Let's consider our one-dimensional collision again, object 1 moving with velocity V1 initial, and object 2 moving with V2 initial.

Let's call this or i hat direction.

And this is our initial state.

And our final state after the collision, we have object 1.

We'll say it's moving this, V1 final, and object 2 moving that way, V2 final.

Now recall our principle of impulse and momentum.

We said that if there is an external force during the time of a collision delta t, then physically that will cause the momentum of the system final minus the momentum of the system initial.

Now when we do this analysis, this side was a description and this side is physics.

Now for our one-dimensional collision, we need to look at this collision and ask ourselves are there any external forces acting on the system, which is consisting of particle 1 and particle 2?

So what we're going to identify here is that the surface is frictionless.

And we'll ignore all air resistance.

And so by our assumptions that there are no f external is 0.

And therefore, the momentum of the system remains constant.

So here our statement is-- many people call this conservation of momentum, but we're saying in this example based on our assumptions that the momentum of the system is constant.

Now how do we actually write that down?

Well, let's now write it first as vector expressions.

So we have the initial momentum, V1 of the system, m1 m2 V2 initial is equal to the final momentum of the system, V1 final plus m2 V2 final.

Now, how do we represent these equations?

Well, you could treat them as vectors if you wanted.

But what we're going to do is express them as components.

So if we wrote this as components, we would have m1 Vx initial i hat plus m2 V2 x initial i hat equals m1 V1 s final i hat plus m2 V2 x final i hat.

So that's the vector expression expressed in terms of components.

The advantage of this is that we really don't know the signs of these two final components.

That's our target quantities.

But we could just write this equation-- instead of writing it as a vector equation, let's just now write this as a component equation.

And when we write this equation in terms of components, we have m1 V1 x initial plus m2 V2 x initial equals m1 V1 x final plus m2 V2 x final.

And this equation here is the equation that we use to express the constancy of the momentum of the system.

We'll call this equation 1.

Now our next approach is to ask are there any other quantities in the system which are constant?