

Friction Lab with Pulleys: Testing Friction dependence on Normal Force

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October 21, 2019

1 Introduction

Recall that the friction force is given by

$$f = \mu N \tag{1}$$

N represents the normal force. On a flat solid surface, $N = mg$. Notice the frictional force therefore does not depend on the area of contact between the two surfaces. This lab is going to explore that.

2 Setup

You will need the following objects:

- A pulley
- A clamp to attach pulley to table.
- A wooden block with velcro on the sides.
- Weights and hook.

Arrange a pulley at the edge of the table using the clamp. The block should have a string attached to allow weights to be hung from it. Place the block on the table, and feed the string through the pulley with the hook and weights on the other side.

3 Free body diagram

Place weights on the hook and the block. What happens? Draw a free body diagram for the forces acting *on the block*:

4 Measurements

Measure the tension force required to make the block move at constant velocity for five different amounts of weight on the block. Repeat the same measurements, but with the block turned on its side, such that a different amount of velcro touches the table. Compare the results. What do you conclude about the frictional force?