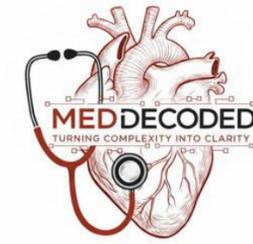


بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



ANATOMY

MID | Lecture 4

Skeletal System 3

وَلَقَدْ خَلَقْنَا الْإِنْسَانَ وَنَعَلَهُمَّا تَوْسُوسٌ بِهِ نَفْسُهُ وَنَحْنُ أَقْرَبُ إِلَيْهِ مِنْ حَبْلِ الْوَرِيدِ

Written by : Yaman Khalil
Amal Al-khatib



Reviewed by : Khaled Abdalla

Introduction to Anatomy

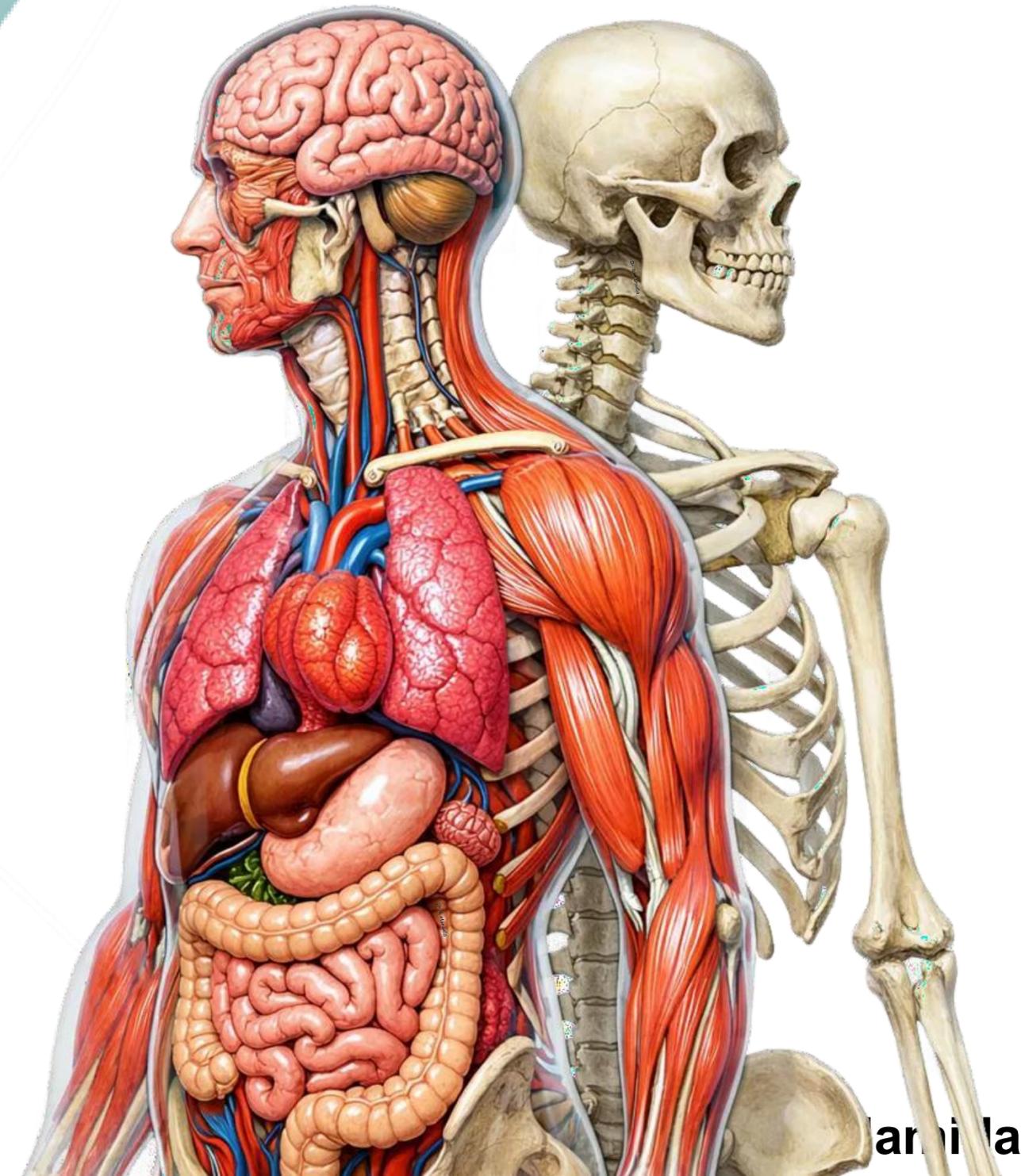
- 1st Year Medical Students
- 2025-2026
- Second Semester

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Hamida

Course Outline:

1 Introduction and Terminology

2 Skeletal System

3 Cardiovascular System

4 Lymphatic System

5 Nervous System

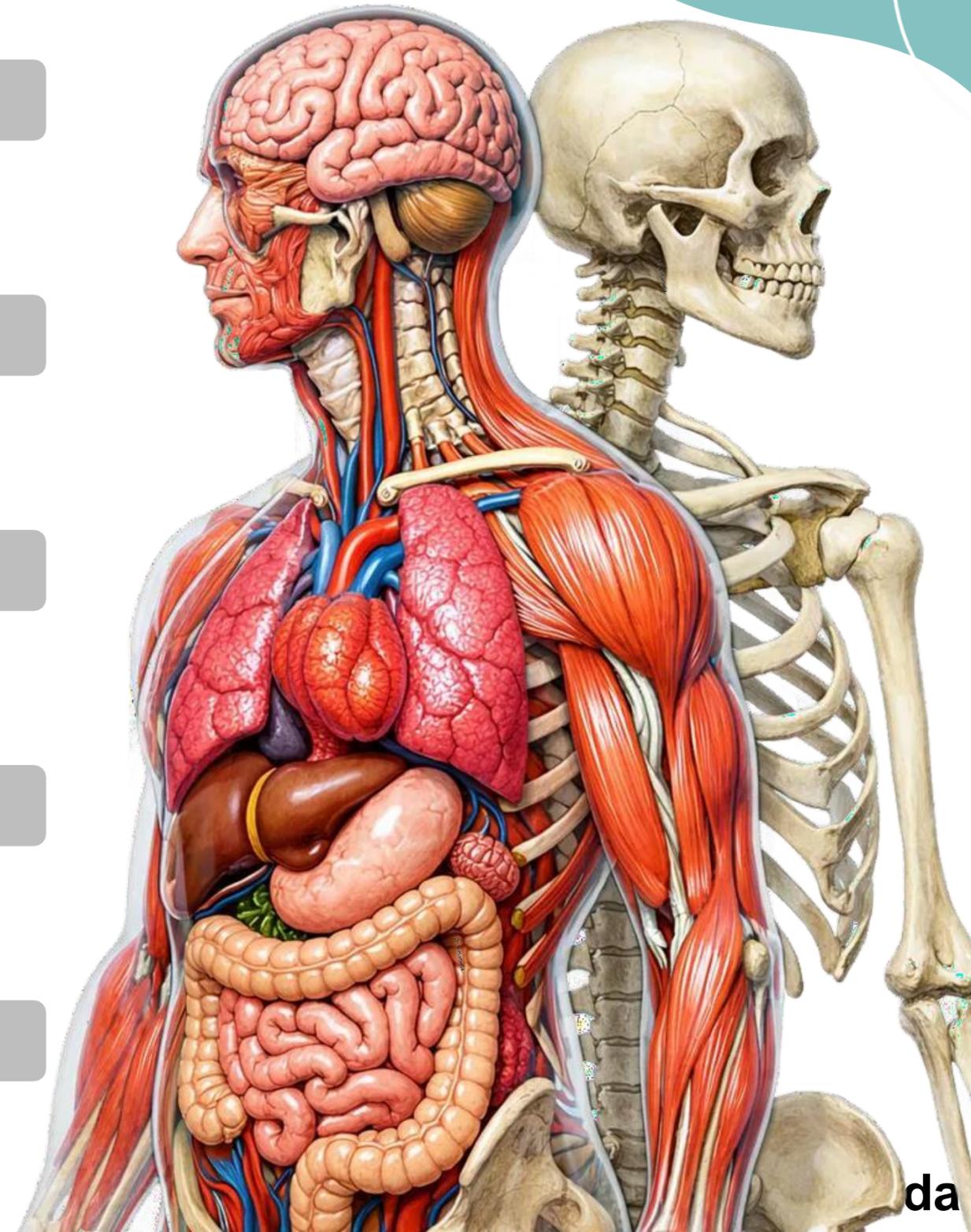
6 Muscular System

7 Respiratory System

8 Digestive System

9 Urinary System

10 Endocrine System



2

Skeletal System

System Outline:

2.1

Axial Skeleton

2.2

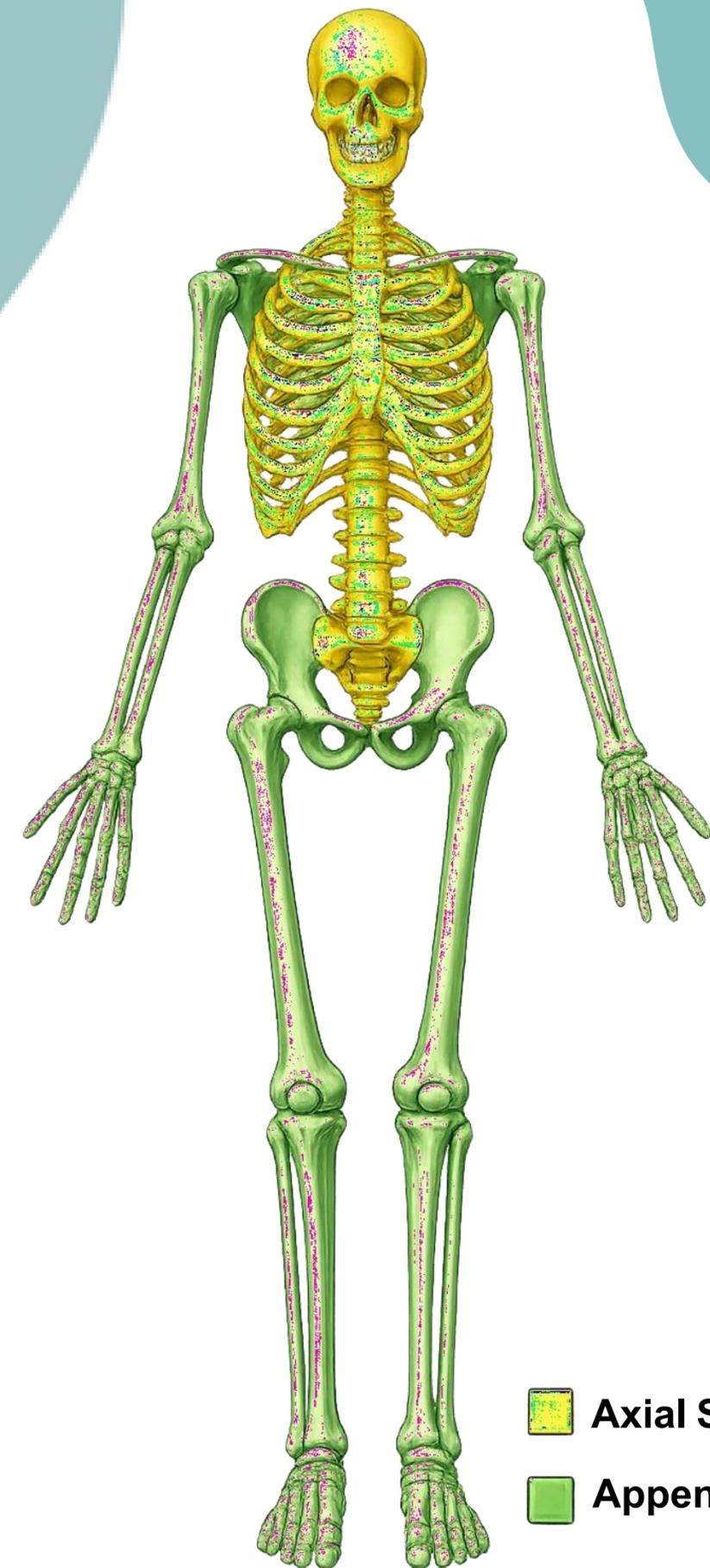
Appendicular Skeleton

2.3

Joints

2

- Skeletal system
- 2. Appendicular Skeleton



-  Axial Skeleton
-  Appendicular Skeleton

2

Skeletal System

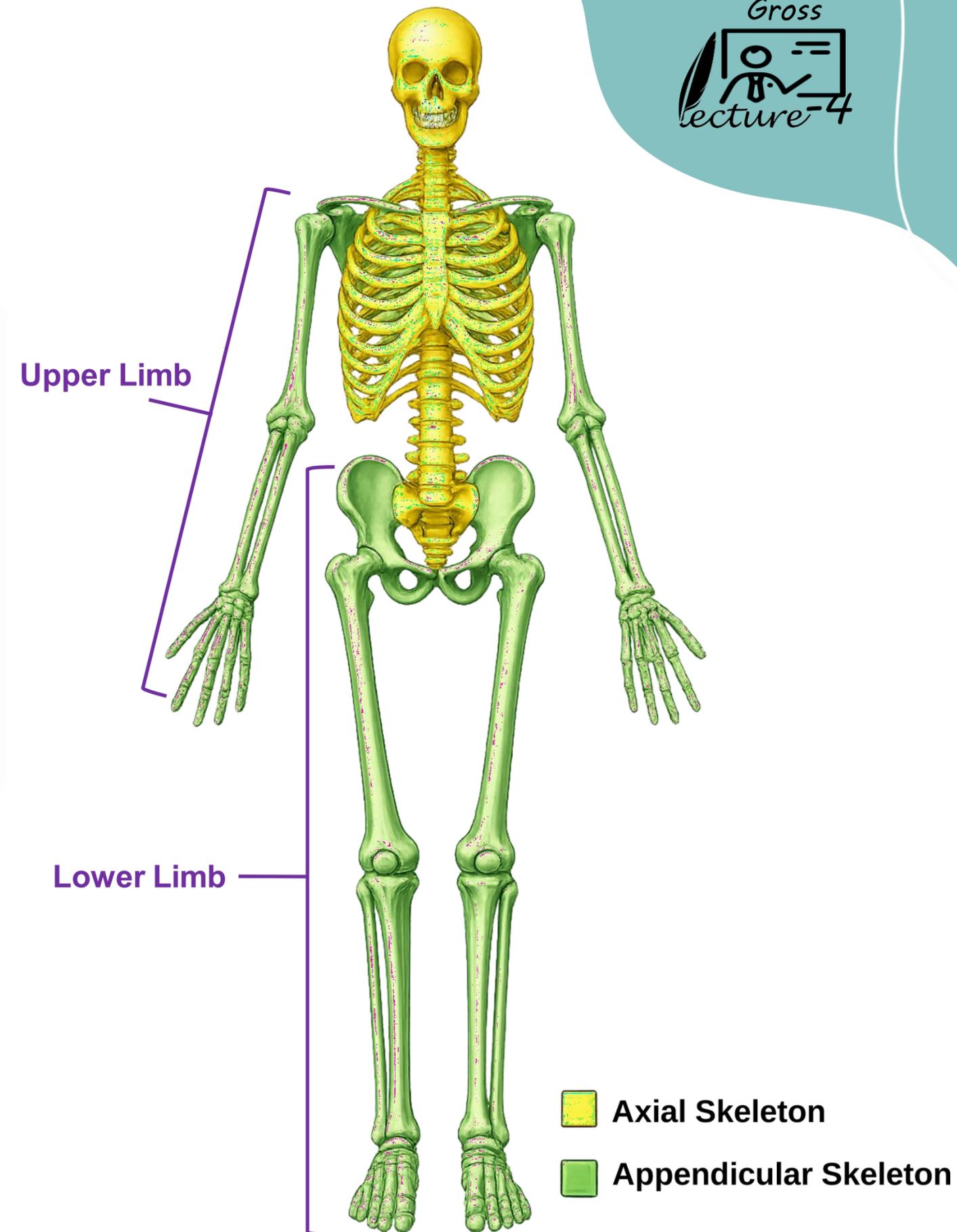
- The human skeletal system consists of **206 bones**
- The skeletal system is classified functionally into:

1. Axial Skeleton :

- Consists of the bones and cartilages that lie close to the central axis of the body.
- It includes the bones of the
 1. Skull
 2. Vertebral Column
 3. Thoracic Cage

2. Appendicular Skeleton :

- It is bilaterally symmetrical and consist of the bones and cartilages of the:
 1. Upper Limb
 2. Lower Limb



2.2 Skeletal System—Appendicular Skeleton

Lecture Outline:

2.2.1 Upper Limb Bones

2.2.1 Lower Limb Bones

In each bone we will talk about:

1- Shape

2- Location

3- Articulations

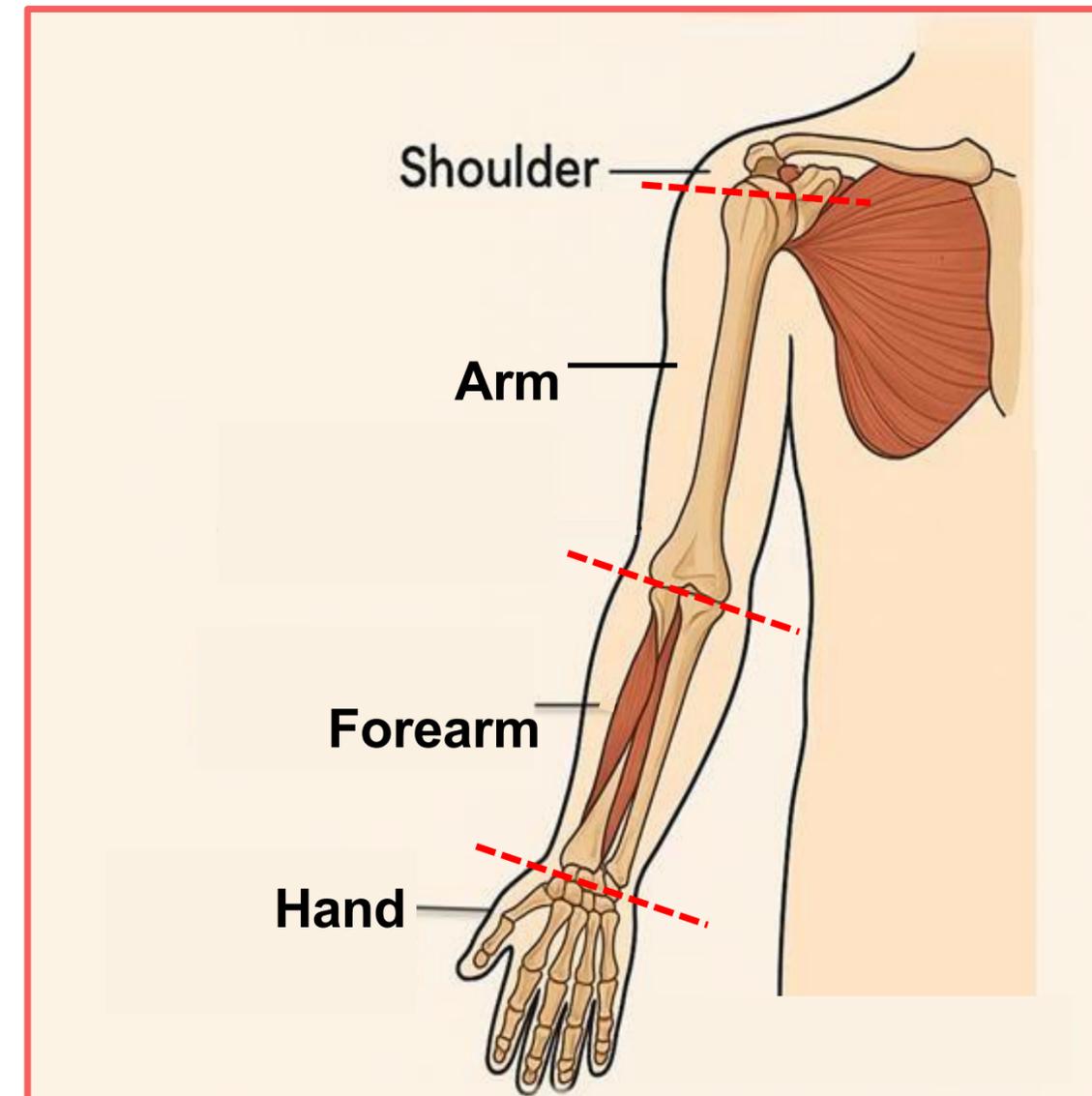
Upper Limb Bones

➤ The upper limb consists of four regions:

1. **Shoulder region (Pectoral Girdle):** the area where the upper limb attaches to the trunk.
2. **Arm:** the region between the shoulder joint and the elbow joint.
3. **Forearm:** the region between the elbow joint and the wrist joint.
4. **Hand:** the region distal to the wrist joint.

Pec (from pectoral) = Shoulder

Pectoral Gridle (Shoulder region) = The combination of the scapula and clavicle bones



Upper Limb Bones

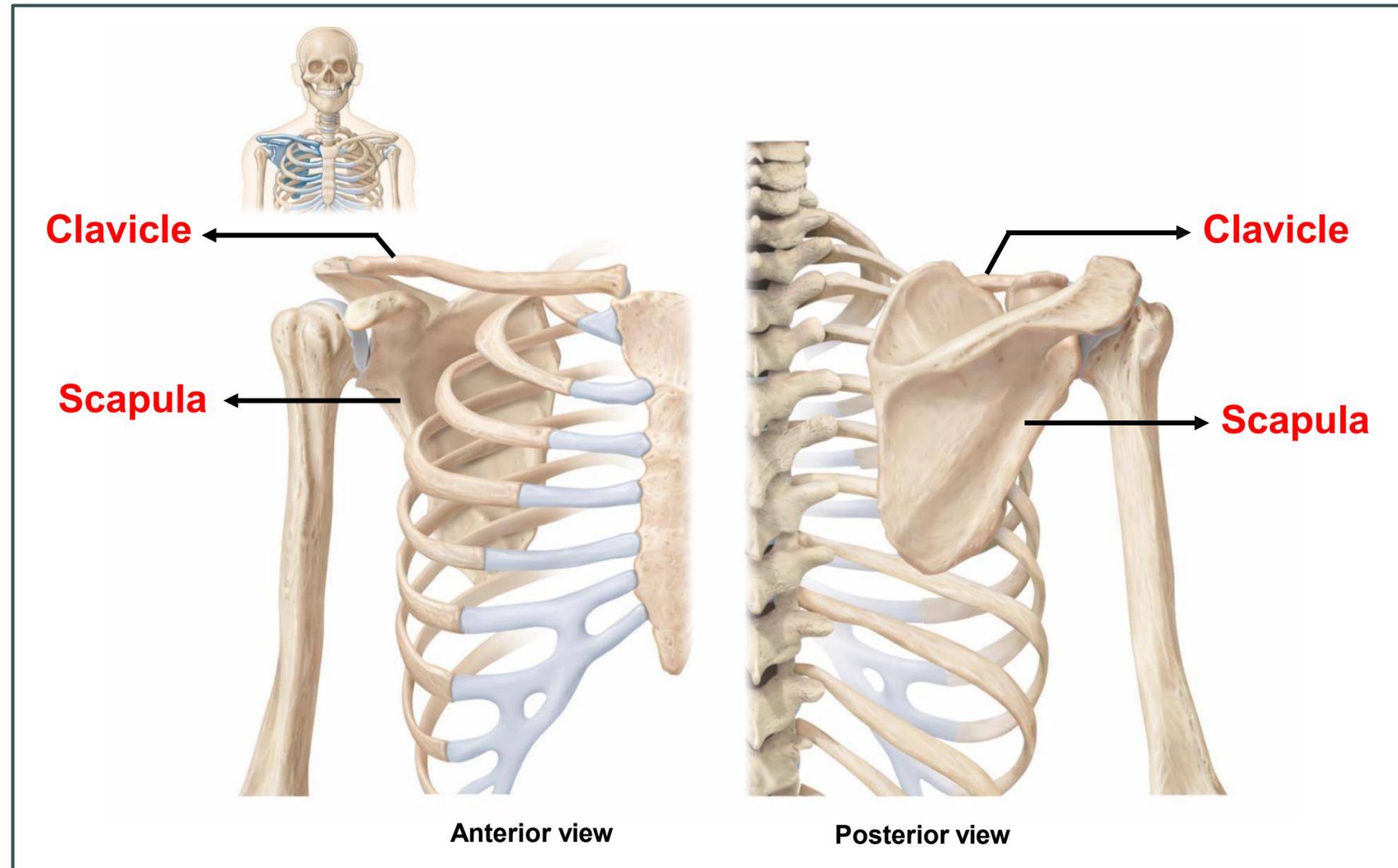
1. Shoulder (Pectoral Girdle)

➤ The shoulder (pectoral girdle) consists of the bones that connect the upper limbs to the axial skeleton.

1. Clavicle

2. Scapula

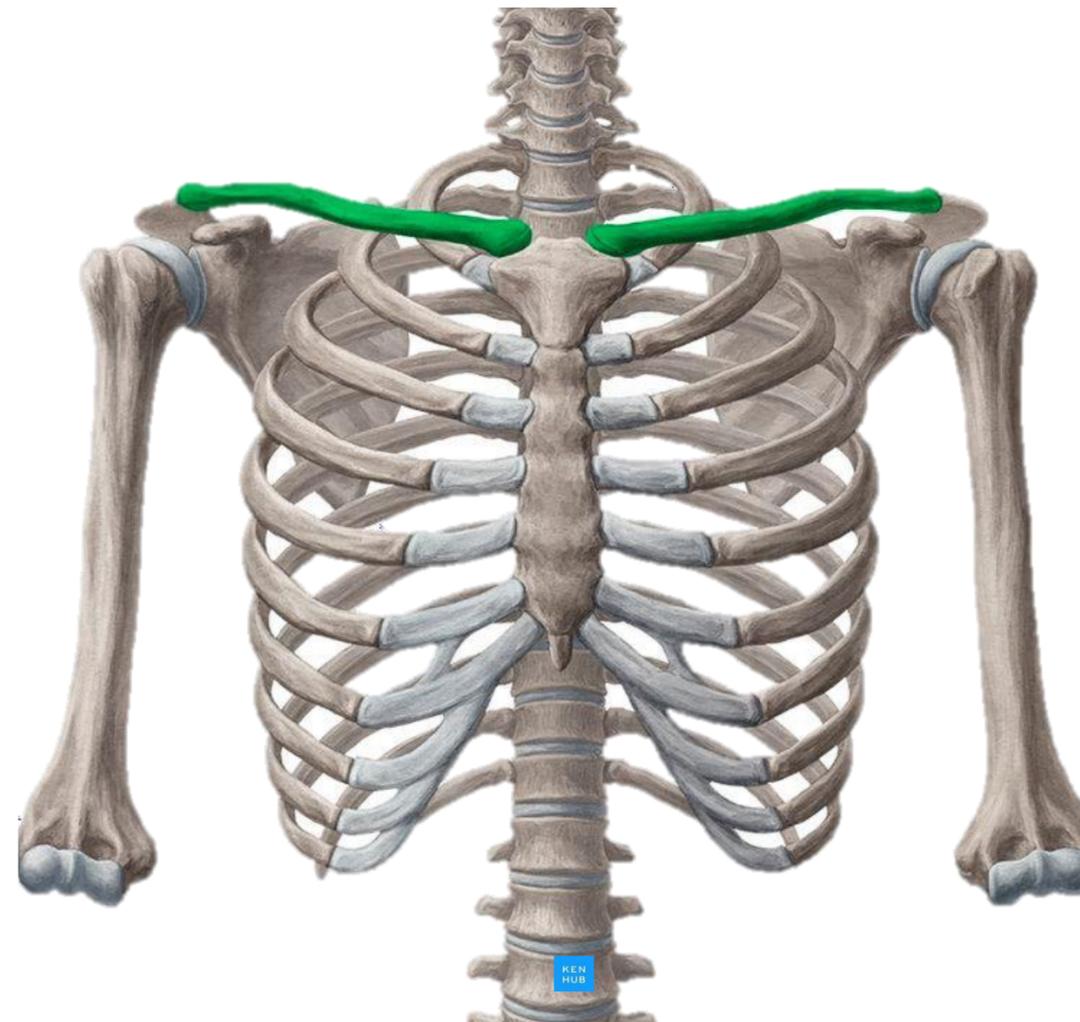
The function of these two bones is connecting the upper limb to the trunk (axial)



➤ Clavicle Bone (collarbone)

- A long, S-shaped bone lying horizontally across the anterior thorax, superior to the first rib.
- It is subcutaneous (under the skin) and easily palpable along its length.
- Articulates medially with the sternum and laterally with the scapula.

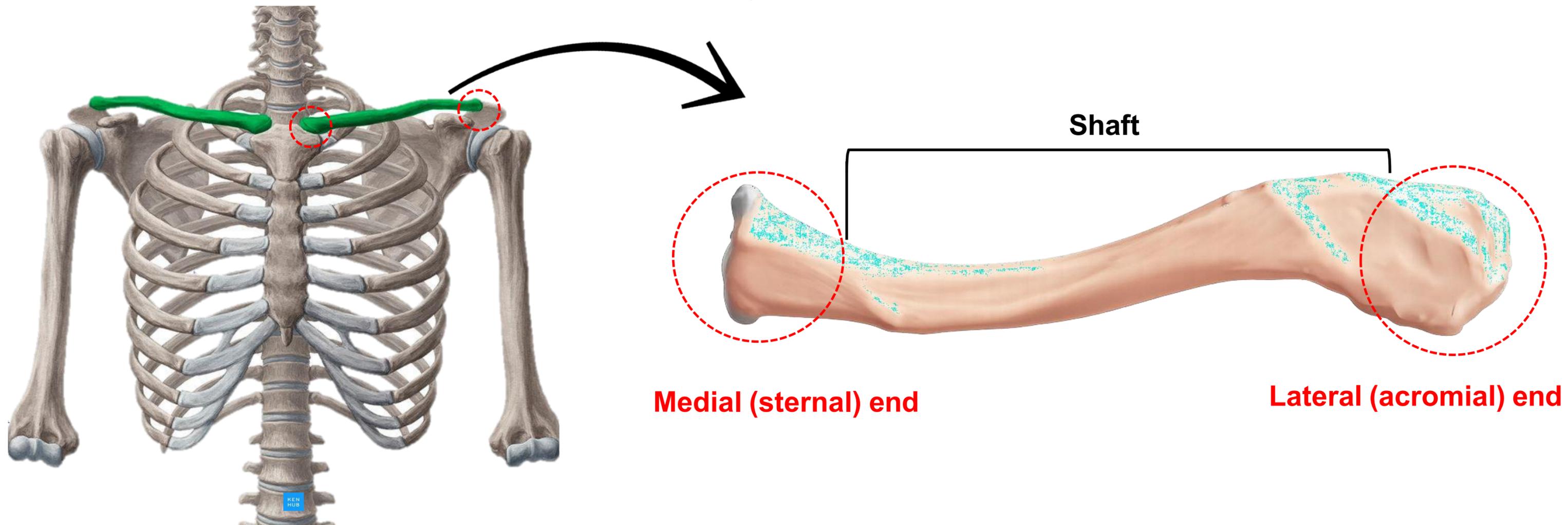
Because the clavicle bone is highly palpable & subcutaneous it makes it more vulnerable to injuries



➤ Clavicle Bone (collarbone)

- It consists of three parts: **the medial end, the lateral end and the shaft.**
 1. **Medial (sternal) end:** rounded and articulates with the manubrium of the sternum.
 2. **Lateral (acromial) end:** broad, flat, lateral end, articulates with the acromion of the scapula.
 3. **Shaft:** curved.

The clavicle is the only horizontal bone



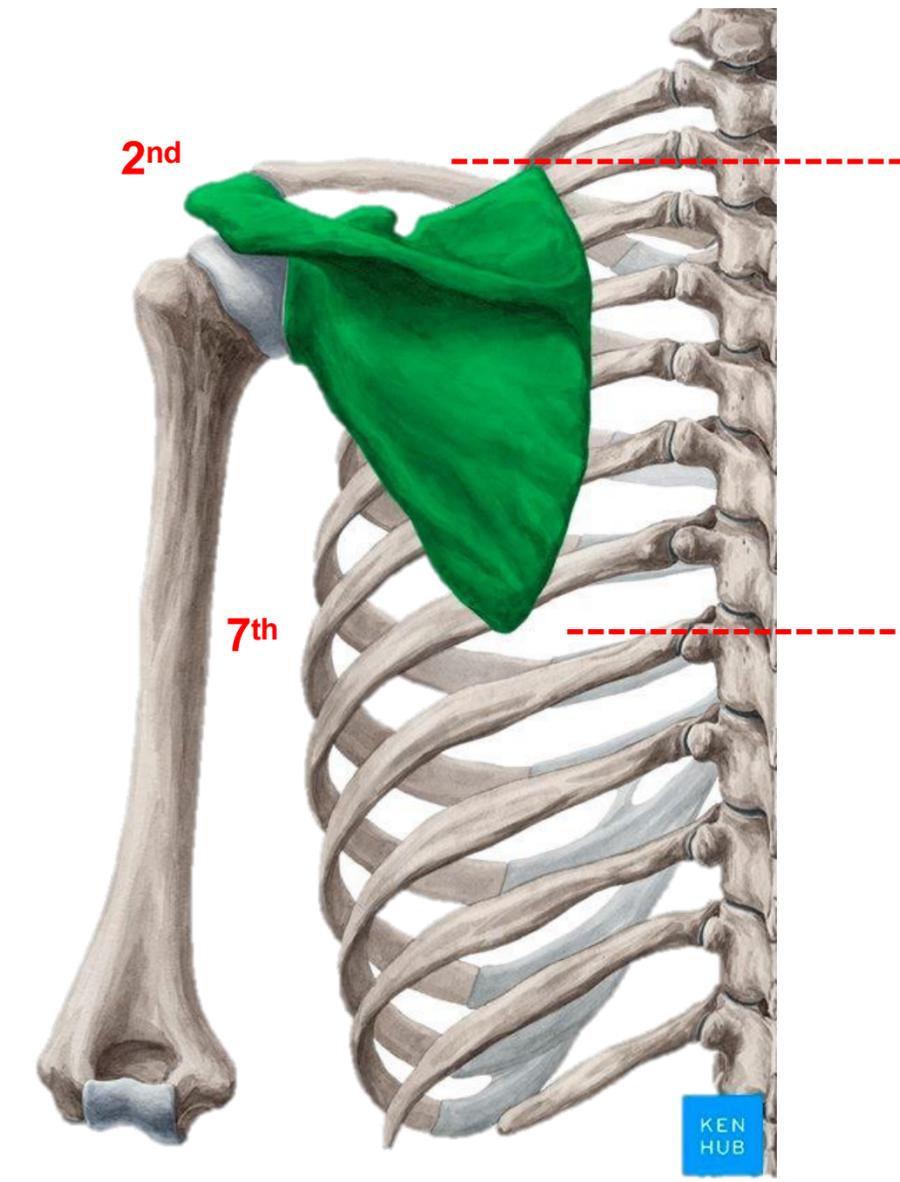
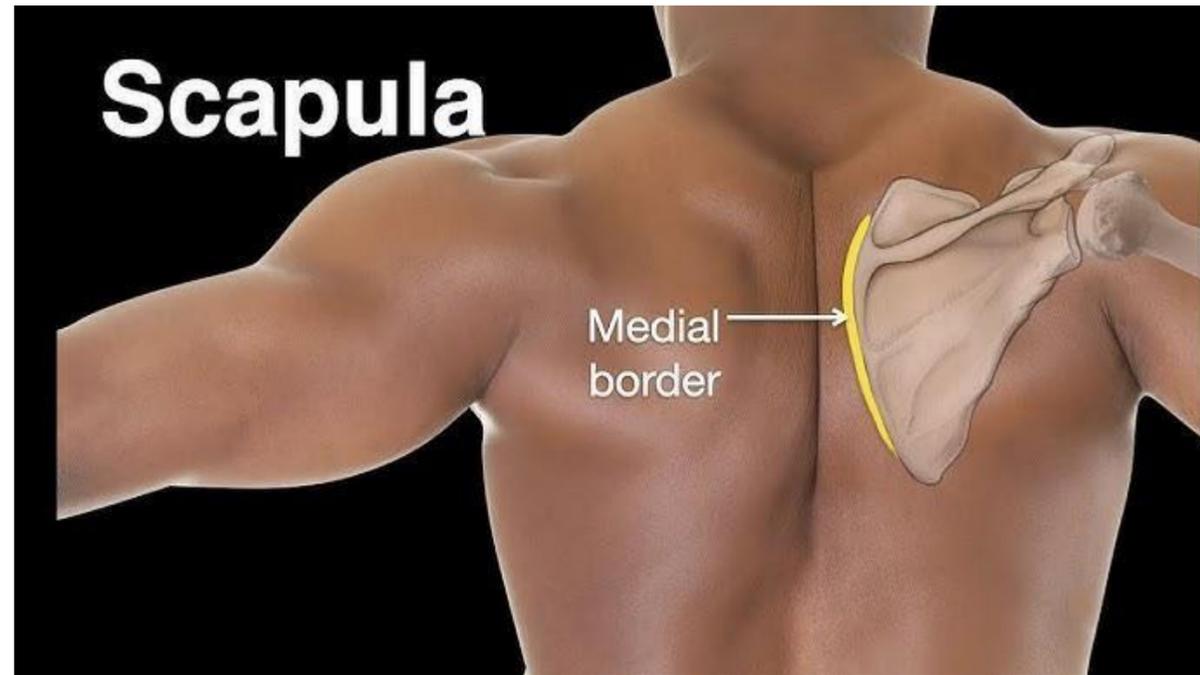
Upper Limb Bones

1. Shoulder (Pectoral Girdle)



➤ Scapula Bone (shoulder plate)

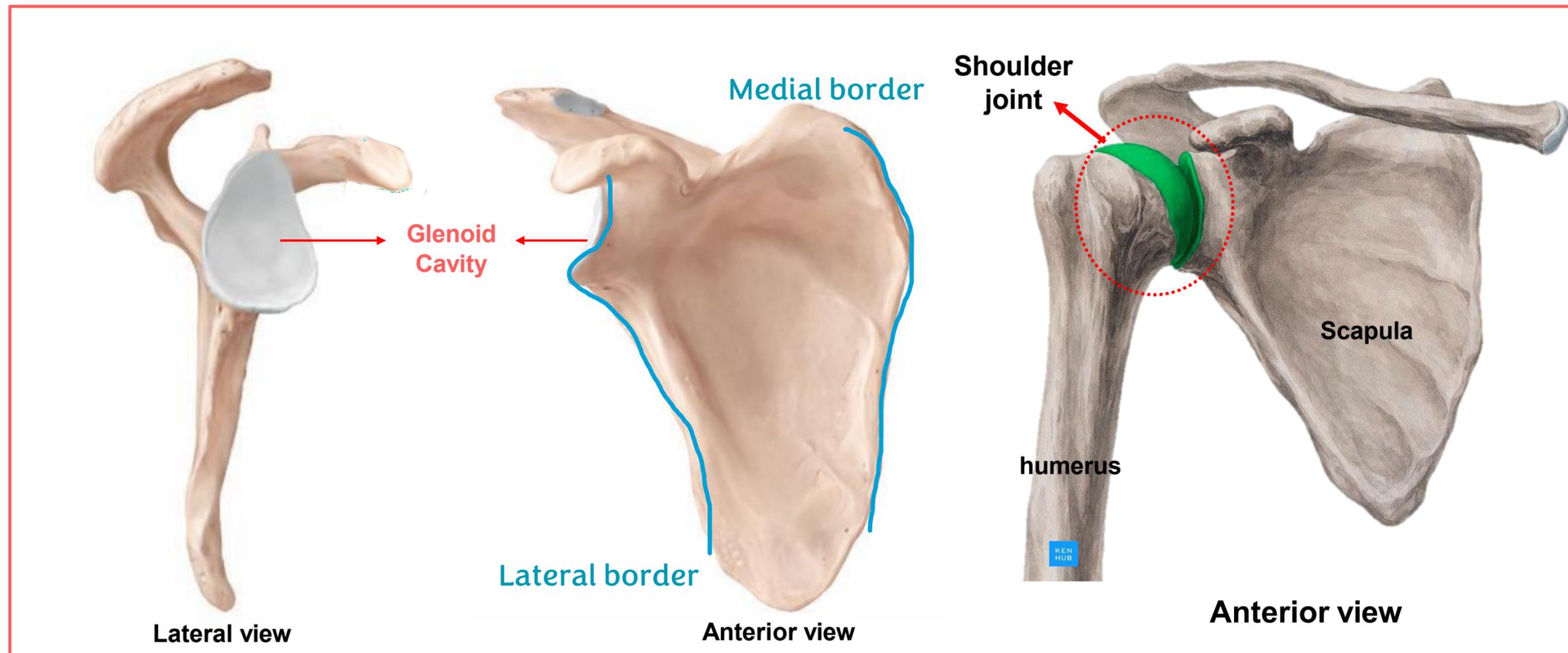
- A flat, triangular bone situated in the superior posterior thorax, between the **2nd and 7th ribs**.



Posterior view

➤ Scapula Bone (shoulder plate)

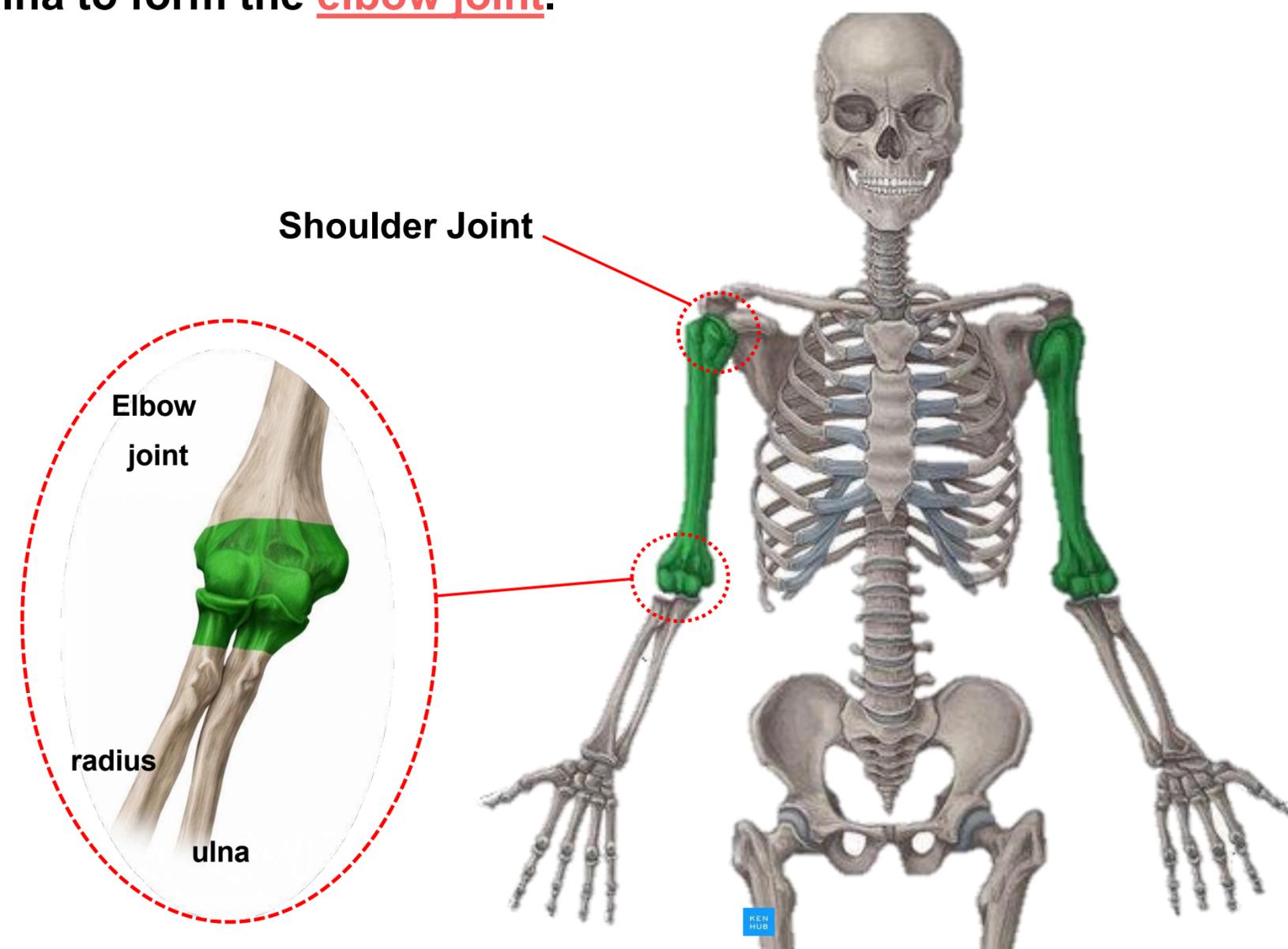
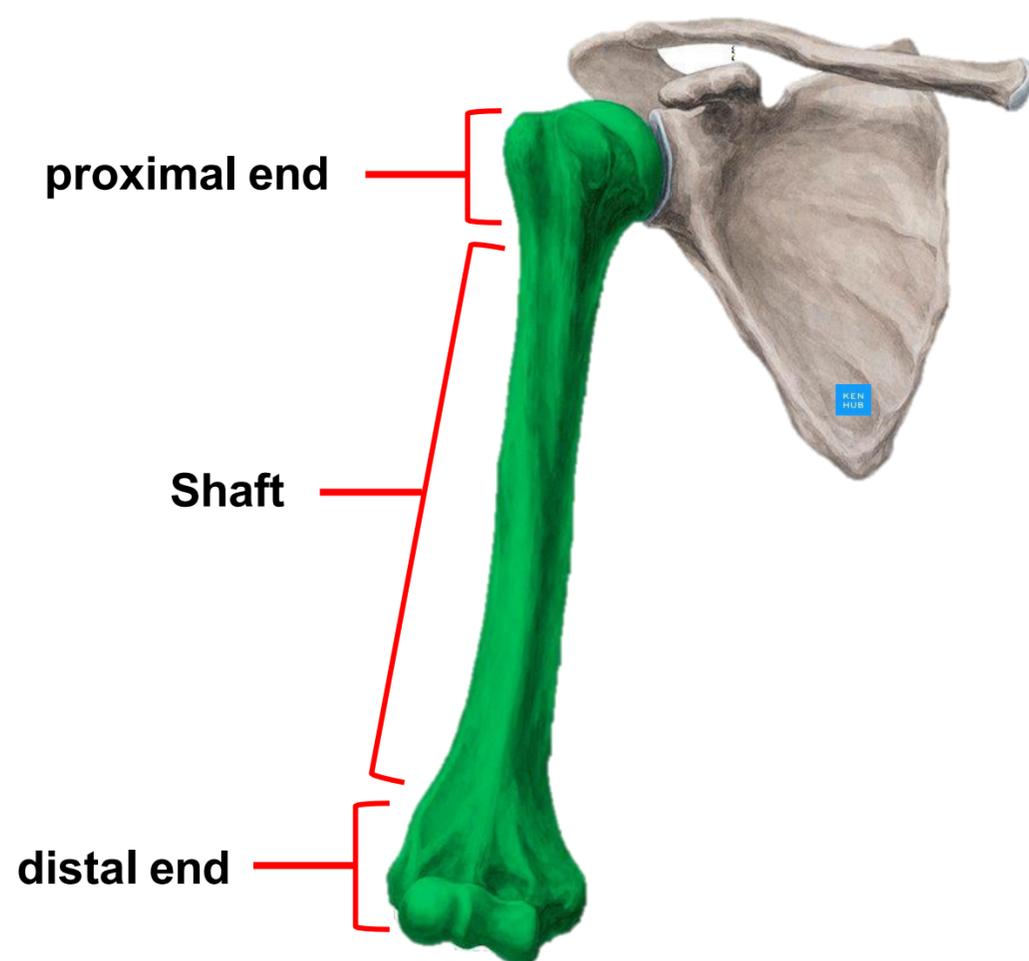
- Articulates laterally with the head of the humerus at the glenoid cavity.
- Glenoid Cavity is a shallow depression that articulates with the head of the humerus to form the shoulder joint.
The proximal end of the humerus



➤ Arm region contains one bone:

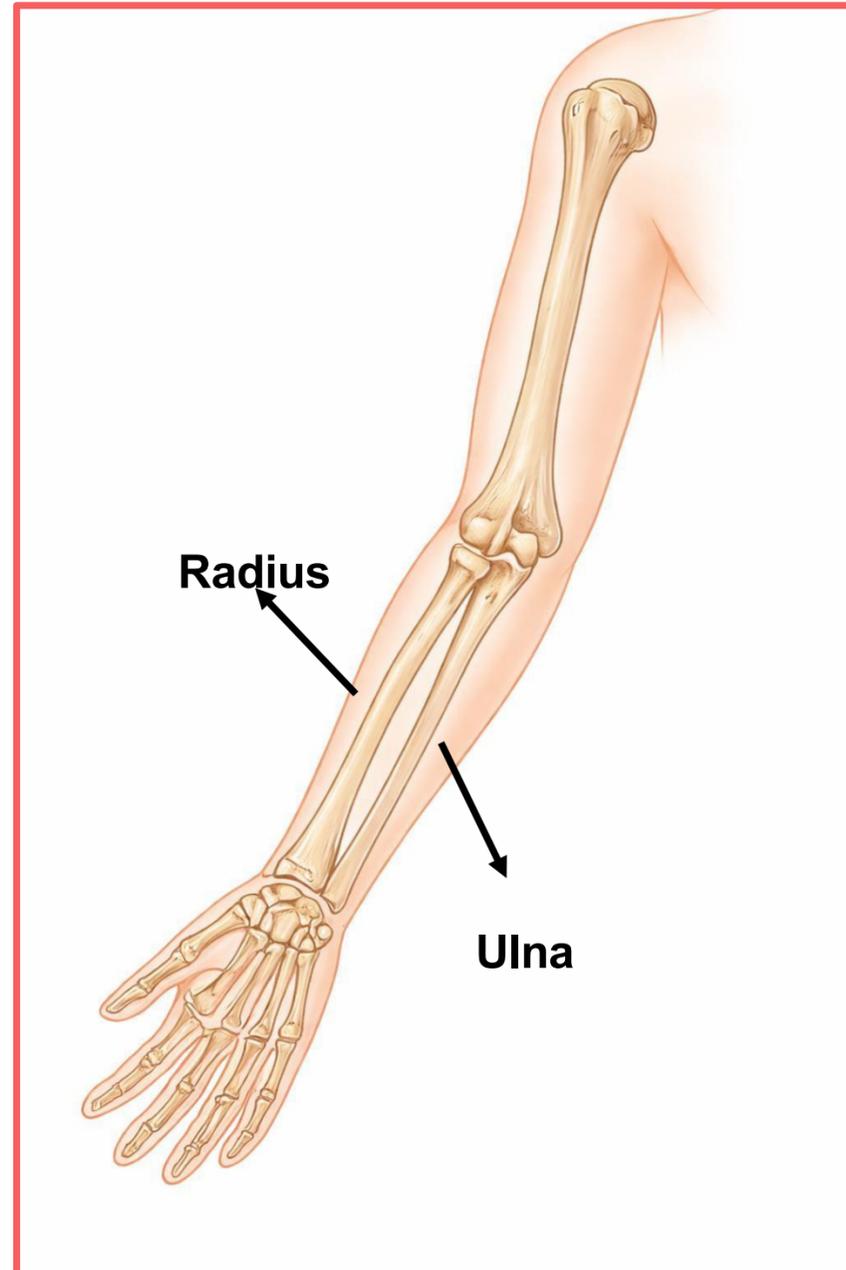
Humerus : 

- A long bone, with a **proximal end**, **shaft**, and **distal end**.
- The proximal end articulates with the scapula at the glenoid cavity to form the **shoulder joint**.
- The distal end articulates with the radius and ulna to form the **elbow joint**.



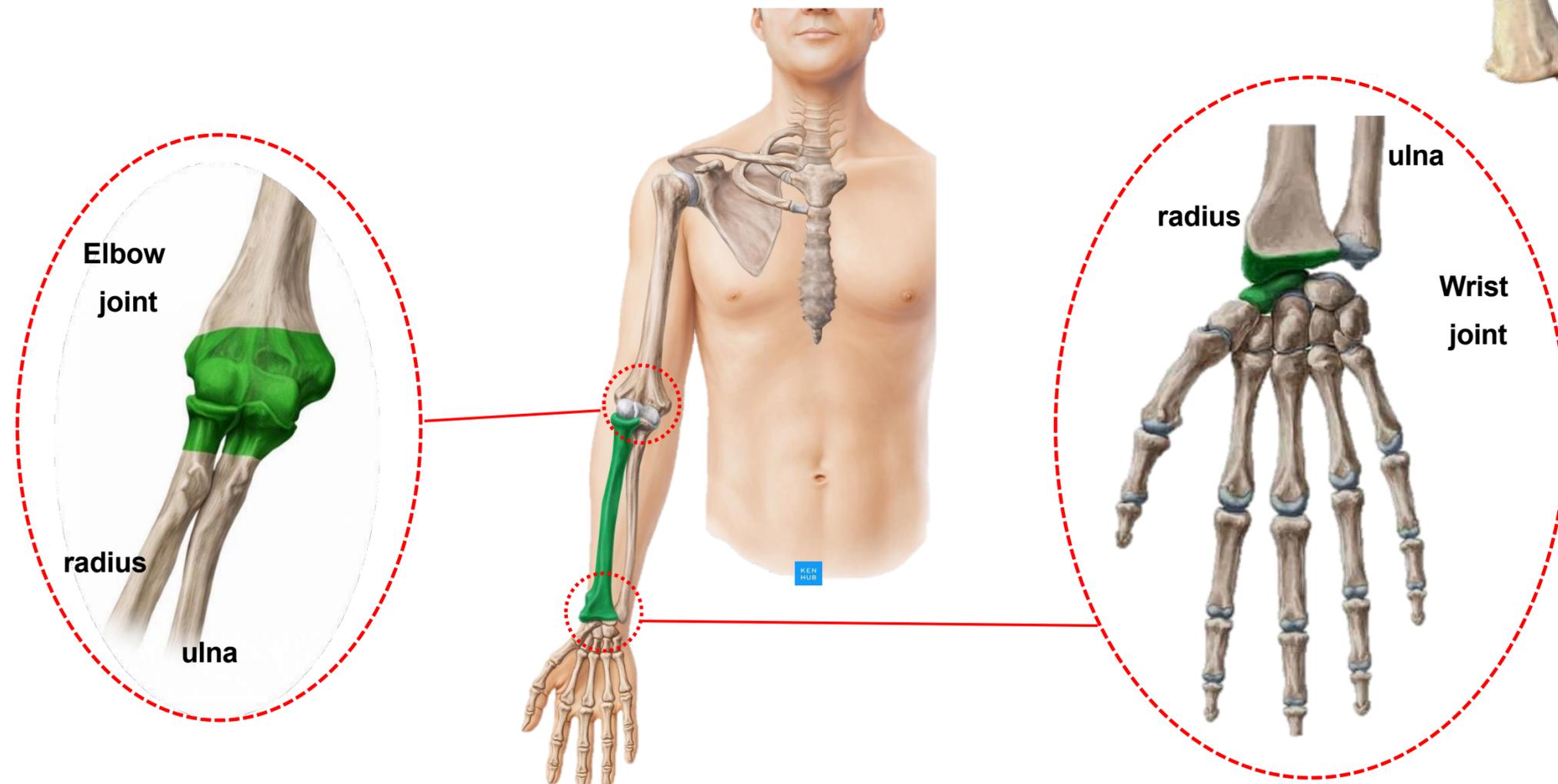
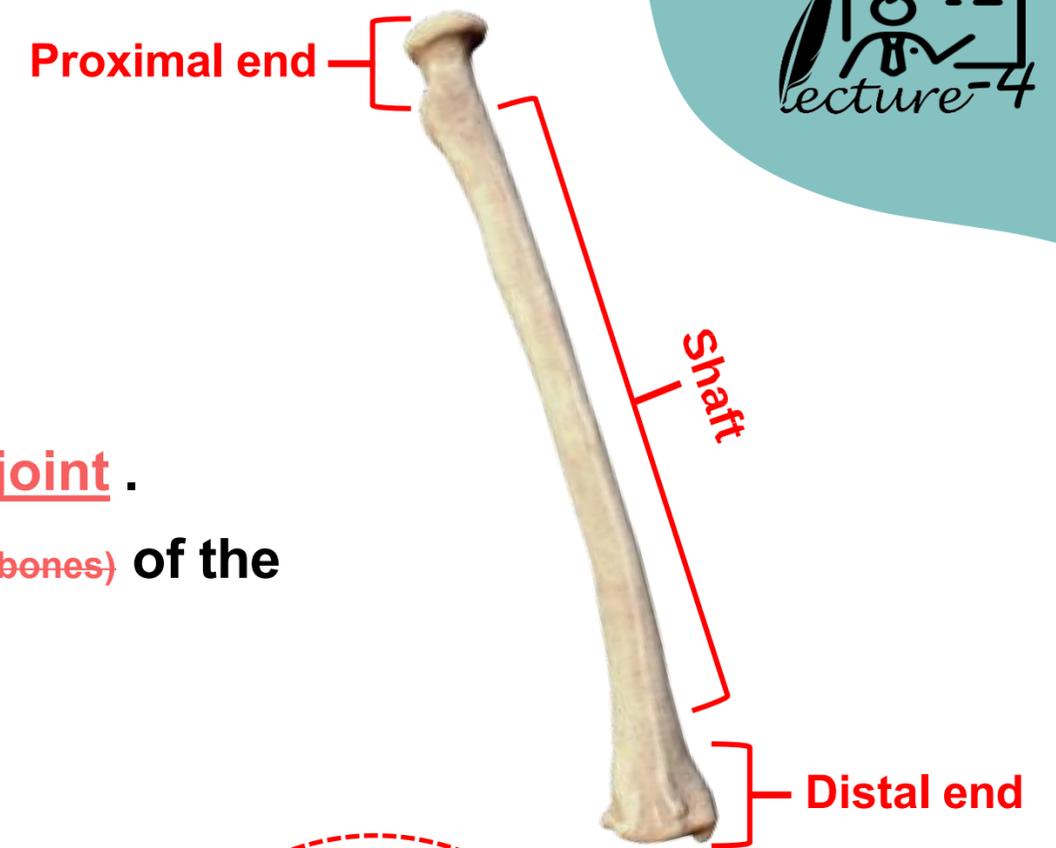
➤ Forearm region contains two bones:

1. **Radius (Lateral)** Near to the thumb
2. **Ulna (Medial)**



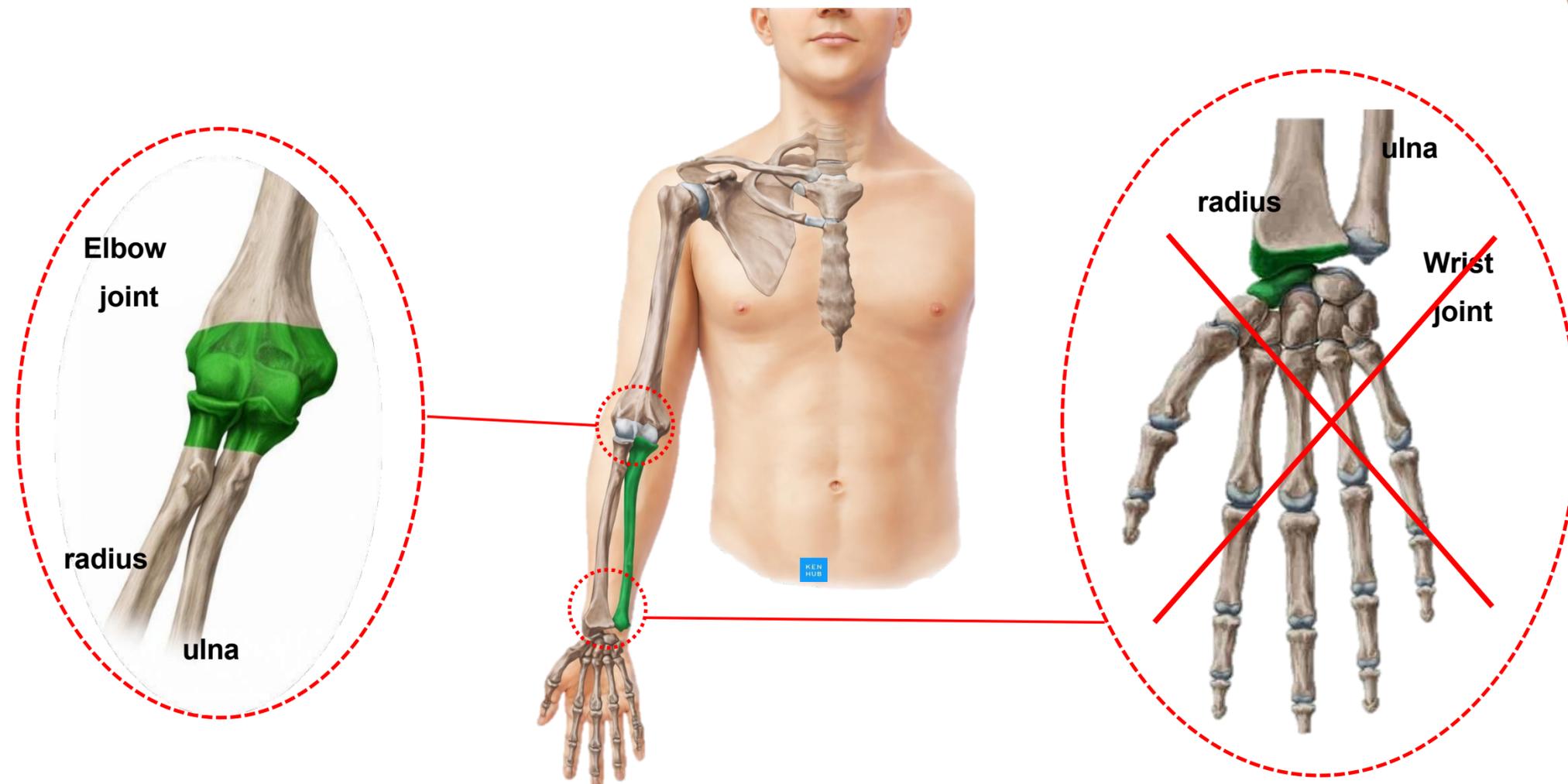
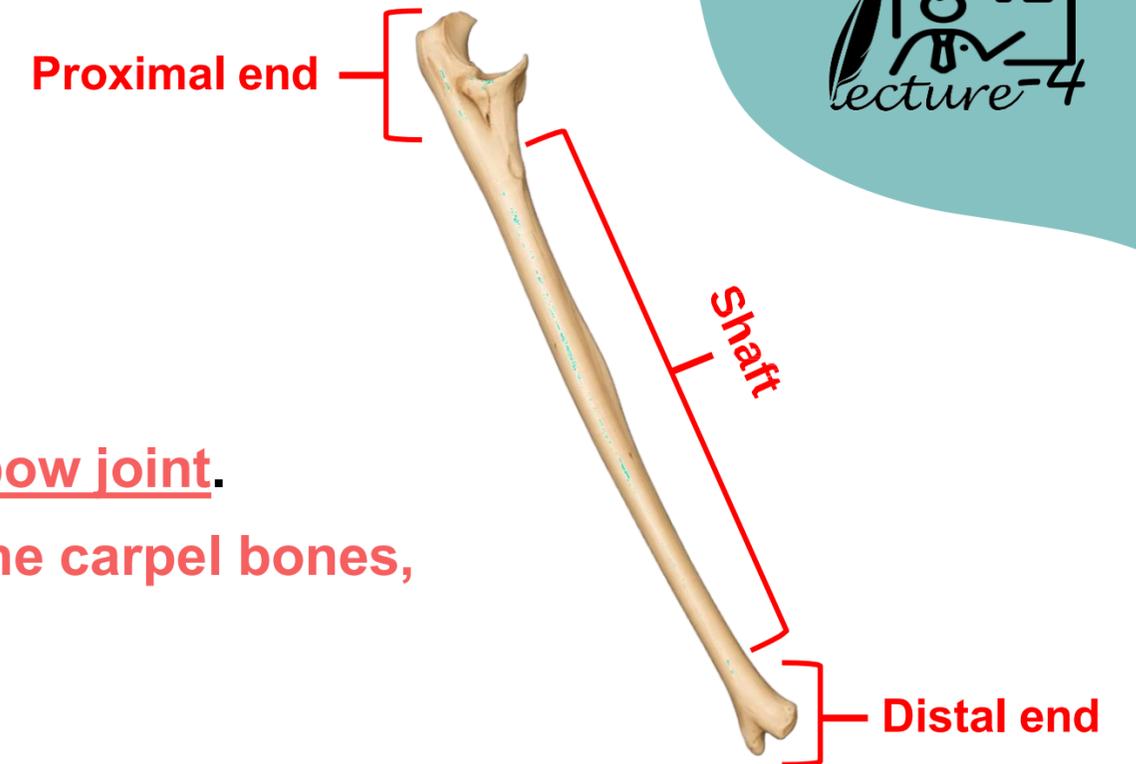
1. Radius :

- The lateral bone of the forearm.
- A long bone, with a **proximal end**, **shaft**, and **distal end**.
- The proximal end articulates with the humerus and ulna at the **elbow joint**.
- The distal end articulates with the carpal bones (~~scaphoid, lunate and triquetral bones~~) of the hand, forming the **wrist joint**.

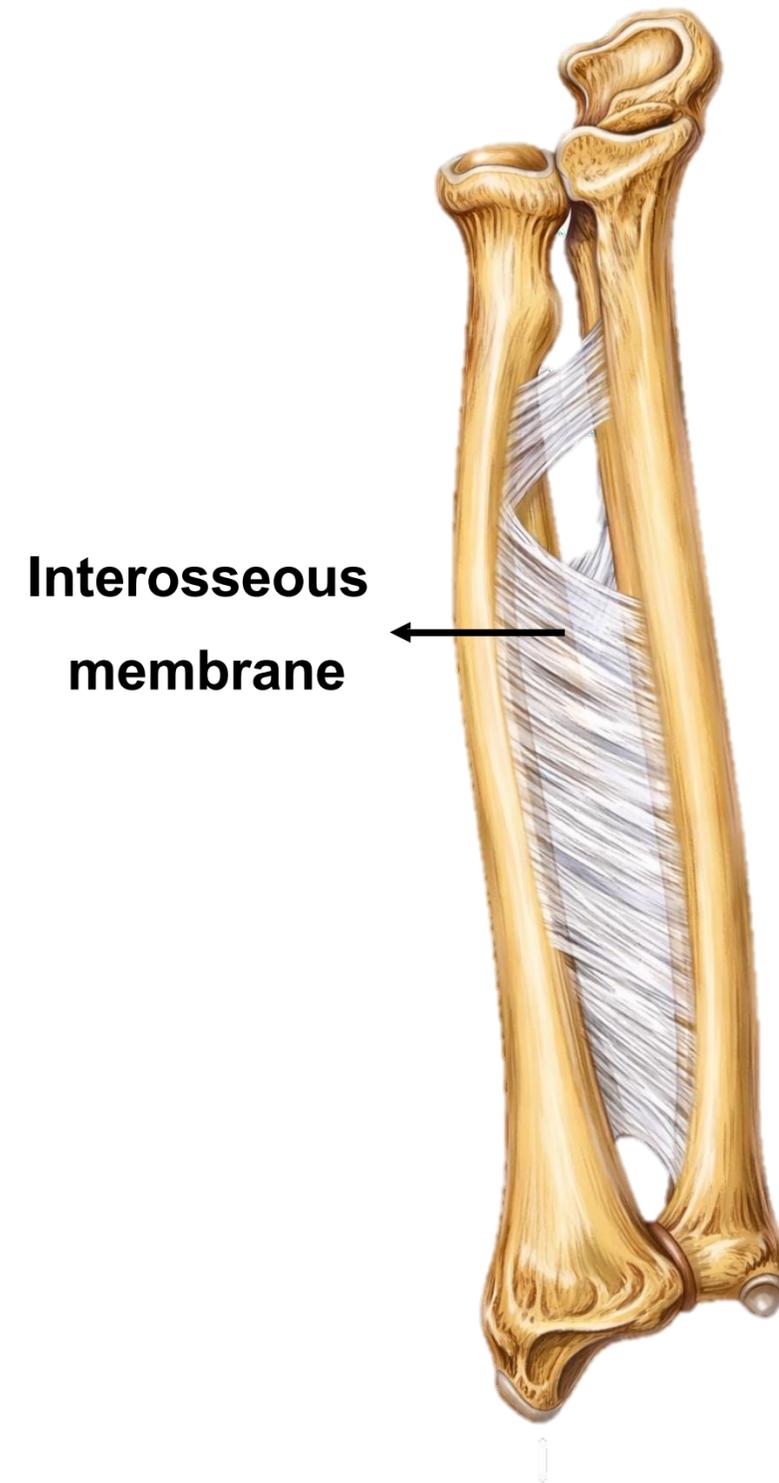


2. Ulna :

- The medial bone of the forearm.
- A long bone, with a **proximal end**, **shaft**, and **distal end**.
- The proximal end articulates with the humerus and radius at the **elbow joint**.
- The distal end articulates with the radius (**does not articulate with the carpal bones, therefore, it is not part of the wrist joint**).



- The radius and ulna are connected by an interosseous membrane



➤ Hand region consists of the following parts:

1. Wrist (carpus): 

- Consists of eight short carpal bones.

2. Palm (metacarpus): 

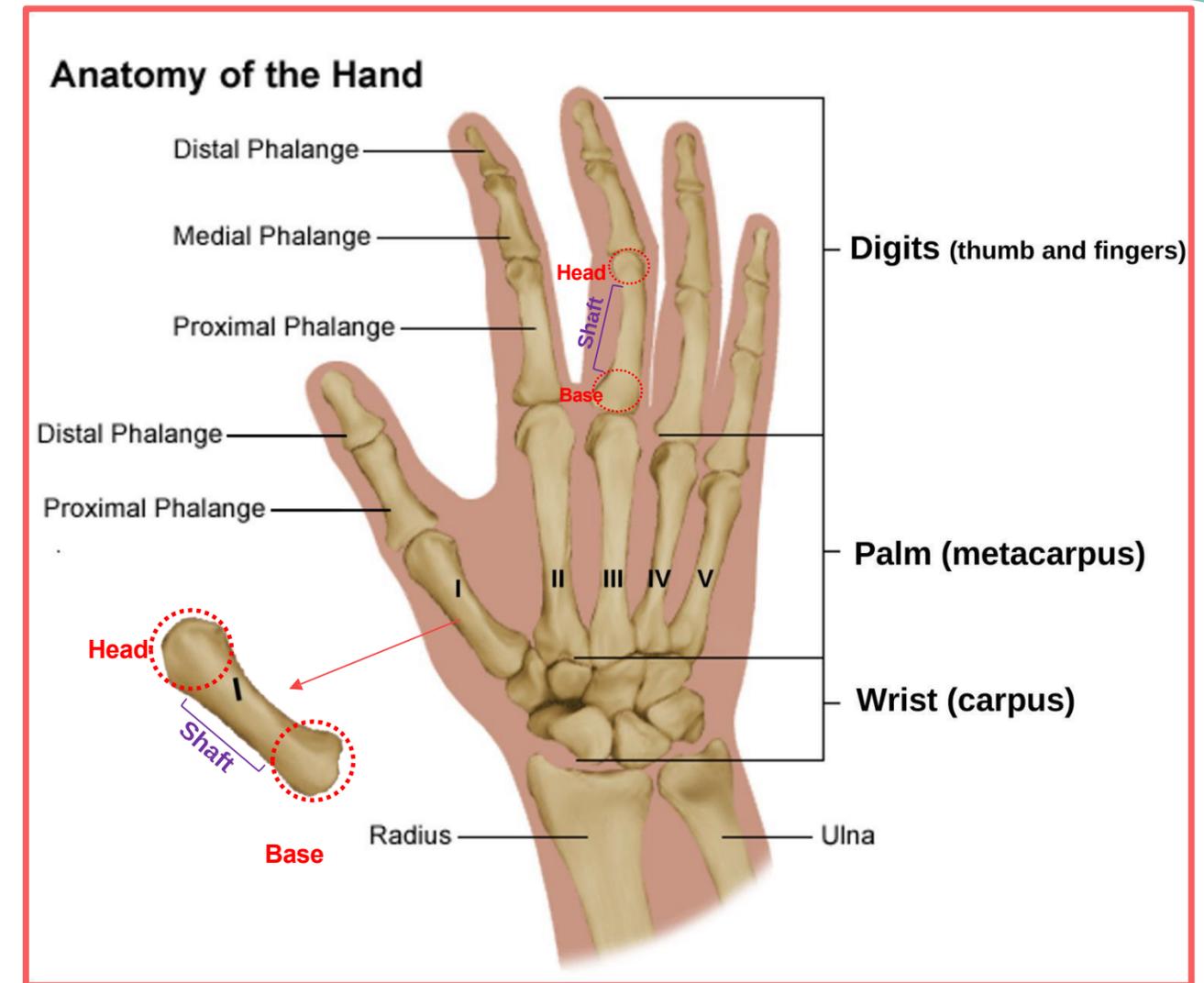
- Consists of five metacarpal bones.
- Numbered I–V from thumb to little finger.
- Each metacarpal bone is a short long bone and consists of a **head, shaft, and base**.

The head is the distal end and the base is the proximal end

3. Digits: 

- Each finger has three phalanges (**proximal, middle, and distal**), except the thumb, which has two phalanges (**proximal and distal**).
- Each phalanx bone is a short long bone consists of a **head, shaft, and base**.

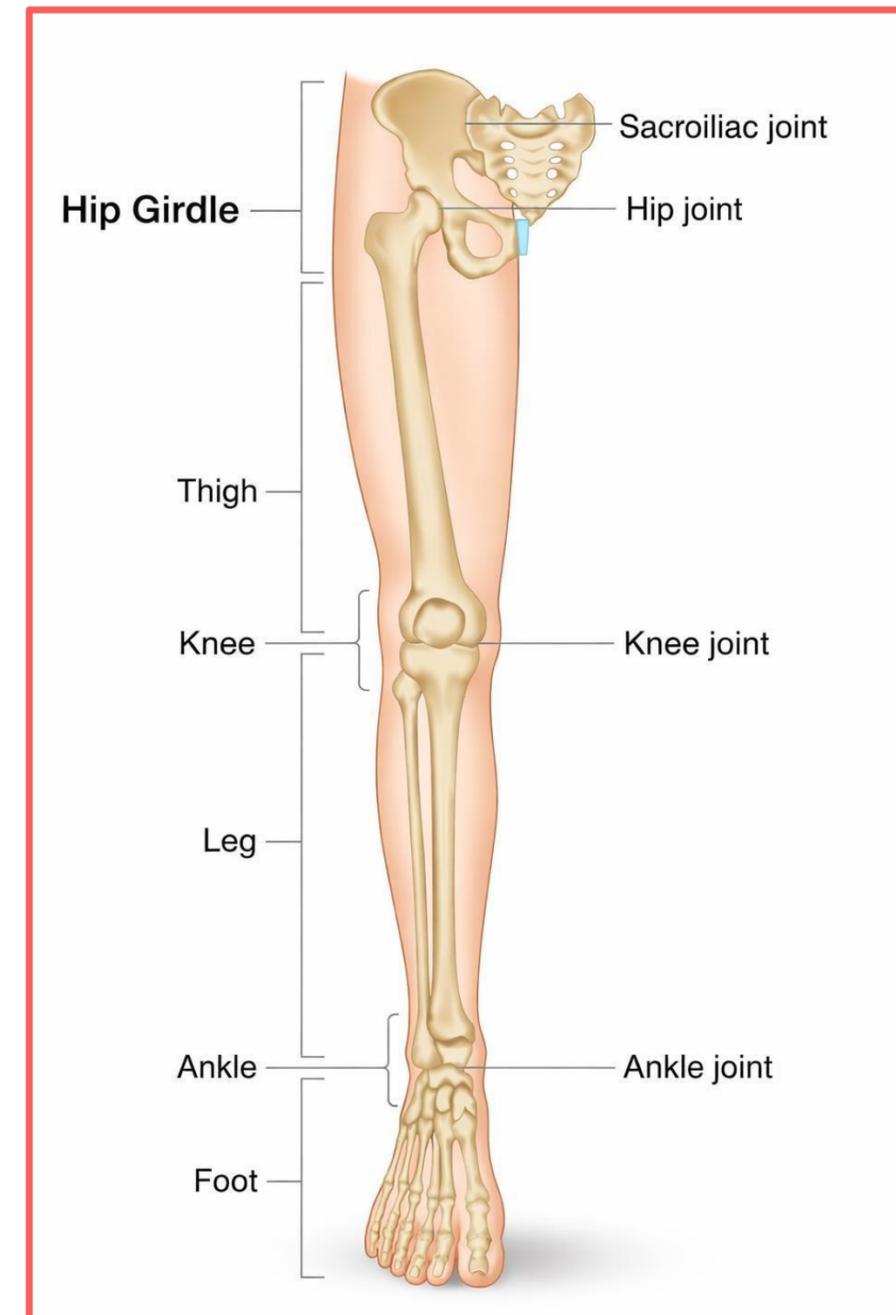
The head is the distal end and the base is the proximal end (this is only in the hand and foot , in the other parts of the body it is the opposite)



Lower Limb Bones

➤ The Lower limb consists of four regions:

1. **Hip region (Pelvic Girdle):** the area where the lower limb attaches to the trunk.
2. **Thigh:** the region between the hip joint and the knee joint.
3. **Leg:** the region between the knee joint and the ankle joint.
4. **Foot:** the region distal to the ankle joint.



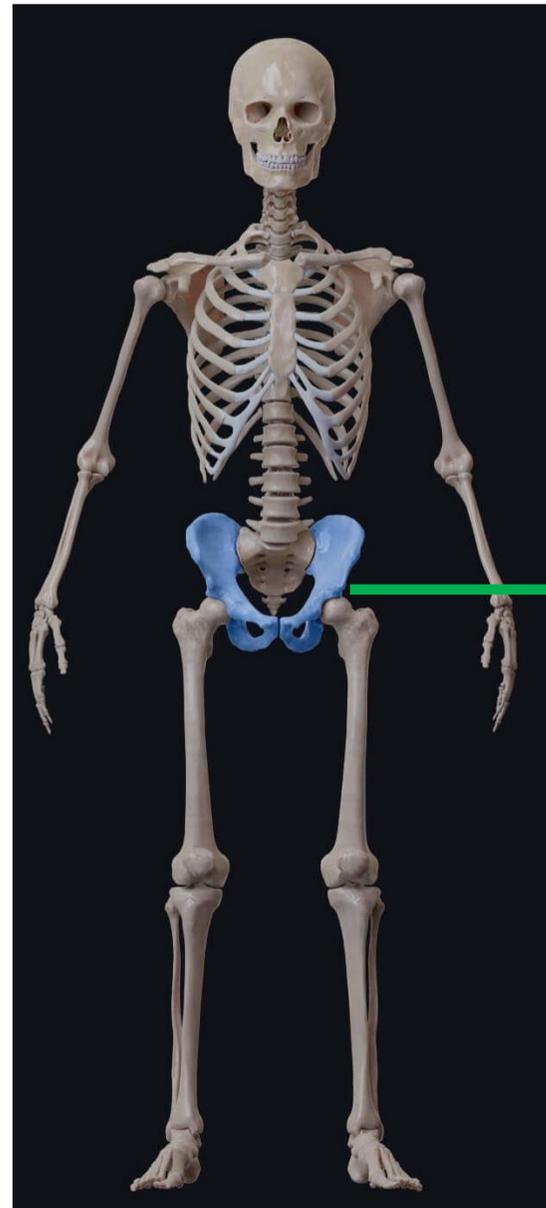
Lower Limb Bones

1. Hip region (Pelvic Girdle)

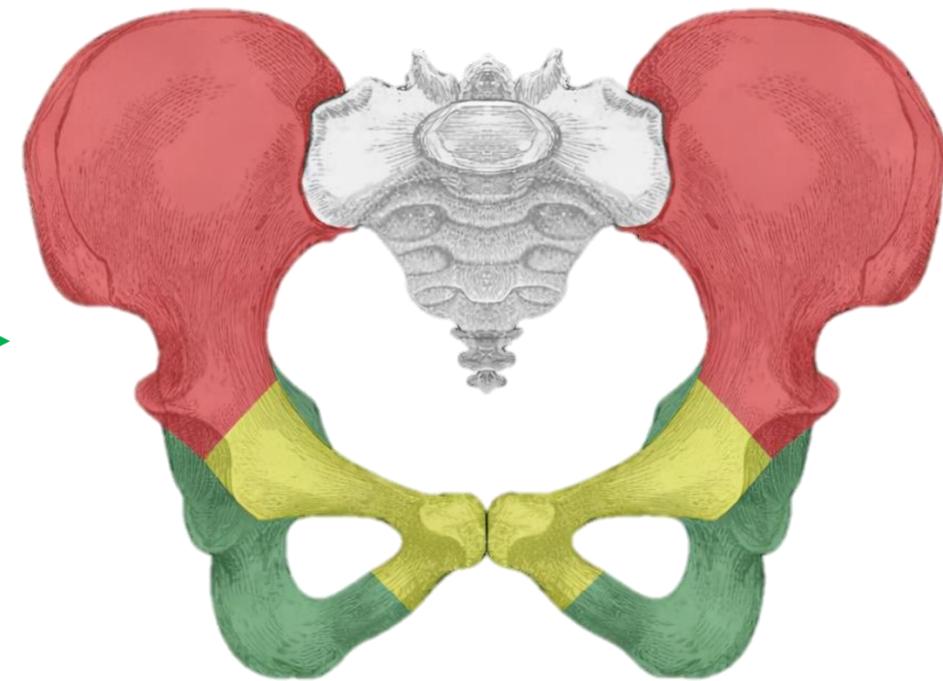
- The hip (pelvic girdles) consists of the bones that connect the lower limbs to the axial skeleton.
- It consists of two hip bones.



- ❑ During childhood, the hip bone is made of 3 bones with a cartilage between for growth and development.
- ❑ but in adulthood ossification happens, the thigh bone that used to be a cartilage is formed and 3 bones that used to make the hip bone are fused together to make 1 bone.



still even after ossification happens , in this course the hip bone will be divided in terms of naming into 3 parts
 انو رح نضل نقسمهم حسب ما كيف كاتو مقسمين قبل بمعنى





➤ Hip bone (flat bone)

- Formed by the fusion of three primary bones:

1. Ilium: (proximal part)

- Forms the superior part of the hip bone.
- The upper palpable part of the ilium is the iliac crest.

2. Ischium: (distal part)

- Forms the inferior, posterior part of the hip bone.
- The ischial tuberosity is the part of ischium on which we sit.

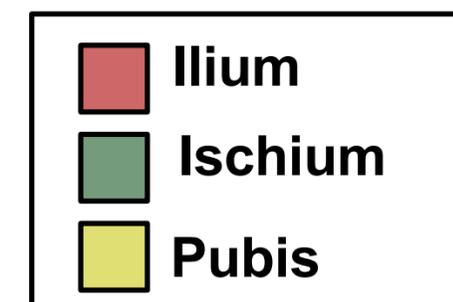
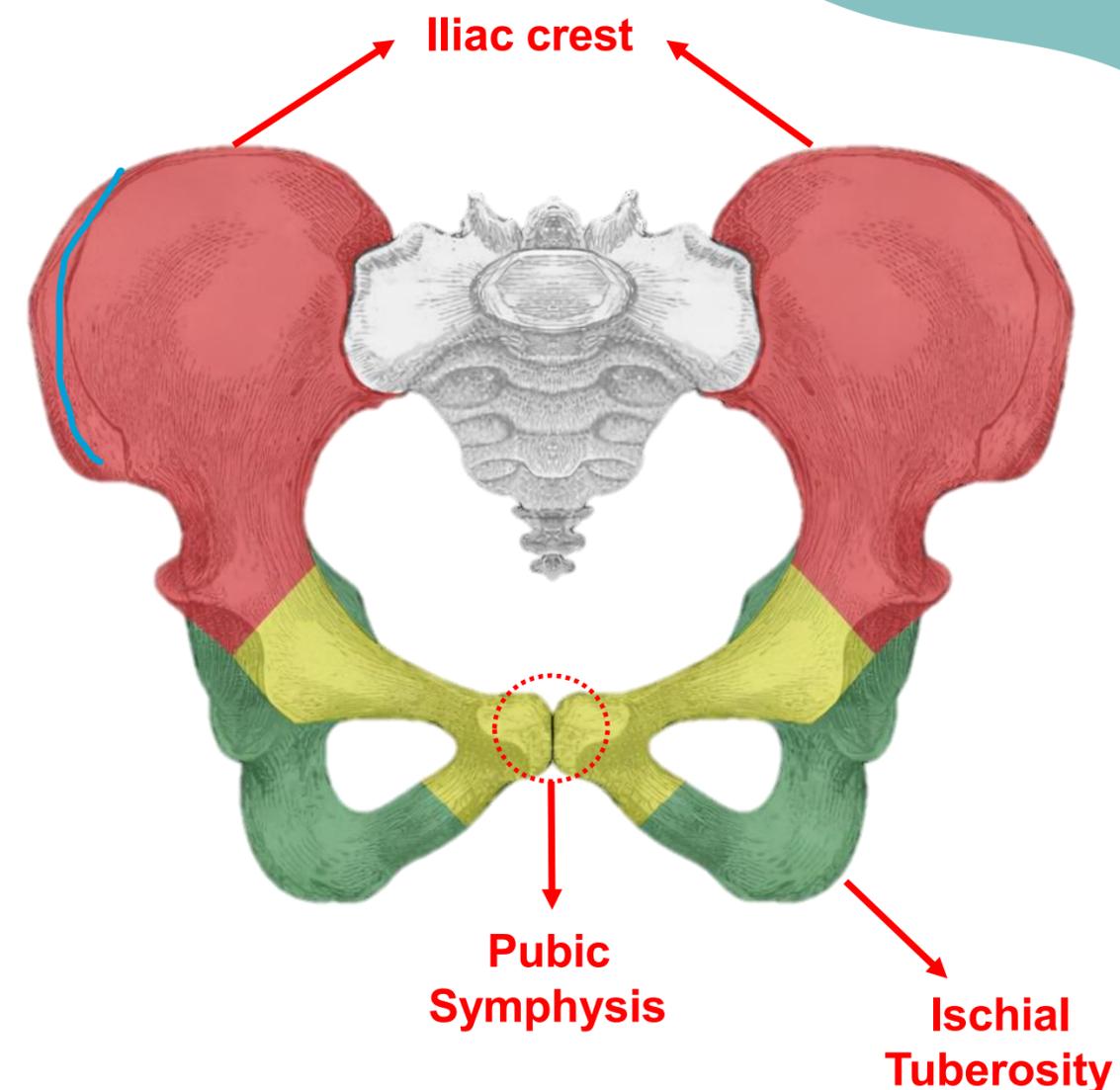
Rough area

- ❖ In the upper border of the ilium, the iliac crest is located, and it has a rough ridge. This is the area you can easily feel if you place your hand on your pelvis (حوض)
- ❖ The bony prominence you touch is the iliac crest.

3. Pubis:

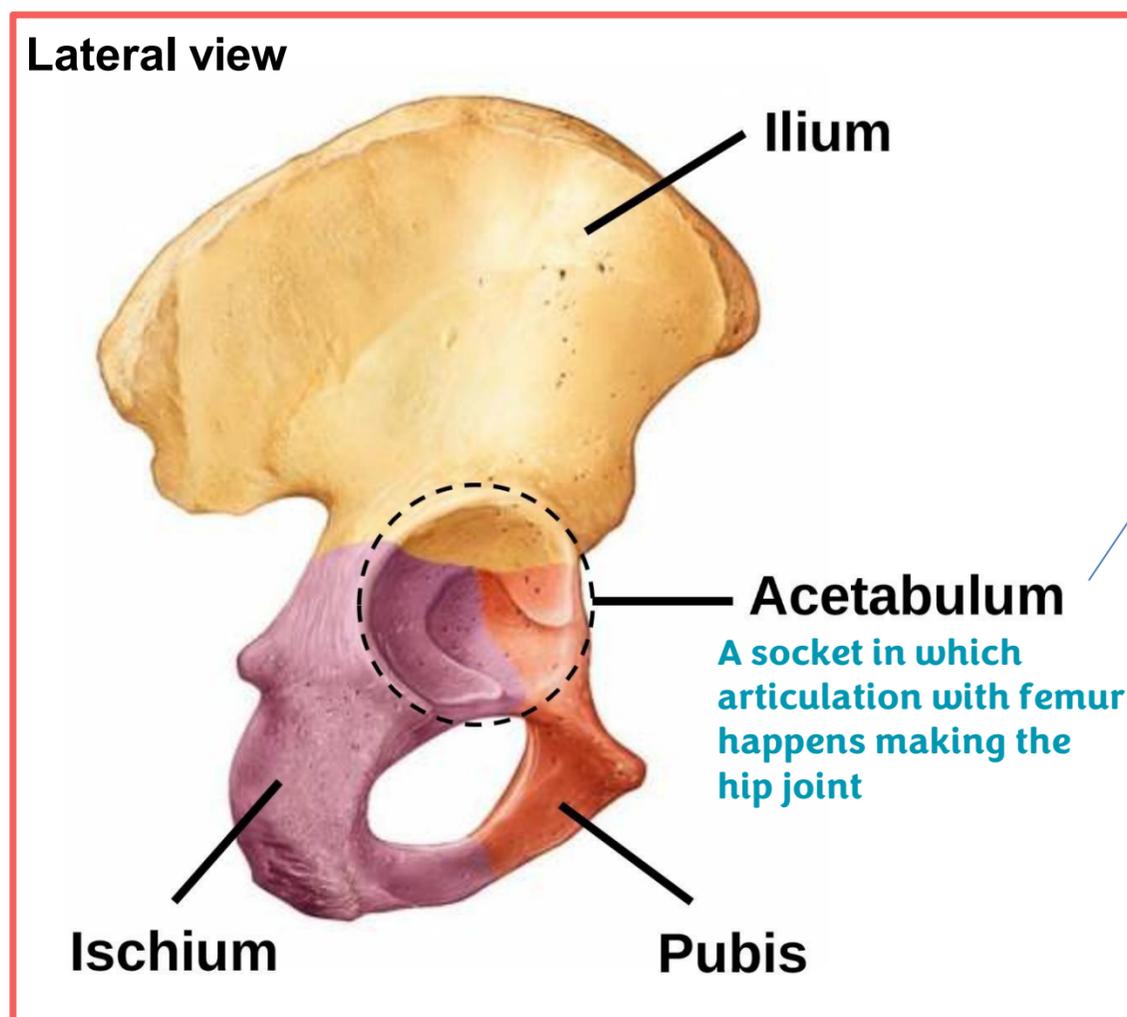
- Forms the anterior and inferior part of the hip bone.
- The two pubic bones articulates anteriorly at joint called the pubic symphysis.

Smooth area



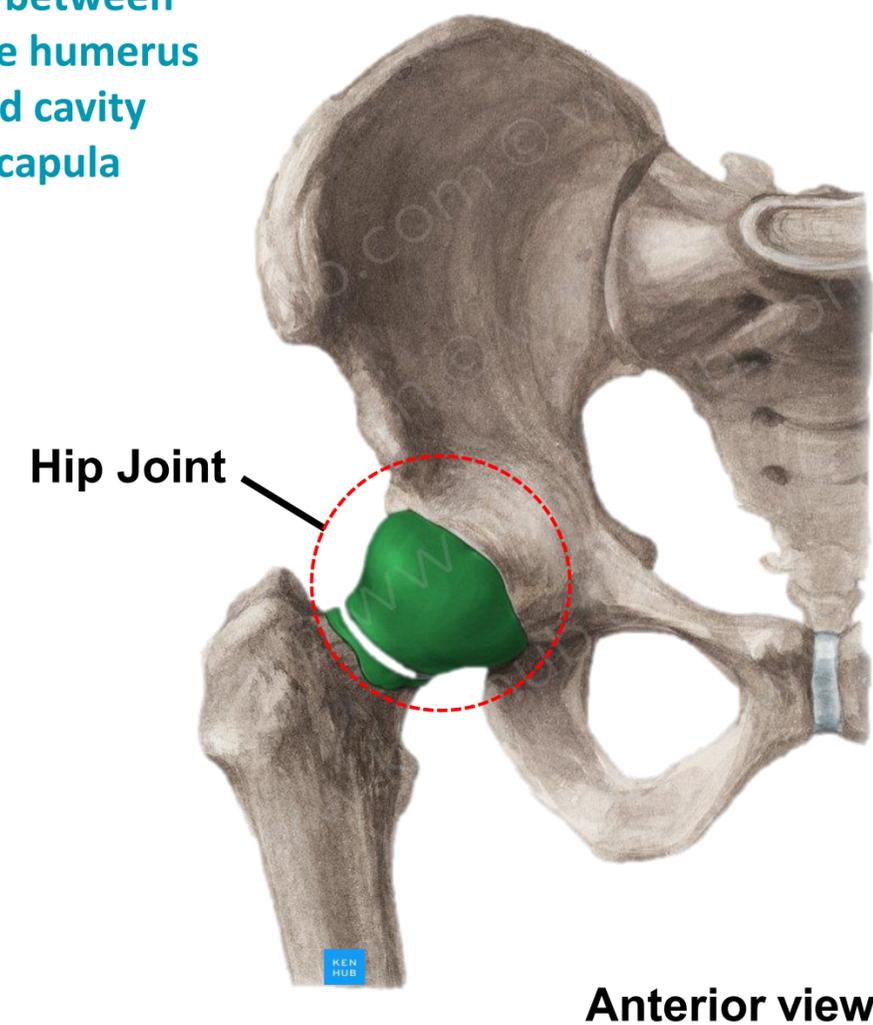
➤ Hip bone 

- The three bones meet at the Acetabulum: a socket where the head of the femur articulates to form the hip joint.

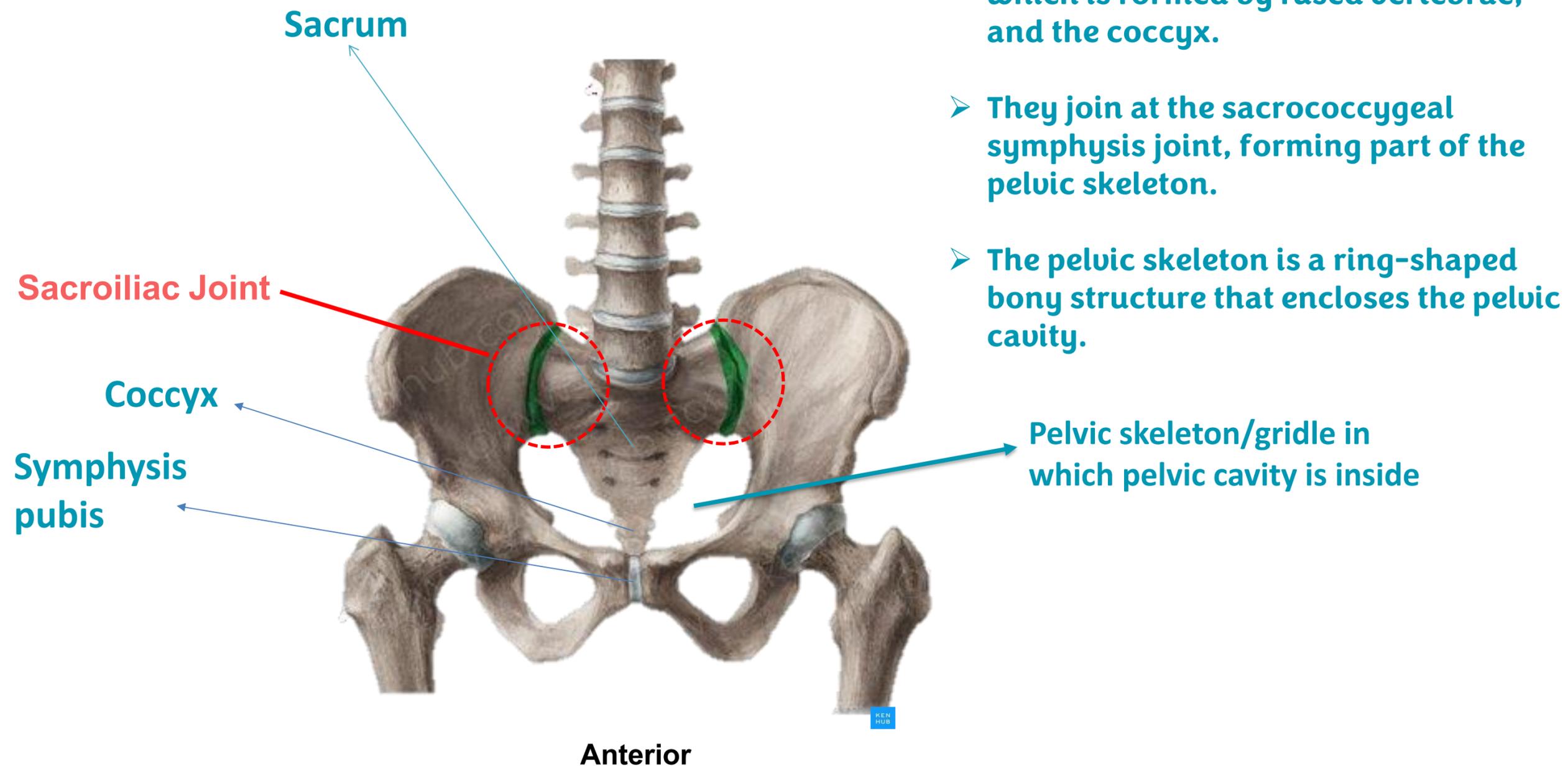


نفس مبدأ

Shoulder joint between the head of the humerus and the glenoid cavity /fossa of the scapula



- Hip bone
- Hip bones articulate posteriorly with the sacrum forming Sacroiliac Joint.

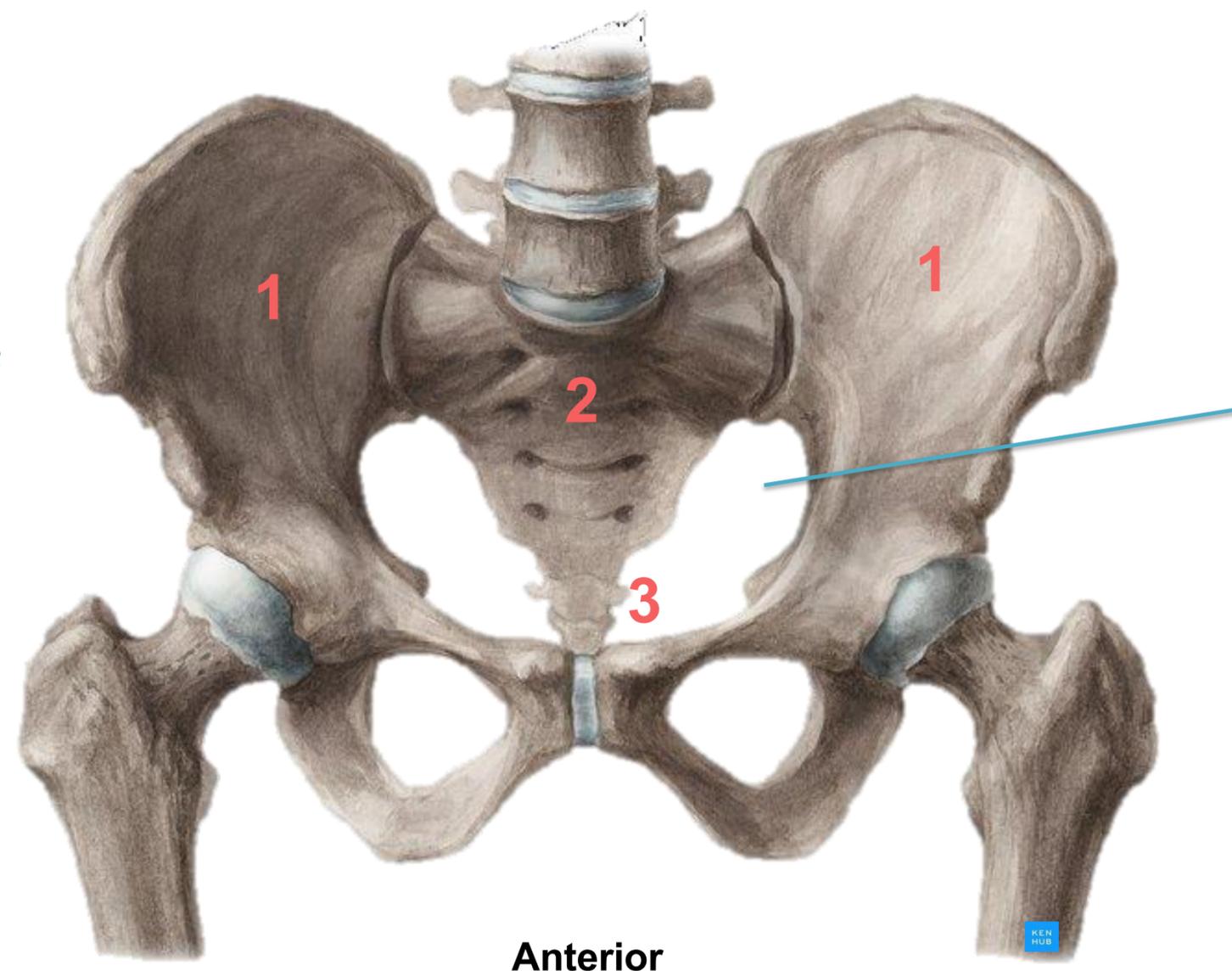


- Posteriorly, we have the sacrum, which is formed by fused vertebrae, and the coccyx.
- They join at the sacrococcygeal symphysis joint, forming part of the pelvic skeleton.
- The pelvic skeleton is a ring-shaped bony structure that encloses the pelvic cavity.

Pelvic skeleton

- The two hip bones¹, sacrum², and the coccyx³ together form the pelvis.

- ❖ During your first practical session, make sure to observe the anatomical position of the pelvis 😊😊
- ❖ Notice the orientation carefully – the pelvis is facing directly forward, right at you, never upward.

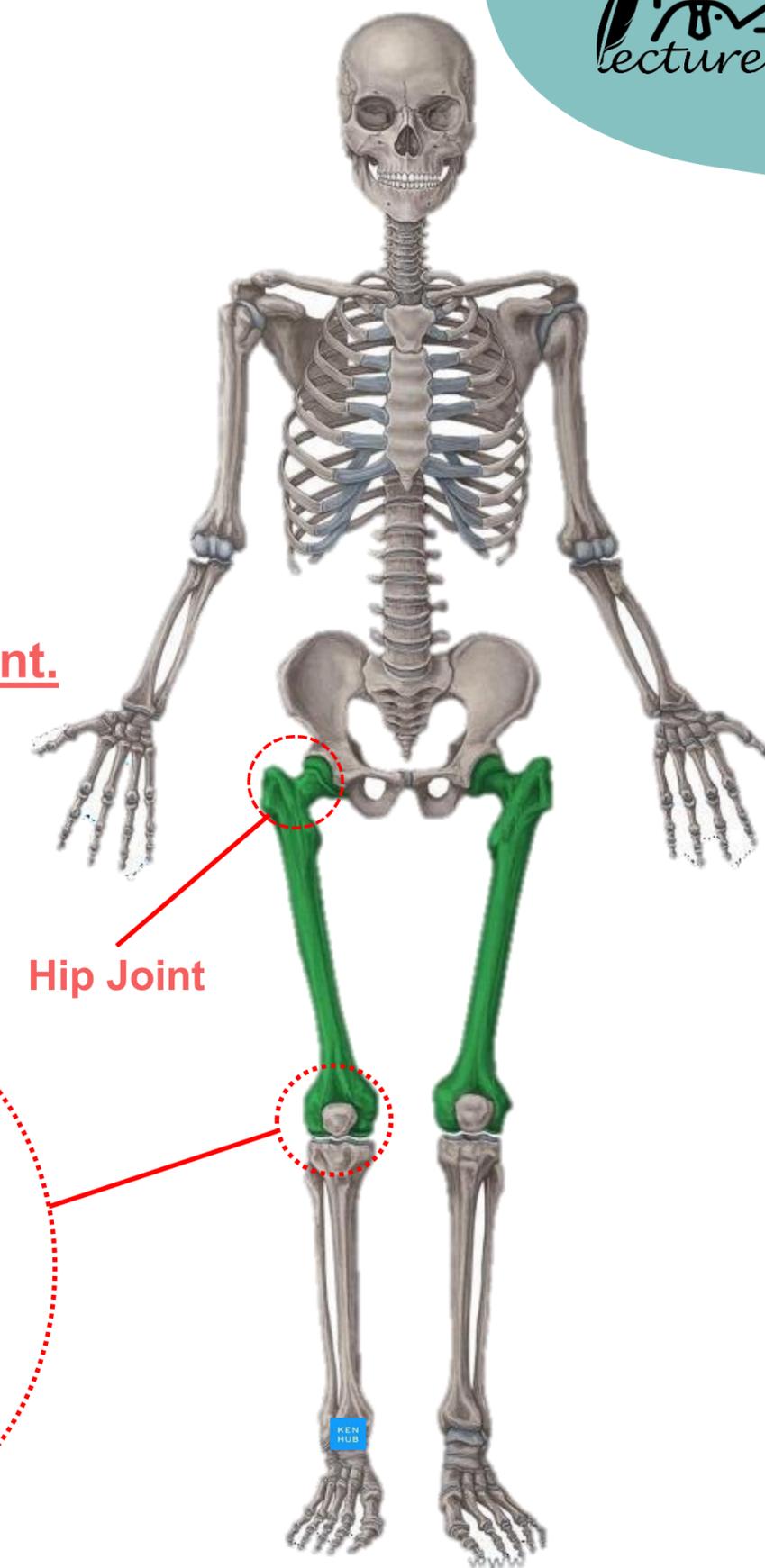
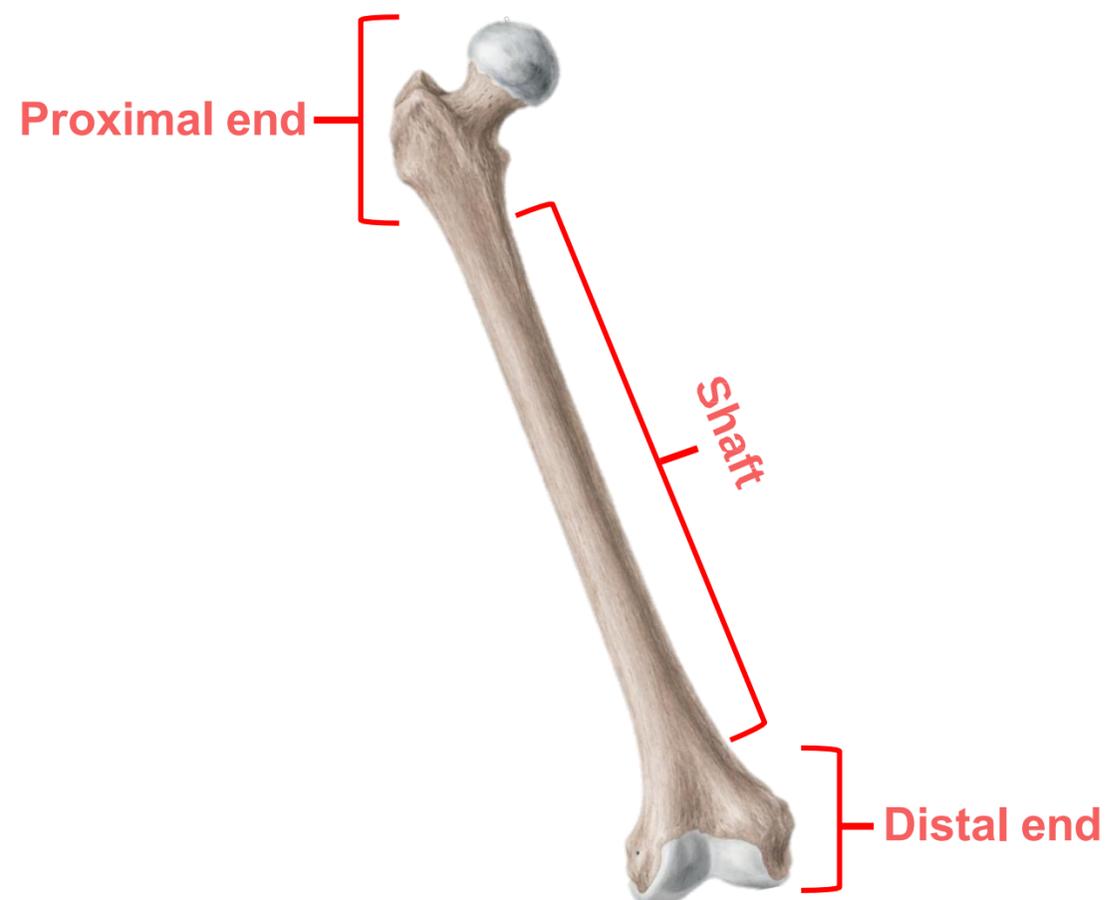


The empty space is the pelvic cavity

➤ Thigh region contains one bone:

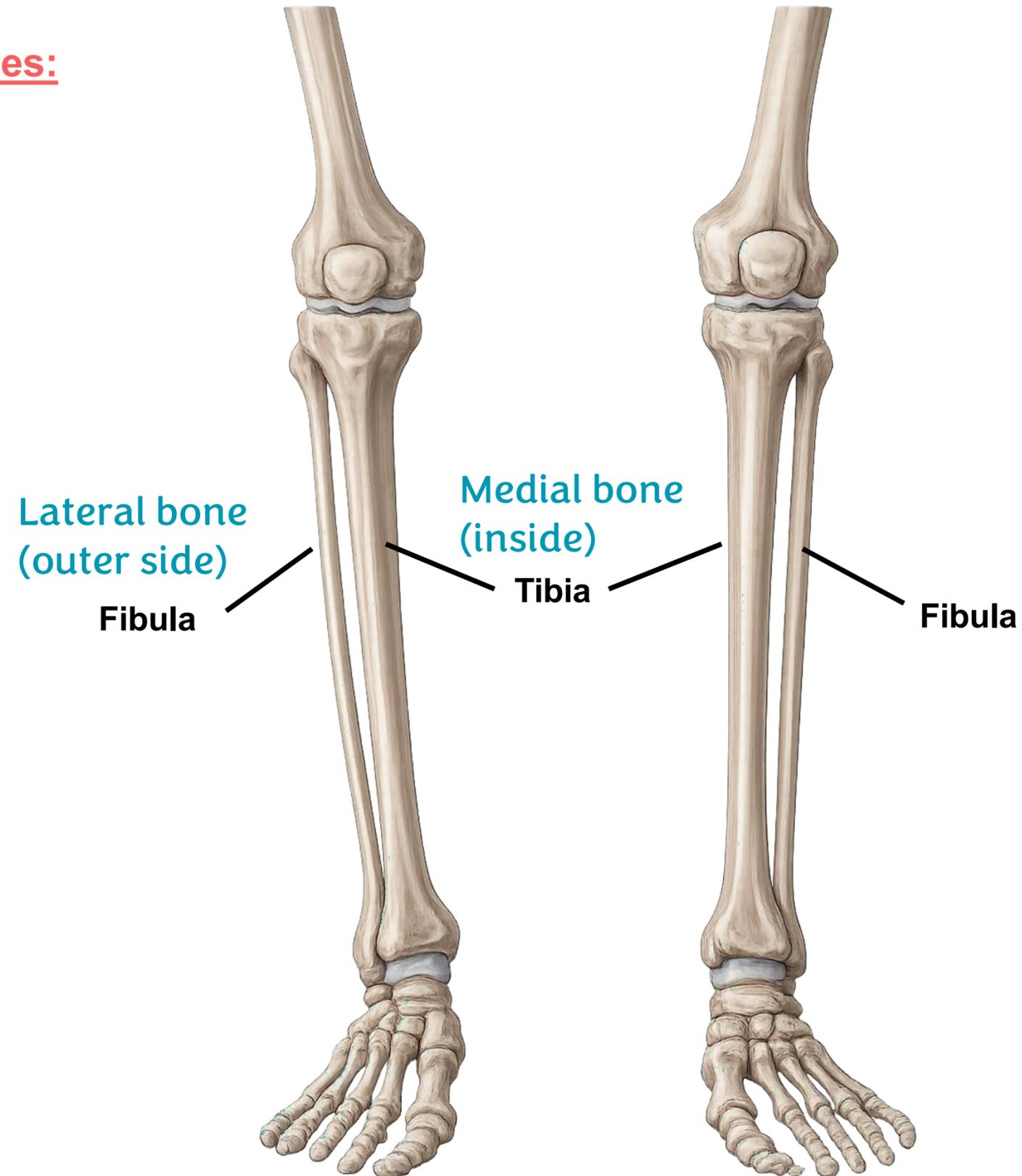
Femur : 

- The longest (45cm), heaviest, and strongest bone in the body, with a **proximal end**, **shaft**, and **distal end**.
- The proximal end articulates with the acetabulum of the hip bone, forming the **hip joint**.
- The distal end articulates with the tibia and patella, forming the **knee joint**.



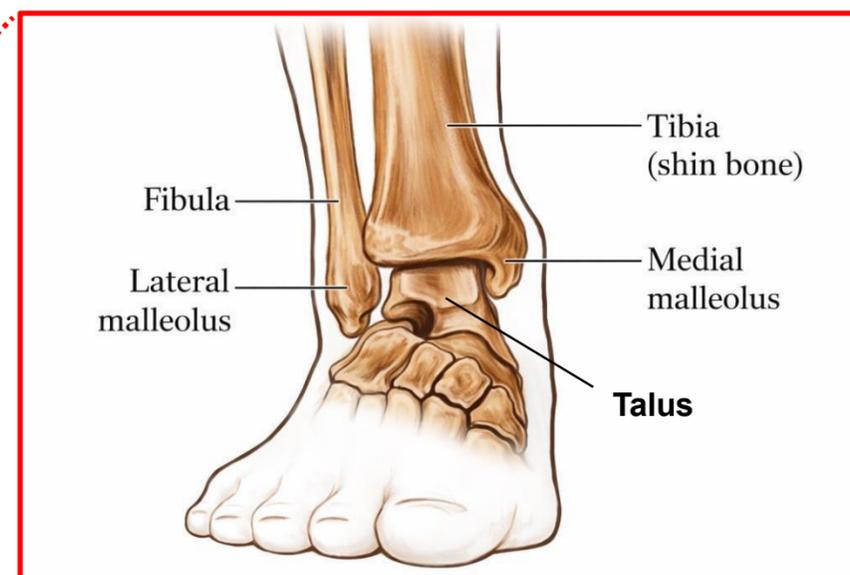
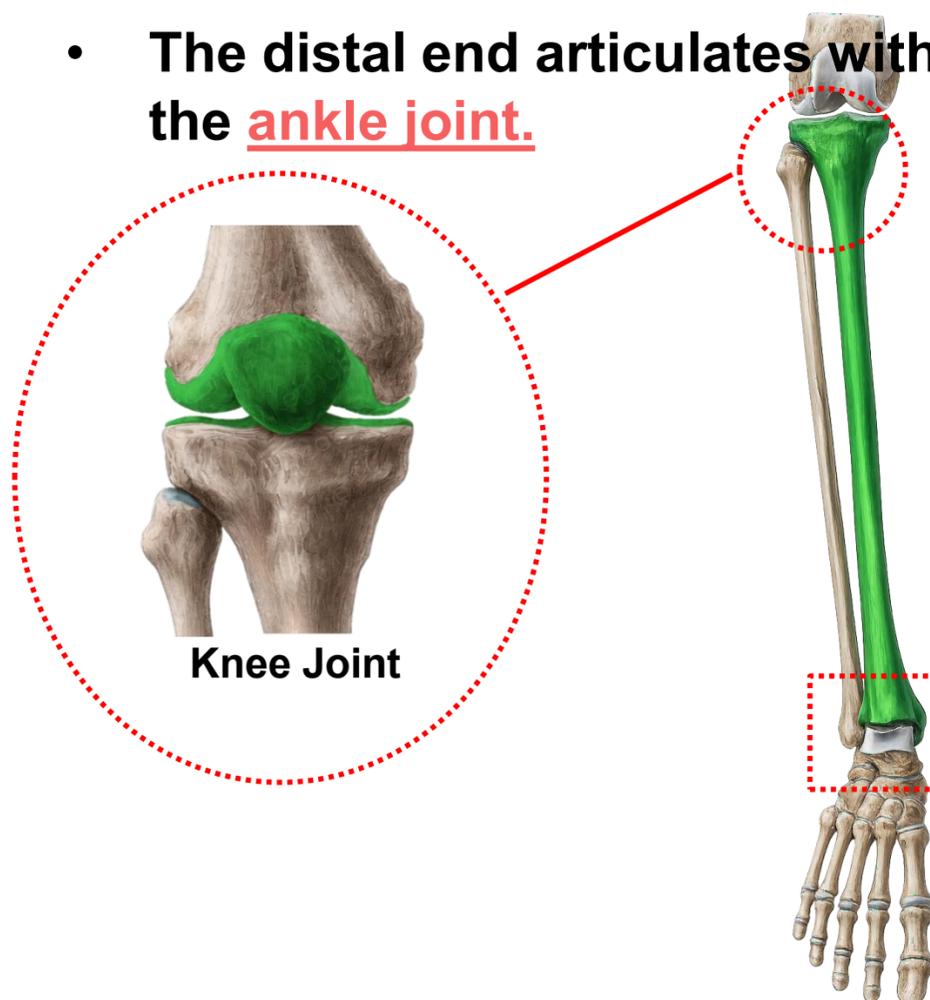
➤ Leg region contains two bones:

1. **Tibia (medial)**
2. **Fibula (lateral)**

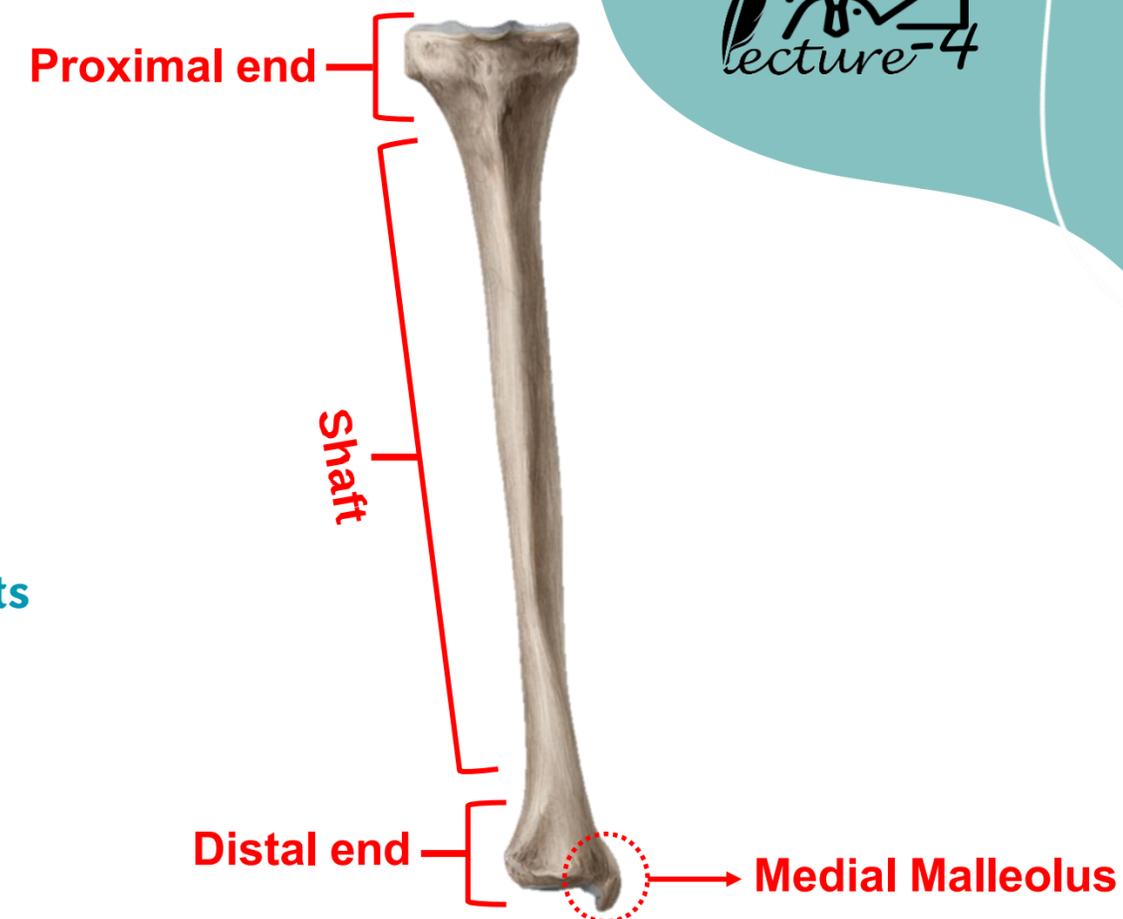


1. Tibia :

- The medial bone of the leg.
- A long bone with a **proximal end**, **shaft**, and **distal end**.
- The distal end has a medial projection known as **Medial Malleolus** (الصابونة)
- The proximal end articulates with the femur (and a small bone called patella, its discussed later on) forming the **knee joint**.
- The distal end articulates with talus (a small bone in foot) and fibula, forming the **ankle joint**.

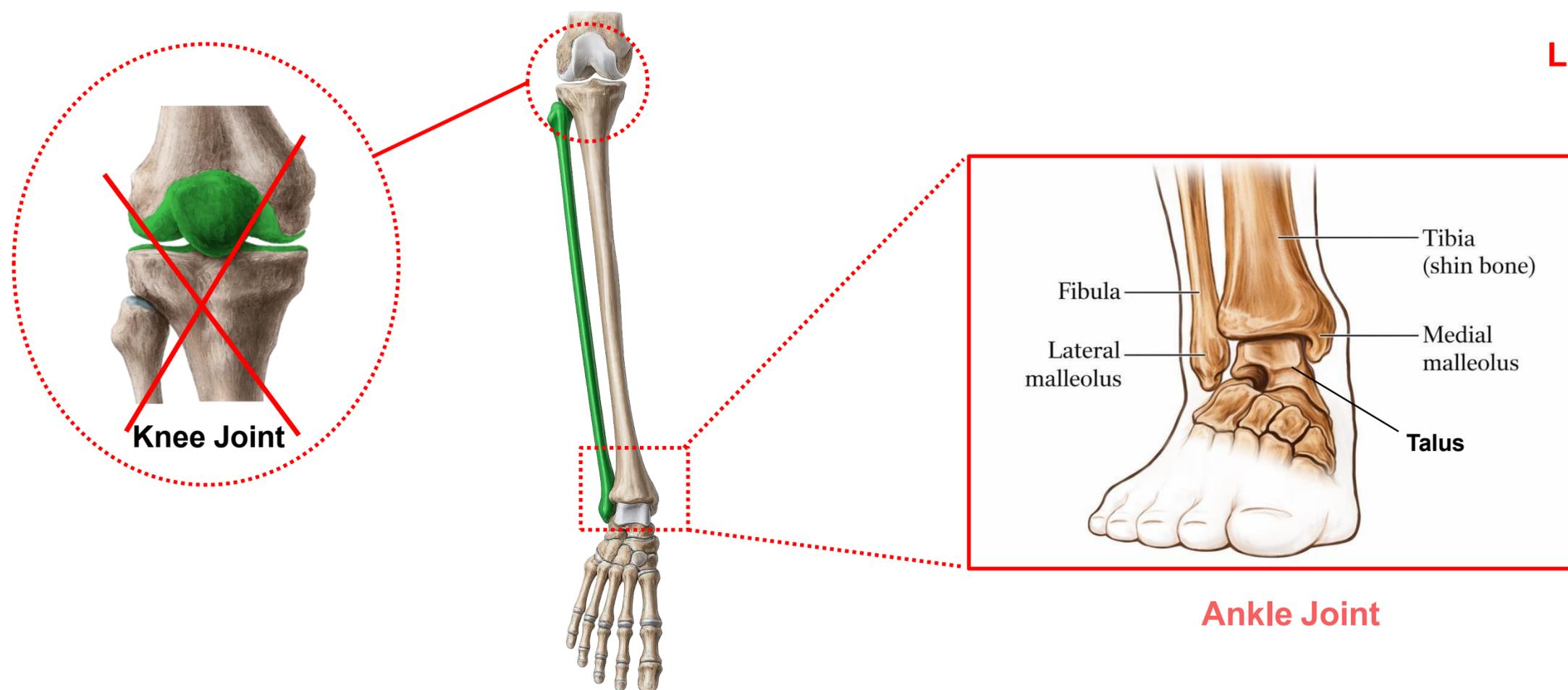
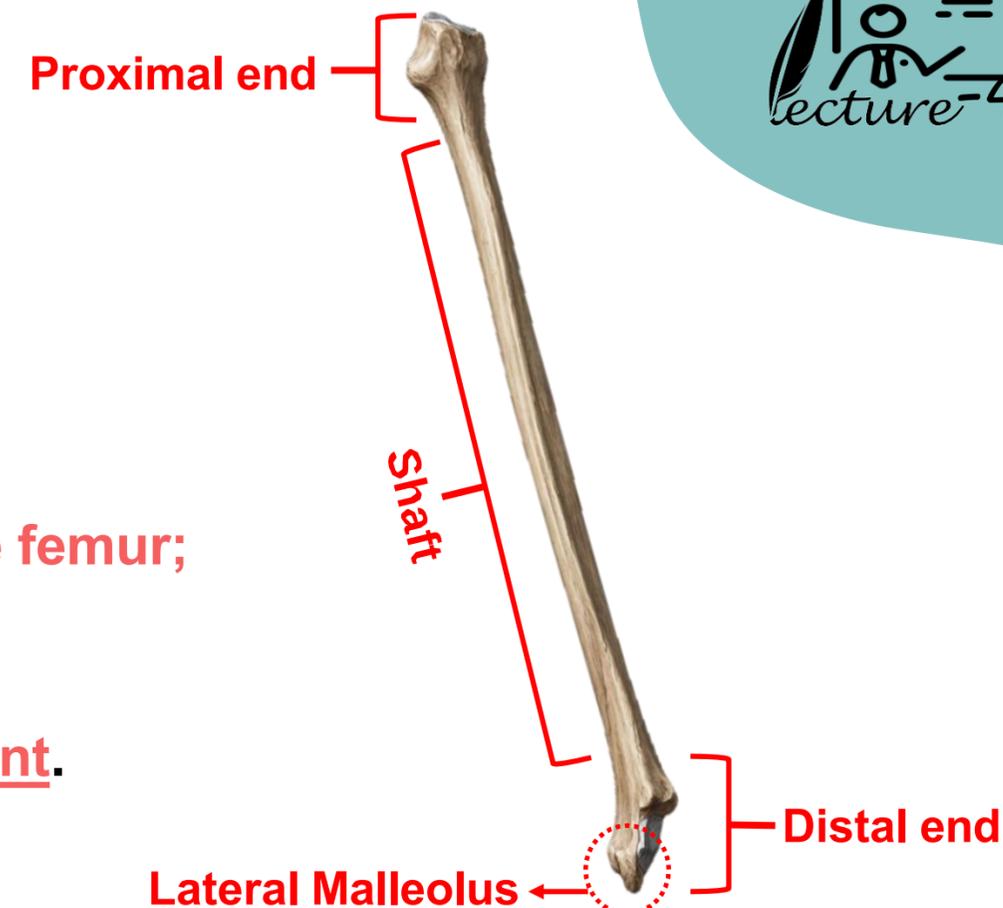


Ankle Joint



2. Fibula :

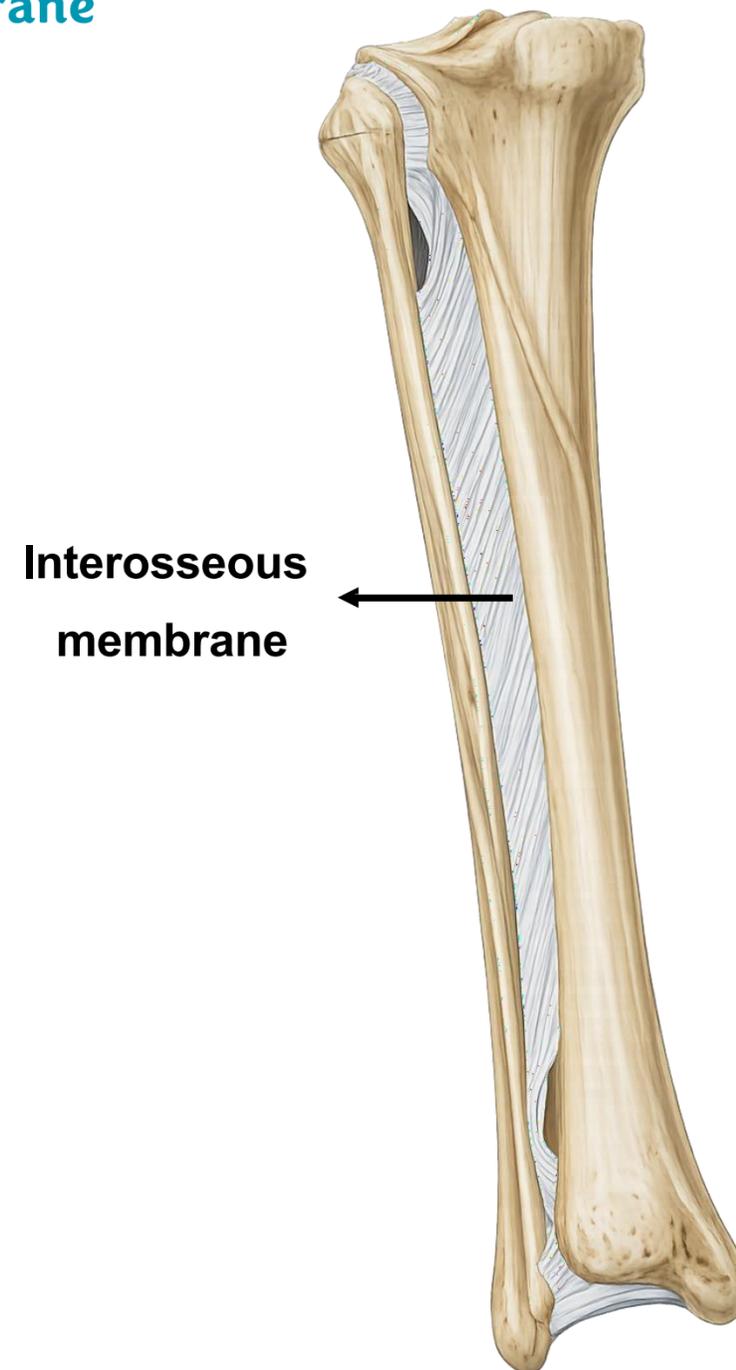
- The lateral bone of the leg
- A long bone with a **proximal end**, **shaft**, and **distal end**.
- The distal end has a lateral projection known as the **Lateral Malleolus**
- The proximal end articulates with the tibia (**does not articulate with the femur; therefore, it is not part of the knee joint**)
- The distal end articulates with the talus and tibia, forming the **ankle joint**.



➤ The tibia and fibula are connected by an **interosseous membrane**

- Same idea as the interosseous membrane between the ulna and radius.

❖ Tibia and fibula have proximal articulation and distal articulation, and between them a membrane called interosseous membrane, hence ulna and radius.

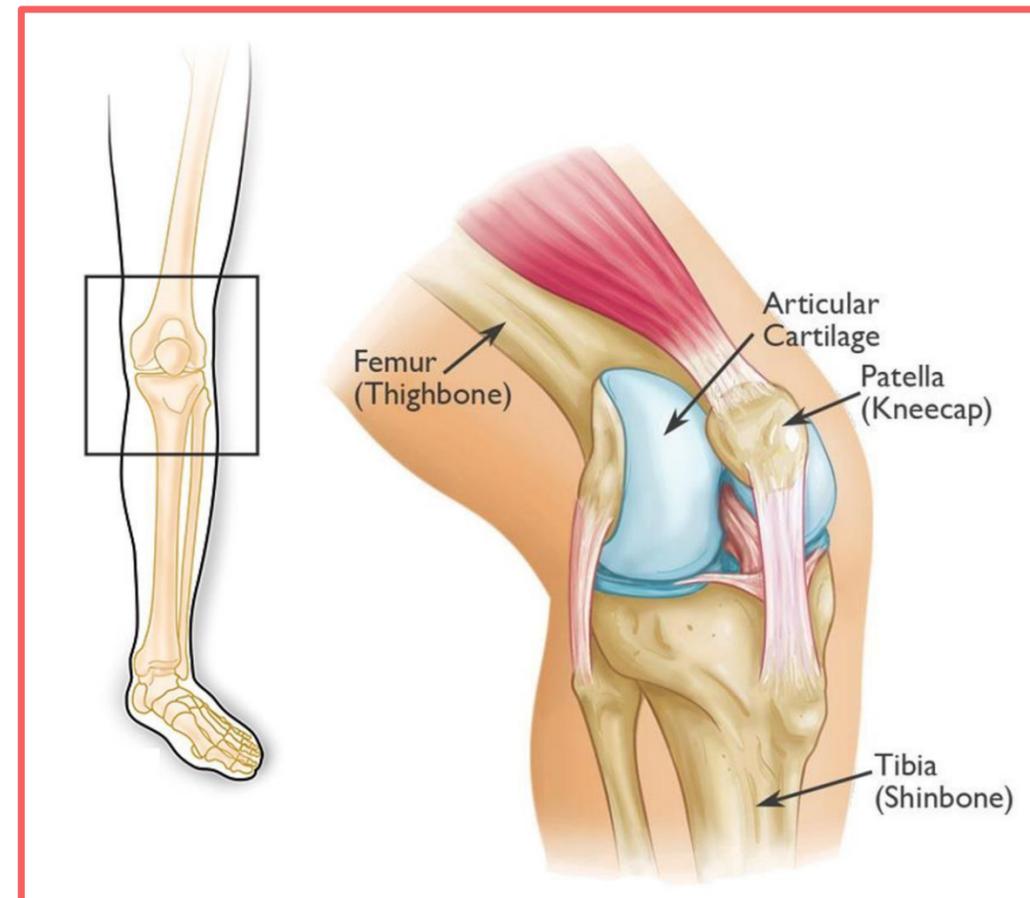


Lower Limb Bones

Patella (kneecap)

- A small, sesamoid, triangular bone located anterior to the knee joint.
- Embedded in the quadriceps (رباعية الرؤوس) tendon and articulates with the femur.
- Covers and protects the anterior aspect of the knee joint.

□ **Sesamoid:** is a term used when a bone or a small bone is embedded within a tendon or muscle, functioning as a pulley to reduce friction, protect tendons /muscles and improve mechanical leverage.



Lower Limb Bones

4. Foot

➤ Foot region contains 3 groups of bones:

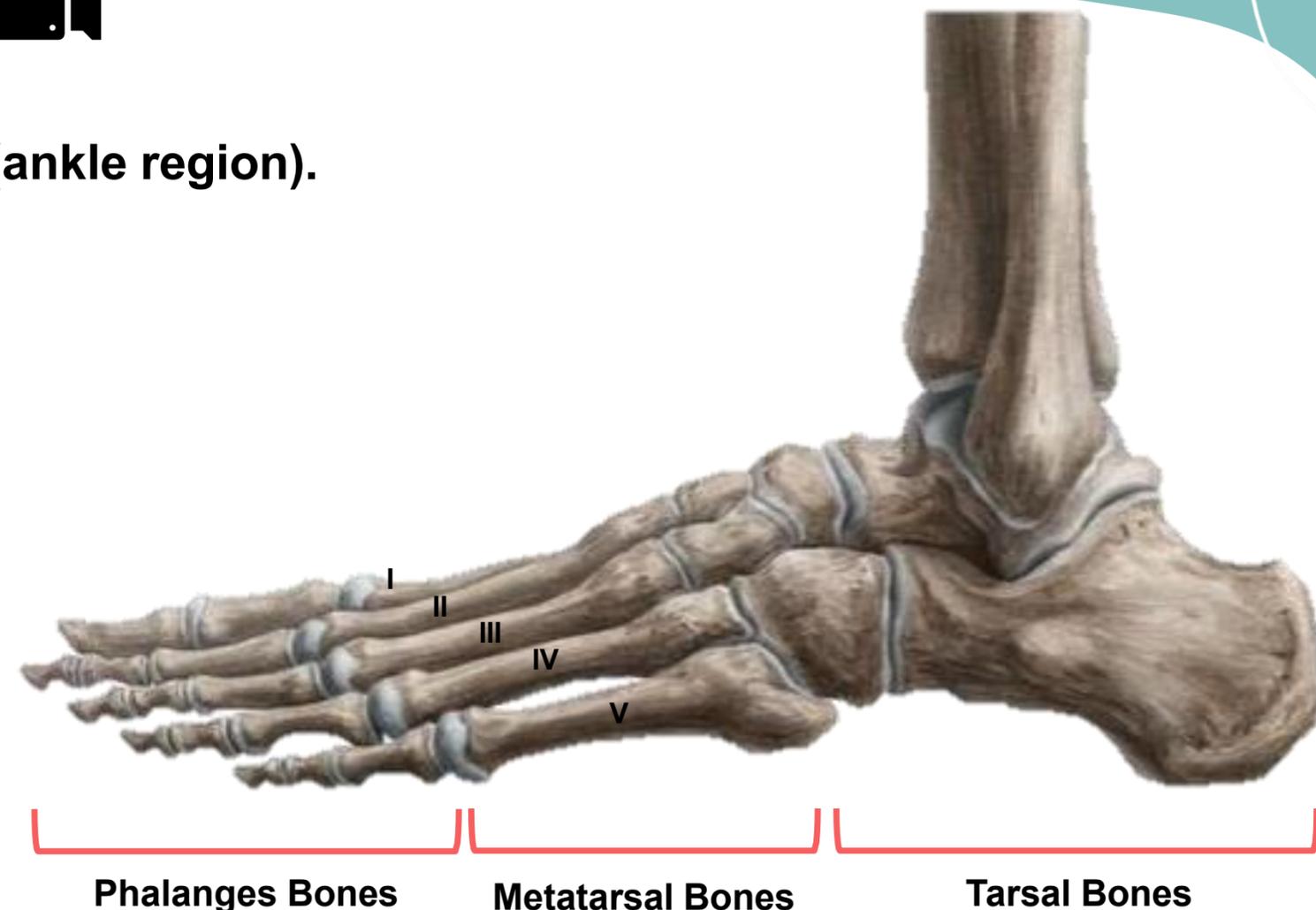
1. Tarsal Bones (like carpal bones in hands):

- Seven short bones forming the posterior part of the foot (ankle region).



2. Metatarsal Bones (like metacarpal bones in hands):

- Five long bones forming the instep
- Numbered 1 to 5 from big toe to little toe.
- Each Metatarsal bone is a short long bone and consists of a **head**, **shaft**, and **base**.



3. Phalanges:

- Bones of the toes; each toe has three phalanges (**proximal**, **middle**, **distal**), except the big toe, which has two phalanges (**proximal** and **distal**).
- Each phalanx consists of a **head**, **shaft**, and **base**.

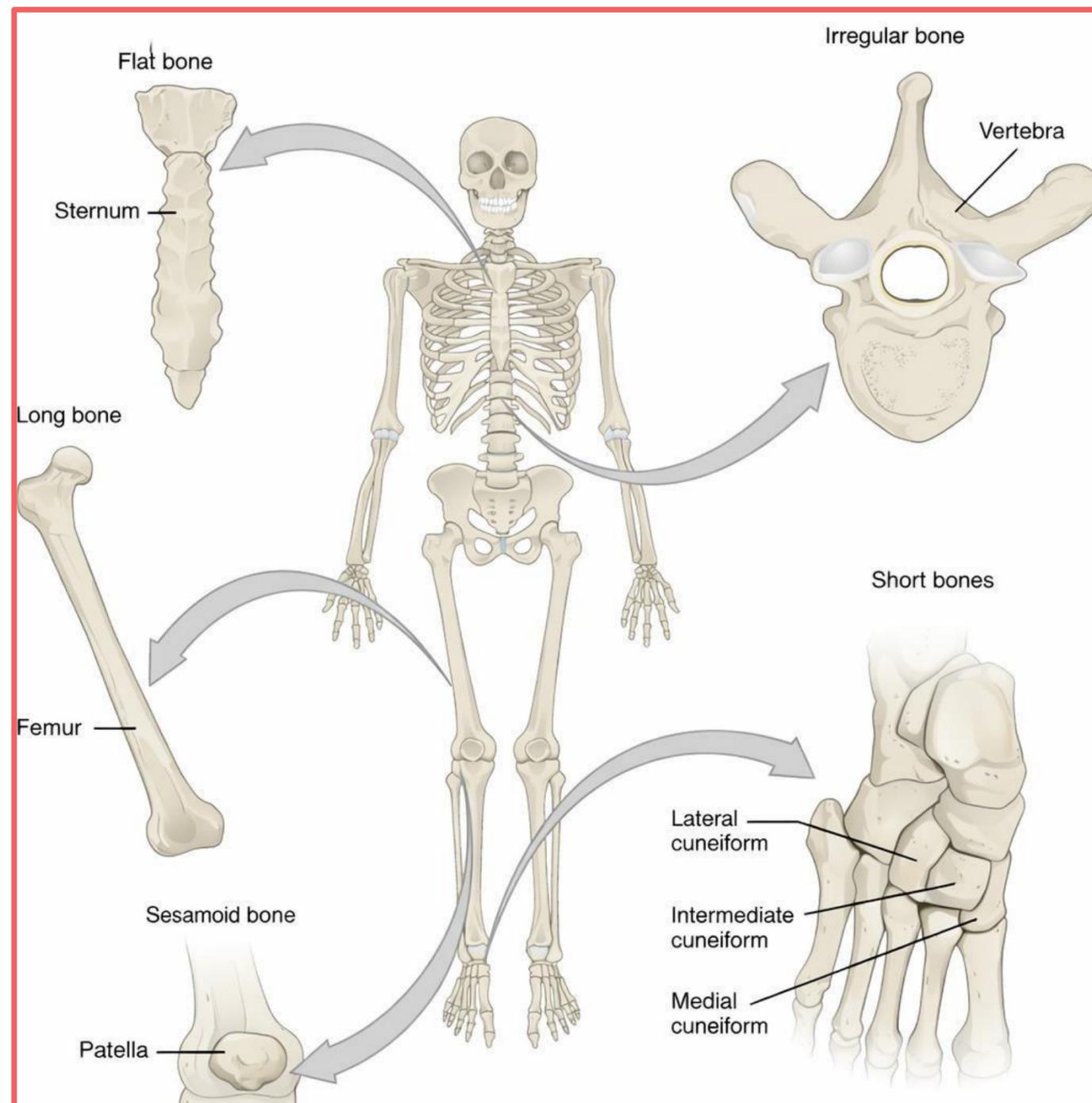


2

Skeletal System

➤ Bones are classified according to their shape into:

1. **Long bones** Length of the bone > Width of the bone
2. **Short bones**
3. **Flat bones**
4. **Irregular bones**
5. **Sesamoid bones**



2

Skeletal System

1. Long Bones

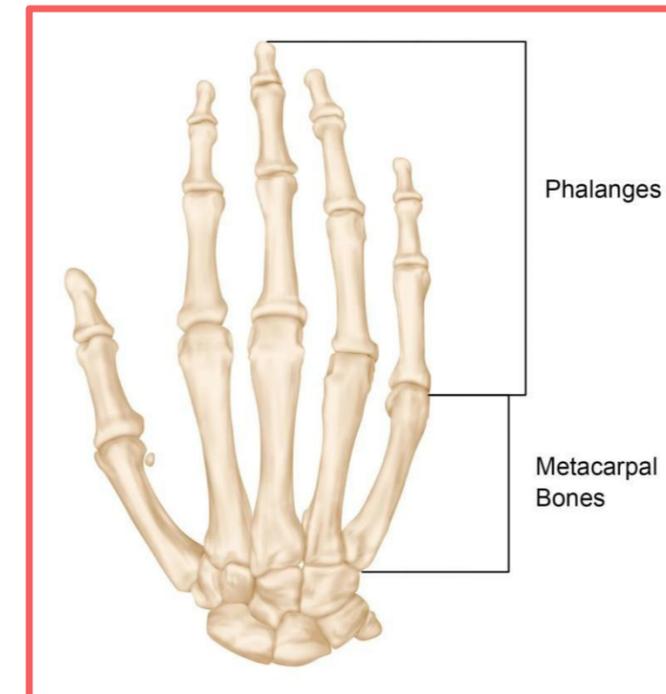
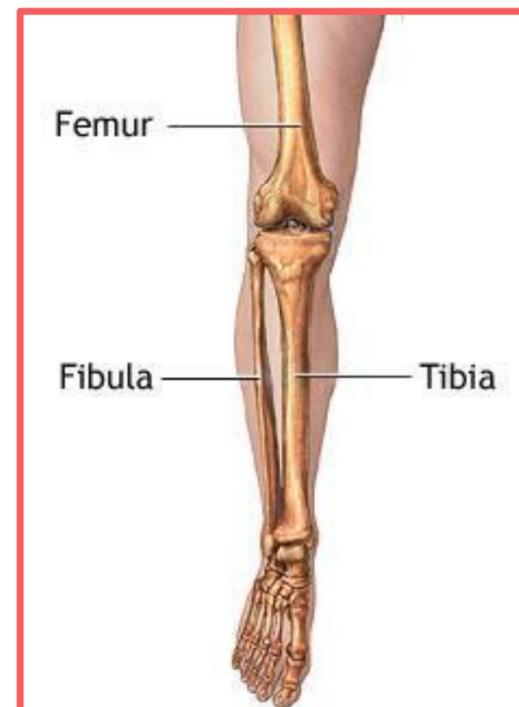
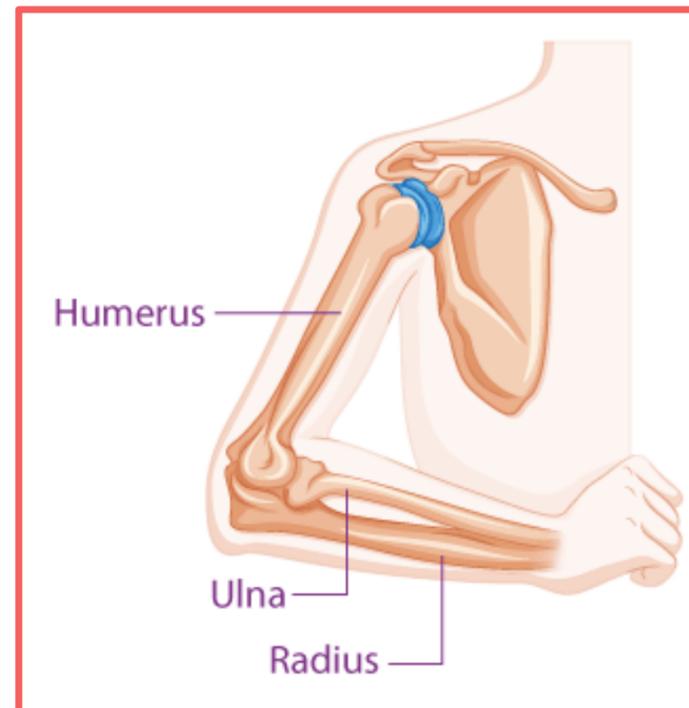
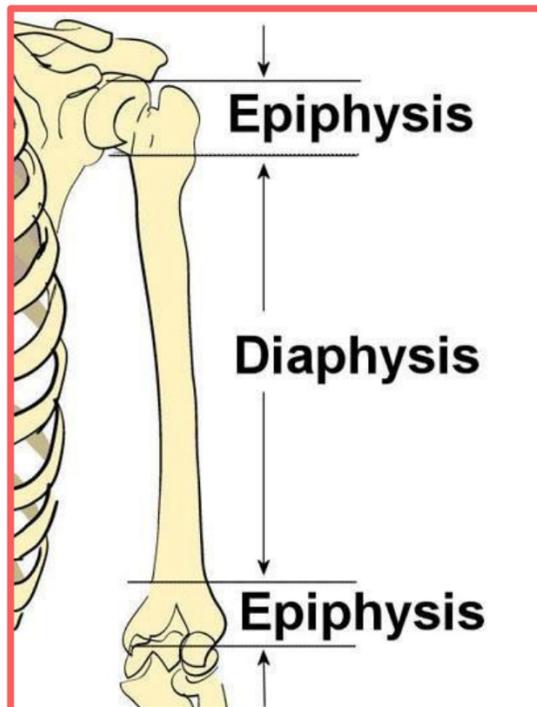
Description

- Cylindrical in shape, longer than they are wide.
- Consist of a shaft (diaphysis) and two expanded ends (epiphyses).

Example

- Arm (**humerus**), Forearm (**ulna**, **radius**), Thigh (**femur**), Leg (**tibia**, **fibula**), Hand (**metacarpals**, **phalanges**), and Foot (**metatarsals**, **phalanges**)

- ❖ Hand and foot bones are called small long bones. For example, metacarpals and the femur (the longest bone in the human body) are both classified as long bones because they share the same structural characteristics.
- ❖ However, the difference in size and length between them is enormous. Because of this significant disparity, the term small long bones was introduced to distinguish them, even though they still belong to the same group of long bones.



2

Skeletal System

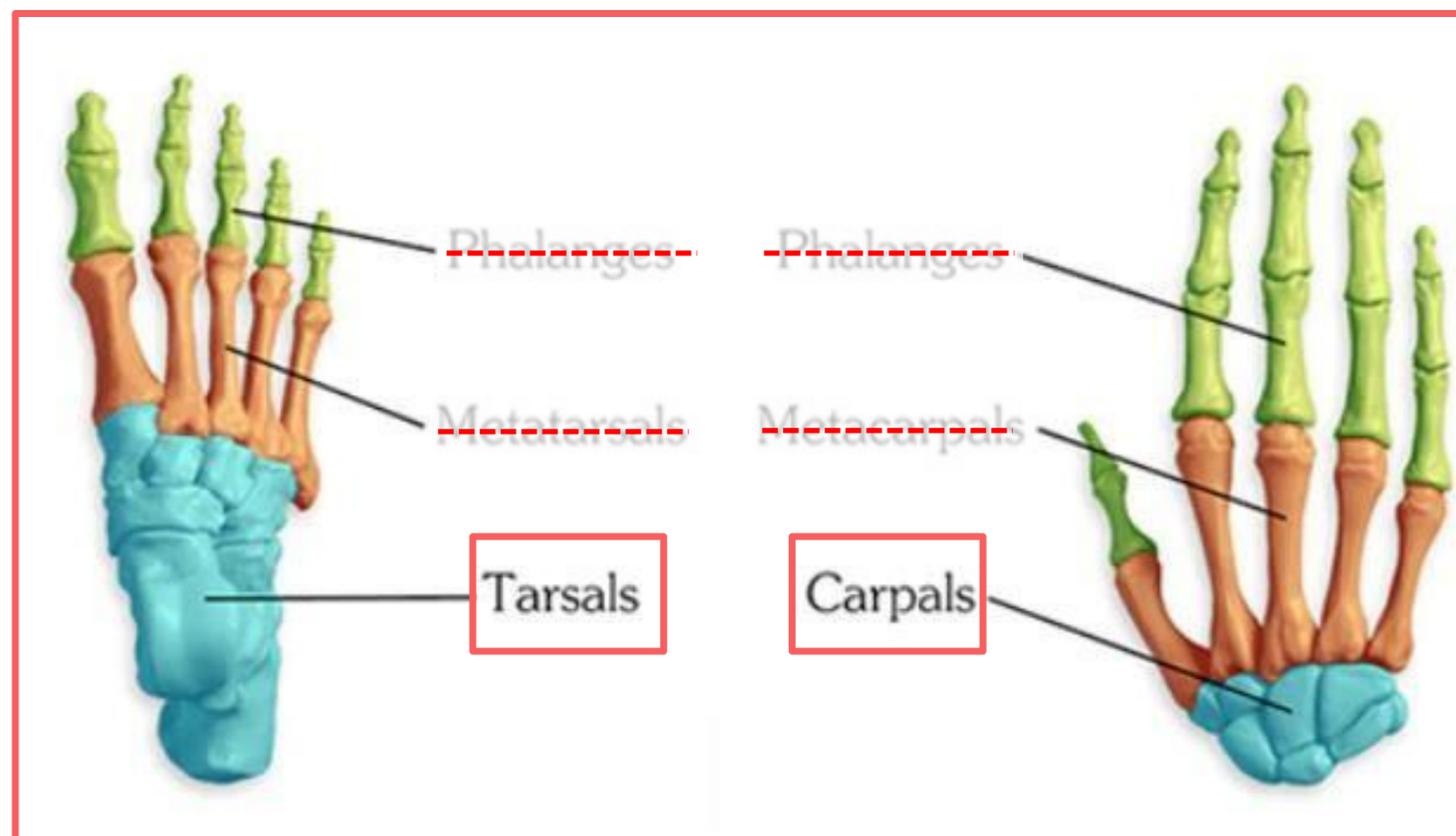
2. Short Bones

Description

- Small, cube-shaped bones, approximately equal in length, width, and thickness.

Example

- Found only in the wrists (**carpals**) and ankles (**tarsals**). And, phalanges



2

Skeletal System

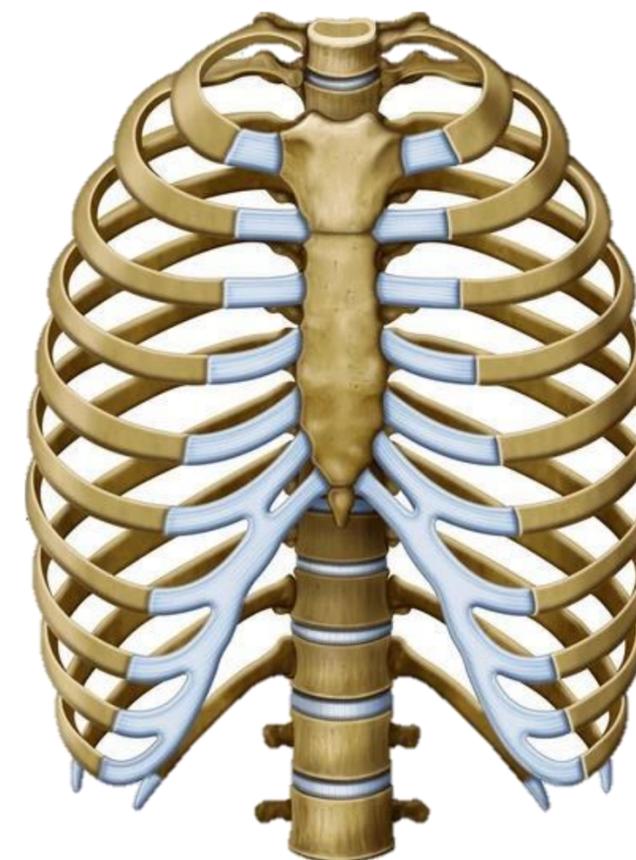
3. Flat Bones

Description	<ul style="list-style-type: none">• Flat and shallow plate-like bones.• They form boundaries of certain body cavities, e.g. cranium cavity, thoracic cavity.
Example	<ul style="list-style-type: none">• Cranial bones of the skull, Scapulae, Sternum, and Ribs.

- Flat bones are the primary, go-to sites for clinical bone marrow extraction in adults.
- One of the most used bones for this procedure is the ilium. This is because the iliac crest is:
 1. Superficial, making it easy to access with a needle.
 2. Especially at the posterior iliac crest, it is rich in red bone marrow, which is responsible for producing red blood cells.



Another example: Vomer



Although its long , but it's a plate, not a cylindrical shape بيكونو بيظفو

2

Skeletal System

4. Irregular Bones

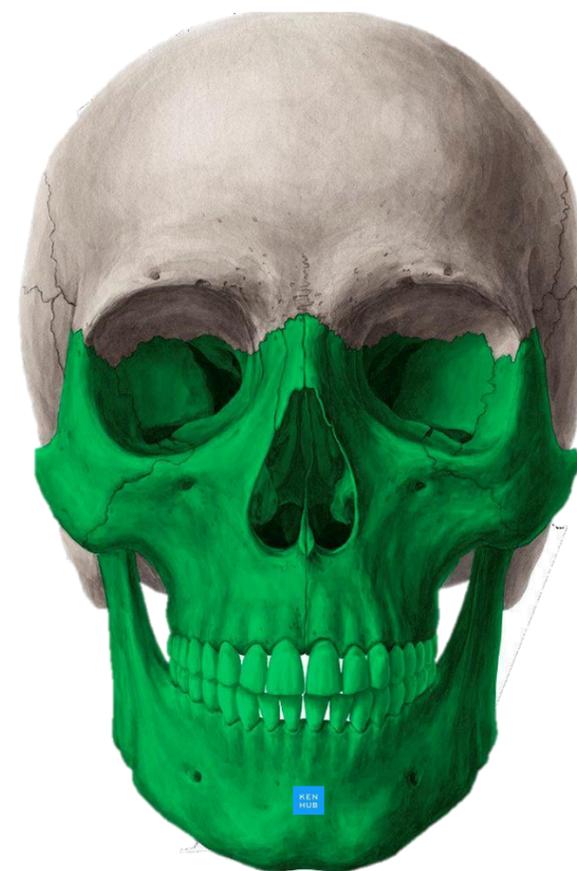
Description

- Have complex shapes that do not fit into other categories.

Example

- **Vertebrae.**
- **Facial bones like** zygomatic bones , mandible , maxilla etc

Also, another example:
Sphenoid



2

Skeletal System

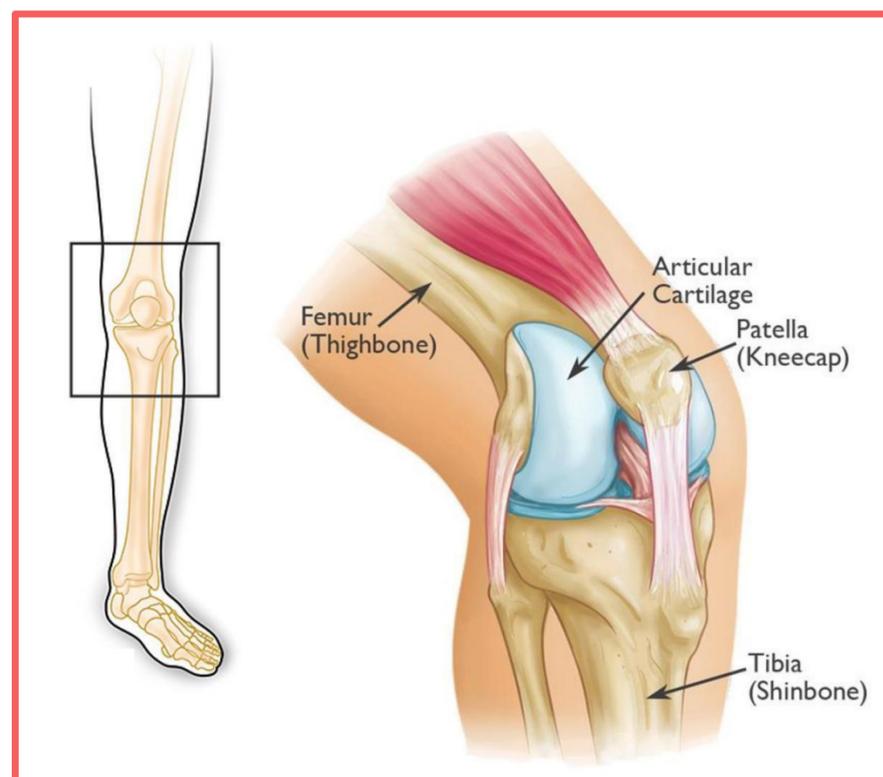
5. Sesamoid Bones

Description

- Small, round bones that develop and found within tendons.
- Resemble a sesame seed in shape (hence the name).

Example

- **Patella** (kneecap).



- ❑ In hand X-ray images, you may notice a small bright spot that looks like it is floating in space.
- ❑ This appears because this tiny bone is not directly attached to another bone. Instead, it is embedded within a tendon (وتر) which makes it seem separate or suspended.
- ❑ This small structure is called a sesamoid bone (عظم سمسمي) in the hand. It is very small in size and can be found in different areas of the hand.

For any feedback, scan the code or click on it.



Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1	All slides		Clarification of some points
V1 → V2			

Additional Resources:

رسالة من الفريق العلمي:

Don't let what you cannot do interfere
with what you can do