

BONE DETECTIVES

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Program Summary

Forensic anthropologists examine human skeletal remains to determine information about unidentified bones for law enforcement agencies. Students become forensic anthropologists as they examine evidence from the “Case of the Buried Bones” to create an Individual Profile based on the remains. Students determine the estimated height, skeletal age, sex, and identify skeletal traumas and pathologies.

Tennessee Science Standards

See www.adventuresci.com to find specific Grade Level Expectations.

EMBEDDED INQUIRY

Conceptual Strand: *Understandings about scientific inquiry and the ability to conduct inquiry are essential for living in the 21st century.*

EMBEDDED TECHNOLOGY & ENGINEERING

Conceptual Strand: *Society benefits when engineers apply scientific discoveries to design materials and processes that develop into enabling technologies.*

STANDARD 9 – MATTER

Conceptual Strand 9: *The composition and structure of matter is known, and it behaves according to principles that are generally understood.*

High School: Human Anatomy and Physiology CLE 3251.1.2, CLE 3251.1.4, CLE 3210.5.2 and Biology CLE 3216.6.1.

Objectives

Students will:

- 1 Understand the reasons for bones in the human body.
- 2 Discover the effects of aging on the human skeleton.
- 3 Learn how to keep bones healthy and prevent osteoporosis.
- 4 Measure bones to calculate an individual’s height with given formulas.

Pre-Visit Activities

1. Divide students into groups and ask them to compare bone characteristics focusing mainly on those listed below:
Forehead: Males are slanted more than females

Vocabulary

Anthropology
Appendicular Skeleton
Axial Skeleton
Compact bone
Forensic Science
Fracture
Joint
Osteoarthritis
Osteoporosis
Pathology
Spongy (cancellous)
bone
Stature
Trauma

Chin: more pronounced and longer in males
 Measure armspan and compare it the height of 3 students in the group.
 Record if armspan is longer, shorter, or the same as height.

- Have students draw a picture of the structure of bone and label the following layers: periosteum, compact bone, cancellous bone, bone marrow.

Post-Visit Activities

1. Rubber Bones Experiment

Materials needed: 2 chicken bones, white vinegar, water, 2 jars with lids

Procedure: Remove meat and all cartilage from chicken bones and let dry overnight. Place one bone in jar and cover completely with white vinegar – label “Vinegar.” Place remaining bone in empty jar and cover completely with water – label “Water.” Let bones soak for 3 days letting students observe any changes. Remove each bone and rinse with water. Compare the properties of each. What do students think happened? Is this a similar process to osteoporosis?

2. Calculating Height in the Classroom

Because the femur is the longest bone in the body, it is the most accurate for calculating height from skeletal remains. Students can measure the length of their own femur in cm (measure from the knee to the hip joint) and use the formula to calculate estimated height. Compare this number to their actual height.

*Please note the different calculations for male and female.

Male: $(2.32 \times \text{length in cm}) + 65.63 \text{ cm}$

Female: $(2.47 \times \text{length in cm}) + 54.13$

Amazing facts about the human body!

- Twenty muscles are used to smile, forty to frown.
- The breathing rate is faster in children and women than in men.
- It takes about 1 minute for a red blood cell to circle the whole body.
- Bones make up about $1/7^{\text{th}}$ of your weight.
- You are taller in the morning, shorter at night.
- You have over 50 bones in your hands. More than half the bones in the human body are in the hands and feet.
- Human thigh bones are stronger than concrete.
- There are almost no muscles in the human hand. The muscles that move your hand are in your arms.

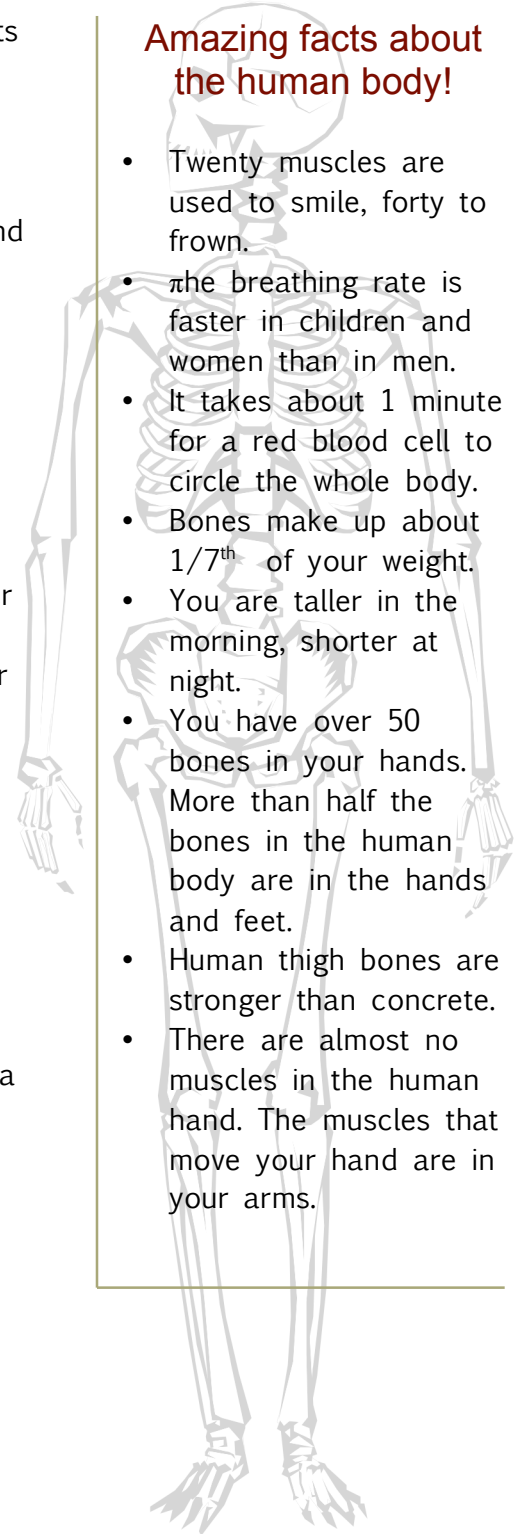


Exhibit Connections

BodyQuest – Students can visit the following exhibits relating to the skeletal system. Skelevision, Bone Bench, Types of Joints, BodyQuest lockers, The Big Catch, Bicycle Exhibit, Mini Med Center

AdventureTower – Level 4

- Femur Tube
- Vertebrae Ladder

Resources

Websites

resources.wardsci.com/tag/bones/

Wards Science – Teacher resource for teaching how bones change over time

www.mayoclinic.com/

The Mayo Clinic’s website contains detailed information about bones and other related

<http://www.csitheexperience.org/>

<http://www.smm.org/csi/educators/>

Science Museum of Minnesota CSI:The Experience web page for educators: No Bones About It

Worksheet Answers

Name that Bone

Answers

- 1 cranium
- 2 clavicle
- 3 ribs
- 4 humerus
- 5 ulna
- 6 pelvis
- 7 femur
- 8 fibula
- 9 phalanges (also on fingers)
- 10 vertebrae
- 11 sternum
- 12 sacrum
- 13 radius
- 14 carpals
- 15 metacarpals
- 16 tibia
- 17 tarsals
- 18 metatarsals

Skeleton Search

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Mixed up sentences


1. Forty muscles are used to frown.
2. You have over 50 bones in your hands.
3. Human thigh bones are stronger than concrete.
4. Bones make up about 1/7th of your weight.

Name _____

Dev. By SM 6/2008

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Skeleton Search



| | | | | | | | | |
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How many words about the human body can you find hidden in the box?

- arm
- bone
- carpals
- cranium
- femur
- humerus
- leg
- muscle
- pelvis
- rib
- skull
- skeleton
- spine
- tibia
- toe
- ulna

Make the words in each line into amazing facts about the human body.

muscles are forty from used to

you bones hand fifty over your have in

thigh human concrete are bones stronger than

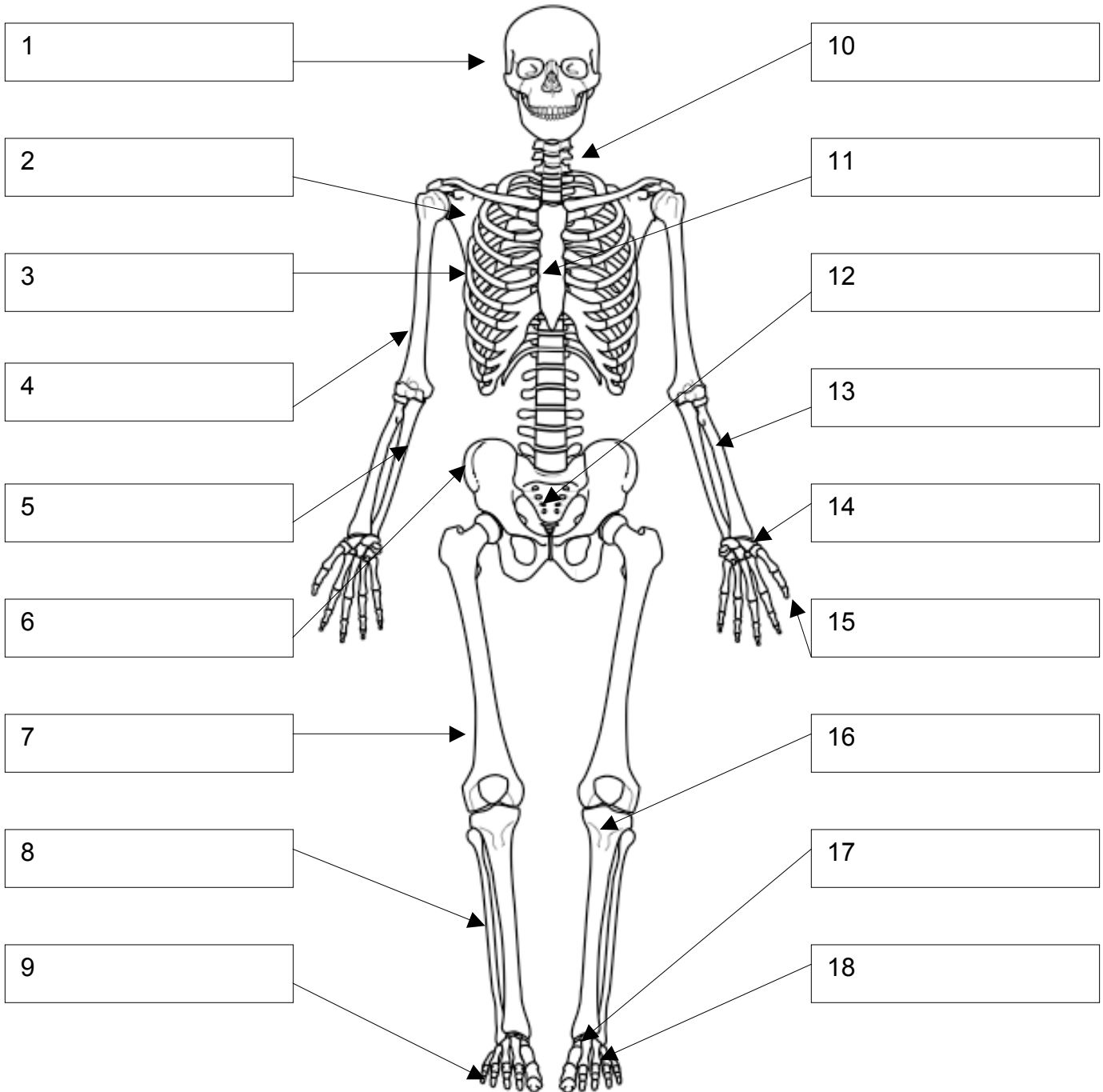
one weight of about up seventh bones your make

Name

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Name That Bone!



- | | | | | | |
|-------------|-------------|---------|-----------|--------|-----------|
| carpals | clavicle | cranium | femur | fibula | humerus |
| metacarpals | metatarsals | pelvis | phalanges | radius | rib |
| sacrum | sternum | tarsals | tibia | ulna | vertebrae |