So we analyzed our one-dimensional collision where we had an object 1 moving with some initial velocity, object 2 also moving with some initial velocity.

And after the collision, we just arbitrarily said object 1 is moving this way and object 2 was moving that way.

And we called that our i hat direction.

In this collision, we assume that it was a frictionless surface.

And there were no external forces.

So momentum is constant.

Now what about energy?

Well, we know that if there is no external forces, then in principle there could be no external work.

However, during the collision, we've established different types of collisions.

We said elastic collision is when we are assuming that the kinetic energy of the system-- that's K system final minus K system initial-- is 0, the statement that the kinetic energy is constant.

We have an inelastic collision in which delta K system has decreased.

And that can come from some deformation of the objects during the collision.

Heat is generated.

Some sound, some other source of energy in which energy is always constant, but the kinetic energy of the system could diminish.

And we also talked about a super elastic collision.

And in this type of collision, the kinetic energy of the system has increased.

Now that's a little bit tricky in terms of what we're calling our system.

But imagine that when these two objects collided, there was some type of chemicals on it that exploded.

And so that was some chemical energy that was converted into extra kinetic energy.

So in order to make a model of our problem, we have to beforehand make some assumptions about the nature of the collision.

Now for our particular collision, let's assume that the collision is elastic.

So we have two conservation principles.

We have that the kinetic energy of the system is constant.

And we've already said that because there's no external forces, the momentum of the system is constant.

So now we can write down our kinetic energy condition.

We have m1 V1-- now here, this can be a little bit tricky how we're going to write this, because remember kinetic energy is a magnitude squared plus 1/2 m2 V2 initial squared equals 1/2 m1 V1 final squared plus 1/2 m2 V2 final squared.

Now because a component, although it can be positive or negative, in one dimension, if you square the component, you get the magnitude.

So I can also write this equation-- and I'm going to divide through by the halves, cancel all those-- as 1x initial squared equal to the magnitude squared plus m2 V2x initial squared equals M1 V1x final squared plus 1/2 m2 V2x final squared.

And we've already canceled all the halves, so we have no half there.

Now given this equation-- we'll call this equation 1-- we can also had our momentum equation, which I'm going to write down as 2, m1 Vx initial plus m2 V2x initial equals m1 V1x final plus m2 V2x final, reminding us of our condition of the constancy of momentum.

So now, if you look at this, if we're given the masses, all the mi's and we're also given the initial state of the system, V2x initial, then we have two equations and two unknowns.

And we can solve algebraically for V1x final and V2x final.

And by determining the signs of these components, we can figure out the actual final state of the system.

So this is going to end up involving a quadratic equation.

And what we'd like to do now is show an alternative way that gives us another kind of conservation, another principle to analyze these one dimensional collisions.

So we'll begin that.