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Physics Project 2 Corrections

However, there are some fundamental problems. Is the moment of inertia of a bowling ball (assume a solid sphere?) - mR^2? It would be for a ring, but it isn't a ring, it's a solid sphere... so with most of the mass closer to the center of rotation, how would this change your answer? How would this change your coefficient of friction? Also, I think that Tracker has your speed at over 3 m/s, no? It does slow down because of rolling friction, but this happens over a time and you can see it happen. But this is rolling friction. When an object rolls, you can't really give it a coefficient as if it were sliding. However, you can find an effective coefficient of rolling friction as you did. Please correct your work in a written statement. Also, I think you would be most effective in finding the coefficient of friction by using the dynamics lens and looking at the acceleration as the rate of decrease in velocity on the Tracker graph.

A solid sphere has an inertia equal to ⅖ mR^2, this is lower than the inertia that we originally calculated. This lower inertia would cause our calculated KE_{rot} to be too large. We used the PE which is equal to the KE_{rot} plus KE_{linear}. Having the KE_{rot} be less would cause the KE_{linear} to be greater because the potential energy is the same. We can solve for velocity using the same setup that we used in the video, and we know that our new calculated velocity should be bigger than the velocity we found in the video. In the video our velocity was 2.74m/s and when we recalculated the velocity now we get 3.27m/s. This changes our calculate omega from 22.8rad/s to 27.3rad/s. When we calculated the coefficient of friction we used the velocity that traker calculated after 6m or at t=2.4, which was 2.7m/s. We did not use the velocity of 3.2 m/s because this is the velocity that he ball has at the end of the hill and before there has been any work done by friction. So the coefficient of friction is now .040 taking into account the inertia of the solid sphere compared to our old answer of 0.0035. When we look at the slope of the decline on the graph we see that eh line has a negative slope of -.347. The slope of the velocity vs time graph is the acceleration. The only force acting on the x axis is friction. We can say the sum of the forces equals mass times the acceleration that we found from the graph, and because friction is the only force in the x axis we can set friction equal to the sum of the forces. We know friction is equal to the normal force times the coefficient of friction, and because there is no movement in the y axis we know the sum of the forces in the y axis is zero. This means that the force of gravity is equal to the normal force, and we know that the force of gravity is equal to mass times the acceleration due to gravity or 10 m/s^2. This means that we can set force friction equal to $mg\mu$, and we can set that equal to mass times acceleration that we found from the graph. So we get $mg\mu=ma$, and the mass cancels and we can solve for μ. $\mu=a/g$ or 0.035. We get different numbers because when we first solved for the coefficient of friction we considered the distance traveled and the velocity of the ball, both of which sque the answer because they don't take into account the rolling of the ball. The dynamics lens just looks at the change in velocity of the ball giving us a more accurate answer.