Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**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 (*fg*) due to gravity (in newtons). Record the forces in Table 1.

 *fg = mg* where (*g* = 9.80 m/s2)

3. Copy the data from Lesson 1, Table 1 for the columns of Force Before Mass Begins Moving (*fb*) and Force While Mass Is Moving (*fm*) into Table 1 below.

4. To find the coefficient of *static* friction (*μs*), divide *fb* by *fg*. This value is called the static friction coefficient because the mass is *not* yet moving. Calculate and record *μs* for each mass (1.0 and 2.0-kg) in Table 2.

5. To find the coefficient of *kinetic* friction (*μk*), divide *fm* by *fg*. This value is called the kinetic friction coefficient because the mass is now moving. Calculate and record *μk* for each mass (1.0 and 2.0-kg) in Table 2.

**Table 1. Gravitational and Frictional Forces**

|  |  |  |  |
| --- | --- | --- | --- |
| **Mass (kg)** | **Force Due to Gravity (*fg*)****(Newtons)** | **Force Before Mass Begins Moving (*fb*)****(Newtons)** | **Force While Mass Is Moving (*fm*)****(Newtons)** |
| **1.0** |  |  |  |
| **2.0** |  |  |  |

**Table 2. Coefficients of Friction**

|  |  |  |
| --- | --- | --- |
| **Mass (kg)** | *μs* | *μk* |
| **1.0** |  |  |
| **2.0** |  |  |

**Do You Understand?**

1. Which coefficient was larger, *μs* or *μk*? Provide a possible explanation for this observation.

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