

MATH/PPE 180
STATISTICS PRACTICE PROBLEMS

PLEASE REVIEW YOUR HOMEWORK FOR PRACTICE ON OTHER TOPICS.

- (1) *Archaeopteryx* is an extinct beast having feathers like a bird but teeth and a long bony tail like a reptile. Only six fossil specimens are known. Because these specimens differ greatly in size, some scientists think they are different species rather than individuals from the same species. If the specimens belong to the same species and differ in size because of age, there should be a linear relationship between the lengths of a pair of bones from all individuals. An outlier would suggest a different species. Here are data on the lengths in centimeters of the femur and the humerus for the five specimens that preserve both bones.

Femur length x	38	56	59	64	74
Humerus length y	41	63	70	72	84

- (a) Make a scatterplot.
 (b) Do you think that all five specimens come from the same species?
 (c) Find the correlation r .
- (2) For each of the following pairs of variables, would you expect a substantial negative correlation, a substantial positive correlation, or a small correlation.
 (a) The age of secondhand cars and their prices.
 (b) The weight of new cars and their gas mileages.
 (c) The heights and weights of adult men.
 (d) The heights and IQs of adult men.
- (3) What are all the values that a standard deviation s can possibly take?
- (4) What are all the values that a correlation r can possibly take?
- (5) Here are six measured lengths (in feet): 7,8,5,6,9,9. Find their median.
- (6) Find the quartiles of the lengths in question 4.
- (7) Suppose data from a table of random numbers are plotted as points on a scatterplot. What would you expect the correlation of this data to be?
- (8) For a biology project, you measure the length (centimeters) and weight (grams) of 12 crickets.
 (a) Do you expect the correlation to be positive or negative? Explain why.
 (b) If you measured the length in inches, how would the correlation change?
- (9) A Gallup poll interviewed 1060 randomly selected adults asking “How would you rate the overall quality of the environment in this country today – as excellent, good, only fair, or poor?” In all 46% answered good or excellent, with a margin of error $\pm 3\%$ for the 95% confidence interval. If the poll had interviewed 1500 people (and still found 46% answering good or excellent), would the margin of error for 95% confidence be larger, smaller, or the same? Explain.
- (10) Refer to question (1).
 (a) Find the least-squares regression line.
 (b) In a dig, a new femur is discovered which is 66 cm long. Knowing the size of the humerus could help you locate it. How long would you expect the humerus to be?

Answers: (1b) The plot shows a strong linear pattern, so we think they all come from one species. (1c) Calculate for femur $\bar{x} = 58.2$, $s_x = 13.2$, $\bar{y} = 66$, $s_y = 15.89$. This gives $r = 0.994$. (2a) negative (2b) negative (2c) positive (2d) small (3) $s \geq 0$ (4) $-1 \leq r \leq 1$ (5) 7.5 (6) 6 and 9 (7) 0 (8a) positive (8b) correlation does not change. (9) Smaller (10a) $y = 1.197x - 3.64$ (10b) 75.7cm