

Pre-AP Physics

Mathematics Preliminaries

Fundamental SI Units (mks)

<u>Quantity</u>	<u>Name</u>	<u>Abbreviation</u>
length	meter	m
mass	kilogram	kg
time	second	s
temperature	kelvin	K

Derived Units

Derived units are combinations of fundamental units.

<u>Quantity</u>	<u>Name</u>	<u>Abbreviation</u>
area	square meter	m ²
volume	cubic meter	m ³
density	kilogram per cubic meter	kg/m ³

SI Prefixes

<u>Factor</u>	<u>Prefix</u>	<u>Abbreviation</u>
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

Scientific Notation

A number that is expressed as a numerical part that is between 1 and 9 multiplied by a whole-number power of 10.

Rules for Significant Figures

All *non-zero digits* in a measurement.

All *final zeros after the decimal place*.

All *zeros between two other significant figures*.

Zeros used for spacing the decimal point are not significant.

Examples:

1004	0.008	0.002005
12.0	2,001,000	50.35

Operations and Significant Figures

Addition and Subtraction are limited by the least precise number.

Add or subtract the numbers and then round the result to correspond to the least precise value involved.

Example:

$$\begin{aligned}24.686 \text{ m} + 2.343 \text{ m} + 3.21 \text{ m} &= 30.239 \text{ m} \\ &= 30.24 \text{ m}\end{aligned}$$

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Operations and Significant Figures

Multiplication and Division are limited by the number with the fewest significant figures.

Multiply or divide the numbers and then round the result so that it has the same number of significant figures as the factor with the fewest number of significant figures.

Example:

$$\begin{aligned}(24.686 \text{ m})(2.343 \text{ m})(3.21 \text{ m}) &= 185.664 \text{ m}^3 \\ &= 186 \text{ m}^3\end{aligned}$$

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Quadratic Formula

For an equation of the form:

$$ax^2 + bx + c = 0$$

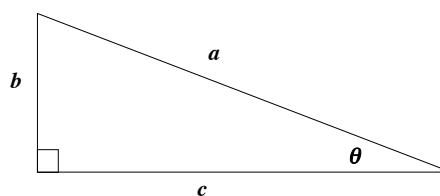
The solution is:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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Right Triangles



$$\begin{aligned}a^2 &= b^2 + c^2 \\ \cos \theta &= \frac{c}{a} & \sin \theta &= \frac{b}{a} & \tan \theta &= \frac{b}{c} \\ \theta &= \tan^{-1} \frac{b}{c}\end{aligned}$$

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Graphing Data

- Use pencil only
- Descriptive title
- y vs x
- Label each axis with the quantity and unit
- Scale each axis independently (from (0, 0)) so that the maximum amount of real estate is used
- Draw a line (or smooth curve) of best fit through the data points. Do not assume that the line passes through the origin. NEVER EVER DRAW DOT-TO-DOT.

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Finding the Slope of a Line of Best Fit

- Pick two points on the line of best fit (neither can be data points).
- Draw two dashed lines parallel to the axes and clearly label the rise and run with scaled values (not squares) and units.
- Show the calculation of the slope and write this value on the graph.

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