

## Forensic Anthropology

While excavating for the new school building, construction workers found partial skeletal human remains. Who is this person? Is the person a male or a female? When did the person die? Forensic anthropologists were called in on the case to analyze the bones and help answer these questions. Police want to know the person's height in order to match the person with missing persons on file. Can you estimate the person's height from his or her skeleton bones?

The long bones such as the femur (thigh), tibia (shin) and ulna (forearm) predict height better than the shorter bones. The only intact long bone is the ulna, which is 28.5 centimeters in length. Your job as the forensic anthropologist's assistant is to estimate the height of the mystery person whose bones were found.

**Step 1: STATE** in a full sentence what you are going to find.

**Step 2: COLLECT DATA** on the height and ulna length from everyone in your class.

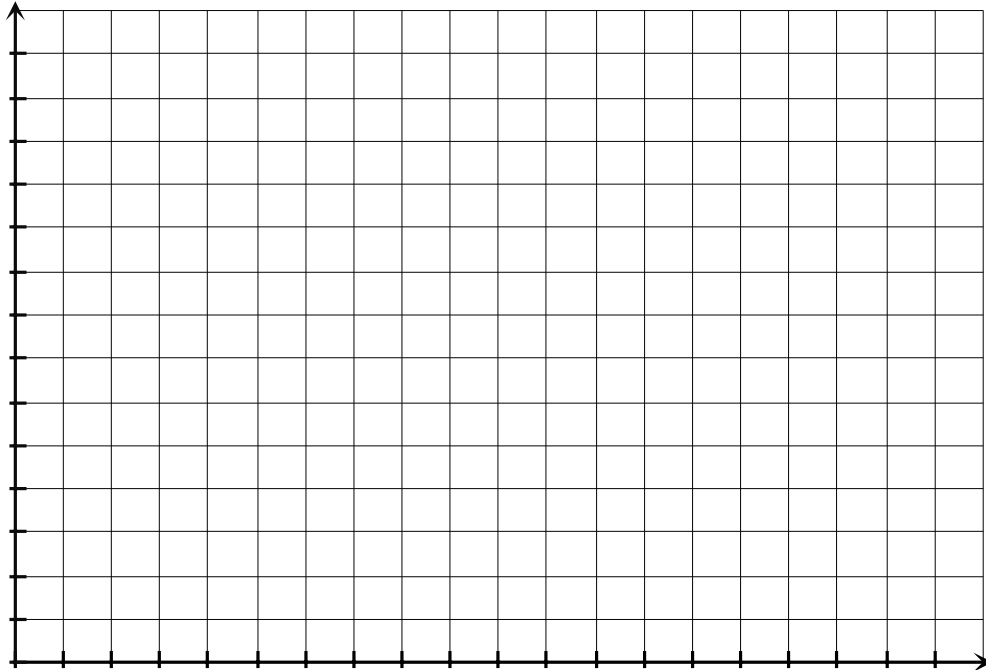
- Measure and record the ulna (forearm) lengths and heights of each of your classmates.
- Place your elbow on the table with the thumb pointed toward your body.
- Have the classmate measure from the round bone in your wrist, just below your pinky finger, to the bottom of your elbow, which is resting on the desk.
- People may measure differently, so it is best to have two different people measure your ulna. Use the average of the two measurements.
  - Measurement 1 = \_\_\_\_\_
  - Measurement 2 = \_\_\_\_\_
  - Average of 2 Measurements = \_\_\_\_\_

Name	Ulna Length (cm)	Height (cm)

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**Step 3: PLOT** the data and find a trend line by hand from the graph.

- Which is the independent variable?
- Which is the dependent variable?
- Graph the data on the coordinate axis below. Create a nice window for your graph with an appropriate scale. Label the axes and give the graph a title.



- Does the data appear linear or not? Explain.
- Sketch a trend line on your scatterplot by hand or using a straight edge. Find the equation of the trend line by hand. Show your work here.
- Is your trend line equation similar to that of your classmates? Why or why not?

**Step 4: USE TECHNOLOGY TO CALCULATE** the regression line and correlation coefficient.

- a. Write the regression line you found using technology.
- b. Write the correlation coefficient  $r$  you found using technology.
- c. Based on your correlation coefficient, comment on the direction and the strength of the linear relationship between ulna lengths and height.
- d. Compare the hand-calculated trend line from step 3e with the regression line you found using technology in step 4a. How close are the two slopes and  $y$ -intercepts? What are the advantages or disadvantages of doing the work by hand or using technology?

**Step 5: Make a PREDICTION.**

- a. Use the linear regression line that you found using technology to estimate the height of the missing person. Remember that the found ulna bone is 28.5 centimeters long. Show your work.
- b. How accurate or reliable is your prediction? Explain your answer by referring to the graph and the correlation coefficient  $r$ .

**EXTENSIONS:**

1. Your boss asked you to do some research online to see if there is already a formula or maybe a table that can be used to determine someone's height from his or her ulna bone length. What is this formula?
2. Use the anthropologist's formula to predict the height of the mystery person. How close was your prediction to the anthropologist's prediction?
3. What might explain the differences in the height that you found using your regression line and the height you found using the anthropologists formula?

**Present Your Results**

Write a letter to the commissioner of the police department informing him of the estimated height of the mystery person.

- ✓ Describe the steps you took to find the height of the person.
- ✓ Analyze how well the model scatterplot and your equation represent the data you collected.
- ✓ Is there a correlation or causation between ulna length and height? Explain
- ✓ Discuss whether or not you could use *your* model to estimate or predict the height of the mystery person.
- ✓ Compare your estimation of the height of the person to the estimation using the anthropologist's equation.
- ✓ Include in your report equations, graphs, estimates, and predictions.