

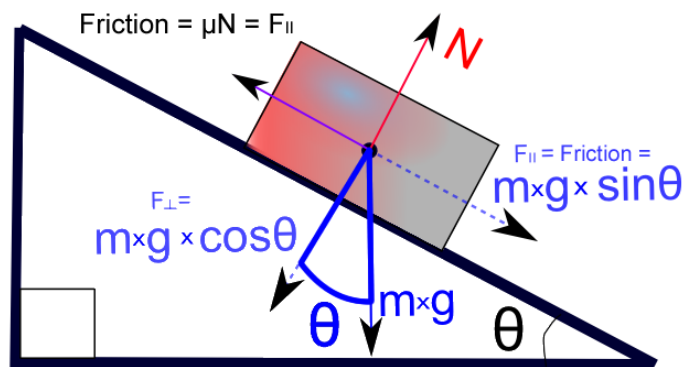
Iona Physics

To measure the angle of repose (also called the friction angle).

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θ = FRICTION ANGLE



The purpose of this lab is to measure the coefficient of static friction between two surfaces. Let's use the physics textbook and a quarter.

Procedure:

1. Place the physics textbook on a table with the quarter on top.
2. Using the binding of the book as a hinge, slowly lift the cover. Stop when the quarter slides down toward the binding at a constant speed.
3. Use Phyphox (under tools, Inclination) to measure the angle of the cover at which the quarter slides at a constant speed.

The math:

When the sliding is at a constant speed, there is equilibrium.

From the diagram you can see that for equilibrium

$$m \cdot g \cdot \sin(\theta) = \mu \cdot N$$

$$N = m \cdot g \cdot \cos(\theta)$$

Combining those gives

$$m \cdot g \cdot \sin(\theta) = \mu \cdot m \cdot g \cdot \cos(\theta)$$

Algebraic manipulation yields

$$\mu = \tan(\theta)$$

Repeat using at least 3 different substances (perhaps a small cardboard box, a small plastic container, a 9 V battery, or any other things you would like to try.)

I used the physics book simply because it provides a nice hinged surface which would be easy to control. You may experiment with other materials also. For example, you could have a piece of wood or glass or stiff plastic which you could set up and vary the angle. Use your imagination.

Data:

Coefficient of friction between

Item 1	Item 2	angle	Coefficient of friction
Physics book	quarter		