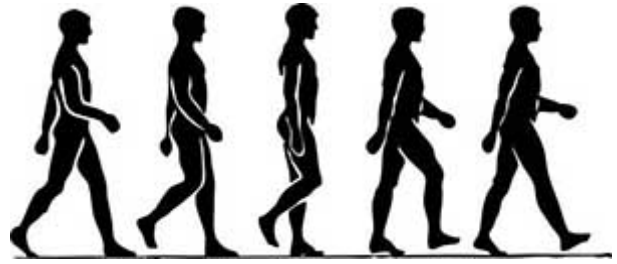Name(s): _____    Period: _____

**Investigation: What is the Relationships Between Stride Length and the Bones of the Leg?**

Objectives:

- Practice using the scientific method.
- Gather data from classmates to determine the relationship between foot length, leg length, height and stride.
- Create graphs using class data.
- Make predictions about a person's height based on foot size and the class data/graphs created.

Materials: Meter Stick or Tape Measure, Computer (Excel or Google Sheets) to Graph Data, or Graph Paper

**Hypothesis**: Write a statement that indicates which measurement (foot length, femur-thigh bone length, ulna-forearm length) can be used to predict height.

Measurements: All measurements should be done in **centimeters**. Gather data from 4 individuals, you can use data from your own group and share with another group to complete the table.

Foot length: distance from back of heel to toe
Femur length: distance from calcaneus (heel bone) to acetabulum (top of hip bone)
Height: distance from floor to the top of the head
Ulna Length: distance between elbow and bulge of the styloid process at wrist

|            | Foot Length | Femur Length | Ulna Length | Height |
|------------|-------------|--------------|-------------|--------|
| Subject 1  |             |              |             |        |
| Subject 2  |             |              |             |        |
| Subject 3  |             |              |             |        |
| Subject 4  |             |              |             |        |

Assign each member of your group to graph one of the variables and height. Height should be on the Y axis, and the other bone lengths should be placed on the X axis. You will have one line for each subject.

- Color code each line and make a key
- Label the Y and X axis and include unit of measurement in parentheses
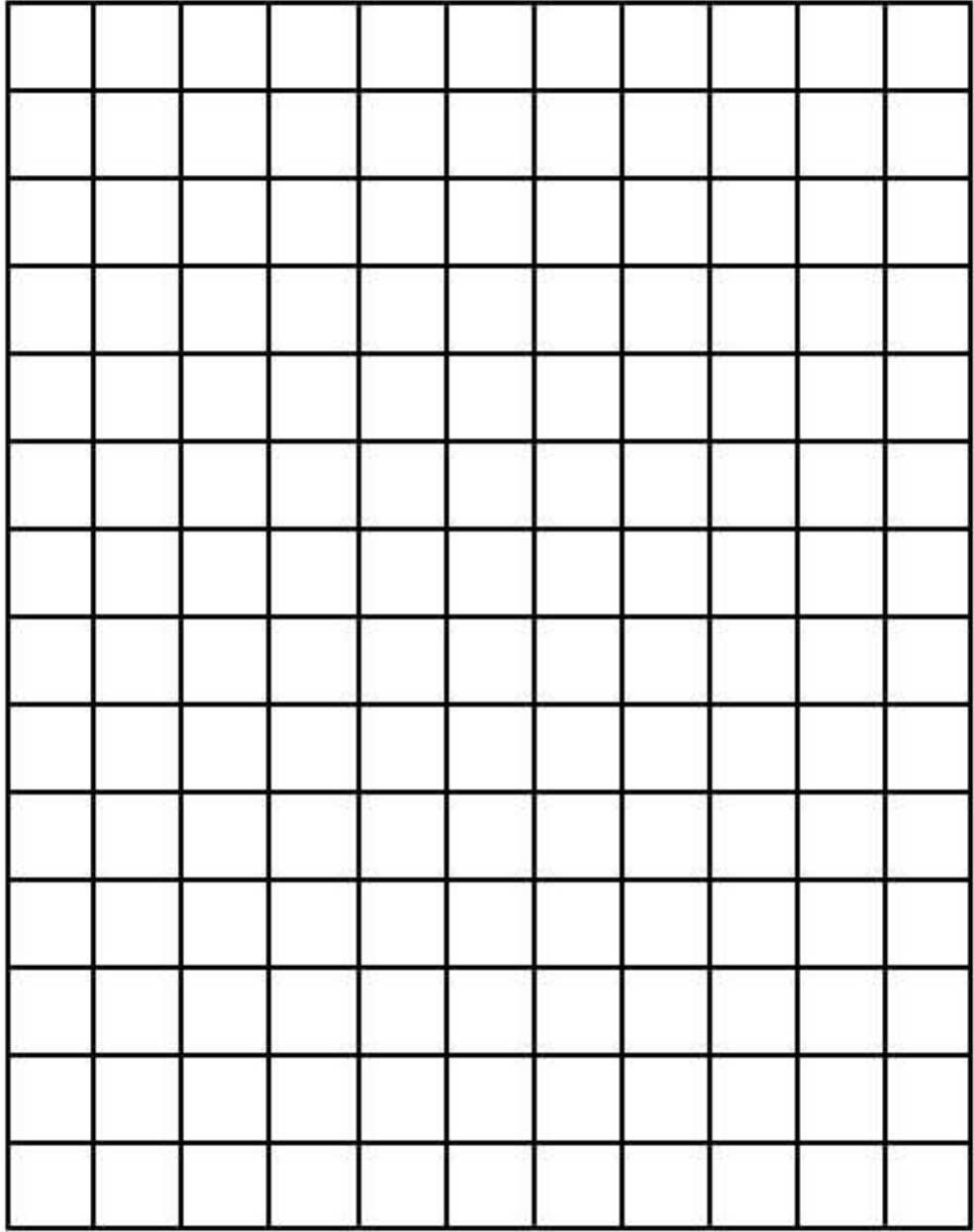
**Analyzing Data**

1) After analyzing each of the graphs created, which two variables have the strongest correlation (relationship) based on your data? **Explain how you know this.** (Attach all graphs to this page.)

2) A person has an ulna length of 26 centimeters. Use your graphs to estimate this person's height:

_____

A person has a foot length of 22 centimeters. Use your graphs to estimate this person's height:

_____

**Part II   What is the Relationship Between Foot Length and Stride Length**

Instructions:

1. Mark a distance of 20 meters, your instructor may have done this already in the hallway.
2. Walk the length by counting the number of steps.
3. Calculate the stride length (Distance / Number of Strides)
3. Measure the leg length, distance from heel to hip
4.  Use your data from the last exercise for foot length.
5.  Calculate stride length to leg length ratio.  (Stride / Leg )
6.  Collect data from 6 different subjects.

|  | Foot Length | Leg Length | Stride Length | Stride / Leg |
|---|---|---|---|---|
| Subject 1 |  |  |  |  |
| Subject 2 |  |  |  |  |
| Subject 3 |  |  |  |  |
| Subject 4 |  |  |  |  |
| Subject 5 |  |  |  |  |
| Subject 6 |  |  |  |  |

**Analyzing Data:**

**Create another graph** showing the relationship between **stride length and leg length**.  Place stride length on the X axis and leg length on the Y axis. Create plot points for each of your subjects.  This will not be a straight line, but should show a general relationship.

1) Do you see a pattern in the graphs?   What seems to be the relationship between stride length and leg length?  (Summarize in a complete sentence).

2) Using both sets of data, describe how you could determine a person's height if you know his stride length.

3) Of the variables tested, which one do you think is the most accurate for determining a person's height?  Defend your choice using data from your experiments.

**Extension Questions**

4) A burglary occurred and police identified two sets of footprints at the scene of the crime.  Use the visual below to estimate the height of the two burglars based on their foot length and stride length.   Defend your estimate by referencing data from any of the graphs you created in this activity.

28cm

76 cm

21 cm

60 cm
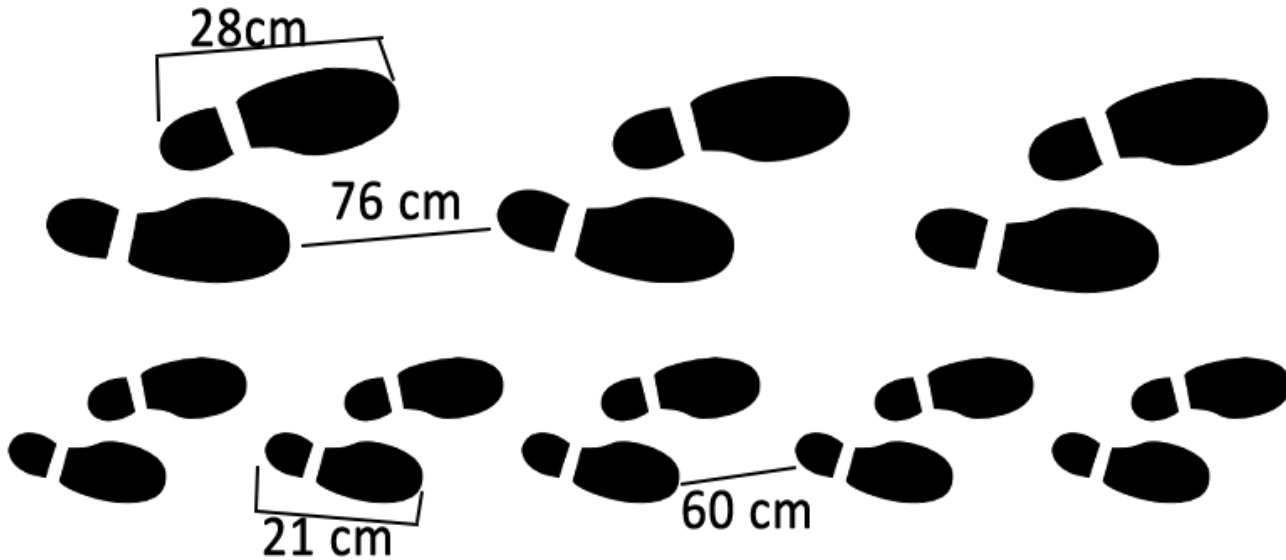
5) Paleontologists fund "footprint tracks" of apes, humans, and ancient hominids.  Features of the tracks can provide information about size, gait (step), and even whether the animal was bipedal (animal with 2 feet) or quadrupedal (animal with 4 feet).  Compare the footprints shown of human (bipedal) and a chimpanzee (quadrupedal).   List two similarities and two differences evident from the image.

Two similarities:

Two differences: