Activity
Playing With Kinematics

Part A. How Fast is Your Grab?

Introduction

Most people think that the accuracy of the stopwatch depends on the accuracy of the clock itself, but that's not the case. To use a stopwatch, you have to see the event you're timing. Light has to travel to your eyes, which produce an image to send to your brain. Then your brain has to receive and interpret the image, decide what action to take, and send a signal to the muscles in your thumb to press the button. All of this takes place over a fraction of a second, but your **reaction time** is not instantaneous. This experiment will give you a feel for how fast you can react to an observed event.

Procedure

Hold your hand out in front of you and position your fingers and thumb so that they are parallel (there should be about an 8 cm gap). Have a lab partner hold a ruler just above the edge of your hand, so that the numbers count up as the ruler falls through your fingers. Your partner will drop the ruler without warning, try to grab it as quickly as you can. Note where the edge of your thumb is on the ruler and mark it on the attached chart. In the space provided rearrange the kinematic equation to solve for the time of the fall, which is also your reaction time. Use the resultant equation for time to determine your reaction time. Do three trials to get an accurate average reaction time for yourself.

Part B. Keeping the Beat

Introduction

As we saw in Part A, timing falling objects with a stopwatch is not a very good idea when extreme accuracy is necessary. However, all humans have a fairly accurate sense of beat. Most of us can tell when a rhythm is not steady (some people are better than others, but we all have this sense). In this experiment your group will attach **4** bobbers to a string. Your goal is to space them so that when the string is dropped the bobbers hit the ground with a steady beat at **0.2 s** intervals.

Procedure

As a group: decide how you want to attach the bobbers on the string so it makes a steady beat. Tell the instructor about your plan. Attach the bobbers, just like you decided. Wait for all the groups to finish before you drop the string. Place an upside down pie plate on the ground so that you can easily hear when the weights hit the ground. Drop your string and listen to the beat. If your group doesn't get a steady beat, determine what pattern will accomplish this.

Lab Datasheet
Playing With Kinematics

Name: _____

Date: _____

Part A. How Fast is Your Grab?

1) Show how the ***kinematic equation*** for an object ***starting from rest*** can be rearranged to find a variable (symbolic) expression for ***'t'***.

Trial	Distance (m)	Reaction Time (s)
1		
2		
3		
Average		

2) What was your average reaction time?

3) What were the average reaction times for your partners?

4) Why do important sporting events use automated timers?

5) How fall would the ruler fall if your reaction time was 1 second?

Part B. Keeping the Beat

1) What pattern did your group pick for your first trial? (How did the spacing between the bobbers change?)

2) What pattern produced a steady beat?

3) Using the kinematics equation, explain why this pattern works.