Suppose we have an object and we're applying a constant force in the horizontal direction.

We would now like to introduce the concept of work.

Suppose our force starts at a point xi, and goes to a position x final, and we'll call this the i hat direction.

Then our force as a vector, we'll write Fx i hat.

And now what we'd like to calculate is the product of force with the displacement of the object.

So our displacement vector, delta x, is equal to delta x i hat, where delta x is equal to x final minus x initial.

And for our constant force for the case where Fx is a constant, we would like to define the work done by this force in displacing the object from our initial position, and we'll mark it like that.

To the final position here is given by the product, so we'll call work is the product of the force Fx times the displacement.

And so that's equal to Fx times x final minus x initial.

And this is our definition for work for the special case where the force is constant.

Now, if we look at this, our force may-- in our diagram, we drew it in the positive x direction.

But if our force Fx were less than 0, and our displacement was in the positive direction, positive, then you can see that the work is negative.

So if the force is opposing the displacement, and that's what would happen if Fx was pointing in the negative direction, the work would be negative.

If Fx is positive and the displacement is positive, then the work is positive.

So we see work is a scalar that has assigned quantity, positive or negative.

Now, whenever we introduce a new quantity, we always have to be a little bit careful about the units.

Since work is the product of force and distance, then our SI units for work are the units of force, which are newtons, times the units of distance, meters.

And we call this a joule.

So one joule is equal to one newton meter.

Now graphically, we can make an interpretation of this.

Let's draw a graph of force, the x component of the force.

And here if we had some origin, we'll have x.

And our object is starting at xi and it's going to x final.

And throughout this process, we're assuming that the force is constant.

So what we see in this diagram here, I'll just shade in this area, that our work, which was the product of force times the displacement, corresponds to the area here.

So we have a geometric interpretation of work as the area under the force versus position graph.

And this is our example of work for a constant force.