We begin with multiplication of a vector by a scalar.

When you multiply a vector, A, by a scalar, this multiplicative factor just rescales the magnitude or the length of the vector.

Let us look at the vector 2 times A. This is in the same direction as the vector A, but is twice as long.

This is vector B. A vector is defined by its magnitude and direction.

So this vector B is the same anywhere in space, including at the origin.

If I want minus 0.5 times B, this vector is in the opposite direction of B and is half the length.

Now let's look at vector addition.

Here's a vector A. Here is B. How do we add them graphically?

We slide the tail of B to the head of A.

And their sum is a vector drawn from the tail of A to the head of B. I could have also added A to B by sliding the tail of A to the head of B.

You can see that this makes a parallelogram, and the sum, vector C, is just the diagonal of this parallelogram.

Subtraction can be thought of as just multiplication and addition.

If I have C is equal to A minus B, I just need to add A to the vector minus B. Minus B is negative 1 times B, which is this vector here.

Now I only have to add A to minus B.

Let's do another example.

Here are my vectors A and B do not start at the origin.

But since vectors are the same anywhere in space, I can go through the process here.

I want A minus B. So I first multiply B by minus 1 to find minus B. And then I move the tail of minus B to the head of A and add the two like this.