

**Learning Goal:** For a linear relationship, use the least squares regression line to summarize the overall pattern and to make predictions.

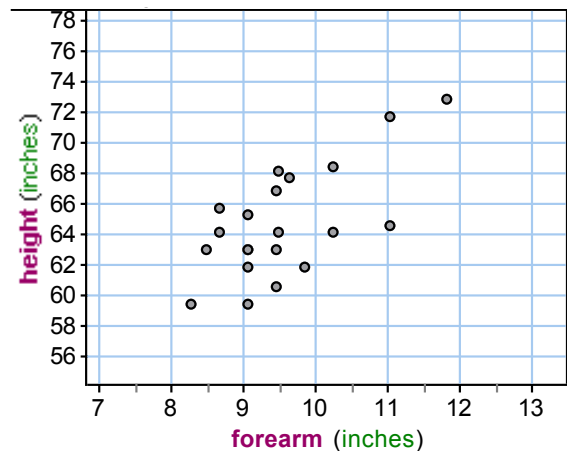
**Introduction:** Statistical methods are used in forensics to identify human remains based on the measurements of bones. In the 1950's Dr. Mildred Trotter and Dr. Goldine Gleser measured skeletons of people who had died in the early 1900s. From these measurements they developed statistical methods for predicting a person's height based on the lengths of various bones. These formulas were first used to identify the remains of U.S. soldiers who died in WWII and were buried in unmarked graves in the Pacific zone. Modern forensic scientists have made adjustments to the formulas developed by Trotter and Gleser to account the differences in bone length and body proportions of people living now. We will not use Trotter and Gleser's formulas in this problem, but we will use a similar process.

Amelia Earhart disappeared in 1937 while flying over the Pacific Ocean. In 1941 bones comprising about a third of a human body were discovered on an uninhabited Pacific island called Nikumaroro. Could these bones be the bones of the aviation pioneer Amelia Earhart?

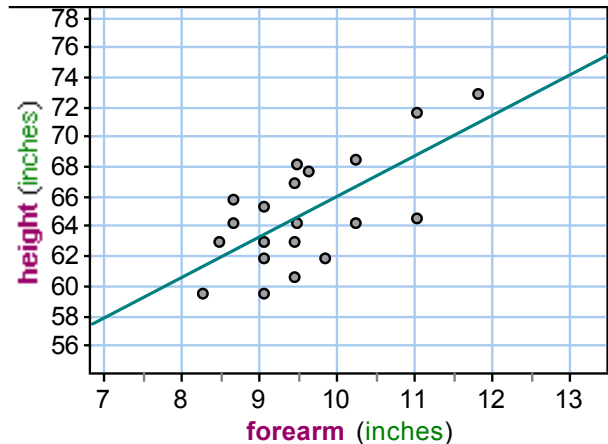
In 1941 an M.D. named Dr. Hoodless measured the bones. The length of the radius, which is the forearm bone, was 9.6 inches. Amelia Earhart said she was 5'8" tall, but other records suggest she might have been closer to 5'7".

1) Here is a scatterplot of the data collected from 21 female college students.

- a) Assuming the bone found on Nikumaroro belonged to a woman, how tall do you think she was? Why do you think so?



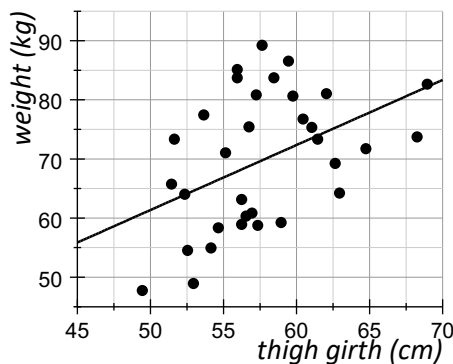
- b) Use the line to predict the height of the person whose bones Dr. Hoodless measured.  
Plot this person in the scatterplot.  
 $height = 39 + 2.7 (forearm)$



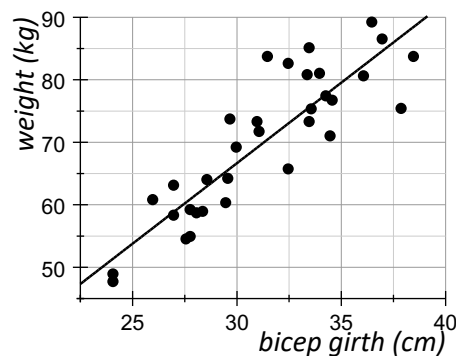
- c) Based on this investigation, do you think the bones could belong to Amelia Earhart? Why or why not?

(Dr. Hoodless concluded that the bones belonged to a short, stocky European male. The bones are now missing, but modern analysis of the notes taken by Dr. Hoodless has revealed many discrepancies and his conclusions are hotly debated.)

- 2) The scatterplots below show body measurements in centimeters for 34 adults who are physically active. The line graphed in each scatterplot is the line of best fit. The equation for each line is given below the scatterplot.



$$Weight = 7.85 + 1.07 (thigh\ girth)$$



$$Weight = -13.45 + 2.67 (bicep\ girth)$$

- a) Adriana has a thigh girth of 57 centimeters and a bicep girth of 25 centimeters. Predict Adriana's weight using both measurements. Show or explain your process.
- b) Which prediction do you think is more accurate? Why?