Chapter C2: Vectors

Different questions about the world lead to different types of mathematical objects.

1. Scalars:

2. Vectors:

In order for mathematics to come alive (and be of any use) we need to figure out how types of mathematical objects "interact." That is, we need to say how they "add" or "multiply" or something.

Vectors. To bring vectors to life we need to do two things. We must say what they are, and then figure out how to add them.

C2.2: Basic Vector Operations

This section defines vectors using the idea of displacement. A vector is specified by its magnitude (length) and direction (usually an angle). Moore uses this idea to motivate addition and subtraction of vectors.

C2.3: Components

Here Moore tells us of another way to specify a vector: by giving its components in a particular coordinate system (i.e., a grid.)

C2.4: Magnitude of a Vector

Moore tells us how to go from a vector's components to its magnitude (length).

C2.5: Vectors in One and Two Dimensions

This section shows us how to convert from the magnitude-direction form to components. We also learn how to calculate a vector's direction if we know its components.

C2.6: Vector Operations in Terms of Components

Moore discusses how to add vectors and multiply a vector by a scalar using components. Usually, if one has to do addition or scalar multiplication, you'll want to represent the vector(s) using components.

Some important notes:

1. The idea of vectors is pretty intuitive. The notation and trigonometry can get confusing. If you get confused, try to take a step back and remind yourself of the concept.

2. There is essentially no physics in this chapter—it's all mathematics.

3. Vectors are not "attached" anywhere. "They're just arrows."

4. Like real numbers, vectors can have any unit attached to them. (See C2.7.)

5. The components of a vector are scalars, not vectors. Components can be negative, though.

6. It's a good idea to clearly indicate your coordinate system when doing a problem.

7. Notation is important – be clear about what's a vector and what's a scalar.

Vector operations:

1. **Vector Addition:** Think of displacements. Vectors add "tip to tail."

2. **Scalar Multiplication:** What does multiplication of two numbers mean?

$$3 * 4 =$$

   Multiplying a vector by a number is defined in the same way.

3. **Subtraction:** How do we define negative numbers? We define "negative vectors" in the same way.