Name___________________________

Muscle Size & Strength

PURPOSE: To compare muscle size and strength

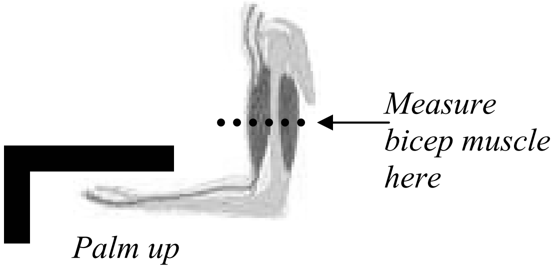
MATERIALS:

Tape measure	Bathroom scale

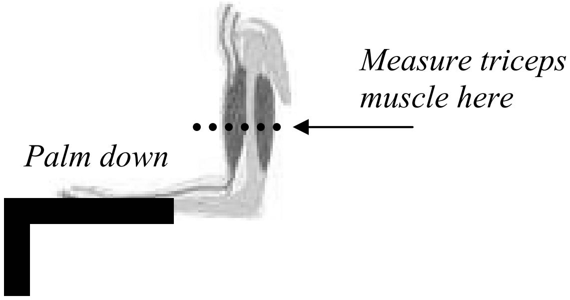
PROCEDURE:

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 spreadsheet in Excel.
4. Repeat with the right *biceps*.
5. Add the two measurements to find the *total biceps size*. Record this information in the spreadsheet in Excel.
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 spreadsheet in Excel.
8. Repeat with the right *triceps*.

9. Add the two measurements to find the *total triceps size*. Record this information in the spreadsheet in Excel.
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 spreadsheet in Excel.

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 sale 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 spreadsheet in Excel.
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 spreadsheet in Excel.

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.

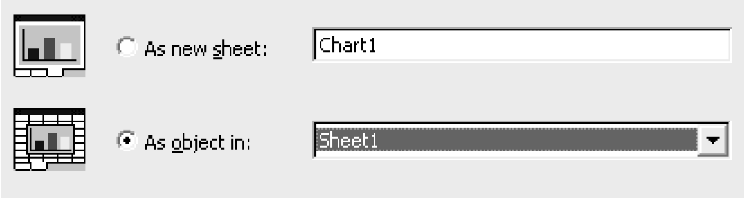
Collect the biceps data from 15 classmates.

Participant	Biceps Size in (cm)	Participant	Biceps Size in (cm)
1		6	
2		7	
3		8	
4		9	
5		10	

Enter this data into the spreadsheet.

Use the spreadsheet to create a scatterplot of this data.

- ✓ Highlight the data
- ✓ Select the chart button →
- ✓ Choose scatterplot → XY (Scatter)
- ✓ Remember to label your variables on the graph
- ✓ Save your graph in Sheet 1



○ As new sheet: Chart1

● As object in: Sheet1

DATA ANALYSIS:

1. What type of relationship is shown by this data?

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.

____

____

____

Based on what you observed, what is the relationship between muscle size and strength? Back up what you say with **evidence**.

____

____

____

____

____

____