**29.** (II) A child slides down a slide with a 34° incline, and at the bottom her speed is precisely half what it would have been if the slide had been frictionless. Calculate the coefficient of kinetic friction between the slide and the child.

**\*\*\*\*\*** using v2 = 2ax, acceleration is down by a factor of 4. Her acceleration was gsin34, the normal force was mgcos34, so friction contributes retarding force μmgcos34, this must be 0.75 of the gravitational force mgsin34 down the slope, so μ = 0.75tan34 = 0.51.

29. We assume that the child starts from rest at the top of the slide, and then slides

*y*

*x*

**

**

a distance  along the slide. A force diagram is shown for the child on the slide. First, ignore the frictional force and so consider the no-friction case. All of the motion is in the *x* direction, so we will only consider Newton’s second law for the *x* direction.



Use Eq. 2-12c to calculate the speed at the bottom of the slide.



Now include kinetic friction. We must consider Newton’s second law in both the *x* and *y* directions now. The net force in the *y* direction must be 0 since there is no acceleration in the *y* direction.







 With this acceleration, we can again use Eq. 2-12c to find the speed after sliding a certain distance.



Now let the speed with friction be half the speed without friction, and solve for the coefficient of friction. Square the resulting equation and divide by  to get the result.

