

Investigation 2.4.1: Measuring Coefficients of Friction

INQUIRY SKILLS

- Questioning
- Hypothesizing
- Predicting
- Planning
- Conducting
- Recording
- Analyzing
- Evaluating
- Communicating

The coefficients of static and kinetic friction can be determined experimentally on a horizontal surface by exerting a horizontal force, using a force-measuring instrument such as a force meter or force scale. But a less sophisticated method, the subject of this self-directed investigation, involves objects on an inclined plane, as shown in **Figure 1** and described in Sample Problem 2 in Section 2.4.

Question

- (a) Make up an appropriate question for this investigation.

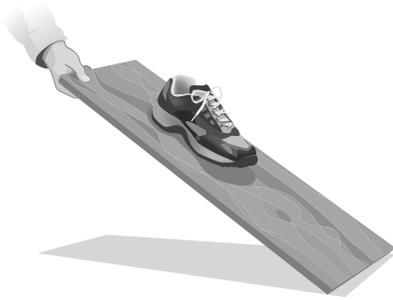


Figure 1

Do you think the coefficients of static and kinetic friction of a rubber shoe on wood change with different tread patterns?

Hypothesis/Prediction

- (b) Write a hypothesis and a prediction for this investigation.

Experimental Design

Design your experiment together with your partners. The materials list may give you some ideas.

- (c) Write up the steps in your plan and outline your safety considerations. Obtain your teacher's approval before beginning.

(continued)

- (d) Carry out the experiment and complete the experimental report.

Materials

metre stick

inclined plane(s)

several examples of materials that you want to test

Analysis

- (e) Make up your own analysis questions and answer them based on your observations and calculations.

(continued)

Evaluation

- (f) Describe the most likely sources of random and systematic error, whether from human or from other sources, in your investigation. How might these errors be reduced?

Synthesis

- (g) Describe how you would verify or refute the following statement with a mathematical proof and an experimental proof: "The coefficient of kinetic friction between an inclined plane and an object sliding down it at a constant speed is independent of the mass of the object."