TRAINING LAB – SKELETAL REMAINS: DETERMINING A VICTIM'S HEIGHT

NAME_____

Background: As a Forensic Anthropologist you have been trained to identify skeletal remains – but what can the bones you identify tell you about the victim? One important piece of information a bone can help you uncover is the victim's approximate height. Knowing the victim's height can be an important first step in discovering the victim's identity.

1. You will be trained to analyze skeletal remains to determine a victim's height.

Procedures:

Part 1 – Measuring Your Own Bones To Determine Your Height

1. Use a meter stick and accurately measure the length of your Femur to the nearest 0.5 centimeter. Record your measurement in Table 1.
2. Repeat Step #1 and measure the length of your Tibia, Humerus, and Ulna to the nearest 0.5 centimeter. Record these measurements in Table 1.
3. Finally, measure your height to the nearest 0.5 centimeter. Record your height in Table 1.
4. Anthropologists have measured the heights and bone lengths of many humans to see if there is a relationship between bone length and height. After analyzing a large mass of data they discovered a distinct relationship between bones and height. Formulas were derived from this data that will allow a Forensic Anthropologist to measure the length of a single bone from a person and calculate that person's approximate height (the height is usually accurate to 1 or 2 inches). These important formulas can be found in Table 2.
5. Use your Femur length measurement (from Table 1) and the correct Femur formula (from Table 2) to calculate your approximate height in centimeters. Record your Calculated Height in Table 1.
6. Repeat Step #5 to calculate your approximate height using your Tibia, Humerus, and Ulna length measurements. Check carefully to make sure you are using the correct formula for each calculation. Record each Calculated Height in Table 1.
7. Convert all your Table 1 Centimeter Heights (Actual and Calculated) into the more familiar Feet and Inches. Follow these simple steps:

Step #1 – Use the following Formula to convert centimeters into inches. Round your answers to the nearest inch.

$$\text{Height in Inches} = \frac{\text{Height in Centimeters}}{\text{2.54 Centimeters per Inch}}$$

Step #2 – Convert total Inches to Feet and Inches (48 inches = 4 feet, 60 inches = 5 feet, 72 inches = 6 feet).
EXAMPLE: 65 inches = 5 feet 5 inches

Record all Feet and Inch heights in Table 1.

Part 2 – Measuring Skeletal Remains To Determine A Victim's Height

1. Your Supervisor has a collection of skeletal remains from various crime scenes that have been sent to you for analysis. Studies of the skulls found with these bones helped investigators determine each victim's race and sex. They need your help to determine each victim's approximate height. Below is the information that is known about each of the bones.

Bone Name	Race	Sex
Ulna	Caucasian	Male
Femur	African-American	Female
Fibula	Unknown	Unknown
Radius	Asian	Male
Tibia	African-American	Male
Humerus	Caucasian	Female

Measure the total lengths of each of the bones as accurately as possible. Determine the Approximate Height (in Feet and Inches) of each of the victims. Record your results in Table 3.

Part 3 – Using Height Calculations To Analyze A Crime Scene

1. A shallow grave, filled with the skeletal remains of what is believed to be at least two people, was recently discovered in a nearby county. Only a mix of arm and leg bones were found in the grave, which has made it difficult for the sheriff's department to determine exactly how many victims were buried. The sheriff's department carefully measured each bone's length (bone length is the only information they have been able to gather from the skeletal remains). This bone length data just arrived in our lab today. They would like for you to use height calculations to help determine the number of victims in the grave.
2. The bone length data can be found in Table 4 – "Bone Evidence Summary Sheet". Complete the "Bone Evidence Summary Sheet" so we can send the results back to the Sheriff's Department.

DATA TABLES – SKELETAL REMAINS: DETERMINING A VICTIM'S HEIGHT

NAME_____

Table 1 – My bone lengths and calculated height

Bone Name	Bone Length (cm)	Calculated Height (cm)	Calculated Height (inches)	Calculated Height (ft./inches)
Femur				
Tibia				
Humerus				
Ulna				

My Actual Height (cm)	
My Actual Height (inches)	
My Actual Height (ft/inches)	

Table 3 – Estimated heights calculated from skeletal remains

Bone Name	Bone Length (cm)	Calculated Height (cm)	Calculated Height (inches)	Calculated Height (ft./inches)
Ulna				
Femur				
Fibula				
Radius				
Tibia				
Humerus				

Table 4 – Bone Evidence Summary Sheet

Bone Name	Bone Length (cm)	Calculated Height (cm)	Calculated Height (inches)	Calculated Height (ft./inches)
Ulna	24cm			
Femur	45cm			
Fibula	34cm			
Humerus	32cm			
Humerus	30cm			
Radius	24.5cm			
Femur	41cm			
Tibia	36.5cm			
Fibula	39cm			
Radius	24.5cm			
Tibia	33.5cm			
Radius	26.5cm			
Femur	48cm			
Humerus	36cm			

How many different victims do you believe were buried in the mass grave? ☐

List the Estimated Height of each victim below. Next to each victim's height write the number of bones from the grave that you believe belong to that victim.

Table 2 – Formulas used to calculate Estimated Height (cm) from Bone Length (all bone measurements MUST be made in Centimeters)

Bone Name	Race	Male	Female
Humerus	Caucasian	(2.89 x length) + 78.10cm	(3.36 x length) + 57.97cm
	African-American	(2.88 x length) + 75.48cm	(3.08 x length) + 64.67cm
	Asian	(2.68 x length) + 83.19cm	use unknown formula
	Unknown	(4.62 x length) + 19.00cm	
Radius	Caucasian	(3.79 x length) + 79.42cm	(4.74 x length) + 54.93cm
	African-American	(3.32 x length) + 85.43cm	(3.67 x length) + 71.79cm
	Asian	(3.54 x length) + 82.00cm	use unknown formula
	Unknown	(3.78 x length) + 74.7cm	
Ulna	Caucasian	(3.76 x length) + 75.55cm	(4.27 x length) + 57.76cm
	African-American	(3.20 x length) + 82.77cm	(3.31 x length) + 75.38cm
	Asian	(3.48 x length) + 77.45cm	use unknown formula
	Unknown	(4.61 x length) + 46.83cm	
Femur	Caucasian	(2.32 x length) + 65.53cm	(2.47 x length) + 54.13cm
	African-American	(2.10 x length) + 72.22cm	(2.28 x length) + 59.76cm
	Asian	(2.15 x length) + 72.57cm	use unknown formula
	Unknown	(2.71 x length) + 45.86cm	
Tibia	Caucasian	(2.42 x length) + 81.93cm	(2.90 x length) + 61.53cm
	African-American	(2.19 x length) + 85.36cm	(2.45 x length) + 72.56cm
	Asian	(2.39 x length) + 81.45cm	use unknown formula
	Unknown	(3.29 x length) + 47.34cm	
Fibula	Caucasian	(2.60 x length) + 75.50cm	(2.93 x length) + 59.61cm
	African-American	(2.34 x length) + 80.07cm	(2.49 x length) + 70.90cm
	Asian	(2.40 x length) + 80.56cm	use unknown formula
	Unknown	(3.59 x length) + 36.31cm	

QUESTIONS – SKELETAL REMAINS: DETERMINING A VICTIM'S HEIGHT

NAME_____

1. On the average, how far off (in inches) were your calculated heights from your actual height?

2. Which of your bone(s) gave you the most accurate estimation of your actual height?

3. Which of your bone(s) gave you the least accurate estimation of your actual height?

4. The formulas that you used for calculating your estimated height are based on measurements from adult bones. How could this affect your calculated height results?

5. Why would knowing the sex of a bone allow you to make a more accurate estimation of the victim's height?

6. You measure a bone and calculate the height of the victim is 5 feet 11 inches. Why is it correct to say that this is the victim's Estimated Height?