Name_____ Physics 206
Activity Mr. Dristle

REACTION TIME

Purpose: to explore the phenomenon of "human reaction time" and to find ways to reduce reaction time error through corporation with your partners.

Background: When we see something happen that requires a response from us, we may think we react to it in an instant, but this simply isn't true. First we have to recognize and process what our sense tell us. Then decide if its something that requires our action and decide what that action will be. Next, our brain must send the signal via the nervous system to the appropriate muscles. All of this takes time. How much time depends upon many things, not the least of which is our state of alertness!

The Task:
- One person will hold a ruler vertically.
- A second person will hold his or her hand adjacent to the bottom edge of the ruler, ready to grasp it.
- When the first person lets go of the ruler, the second person will try to catch (grasp) the ruler before it falls past their fingers.
- The distance the ruler falls should be measured between the ruler's bottom end and the point where the person caught it.
- To calculate the reaction time of the person, you will need the distance the ruler fell and the acceleration of gravity.

Here's the equation: $$d = \tfrac{1}{2} a\, t^2$$

Solving for time, the equation becomes:

$$t = \sqrt{\frac{2\,d}{a}}$$

where d is the distance the ruler fell (in centimeters) and $a = 980$ cm/s^2.

Procedure:

A. One person's reaction--unanticipated

1. The person holding the ruler will let go without giving any indication to the person trying to catch it as when he or she will let go.
2. The person trying to catch the ruler must react as quickly as they see the ruler begin to drop.
3. Perform four trials and then find the average distance the ruler dropped.

d_1 = _____ d_2 = _____

d_3 = _____ d_4 = _____

average distance = _____

4. Using the equation, calculate the average reaction time in this situation.

reaction time = _____

B. One person's reaction--anticipated

1. This time, the first person will count down "3-2-1-GO", letting go of the ruler at the same instant he says "GO".
2. Once again, do four trials and find the average distance the ruler drops.

d_1 = _____ d_2 = _____

d_3 = _____ d_4 = _____

average distance = _____

3. Using the equation, calculate the average reaction time in this situation.

reaction time = _____

C. Two person's reactions--unanticipated

1. This time, the first person lets go of the ruler only when he or she hears a third person say "GO". (There is no countdown.) Both the person dropping the ruler and the person who is trying to catch it must react to the third person's signal.
2. Once again, do four trials and find the average distance the ruler drops.

d_1 = _____ d_2 = _____

d_3 = _____ d_4 = _____

average distance = _____

3. Using the equation, calculate the average reaction time in this situation.

reaction time = _____

D. Two person's reactions--anticipated

1. Repeat the procedure from part C except that this time the third person will countdown "3-2-1-GO".
2. Once again, do four trials and find the average distance the ruler drops.

d_1 = _____ d_2 = _____

d_3 = _____ d_4 = _____

average distance = _____

3. Using the equation, calculate the average reaction time in this situation.

reaction time = _____

E. No visual cue--anticipated

1. Repeat the procedure from part D except that this time the person who is trying to catch the ruler must have his or her eyes closed.
2. Once again, do four trials and find the average distance the ruler drops.

d_1 = _____ d_2 = _____

d_3 = _____ d_4 = _____

average distance = _____

3. Using the equation, calculate the average reaction time in this situation.

reaction time = _____

Questions:

1. Show a sample of the calculation of a reaction time, based on how far the ruler fell from one of your trials above.

2. Explain why countdowns generally work better than just saying "GO".

3. Explain why it can be better for a third person to give the signal to let go, even when there is no countdown involved.

4. Describe a procedure that lab partners could use to reduce their reaction time error with stopwatch timings of an event.

5. A teacher had the idea of constructing a scale of "time" that could be pasted over the length markings on a ruler so that a person doing this activity could read their reaction time right off the ruler without doing any math. How would the teacher go about making this scale of time? Would the markings for tenths of a second be evenly spaced or not? Explain.

For BONUS credit: Actually construct the scale referred to in question 5. Show how you figured out how to space the markings.