Shapes of Bones Lab

Name _____
Date _____
Period _____

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Do Now Press on your shin, the front of your lower leg. Then press on the top of your head. 2 minutes, before you open the lab
Both are bone.

A. Which bone feels shaped more like a pipe? ☐ The shin bone ☐ The top of the head ☐ Both feel the same

B. Name one way the two bones are different.

_____

☐ I can sort a bone as long, short, flat, irregular or sesamoid from its measurements and its look.

☐ I can explain how a bone's shape fits its job, with an example of each shape.

Part 1. Measure four bones (Tab 1)

SEP 3 Investigating · SEP 5 Math

Pick a bone. Pick **Length L**, **Width W** or **Thickness T**. Press **Close the caliper**. Copy the reading in mm. **L** = the longest way. **W** = across the middle, the wide way. **T** = across the middle, the thin way.

1. Femur. Measure W **At the middle**: _____ mm. Then W **Near an end**: _____ mm. The end is ☐ wider ☐ narrower than the middle.

2. Measure L, W and T at the middle of all four bones. Then divide. Round to one decimal.

Bone	L (mm)	W (mm)	T (mm)	L ÷ W	W ÷ T
Femur (thigh bone)					
Scapula (shoulder blade)					
Capitate (a wrist bone)					
Lumbar vertebra (lower back)					

3. Biggest L ÷ W: _____ Biggest W ÷ T: _____ The two bones with L ÷ W under 2: _____ and _____

READ FIRST. In the lab, find the green **Learn It** box and read it. Then answer 4 to 6.

4. Use the rule. Tick one shape for each bone.

Bone	Long	Short	Flat	Irregular
Capitate	☐	☐	☐	☐
Lumbar vertebra	☐	☐	☐	☐
Femur	☐	☐	☐	☐
Scapula	☐	☐	☐	☐

5. The vertebra's W ÷ T is more than 2. Why is it **irregular**, not flat?

_____

6. Plan check (SEP 3). Why should every bone be measured at the middle, not near an end? Use your femur numbers from 1.

_____

Part 2. Test the rule on new bones (Tab 2)

SEP 5 Math · CCC Scale, Proportion and Quantity

Measure each bone the same way. Then pick **In the body** to see where it sits.

7. Measure L, W and T at the middle. Then divide.

Bone	L (mm)	W (mm)	T (mm)	L ÷ W	W ÷ T
Distal phalanx (fingertip)					
Talus (ankle bone)					
Patella (kneecap)					

8. Compare sizes. The fingertip bone is _____ mm long. The capitate is _____ mm long. The talus is _____ mm long. The smallest of the three is the _____.

9. Kneecap, **In the body**. Where does it sit?

☐ between the femur and the tibia, end to end ☐ in front of the knee, inside the pink tendon

Part 2, continued (Tab 2)

SEP 6 Explanations · CCC Scale, Proportion and Quantity

READ FIRST. In the lab, find the green **Learn It** box and read it. Then answer 10 and 11.

10. Use the full rule. Tick one shape for each bone.

Bone	Long	Short	Flat	Irregular	Sesamoid
Patella (kneecap)	☐	☐	☐	☐	☐
Distal phalanx (fingertip)	☐	☐	☐	☐	☐
Talus (ankle bone)	☐	☐	☐	☐	☐

11. A student says: “Short bones are the small ones.” Fix it. Use the fingertip and the talus, and one number for each.

Part 3. Shape fits the job (Tab 3)

SEP 4 Data · CCC Systems · CCC Structure and Function

All 206 bones are colored by shape. Press each shape in the key to light up only those bones. Drag to turn the skeleton. Use + to zoom in.

12. Systems (CCC 4). Copy the count for each shape from the key.

Shape	Long	Short	Flat	Irregular	Sesamoid	All bones
Number of bones						

13. Light up one shape at a time. Where are most of those bones? Tick one place for each shape.

Shape	Arms, legs, fingers and toes	Wrists and ankles	Skull, ribs and sternum	Spine, face and hips
Flat bones	☐	☐	☐	☐
Long bones	☐	☐	☐	☐
Irregular bones	☐	☐	☐	☐
Short bones	☐	☐	☐	☐

READ FIRST. In the lab, find the green **Learn It** box and read it. Then answer 14 to 16.

14. Structure and function (CCC 6). Tick the job each shape does best.

Shape	A lever	Bend many ways	Protect organs	Guard the spinal cord, anchor muscles	Help a tendon
Short	☐	☐	☐	☐	☐
Irregular	☐	☐	☐	☐	☐
Sesamoid	☐	☐	☐	☐	☐
Flat	☐	☐	☐	☐	☐
Long	☐	☐	☐	☐	☐

15. Model check (SEP 2). This lab is a model of real bones. One thing it shows well: _____

One thing it leaves out: _____

16. Explain it (SEP 6). Why are the bones on top of the skull flat plates, but finger bones are long? Build the explanation in three parts.

Part	Your explanation
What happened (two bones, one number each)	
The science idea (shape fits the job)	
How the data shows the idea	

Rule card. Keep it for next lesson.

Check in this order. 1. Inside a tendon? **Sesamoid**. 2. Odd shape with a ring or knobs? **Irregular**. 3. W ÷ T is 2 or more? **Flat**. 4. L ÷ W is 3 or more? **Long**. 5. L ÷ W is under 2? **Short**.

NYSSLS: building toward HS-LS1-2 (a model of a system of specialized parts) and HS-LS1-1 (structure and function). Hole's Essentials 3e, Section 7.2 (AP.4.7.2). Bones: Z-Anatomy 3D skeleton built on BodyParts3D (DBCLS), CC BY-SA 4.0, one adult man, measured to the nearest millimeter by the lab. The ratio cutoffs (2 and 3) are a classroom rule, not the book's. SEP = Science and Engineering Practice, CCC = Crosscutting Concept.