Question: Does the surface area of an object impact the coefficient of friction?
Hypothesis: The surface area has no effect on friction.

Strategy:

- A wooden block weighing 125.4g was connected to a 90.01g weight using a string that was on a modified Atwood's machine (as shown in figure 2)
- The block started 40cm away from a photogate sensor, and was released
- This was repeated 10 times on both the long side (side x) (13.2cm x 5.0cm) and the short side (side y) (2.5cm x 5.0cm) as shown in figure 1

Data:

Long side (v) in m/s	Short side (v) in m/s
1.072	1.16
1.063	1.129
1.091	1.13
1.079	1.131
1.081	1.129
1.074	1.128
1.109	1.135
1.112	1.12
1.108	1.129

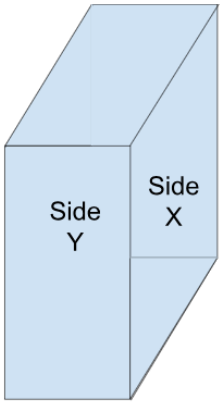

Figure 1: Depiction of the block's long and short sides

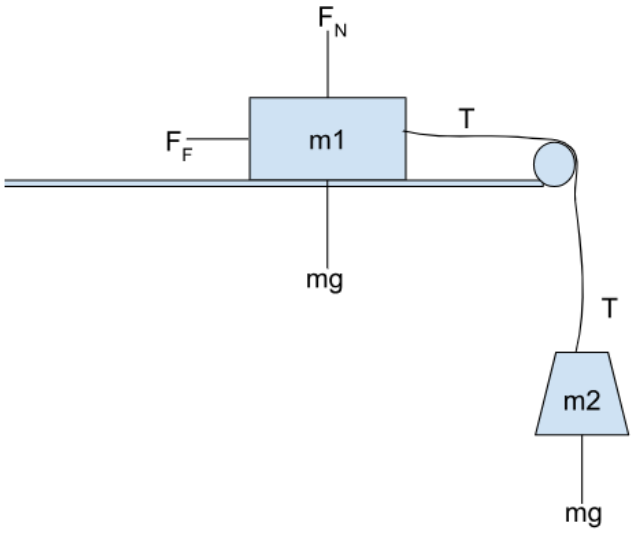

Figure 2: Free-body diagram where m1 is the block and m2 is the weight

Analysis:
The velocity of both tests was collected (as shown in figure 3) and an average was found: 1.093m/s for the long side, and 1.131m/s for the short side. Using an equation based off of $F_F=m_2g-m_1a$, where F_F is equal to $\mu m_1 g$ (Figure 2). The average value of μ for both of the sides was 0.716. This proves the hypothesis that surface area does not affect the coefficient of friction because the values are equivalent, and since the values of m_1 and g remain constant, friction is also unaffected. Possible sources of error in this experiment could include the surface and the pulley. Since this was tested on cardboard, this could have a minor effect if there is a dent or cut in the surface. However, since all experiments were in the same location, this would likely not have affected the experiment. The pulley was not completely fastened to the table, and we did have to check that it was in the correct location each time. This only caused a problem when the pulley fell off, but this value was voided due to not being under the same conditions as the other trials.

Figure 3: Velocity graph