

Name _____ Date _____

Partners _____

Your Reaction Time: Lab #1

By M.L. West

Equipment: stopwatch, meter stick, dollar bill, 2-meter stick, coffee filter, metal ball

Introduction: People are different in how fast they can react to something they see. Sometimes this is important to their activity, sometimes not. What are some activities in which having a short reaction time is important?

1. Stopwatch (finger recycling)

How fast can you start and stop a stopwatch? Make four trials and then average them.

Trial 1	Trial 2	Trial 3	Trial 4

Your average reaction time for the stopwatch activity: _____
(Remember to write down the units.)

2. Making Dots (wrist recycling)

Part of your eye/hand reaction time is the time it takes your hand muscles to recycle to start again. We can measure this approximately by asking how fast can you make pencil dots on a piece of paper. Your partner will tell you when to start and when to stop (5 seconds later). Make as many separate dots as you can in that time period.

You made _____ dots in 5 seconds.

Your reaction time is 5 seconds divided by this number of dots.

Your reaction time for the dot making activity: _____

3. Catching a ruler (eye-hand reaction time)

Now we will try to measure your eye/hand reaction time more directly. Try to catch a dropped ruler or meter stick as quickly as you can. Start with your fingers hovering over the zero end at the bottom. Your partner will drop the ruler when you least expect it.

Trial 1, cm	Trial 2, cm	Trial 3, cm	Trial 4, cm

Let D = Average distance _____ cm. = _____ m

Let S = Square root of this average distance = $(D)^{1/2}$ = _____ $m^{1/2}$

The falling time is given by $t = (.4518 m^{-1/2} sec) * S$

Your average reaction time for the ruler catching activity: _____

Challenge: Can you catch a dollar bill starting with your fingers over George Washington's face?

_____ If you can catch it consistently (2 out of 3 tries) then you can keep it!

4. Summary and Discussion

Your various reaction times were:

Stopwatch	Making dots	Ruler catching

Examine these values and discuss if one should be discarded, and why:

Average all the values which remain _____

Who in your lab group team has the fastest reaction time? _____

What is his/her time? _____

There will be two number lines for reaction times on the blackboard. Post your value at the proper position so that we can make separate histograms for men and for women.

Discussion:

5. Application A: times of falling objects

a) Have the person with the shortest reaction time in your team measure the time for a coffee filter to fall 2 meters. Do this for 10 trials and calculate the average time. _____

Make a histogram of the 10 times. Is there an outlier that should be discarded? _____

If so, then recalculate the average time without this data point. _____

Now examine the largest and smallest time to find the largest difference from the average time.

Rewrite the result of your experiment as “average time +/- largest difference” _____

Another way to record a result is as “average time +/- percent largest difference”

b) Have the same person measure the time for a metal ball to fall 2 meters.

Do this for 10 trials and calculate the average time. _____

Make a histogram of the 10 times. Is there an outlier that should be discarded? _____

If so, then recalculate the average time without this data point. _____

Now examine the largest and smallest time to find the largest difference from the average time.

Rewrite the result of your experiment as “average time +/- largest difference” _____

Another way to record a result is as “average time +/- percent largest difference”

c) Discuss the accuracy of these measurements in light of the person's reaction time.

6. Application B: heart rate

Measure how long it takes for your heart to beat 50 times. _____

Calculate the number of your heartbeats in a minute. _____

Express this measurement with its uncertainty. _____

There will be a number line for heart rate in beats/minute on the blackboard. Post your value at the proper position so that we can make a histogram.

Discuss:

7. Future research in the topic of reaction time

Suggest ten research mini-projects as you can, such as

a) Does it matter which finger you use on the stopwatch?

b)

c)

d)

etc.

Write an organized lab report which includes a list of equipment, objective, brief procedure, data tables, example of a calculation, discussion of results. Remember to write in full sentences, use a topic sentence in each paragraph, answer all the questions, include units, and proofread. Please staple this outline to the back of your report.

The report is due at the start of next week's lab period.