When we discuss the rolling of the wheel, we chose a reference frame fixed to the ground.

So that was what we called frame A. And in that reference frame, the motion of the point P on the rim was quite complicated.

Now what we'd like to look at it in the reference frame moving with the center of mass.

And we call that frame cm.

Now the picture there is much easier because the object is-- in that reference frame, the center of mass is not moving.

And the point P on the rim, the object is just undergoing circular motion.

So in that frame, the velocity of that point P in the center of mass frame is just tangent to the circle.

And as the object moves around, at a later time, the velocity is always tangential.

And in this reference frame, it's just pure circular motion.

And we know that the speed in that reference frame is given by the radius of the wheel times the rate d phi to dt.

And here let's define the variable theta this way.

And so, in this frame what's happening is pure circular motion.

Now we know our law of addition of velocity tells us that the velocity in the frame fixed to the ground of that point is equal to the velocity of the center of mass plus the velocity of the object, the point on the run in the center of mass frame.

Now what we want to do now is draw a picture which illustrates this law of addition of velocities.