AP Physics 1 Summer Assignments

Greetings Students and Welcome to AP Physics 1!

The Summer assignments are comprised of two parts:
- Book Report
- Math Review Packet

These assignments are due on the **First Day of Class**.
Each Assignment will count as a Quiz Grade.
The Westlake Honor Code is in effect for this assignment.
Please govern yourselves accordingly.

**Assignment 1: Book Report**
Choose 1 book from the list below to read. Be prepared to have a lively discussion about your book on Day 1. If you are led to read more than one, feel free to do so, but you will only receive **one grade for one book** report.

Your book report must be sent ELECTRONICALLY TO bennettv@fultonschools.org AND you must bring a hardcopy printout the first day of school.

Prepare a **quality, type written** report that thoroughly answers the following questions:
- a. What are some of the things that you found to be the most intriguing about what you read and why?
- b. What are the new words/terms that you found in the reading? Make a list and define those terms.

- Newton's Football - The Science Behind America's Game by Allen St. John and Ainissa Ramirez
- A Short History of Nearly Everything by Bill Bryson
- Physics for Future Presidents by Richard Muller
- Fizz - Nothing is as it Seems by Zvi Schreiber
- The Evolution of Physics by Albert Einstein and Leopold Infeld
- Origins: Fourteen Billion Years of Cosmic Evolution by Neil deGrasse Tyson and Donald Goldsmith
- Black Apollo of Science: The Life of Ernest Everett Just by Kenneth R. Manning
- Rocket Girl: The Story of Mary Sherman Morgan, America's First Female Rocket Scientist by George D. Morgan
Be sure to **SHOW ALL WORK** to receive credit and complete in PENCIL ONLY. Legible Handwriting is required.

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**I. Order of Operations (PEMDAS)**

- Parenthesis and other grouping symbols.
- Exponential expressions.
- Multiplication, Division
- Addition & Subtraction.

Tutorial:
http://www.regentsprep.org/Regents/Math/orderop/Lorder.htm
http://www.math.com/school/subject2/lessons/S2U1L2GL.html

Simplify each numerical expression. Show all work! Only use a calculator to check.

1) \( 6 + 2 \times 8 - 12 + 9 \div 3 \)
2) \( 25 - (2^3 + 5 \times 2 - 3) \)
3) \( \frac{-2 (-30) + 0.5 \times 20}{4^2 - 6} \)
4) \( \frac{15 - [8 - (2 + 5)]}{18 - 5^2} \)
II. Evaluating Algebraic Expressions
To evaluate an algebraic expression:
- Substitute the given value(s) of the variable(s).
- Use order of operations to find the value of the resulting numerical expression.

Tutorials:
http://www.purplemath.com/modules/evaluate.htm

Evaluate.

1) \( x \left( \frac{y + 3z^2}{z^2} \right) - 2x \) if \( x = \frac{1}{2}, y = 4, z = -2 \)
2) \( 12a - 4a^2 + 7a^3 \) if \( a = -3 \)

3) \( \frac{-b + \sqrt{b^2 - 4ac}}{2a} \) if \( a = 1, b = -4, c = -21 \)
4) \( 1.2(3)^x \) if \( x = 3 \)

5) \( \frac{3(x+y) - 2(x-y)}{5x+y} \) if \( x = 3 \) and \( y = 4 \)
6) \( 2 \left( \frac{1}{3} \right)^x \) if \( x = 2 \)

7) \( A = P \left( 1 + \frac{r}{n} \right)^{nt} \) if \( P = 650, r = 6\%, n = 2, t = 15 \)
8) If \( k \odot n = k^3 - 3n \), then evaluate \( 7 \odot 5 \)
### III. Solving Literal Equations
Solving for a variable in an equation is often what is required when solving Physics problems. Let’s see your skills in this area.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Show work here</th>
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</thead>
<tbody>
<tr>
<td>$P = IRT$ Solve for $T$</td>
<td></td>
</tr>
<tr>
<td>$V = \pi r^2 h$ Solve for $h$</td>
<td></td>
</tr>
<tr>
<td>$A = \frac{x + y^2}{2}$ Solve for $y$</td>
<td></td>
</tr>
<tr>
<td>$A = \frac{r}{2L}$ Solve for $L$</td>
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</tbody>
</table>

Solve $V = \frac{1}{3} \pi h^2 (3r - h)$ for $r$

Solve $h = vt - 16t^2$ for $v$

Solve $h = vt - 16t^2$

Solve the equation for variable $t$

Solve $F = \frac{g m_1 m_2}{d^2}$ for $g$
### IV. Properties of Exponents - Complete the example problems.

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product of Powers</td>
<td>$a^m \cdot a^n = a^{m+n}$</td>
</tr>
<tr>
<td>Power of a Power</td>
<td>$(a^m)^n = a^{mn}$</td>
</tr>
<tr>
<td>Power of a Product</td>
<td>$(ab)^m = a^m b^m$</td>
</tr>
<tr>
<td>Negative Power</td>
<td>$a^{-n} = \frac{1}{a^n}$ (a≠0)</td>
</tr>
<tr>
<td>Zero Power</td>
<td>$a^0 = 1$ (a≠0)</td>
</tr>
<tr>
<td>Quotient of Powers</td>
<td>$\frac{a^m}{a^n} = a^{m-n}$ (a≠0)</td>
</tr>
<tr>
<td>Power of Quotient</td>
<td>$(\frac{a}{b})^n = \frac{a^n}{b^n}$ (b≠0)</td>
</tr>
</tbody>
</table>

Tutorials:
- [http://www.purplemath.com/modules/exponent.htm](http://www.purplemath.com/modules/exponent.htm)

Simplify each expression. Answers should be written using positive exponents.

1) $g^5 \cdot g^{11}$ ____________  2) $(b^6)^3$ ____________

3) $w^{-7}$ ____________  4) $\frac{y^{12}}{y^4}$ ____________

5) $(3x^7)(-5x^{-3})$ ____________  6) $(-4a^{-5}b^0c)^2$ ____________

7) $\frac{-15x^7y^{-2}}{25x^{-9}y^5}$ ____________  8) $\left(\frac{4x^9}{12x^4}\right)^3$ ____________
IV. Solving Linear Equations
To solve linear equations, first simplify both sides of the equation. If the equation contains fractions, multiply the equation by the LCD to clear the equation of fractions. Use the addition and subtraction properties of equality to get variables on one side and constants on the other side of the equal sign. Use the multiplication and division properties of equality to solve for the variable. Express all answers as fractions in lowest terms.

Tutorials:
Solving Linear Equations: http://www.purplemath.com/modules/solvelin.htm
Solving Equations: http://www.regentsprep.org/Regents/Math/solveq/LSolvEq.htm

Examples:

a) \(3(x + 5) + 4(x + 2) = 21\)
\[3x + 15 + 4x + 8 = 21\]
\[7x + 23 = 21\]
\[7x = -2\]
\[x = -\frac{2}{7}\]

b) \(2(5x - 4) - 10x = 6x + 3(2x - 5)\)
\[10x - 8 - 10x = 6x + 6x - 15\]
\[-8 = 12x - 15\]
\[7 = 12x\]
\[\frac{7}{12} = x\]

c) \(\frac{2}{3}x + 5 = 6x - \frac{3}{4}\)
\[\frac{2}{3}x + 5 = 6x - \frac{3}{4}\]
\[12 \left(\frac{2}{3}x + 5\right) = 12 \left(6x - \frac{3}{4}\right)\]
\[8x + 60 = 72x - 9\]
\[69 = 64x\]
\[\frac{69}{64} = x\]

Solve for the indicated variable:

1) \(3n + 1 = 7n - 5\)
2) \(2[x + 3(x - 1)] = 18\)

3) \(6(y + 2) - 4 = -10\)
4) \(2x^2 = 50\)

5) \(5 + 2(k + 4) = 5(k - 3) + 10\)
6) \(6 + 2x(x - 3) = 2x^2\)

7) \(\frac{2}{3}x - 18 = \frac{x}{6}\)
8) \(\frac{x - 2}{3} = \frac{2x + 1}{4}\)
V. Operations With Polynomials
To add or subtract polynomials, just combine like terms.
To multiply polynomials, multiply the numerical coefficients and apply the rules for exponents.

Tutorials:
Polynomials (adding & subtracting): http://www.purplemath.com/modules/polyadd.htm,
Polynomials (multiplying): http://www.purplemath.com/modules/polymult.htm,

Examples:

a) \((x^2 + 3x - 2) - (3x^2 - x + 5)\)
\[x^2 + 3x - 2 - 3x^2 + x - 5\]
\[-2x^2 + 4x - 7\]

b) \(3x(2x + 5)^2\)
\[3x(4x^2 + 20x + 25)\]
\[12x^3 + 60x^2 + 75x\]

c) \(4(5x^2 + 3x - 4) + 3(-2x^2 - 2x + 3)\)
\[20x^2 + 12x - 16 - 6x^2 - 6x + 9\]
\[14x^2 + 6x - 7\]

d) \((4x - 5)(3x + 7)\)
\[12x^2 + 28x - 15x - 35\]
\[12x^2 + 13x - 35\]

Perform the indicated operations and simplify:

1) \((7x^2 + 4x - 3) - (-5x^2 - 3x + 2)\)
2) \((7x - 3)(3x + 7)\)

3) \((4x + 5)(5x + 4)\)
4) \((n^2 + 5n + 3) + (2n^2 + 8n + 8)\)

5) \((5x^2 - 4) - 2(3x^2 + 8x + 4)\)
6) \(-2x(5x + 11)\)

7) \((2m + 6)(2m + 6)\)
8) \((5x - 6)^2\)
VI. Factoring Polynomials

Examples:

- **Factoring out the GCF**
- **Difference of Squares**
- **Perfect Square Trinomial**

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>a)</td>
<td>$6x^2 + 21x$</td>
<td>b)</td>
</tr>
<tr>
<td></td>
<td>$3x(2x + 7)$</td>
<td></td>
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</tbody>
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</thead>
<tbody>
<tr>
<td>d)</td>
<td>$3x^2 + 7x + 2$</td>
<td>e)</td>
</tr>
<tr>
<td></td>
<td>$(3x + 1)(x + 2)$</td>
<td></td>
</tr>
</tbody>
</table>

**Tutorials:**

- Factoring Polynomials (video): [http://www.youtube.com/watch?v=uoEoWzHXaJ8](http://www.youtube.com/watch?v=uoEoWzHXaJ8)

Factor Completely.

1)  $16y^2 + 8y$  
2)  $18x^2 - 12x$  
3)  $6m^2 - 60m + 10$

4)  $6y^2 - 13y - 5$  
5)  $20x^2 + 31x - 7$  
6)  $12x^2 + 23x + 10$

7)  $x^2 - 2x - 63$  
8)  $8x^2 - 6x - 9$  
9)  $x^2 - 121$
VII. Linear Equations in Two Variables

Examples:

a) Find the slope of the line passing through the points (-1, 2) and (3, 5).

\[ m = \frac{y_2 - y_1}{x_2 - x_1} \rightarrow m = \frac{5 - 2}{3 - (-1)} = \frac{3}{4} \]

b) Graph \( y = \frac{2}{3} x - 4 \) with slope-intercept method.

Reminder: \( y = mx + b \) is slope-intercept form where \( m \) = slope and \( b \) = \( y \)-intercept. Therefore, slope is 2/3 and the \( y \)-intercept is -4.

Graph accordingly.

c) Graph \( 3x - 2y - 8 = 0 \) with slope-intercept method.

Put in Slope-Intercept form: \( y = -\frac{3}{2} x + 4 \)

\[ m = \frac{3}{2} \quad b = -4 \]

d) Write the equation of the line with a slope of 3 and passing through the point (2, -1)

\[ y = mx + b \]
\[ -1 = 3(2) + b \]
\[ -7 = b \quad \rightarrow \quad \text{Equation: } y = 3x - 7 \]

Tutorials:
Using the slope and \( y \)-intercept to graph lines: [http://www.purplemath.com/modules/slopgrph.htm](http://www.purplemath.com/modules/slopgrph.htm)

Find the slope of the line passing through each pair of points:

1) (-3, -4) (-4, 6)  
2) (-4, -6) (-4, -8)  
3) (-5, 3) (-11, 3)
Write an equation, in slope-intercept form using the given information.

4) \((5, 4) \quad m = \frac{-2}{3}\)  
5) \((-2, 4) \quad m = -3\)  
6) \((-6, -3) \quad (-2, -5)\)

VIII. Significant Figures and Scientific Notation
You can use Purplemath as a great resource to understand the rules for “SigFigs”. [http://www.purplemath.com](http://www.purplemath.com)

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

   a.) 6.001  Answer: ________  
   b.) 0.0080  Answer: ________  
   c.) 206,000  Answer: ________  
   d.) 27.00  Answer: ________  
   e.) \(\pi\)  Answer: ________

Directions: Find the following. 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.) \(\frac{6.000 \times 10^{-11}}{1.00 \times 10^{26}} = \frac{8400}{2.00 \times 10^{7}}\)  
5.) \(1.2 \times 10^{7}\)
IV. SI Units and Conversions Review

You can use Purplemath as a great resource to understand the rules for Unit Conversions. http://www.purplemath.com

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Numerical Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td></td>
<td></td>
</tr>
<tr>
<td>μ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>m</td>
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<td>c</td>
<td>centi</td>
<td>$10^{-2}$</td>
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<tr>
<td>k</td>
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<td>M</td>
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<tr>
<td>G</td>
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</tbody>
</table>

7.) 16.7 kilograms is how many grams?

8.) 560 nm is how many meters?
9.) 15 years is how many seconds?

10.) $8.99 \times 10^9$ seconds is how many years?

11.) $2.998 \times 10^4$ m/s is how many kilometers per hour?