Let's talk about kinetic energy.

We're calling kinetic energy K, and it's given by 1/2mv squared.

And this is a scalar quantity.

So it's going to be either 0 or positive.

It's never going to be negative.

The SI unit for kinetic energy is joule, so we have one joule here for kinetic energy.

And the units come from this, so we have kilogram and then meter per second squared.

Now, let's assume we have an object that is first at rest and then it speeds up with a certain velocity, which means the object is going to experience a change in kinetic energy.

And so we'll express this as 1/2mv final squared minus 1/2mv initial squared.

And if we have a motion, so velocity in, let's say a 2D or a 3D space, then we have to consider all these components here and we can also pull out the 1/2m, and then we have vx final squared plus vy final squared plus vz final squared and then minus all the initial values, x initial, y initial, and z initial.

Now when we consider just a point particle, then we can also ask what is the momentum?

How can we pair up momentum and kinetic energy?

So I'm writing it again here, k equals 1/2mv squared.

If we multiply this by m upstairs and downstairs, we're going to have m squared over v squared, and that's actually p squared.

Remember p equals mv.

And so we're going to get that this actually can be expressed as p squared over 2m.

And so that is the kinetic energy expressed in terms of the momentum of a particle.