# Lab: Newton's 2nd Law of Motion--Friction          **AP Physics**

**Background**
The ratio between the Force of friction $F_{friction}$ and the normal Force $F_{Normal}$ acting between two parallel surfaces sliding against each other is called the *coefficient of friction* $\mu$:

$$\mu = \frac{F_{friction}}{F_{Normal}}$$

The value $\mu$ is determined experimentally.

**Objectives**
To experimentally determine the static and kinetic coefficient of friction between two solid materials: brick on wood, textbook on floor, etc.

**Equipment**
(To be determined, and carefully described, by you.)

**Procedure**
(To be determined, and carefully described, by you in your lab notebook.)

**Questions**

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**Additional Notes**
- This lab is an open-ended lab.
- Two techniques immediately present themselves (although students may need some hints, depending on where they are in the development of this topic):
    - Inclined plane approach:
        - Static coefficient of friction: lift the inclined plane until the stationary objects breaks loose and slides down the plane. Record this theta valule, and analyze using a free-body diagram to find that $\mu = \tan\theta$.
        - Kinetic coefficient of friction: left the inclined plane slowly, while gently tapping the surface to try to get the object moving. Once it's moving at a constant velocity, record this theta value, and analyze using a free-body diagram.
    - Logger Pro approach:
        - Attach a force sensor via a string to a object (a book, say), and slowly apply force to attempt to drag the book across the surface. Once the book breaks free of the surface, a maximum force of Friction should be evident in the Force-time graph. Use this maximum Force as the force of friction.
        - With the force sensor still attached to the book, drag the book across the book at a constant velocity. The Force time graph should indicate a more-or-less constant Force. Use a best-fit line to determine this force applied, which is equal to the force of kinetic friction.