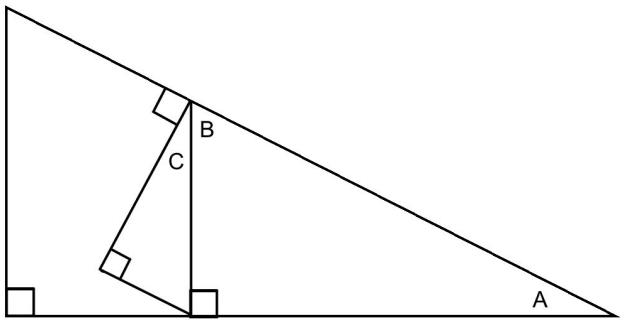
14. Find θ if given *b* and *c*.

15. If *a* = 2.0 and *c* = 7.0, what is *b*?

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

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

Answer:



17. Complete the table below.

Angle	0°	90°
sin θ		
cos θ		

18. 360 degrees = _____ radians.

19. 4.5 revolutions = _____ radians.

Algebra Review

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

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

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

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

20. $v_1 + v_2 = 0.$ Solve for v_1.

21. $a = \dfrac{v - v_0}{t}$. Solve for t.

22. $v_x^{\,2} = v_{x0}^{\,2} + 2a(x - x_0)$

a. Solve for v_{x0}. b. Solve for x.

23. $x = x_o + v_{xo}t + \frac{1}{2}a_x t^2$

a. Solve for v_{xo}. b. Solve for t, if $v_{xo} = 0$ c. Solve for t, if $x_o = x$.

24. $F = m\frac{v_f - v_i}{t_f - t_i}$

a. Solve for v_f, if $t_i = 0$. b. Solve for t_f, if $v_f = 0$ and $t_i = 0$.

25. $a_c = \frac{v^2}{r}$. Solve for v.

26. $mg\sin\theta = \mu mg\cos\theta$ Solve for θ.

27. $\frac{1}{2}mv_f^{\,2} + mgh_f = \frac{1}{2}mv_0^{\,2} + mgh_0$

a. Solve for h_f, if $h_0 = 0$ and $v_f = 0$. b. Solve for v_f, if $h_f = 0$.

28. $Ft = mv_f - mv_0$. Solve for v_f.

29. $m_1 v_{0,1} + m_2 v_{0,2} = (m_1 + m_2) v_f$. Solve for $v_{0,2}$.

30. $m_1 v_{0,1} + m_2 v_{0,2} = m_1 v_{f,1} + m_2 v_{f,2}$. Solve for $v_{f,2}$ if $v_{0,1} = 0$.

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

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

33. $\left|\vec{F}_g\right| = G\frac{m_1 m_2}{r^2}$. Solve for r.

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

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

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

37. $\frac{1}{2}mv_f^{\,2} + \frac{1}{2}kx^2 = \frac{1}{2}mv_0^{\,2} + mgh_0$. Solve for x if $v_f = 0$.

38. $\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2}$. Solve for R_P.

Miscellaneous

39. 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 _____.

Systems of equations

Use the equations in each problem to solve for the specified variable in the given terms. Simplify.

40. $F_f = \mu F_N$ and $F_N = mg\cos\theta$. Solve for μ in terms of F_f, m, g, and θ.

41. $F_1 + F_2 = F_T$ and $F_1 \cdot d_1 = F_2 \cdot d_2$. Solve for F_1 in terms of F_T, d_1, and d_2.

42. $\Sigma F = ma_c$ and $a_c = \frac{v^2}{r}$. Solve for r in terms of ΣF, m, and v.

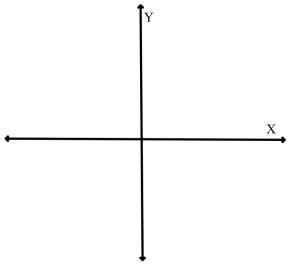
43. $T = 2\pi\sqrt{\frac{L}{g}}$ and $T = \frac{1}{f}$. Solve for L in terms of π, g, and f.

Graphing Equations

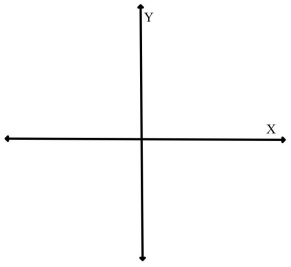
44. If $r = -x*t+c$ was graphed on an r vs. t graph, what would the following be?
Slope: _____ y-intercept: _____

45. On the y vs. x graphs below, sketch the relationships given.

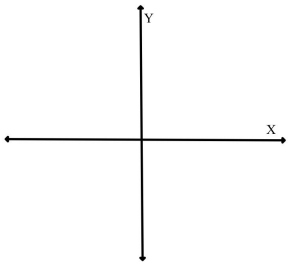
a. y = mx + b, if $m > 0$ and $b = 0$.



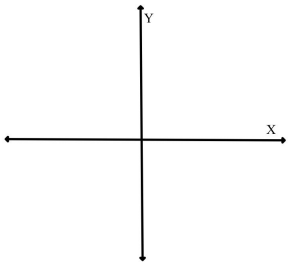
b. y = mx + b, if $m < 0$ and $b > 0$.



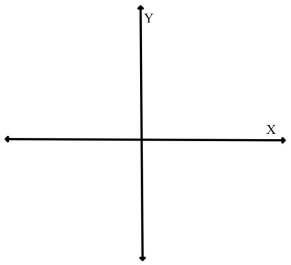
c. $y = x^2$



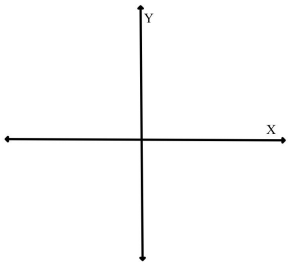
d) $y = \sqrt{x}$



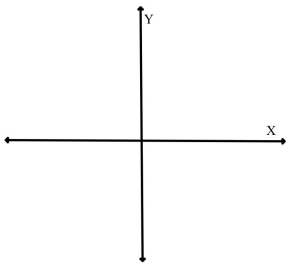
e. y = 1/x



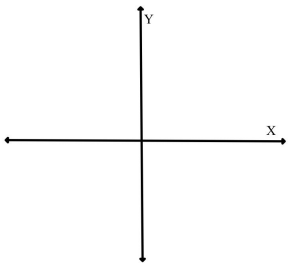
f. $y = 1/x^2$



g. $y = \sqrt{\frac{1}{x}}$



h. y = sin(x)



Marbles in Cylinder Lab

a. You received a graduated cylinder with three identical marbles and an unknown amount of water already in it. You placed extra identical marbles in the cylinder and obtained the data below. Use the data to graph a best-fit line showing the relationship between the water level and the number of marbles. The y-intercept should be visible on the graph. Label your axes and include units.
b. From the graph, determine a mathematical formula for the water level for any number of marbles. Lastly, give an explanation of your formula in words. Make sure to give an explanation of the slope and y-intercept of your formula.

Number of Marbles in Water	Water level (mL)
3	58
4	61
5	63
6	65
7	68

46. Graph the data point to the right.

47. Formula: _____

48. Explanation of the formula in words: (Include the meaning of the **slope** and **y-intercept**.)