When we did our analytic analysis of the constraint conditions between the accelerations of objects 1 and 2, we came up with the condition that a1 was equal to minus 2 a2.

Now let's do something which we call a virtual displacement argument.

Suppose that b and 2 move down a certain amount.

Let's imagine-- and I'm going to draw in a different color, too-- so we have object 2, and pulley 2 has moved down.

Now, this object has displaced by distance delta y 2, which is also equal to delta y b because they're connected.

Now, what happens when the system does that, is our rope has to extend downwards around this pulley and come back up.

And that means that the rope that object 1 has been foreshortened by not just delta y2, but on both sides, delta y2 and delta y2, object 1 has displaced up by that amount.

So we'll just make this so we can draw it in a reasonable way.

So what we see here is that delta y1 is equal to-- now notice, if 2 goes down, by delta y2, then delta y1-- which is this whole distance-- is a negative quantity.

And it's going upwards.

And so we see that that's minus 2 delta y2.

And if we took two derivatives-- or displacement and then look at the change in displacement-- we would see that this implies that the acceleration of 1 is minus 2 a2.

But let's come back to our two conditions for length and see the same thing here.

Because delta l2 is 0, this tells us that delta y2 is equal to delta y d.

So we'll write minus equals 0.

And that was our condition that the block and 2 were moving together.

And up here, we see that, because delta l1 is also 0, this implies-- and now I'll make that substitution that delta y b is equal to delta y2-- that 2 delta y2 here and here plus delta y1 has to be 0 coming from that piece.

And so we see that delta y1 is minus 2 delta y2.

Which is what our virtual displacement argument showed us.

And again, if you take two derivatives here, we have that recall that, in the simplest way, that the velocity is dy1 dt.

And the acceleration, a1, is d squared y1 dt squared.

Then, this same proportionality is maintained under the two derivatives.

And that's another way of thinking about how to get the relationship between the accelerations.

But you have to be extremely careful about that sign because this 2 goes in the positive direction, 1 will go in the negative direction.