

Name _____

Muscle Size & Strength



PURPOSE: To compare muscle size and strength

MATERIALS:

Tape measure

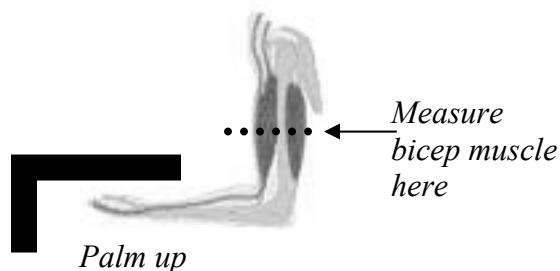
Bathroom scale

TI-73 Graphing Calculator

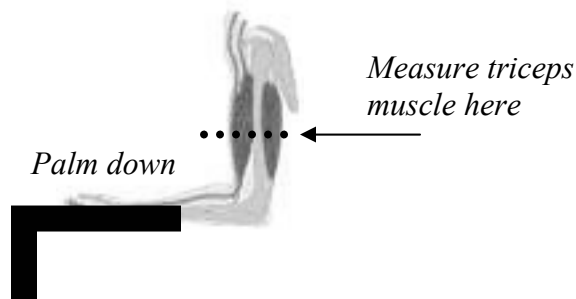
PROCEDURE:

Part 1 – Measuring the size of your muscles:

1. Work with a partner.
2. Sit at your desk with the palms of your hands pressing up against the bottom of the desk like this:



3. Have your partner wrap the tape measure around your left biceps muscle as shown in the diagram above. Record this measurement in the data chart.
4. Repeat with the right biceps.
5. Add the two measurements to find the *total biceps size*. Record this information in the data chart.
6. Put your palms on top of the desk.



7. Have your partner wrap the tape measure around your left triceps muscle as shown in the diagram above. Record this measurement in the data chart.
8. Repeat with the right triceps.

9. Add the two measurements to find the total triceps size. Record this information in the data chart.
10. Hold a textbook with both hands. Without using your thumbs, squeeze the book as hard as you can while your partner measures each of your forearms. Record these numbers in the data chart.

Part 2 – Measuring the strength of your muscles

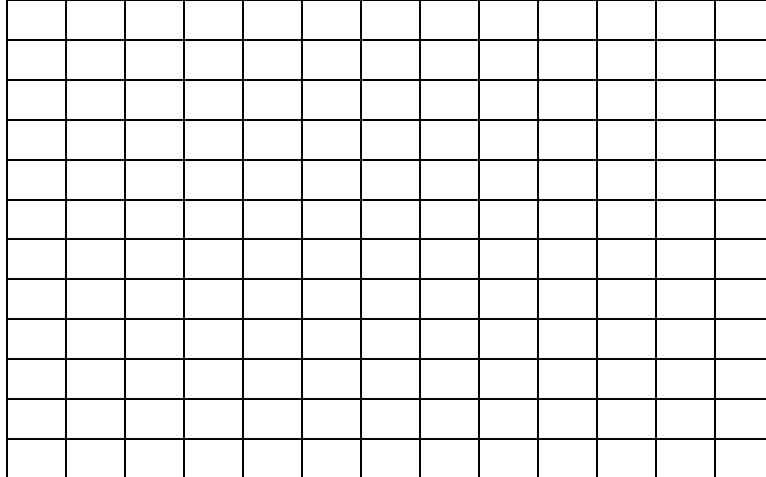
1. Put the bathroom scale against the bottom surface of your desk. Use your palms to press up against the scale. The scale should be between the bottom of the desk and your palms. Be careful to press with your hands, not your arms or body.
2. Measure the force in pounds you exert against the scale. This is the force your biceps are exerting against the scale.
3. Record the results in the data chart.
4. Repeat the techniques from part one to measure the force you exert with your triceps and forearms. When measuring the force you exert with your forearm muscles, keep your thumbs away from the scale.
5. Record your results in the data chart.

DATA:

Muscle Size & Strength				
Muscle	Left Muscle Size (cm)	Right Muscle Size (cm)	Total Muscle Size (cm)	Force Exerted (pounds)
Biceps				
Triceps				
Forearm				

A scatterplot gives us a *visual* means of seeing relationships between two variables – in this case muscle size and muscle strength. We call a relationship *positive* if an increase in one variable corresponds to an increase in the other. When one variable increases and the other decreases, we call the relationship *negative*.

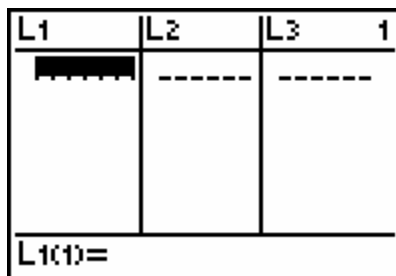
Make a scatterplot of the total **biceps** size compared to the force exerted. Use the data from at least 10 people.



*We are going to only plot the **biceps** data here*

Draw a scatterplot on a graphing calculator:

1. Turn the calculator **ON**.
2. Press **LIST**. Your calculator screen will look like this:



3. If there are numbers in the lists, clear them out.
4. Enter the data for total muscle size in List 1 (**L₁**). Press **ENTER** after each number.
5. Your calculator screen will look something like this (*these are made up data*):

L1	L2	L3	1
1 2 3	-----	-----	
L1(4) =			

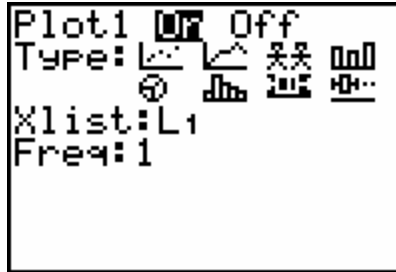
- Use the **ARROW KEY** to move over to List 2 (**L₂**). Enter the force exerted in this list. Press **ENTER** after each number.
- Your calculator screen will look something like this (*these are made up data*):

L1	L2	L3	2
1 2 3	4 8 16	-----	
L2(4) =			

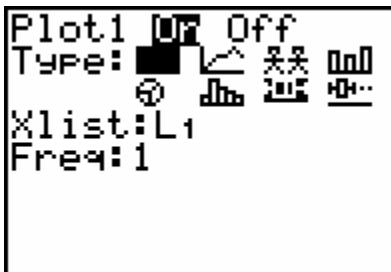
- Press **2nd**, press **PLOT** (Y=). Your calculator screen will look like this:

STAT PLOTS			
1	Plot1...On		
	☐ L1	1	
2	Plot2...Off		
	☐ L1	L2	☐
3	Plot3...Off		
	☐ L1	L2	☐
4	PlotsOff		

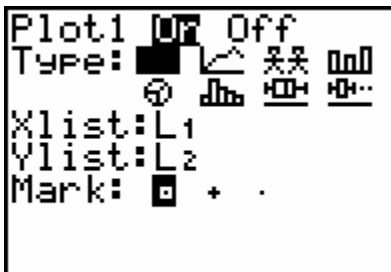
- Press **ENTER**. Your calculator screen will look like this:



10. Make sure plot is **ON**.
11. Use **the ARROW KEYS** to go to **TYPE**, select the scatterplot (the first icon). Your calculator screen will look like this:



12. Press ENTER. Your calculator screen will look like this:



13. Press **ZOOM**. Your calculator screen will look like this:



14. Select 7, and you will get a scatterplot of your data.
15. To calculate the **line of best fit** for a scatter plot:

- a. Press **2nd** , Press **STAT**(the LIST key)
- b. **ARROW** over to **CALC**
- c. Press **5: LinReg(ax+b)**. Press **ENTER**.
- d. Press **Y=**
- e. Press **2nd**
- f. Press **VARS** (the **APPS** key)
- g. Press **3:Statistics**
- h. **ARROW** over to **EQ**. Press **1:RegEQ**. Press **ENTER**
- i. Press **Graph**

DATA ANALYSIS:

Questions:

- 1. What was the manipulated (independent) variable in this experiment?

- 2. What was the responding (dependent) variable I this experiment?

- 3. What were some controlled variables in this experiment?

- 4. What information does a scatterplot give us about data?

- 5. What could have been done to make the results of this experiment more accurate? _____

Conclusion:

Look at the diagrams on the first page again. What kind of lever system does your arm make when you are pressing up and down against the scales with your palms? Explain your answer.
