In this lab, we are going to investigate the “Pretty Woman” problem. In the movie “Pretty Woman,” starring Julia Roberts and Richard Gere, Roberts’ character Vivian states, “Did you know that the distance from your wrist to your elbow is the same as the length of your foot?” In this lab, we will look at the validity of this statement.

1. Data Collection:

You will measure the left forearm and left foot of each individual in your group. To make sure everyone is measuring the same forearm bone, you should measure the left ulna. To do this, place your left forearm palm down on the table in front of you. The ulna is the bone on the outside of your forearm. One end of the ulna is the larger portion of the elbow; the bone closest to the table. The other end of the ulna is the small bone on the outside of the left wrist. This bone sticks out a little bit for most people. Take a tape measure or meter stick and measure the distance between the two points. Make sure the measurement is in centimeters. On the group answer sheet, record the names and measurements for each group member.

You will need to measure the foot length in centimeters of each member of your group. Measure the length of your left foot with your shoe off. Record these measurements on the group answer sheet. Be sure that your foot measurement is paired with your forearm measurement.

Make a scatter plot of the measurements. Place the forearm length on the x axis and the foot length on the y axis.

Finally, get together with one or two other groups and share your data with them. Put the other groups’ data on the scatter plot. You should have at least 10 data points on your plot.

Answer the following questions on the group answer sheet.

a) Describe the scatter plot of arm length vs. foot length. Make sure to mention form, direction, strength, and the presence of any outliers.

2. Visual Regression Analysis: Now, we want to add a straight line to the scatter plot. This straight line will help predict the length of a person’s foot based on the length of a person’s forearm. To make the straight line, draw a line on the scatter plot which you believe best fits the points on the graph. Be sure to extend the line to the left until it crosses the y-axis. Answer the following questions on the group answer sheet.

a) Visually estimate the y-intercept of your line. This is the point where the line crosses the y-axis. This is also the y-value for the line when x = 0.

b) Estimate the slope of your line by using the “rise-over-run” formula, \( \text{slope} = \frac{\text{rise}}{\text{run}} \), where the rise is the change in the vertical, y, direction as you move (left to right) from one point on the line to another point on the line and the run is the change in the horizontal, x, direction.

c) Give the equation for your “visual regression” line.

d) Use your “visual regression” equation to predict the foot length of a person with forearm length of 27 cm.

e) If Vivian's claim is true, the equation for the regression line should be \( \hat{y} = x \). Draw this line on your graph as a dotted line. Using this “true line,” predict the foot length of a person with forearm length of 27 cm. How close is this value to your answer in part d)?

f) Based on your scatter plot, do you believe Vivian's claim? Explain your answer.
# Stat 101: Laboratory 4 - Group Answer Sheet

## Group Members:

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<tr>
<th>Name</th>
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### Foot vs. Forearm

A blank graph is provided for plotting the relationship between foot and forearm measurements.
1. Data Collection
   a) Describe the scatter plot of arm length vs. foot length. Make sure to mention form, direction, strength, and the presence of any outliers.

2. Visual Regression Analysis
   a) Visually estimate the y-intercept of your line.

   b) Estimate the slope of your line by using the “rise-over-run” formula, $slope = \frac{rise}{run}$.

   c) Give the equation for your “visual regression” line.

   d) Use your “visual regression” equation to predict the foot length of a person with forearm length of 27 cm.

   e) Using $\hat{y} = x$ this “true line,” predict the foot length of a person with forearm length of 27 cm. How close is this value to your answer in part d)?

   f) Based on your scatter plot, do you believe Vivian's claim? Explain your answer.