

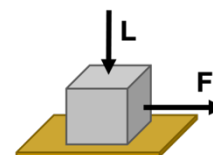
Friction

Friction is a force that resists the motion of objects. A group of students are conducting experiments on friction.

Experiment 1

Figure 1 depicts a procedure that is used to measure the friction force. A horizontal force is applied to a block on a table to accelerate it from rest. One observes that the force needed to initiate the motion (accelerate it from rest) is greater than the force needed to sustain the motion at a constant speed. Masses can be added to the block, thus increasing the load (L). The force required to initiate the motion is equal to the maximum value of the static friction force (F_{static}). The force required to sustain the motion at a constant speed is equal to the kinetic friction force (F_{kinetic}). **Table 1** represents typical data from such an experiment.

Figure 1



Experiment 2

A student decides to investigate the effect of the surface on the amount of friction. She layers the bottom of the block with coarse sandpaper and then repeats the procedure described in

Experiment 1. Her data are shown in **Table 2**.

Table 1

Trial	L (N)	F_{static} (N)	F_{kinetic} (N)
1	2.41	1.56	1.39
2	2.91	1.89	1.68
3	3.41	2.20	1.98
4	3.91	2.55	2.28
5	4.41	2.87	2.53
6	4.91	3.18	2.85

Table 2

Trial	L (N)	F_{static} (N)	F_{kinetic} (N)
1	2.42	1.87	1.59
2	2.92	2.28	1.93
3	3.42	2.67	2.25
4	3.92	3.06	2.59
5	4.42	3.45	2.95
6	4.92	3.84	3.25

Experiment 3

Another student makes an effort to determine if the area of contact between the block and the table affects the amount of friction. The student finds a rectangular block with three unequal length sides. The three areas of the sides of the block are shown. The student pulls the block (without the sandpaper) along each of the sides at a constant speed. The data are shown in

Table 3.

Side A	Side B	Side C
65 cm ²	42 cm ²	78 cm ²

Table 3

L (N)	Side A - F_{kinetic} (N)	Side B - F_{kinetic} (N)	Side C - F_{kinetic} (N)
3.58	2.04	2.01	2.05
4.08	2.38	2.31	2.37
4.58	2.61	2.63	2.62
5.08	2.90	2.94	2.95