Name_____ Period _____ Date _____

STEM Sims

Lesson 2: How Rough It Is

The coefficient of friction (μ) is a measure of the roughness of a surface. The larger the value of μ, the rougher the surface. Can you determine which factors affect the value of μ and which have no effect?

Doing the Science

1. You must have completed Lesson 1 prior to conducting this lesson. You must have the data from Lesson 1, Table 1 for this lesson's calculations.
2. Use the following equation to convert the masses (m) (1.0 and 2.0 kilograms) from Lesson 1 into weight, which is the force (f_g) due to gravity (in newtons). Record the forces in Table 1.

$$f_g = mg \qquad \text{where } (g = 9.80 \text{ m/s}^2)$$

3. Copy the data from Lesson 1, Table 1 for the columns of Force Before Mass Begins Moving (f_b) and Force While Mass Is Moving (f_m) into Table 1 below.
4. To find the coefficient of *static* friction (μ_s), divide f_b by f_g. This value is called the static friction coefficient because the mass is *not* yet moving. Calculate and record μ_s for each mass (1.0 and 2.0-kg) in Table 2.
5. To find the coefficient of *kinetic* friction (μ_k), divide f_m by f_g. This value is called the kinetic friction coefficient because the mass is now moving. Calculate and record μ_k for each mass (1.0 and 2.0-kg) in Table 2.

Table 1. Gravitational and Frictional Forces

Mass (kg)	Force Due to Gravity (f_g) (Newtons)	Force Before Mass Begins Moving (f_b) (Newtons)	Force While Mass Is Moving (f_m) (Newtons)
1.0			
2.0			

Table 2. Coefficients of Friction

Mass (kg)	μ_s	μ_k
1.0		
2.0		

Do You Understand?

1. Which coefficient was larger, μ_s or μ_k? Provide a possible explanation for this observation.

2. Did the size of the mass on the surface affect the value of μ_s or μ_k? Provide a possible explanation for your response.