Raw Data Sheet

Student Name: ____________________________________________

Team members:
1.- ____________________________________________  2.- ____________________________________________

3.- ____________________________________________  4.- ____________________________________________

Instructor: ____________________________________________

Velocity and Acceleration of Students

How does your motion correspond to the readings on the graph? Does the motion sensor read negative when you approach or when you walk away?

Acceleration Along an Air Track

Record the mass of the car and of the weight as instructed in the manual. Record the slope of the velocity plot. Make one printout per group to be handed in, and note down the section title. Include units.

\[ m_1 \text{ (mass of the cart): } \]

\[ m_2 \text{ (mass of the hanging weight): } \]

Slope: 

Plot (v vs. t): 

String Tension Along an Air Track

Record the mass of the car and of the weight as instructed in the manual. Record the slope of the velocity plot and the value of the tension. Make one printout (per plot) per group to be handed in, and note down the section title. Be sure to write down the units.

\[ m_1 \text{ (mass of the cart with the force sensor): } \]

\[ m_2 \text{ (mass of the hanging weight): } \]

Slope: 

Tension: 

Plot (v vs. t): 
Plot (F vs. t): 

1
Acceleration Through an Atwood Machine

Record the masses of each trial, and record the slope of the velocity curve. Make one printout per group to be handed in, and note down the section title. Be sure to write down the units.

Trial 1: \( m_1 \): \______________ \( m_2 \): \______________ Slope: \______________ Plot\( (v \text{ vs. } t) \): \[ ]

Trial 2: \( m_1 \): \______________ \( m_2 \): \______________ Slope: \______________ Plot\( (v \text{ vs. } t) \): \[ ]

Trial 3: \( m_1 \): \______________ \( m_2 \): \______________ Slope: \______________ Plot\( (v \text{ vs. } t) \): \[ ]

Static Friction on a Horizontal Surface

Record the type of surface and the maximum force applied before the 2 kg mass started to move. Make one printout per group to be handed in, and note down the section title along with corresponding surface. Include units.

Surface: \______________

Maximum force: \______________

Plot \( (F \text{ vs. } t) \): \[ ]

Kinetic Friction on an Inclined Surface

Record the mass of the wooden block, the inclination angle and the slope of the velocity curve. Make one printout per group to be handed in, and note down the section title. Be sure to write down the units.

\( m_{\text{block}} \): \______________

Angle: \______________

Slope: \______________

Plot \( (v \text{ vs. } t) \): \[ ]
Work Sheet

Introduction

Analysis

Acceleration Along an Air Track

1. Use \( a_{\text{ideal}} = g \left( \frac{m_2}{m_1 + m_2} \right) \) to calculate the theoretical acceleration.

2. Find the error percentage. This quantity is caused by the frictional force.

3. Use \( f = (m_1 + m_2)(a_{\text{ideal}} - a_{\text{measured}}) \) to calculate the frictional force. Explain what can cause this frictional force in this experiment.

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\(^1\)This is an adaption from S. Sugaya’s original version
String Tension Along an Air Track

1. Use \( a_{\text{ideal}} = g \left( \frac{m_2}{m_1 + m_2} \right) \) to calculate the theoretical acceleration.

2. Find the error percentage. This quantity is caused by the frictional force.

3. Use \( f = (m_1 + m_2)(a_{\text{ideal}} - a_{\text{measured}}) \) to calculate the frictional force. Explain what can cause this frictional force in this experiment. How is it different compared to the previous experiment?

4. Use \( T = m_2(g - a_{\text{measured}}) \) to calculate the tension in the string.

5. Find the error percentage for the tension. Why is it different? Explain
Acceleration Through an Atwood Machine

1. Draw the free body diagram for this experiment. Be sure to label the masses and the forces.

2. Use \( a = g \left( \frac{m_2 - m_1}{m_2 + m_1} \right) \) to calculate the theoretical acceleration for each trial. Label them clearly!

3. Calculate the error percentage for each trial. Which error percentage is the lowest and why? Explain
Static Friction on a Horizontal Surface

1. Draw the free body diagram for this experiment. Be sure to label the masses and the forces.

2. Use $\mu_s = \frac{|F_{\text{applied}}|}{mg}$ to calculate the coefficient of the static friction for each material you used. Clearly label them. $F_{\text{applied}}$ is the maximum force you recorded.

Kinetic Friction on an inclined surface

1. Use $\mu_k = \tan \theta - \left| \frac{2}{g} \right| \sec \theta$ to calculate the coefficient of the kinetic friction between the wooden surface and the inclined surface.

2. Considering the previous experiment, would $\mu_k$ change with different surfaces? If so, how?

Conclusion