# Introduction: Mathematics

**Unit:** Mathematics

**Topics covered in this chapter:**



The purpose of this chapter is to familiarize you with mathematical concepts and skills that will be needed in physics.

- *Standard Assumptions in Physics* discusses what you can and cannot assume to be true in order to be able to solve the problems you will encounter in this class.
- *Solving Word Problems Systematically* discusses how to solve word problems, including determining which quantity and which variable apply to a number given in a problem based on the units, choosing an equation that applies to a problem, and substituting numbers from the problem into the equation.
- *Solving Problems Symbolically* discusses rearranging equations to solve for a particular variable before (or without) substituting values.
- *The International System of Units* and *Scientific Notation* briefly review skills that you are expected to remember from your middle school math and science classes.
- *Vectors*, *Vectors* vs. *Scalars in Physics*, and *Vector Multiplication* discuss the use and manipulation of vectors (quantities that have a direction) to represent quantities in physics.
- *Logarithms* is a review of the base 10 and natural logarithm functions.

Depending on your math background, some of the topics, such as trigonometry and vectors, may be unfamiliar. These topics may be taught, reviewed or skipped, depending on the needs of the students in the class.

Use this space for summary and/or additional notes:

## Standards addressed in this chapter:

**MA Curriculum Frameworks (2016):**

This chapter addresses the following MA science and engineering practices:

**Practice 4**: Analyzing and Interpreting Data

**Practice 5**: Using Mathematics and Computational Thinking

**Practice 8**: Obtaining, Evaluating, and Communicating Information

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**AP® Physics 2 Learning Objectives & Science Practices:**

**SP 2.1**: The student can *justify the selection of a mathematical routine* to solve problems.

**SP 2.2**: The student can *apply mathematical routines* to quantities that describe natural phenomena.

**SP 2.3**: The student can *estimate numerically quantities* that describe natural phenomena.

## Skills learned & applied in this chapter:

- Identifying quantities in word problems and assigning them to variables
- Choosing a formula based on the quantities represented in a problem
- Using trigonometry to calculate the lengths of sides and angles of triangles
- Representing quantities as vectors
- Adding and subtracting vectors
- Multiplying vectors using the dot product and cross product

## Prerequisite Skills:

These are the mathematical understandings that are necessary for Physics 1 that are taught in the MA Curriculum Frameworks for Mathematics.

- Construct and use tables and graphs to interpret data sets.
- Solve simple algebraic expressions.
- Perform basic statistical procedures to analyze the center and spread of data.
- Measure with accuracy and precision (*e.g.,* length, volume, mass, temperature, time)
- Convert within a unit (*e.g.,* centimeters to meters).
- Use common prefixes such as milli-, centi-, and kilo-.
- Use scientific notation, where appropriate.
- Use ratio and proportion to solve problems.

***Fluency in all of these understandings is a prerequisite for this course.*** Students who lack this fluency may have difficulty passing the class.

Use this space for summary and/or additional notes: