

COMPILATION: unit 5 - Friction First

Date: Sun, 11 Nov 2001
From: mitchell johnson <mitchjohnson@EARTHLINK.NET>
Subject: friction before $f=ma$

I stumbled into the idea of having the students doing the friction lab before the atwood lab in my honors class this year. My reasoning is because they already saw blocks moving a constant velocity in the inertia worksheets, they were ready to tackle the friction. Since they had already performed a normal and perpendicular force lab on an incline, and the worksheets were on an incline, I had them raise a board until the block slid with constant velocity and uses sin weight and cos weight as independent and dependent and found $\tan=\mu$. 2 birds with one stone. I also had them find breakaway angles for different weights and as a complete shock to them it was virtually the same angle. Next year I am planning to move the friction lab into the inertia chapter with the work sheets but after they have solved the constant velocity on an incline problem.

Date: Mon, 12 Nov 2001
From: Chris Horton <chrisahorton2@HOTMAIL.COM>
Mitch Johnson wrote:

> I stumbled into the idea of have the students doing the friction lab before the atwood lab ...

I think that is a good idea. You might want to consult with Camp and Clement's "Preconceptions in Mechanics", which follows the sequence: Normal Forces, Kinematics, Friction Forces, Tension, Gravity, Inertia,...

This sequence addresses the things students experience in their lives more immediately than does the traditional one.

Date: Mon, 12 Nov 2001
From: Bob Baker <bob.baker@WORLDNET.ATT.NET>

I agree with Mitch about when to complete the friction Lab. My students do a lab activity sequence to develop the following concepts:

- (1) Weight is directly related to mass
- (2) Force is a single interaction between two objects.
- (3) Force throughout a string, rope, chain etc is constant.
- (4) Pulleys change the direction of force but not the magnitude of force.
- (5) Forces on a flat surfaces are perpendicular and parallel to the surface.
- (6) Force (Friction) is directly related to weight.

The lab and activity sequence we run is:

- (1) The spring scale lab to develop weight.
- (2) A spring scale activity where each student has a spring scale. Pairs of students hook their scales together to develop the idea of one interactive force between two objects.
- (3) Students guess at the reading of the middle spring scale when two outside spring scales each read 10 N and then use their results to develop the concept of constant tension in a string or rope.
- (4) We do a series of pulley activities to develop the concept that a pulley changes the direction of force and not the magnitude of force.
- (5) An activity that develops the normal force and parallel force on an incline plane.
- (6) A friction lab.

Date: Mon, 12 Nov 2001

From: John Roeder <JLRoeder@AOL.COM>

I was very interested in Mitchell Johnson's piece about doing friction before Newton's 2nd law via the Atwood's machine. I fell into that this year, too. When I asked my students to assess the forces acting on the Atwood machine, they focused in on friction, and I thought that the best thing to do was to have them deal with friction first. Besides, it was easier for them to analyze the forces in a system of pulling weights on a wooden block across the table, and the act of measuring the friction force turned out to be a good example of Newton's first law.
