So we've been trying to find the velocity of the cart and the velocity of the person in terms of the relative velocity of the person jumping in the reference frame of the moving cart, the mass of the person, and the mass of the cart.

We've already solved this in the ground frame, now I would like to solve this in which my reference frame is the moving frame.

So our pictures in the moving frame were actually much easier.

Because the moving frame is traveling with the final speed of the cart, at the final interaction-- after the interaction is done-- in this moving frame, the cart is at rest.

They're moving together.

You're sitting in the cart.

You're moving at the same speed.

The person jumped off with speed u relative to the cart.

The tricky part was to realize that, in the ground frame-- when the cart is at rest here in the ground frame-- an observer moving with speed Vc would see the person in the cart moving backwards in the moving train with a speed minus Vc.

So now we can apply the momentum principle to these two states.

In the moving frame, we have that momentum of the system initially equals the momentum of the system finally.

Now, the initial momentum is just minus Mp plus M cart V cart-- notice the minus V cart.

And the final momentum is equal to just M person u.

And so we see that V cart equals minus M person u over M person plus Mc, which is exactly the same result that we got in the ground frame but it was actually much easier to solve in the moving frame.