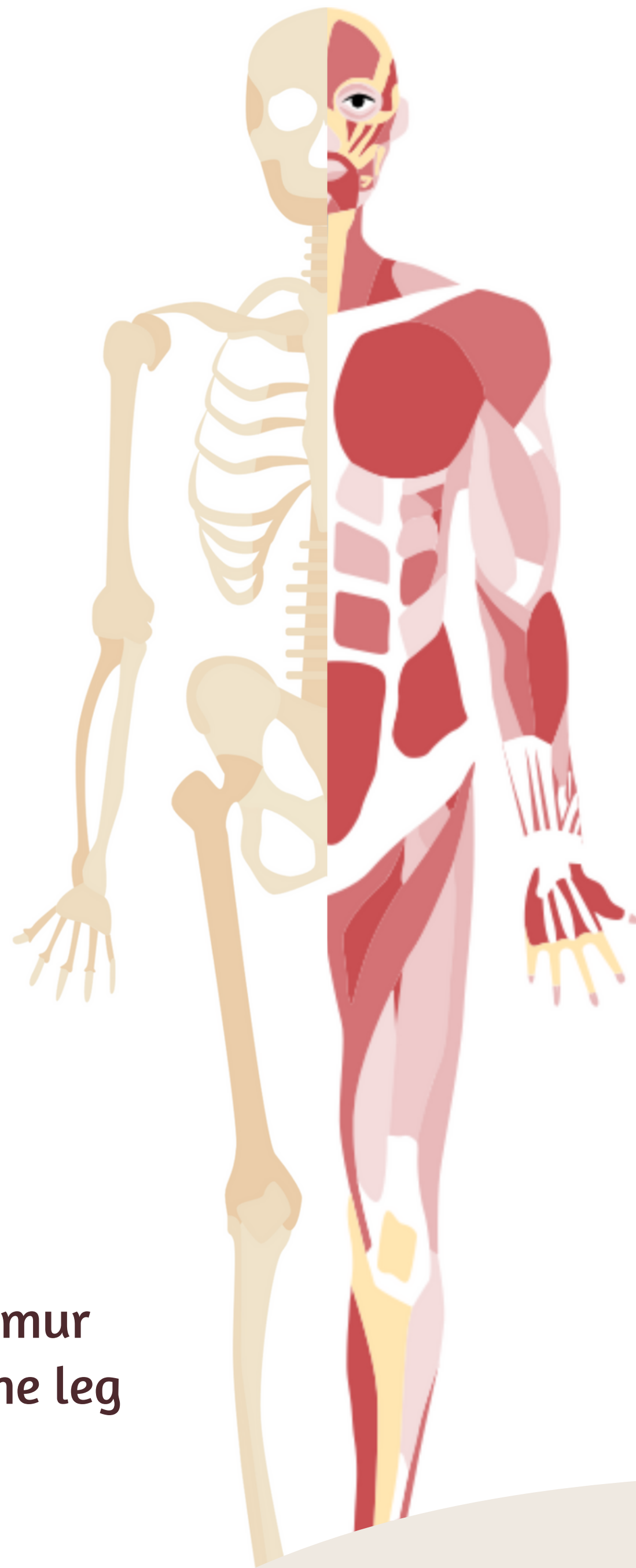


# Lecture 1

# BONES OF THE UPPER AND LOWER LIMBS

## OBJECTIVES

- Classify the bones of the three regions of the upper and lower limb.
- Memorize the main features of the:
  - Bones of the arm (humerus), of the thigh (femur)
  - Bones of the forearm (radius and ulna), of the leg (tibia and fibula).
  - Bones of the hand (carpels, metacarpals, phalanges).
- Recognize the side and position of each bone.



### Color Index:

- Main text
- Boys' Slides
- Girls' Slides
- Important
- Dr's Notes
- Extra

 [Editing File](#)

# ANATOMIC TERMINOLOGY FOR THIS LECTURE

#Thanks to Team 439

- **Anterior**: near to front.
- **Posterior**: near to back.
- **Inferior** : away from head.
- **superior**: near to the head.
- **Medial**: near to median plane.
- **Lateral**: away from median plane.
- **Proximal**: near to trunk (Closer to origin).
- **Distal**: away from trunk (Further Away).

Terms	Meaning	Example
Ridge	The long and narrow upper edge, angle, or crest of something	The supracondylar ridges (in the distal part of the humerus)
Notch	An indentation, (incision) on an edge or surface	The trochlear notch (in the proximal part of the ulna)
Tubercles	A nodule or a small rounded projection on the bone	(Dorsal tubercle in the distal part of the radius)
Fossa	A hollow place (The Notch is not complete but the fossa is complete and both of them act as the lock of the joint)	Subscapular fossa (in the concave part of the scapula)
Tuberosity	A large prominence on a bone usually serving for the attachment of muscles or ligaments ( is a bigger projection than the Tubercle )	Deltoid tuberosity (in the humerus) and i connects the deltoid muscle
Processes	A V-shaped indentation (act as the key of the joint)	Coracoid process ( in the scapula )
Groove	A channel, a long narrow depression sure	Spiral (Radial) groove (in the posterior aspect of (the humerus)
Interosseous border	Between bones ( the place where the two parallel bones attach together by the interosseous membrane )	Lateral interosseous sharp end of the ulna
Spine	Thick projecting ridge of bone	Spine of the scapula
Articulation	Meeting of two bones to make the joints	The articulation between the glenoid cavity and humerus

لا تتعب نفسك وتحاول تفهم الجدول الحين،  
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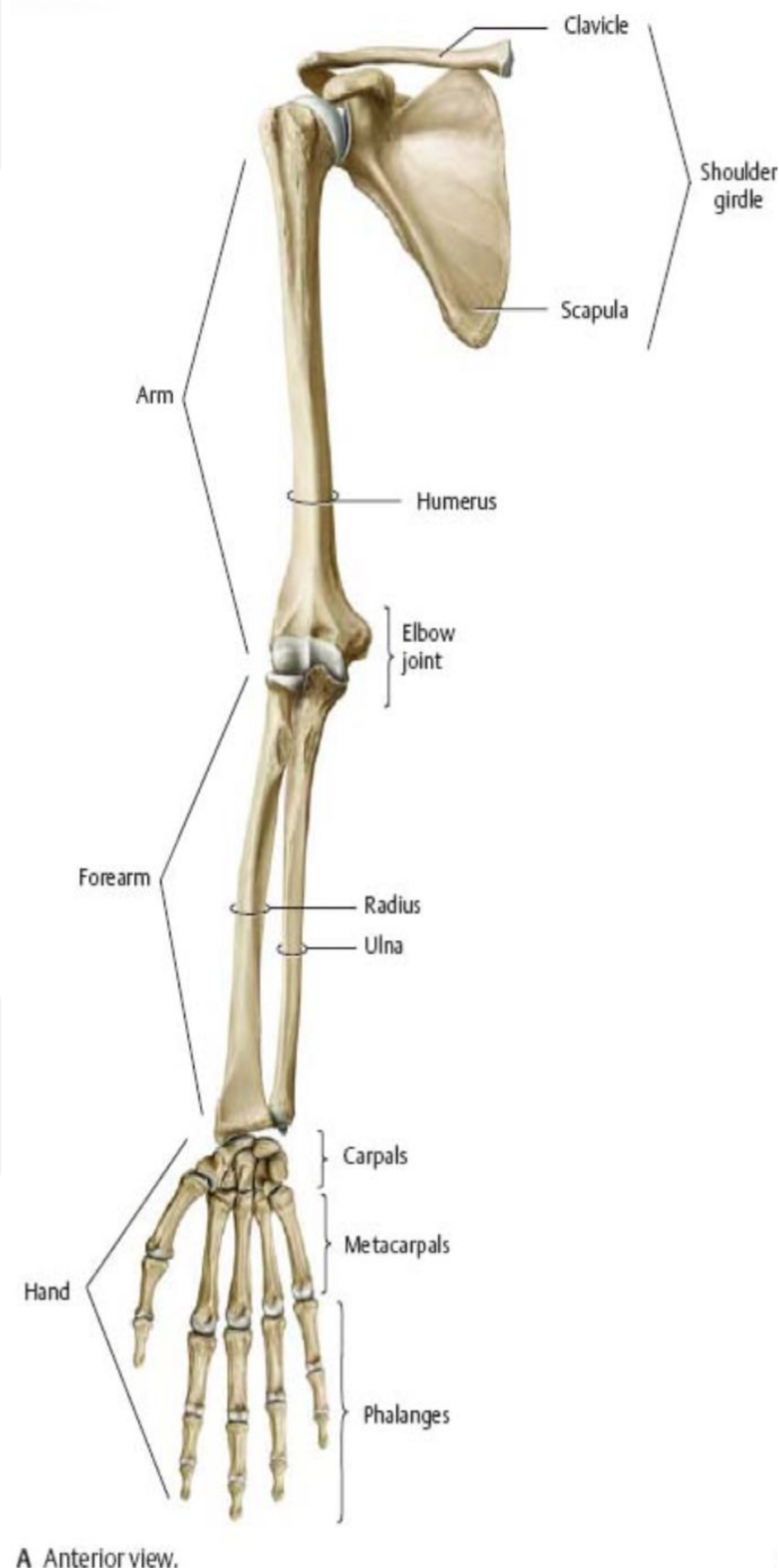
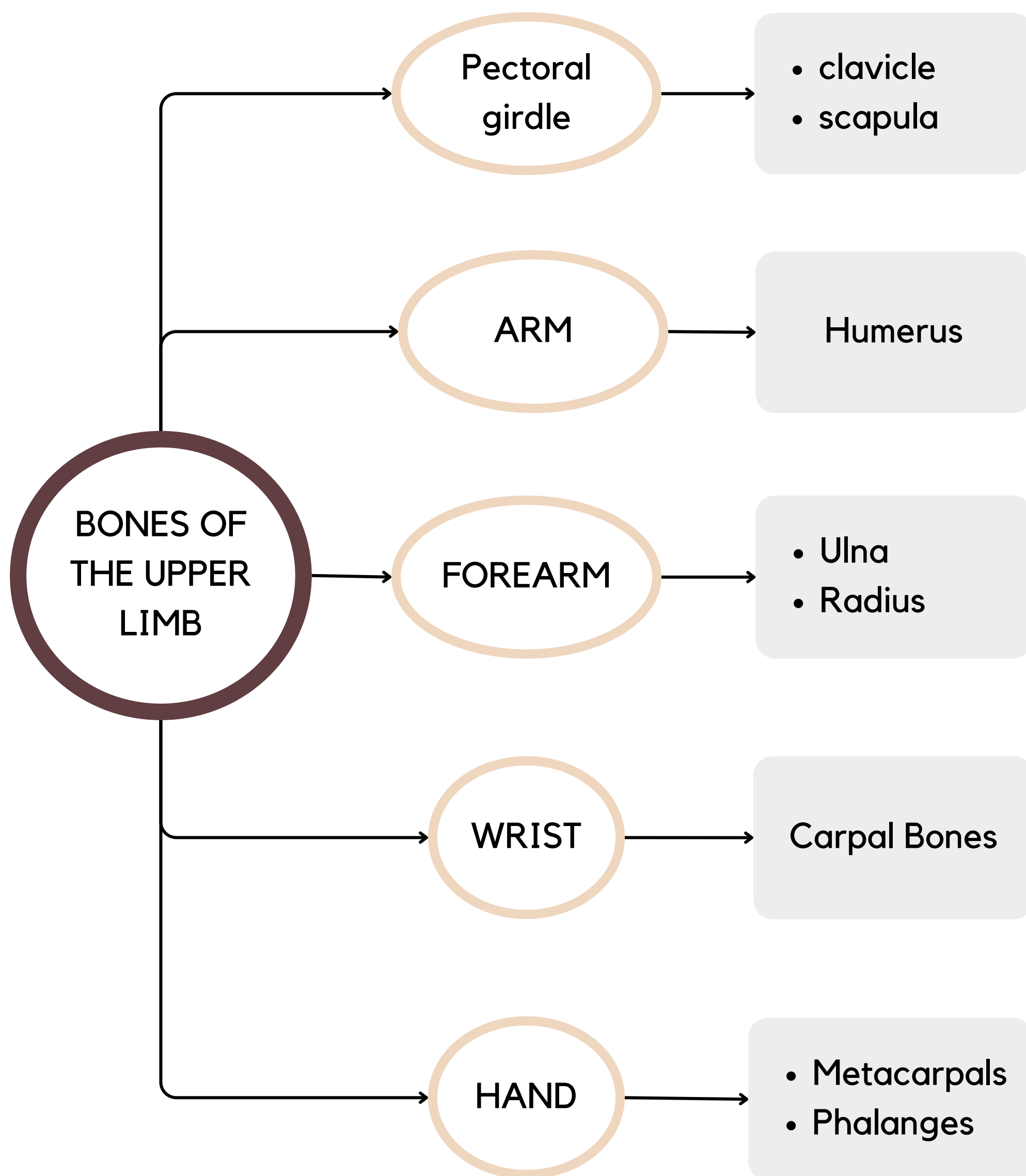
## Introduction:



- The human skeleton serve as a framework for the body with many Bones, Cartilage, Ligamentes, Tendons.
- The human skeleton consist of two principal subdivision, each with origins distinct from the others and each presenting certain individual features.
- The Axial skeleton: composed of Vertebral column, Rib cage, Skull.
- The Appendicular skeleton: composed of limbs (upper and lower) and Girdles (Pectoral and pelvic).



# Bones of Upper and Lower Limb



# Pectoral Girdle

Contain two Bones:

- **Clavicle** (the one in this slide)
- Scapula

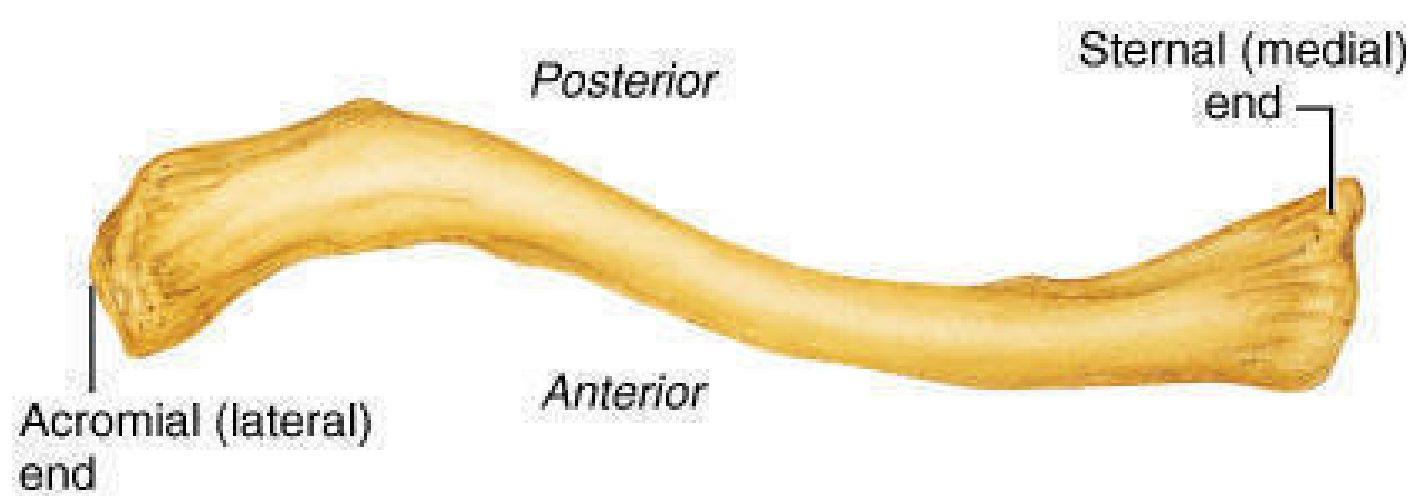
Characteristics of clavicle:

- Very light
- allows the upper limb to have exceptionally free movement.

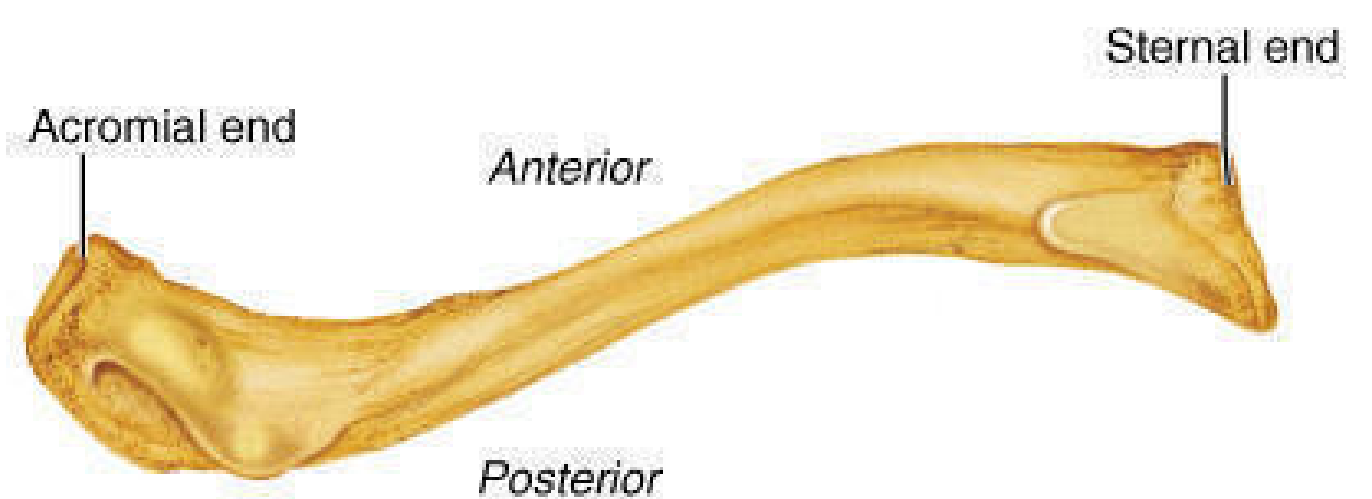
## Clavicle (Anteriorly)

It is a double curved long bone lying horizontally across the root of the neck, **Subcutaneous** throughout its length. (can be felt under the skin)

<p><b>Two Surfaces</b></p>	<ul style="list-style-type: none"> <li>• <b>S</b>uperior: <b>S</b>mooth as it lies just deep to the <b>S</b>kin (subcutaneous).</li> <li>• Inferior: Rough because strong ligaments bind it to the 1st rib.</li> </ul>
<p><b>Body (shaft)</b></p>	<ul style="list-style-type: none"> <li>• It's medial <math>\frac{2}{3}</math> is <b>convex</b> forward.</li> <li>• It's lateral <math>\frac{1}{3}</math> is <b>concave</b> forward.</li> </ul>
<p><b>Two ends</b></p>	<ul style="list-style-type: none"> <li>• <b>Sternal End</b> (Medial): <b>Articulates with the Sternum</b> , It's shape Enlarged and triangular.</li> <li>• <b>Acromial End</b> (Lateral): <b>Articulates with of Acromion of the Scapula</b>, It's shape Flattened</li> </ul>



(b) Right clavicle, superior view



(c) Right clavicle, inferior view

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**Clavicle** is the most commonly fractured bone in the body, commonly result from a fall onto the shoulder or onto an outstretched hand.

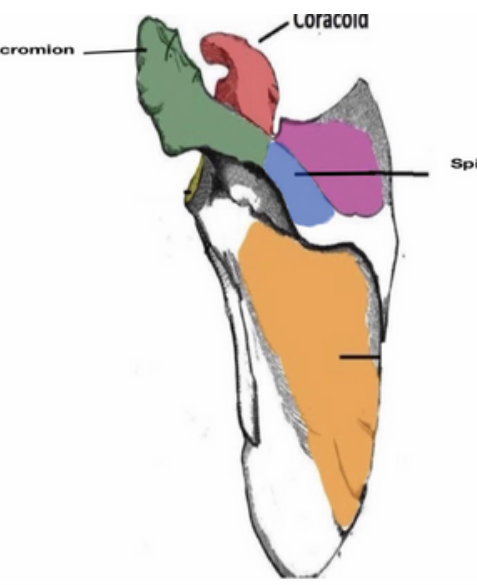
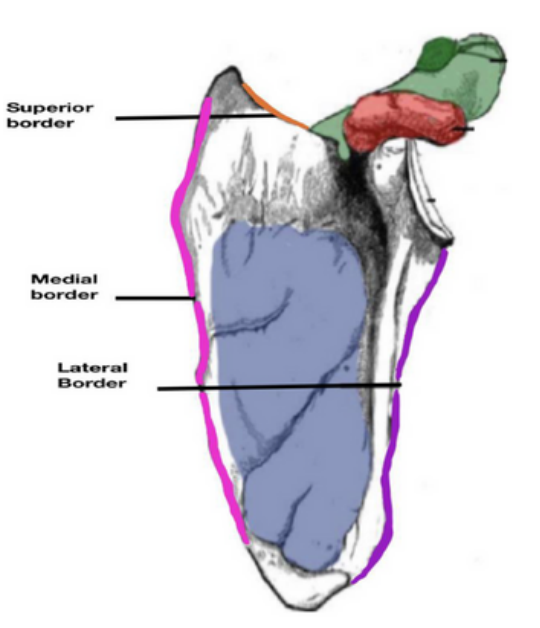
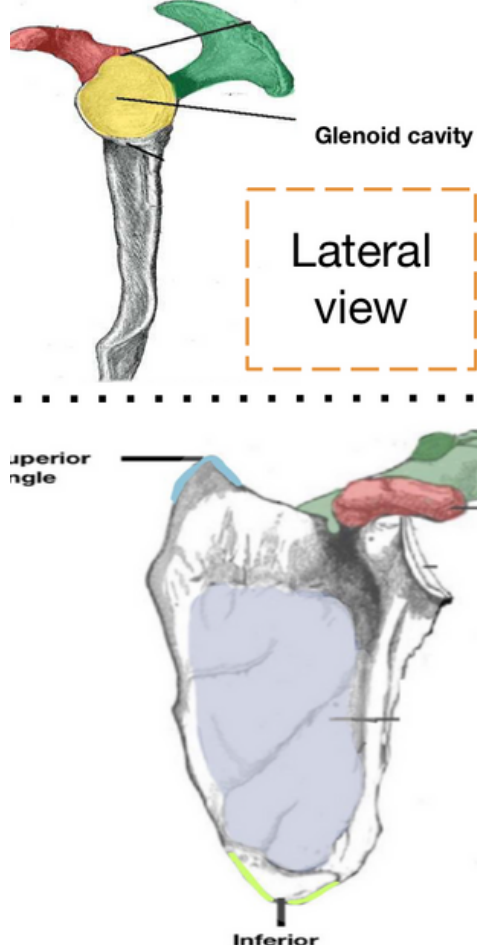
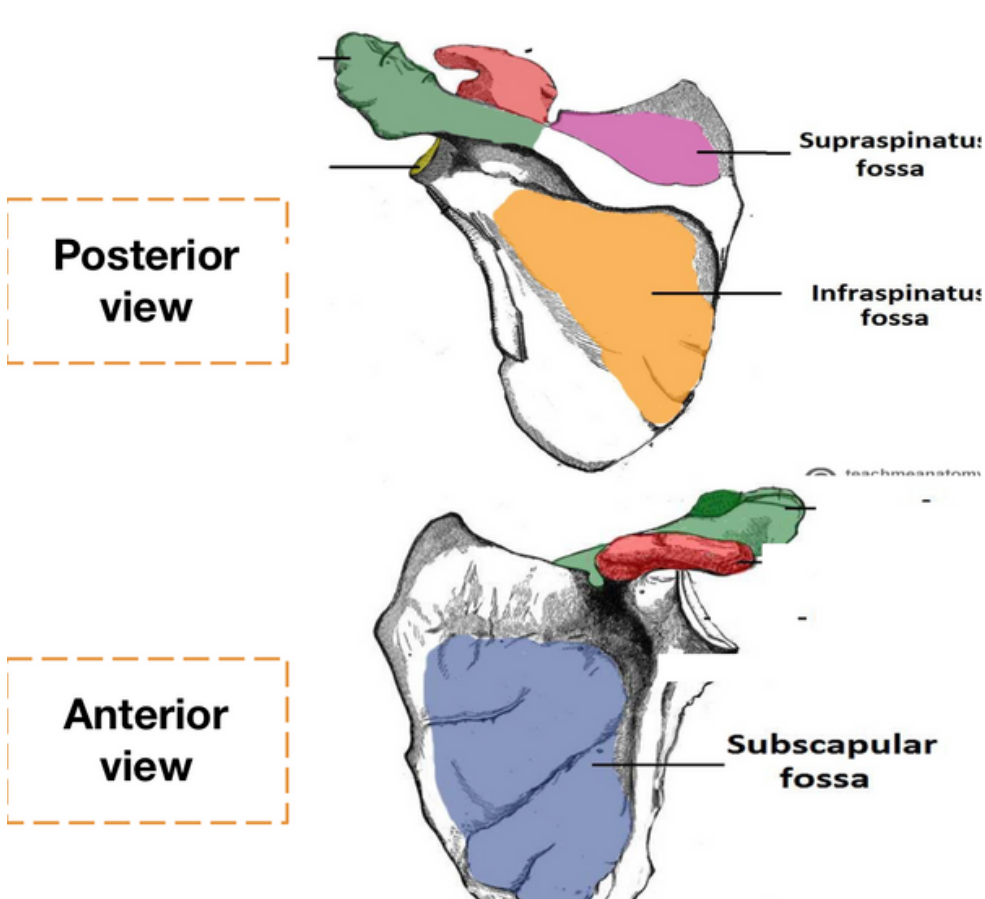
# Pectoral Girdle

Contain two Bones:

- Clavicle (Anterior)
- **Scapula** (Posterior) (the one in this slide)

## Scapula (posteriorly)

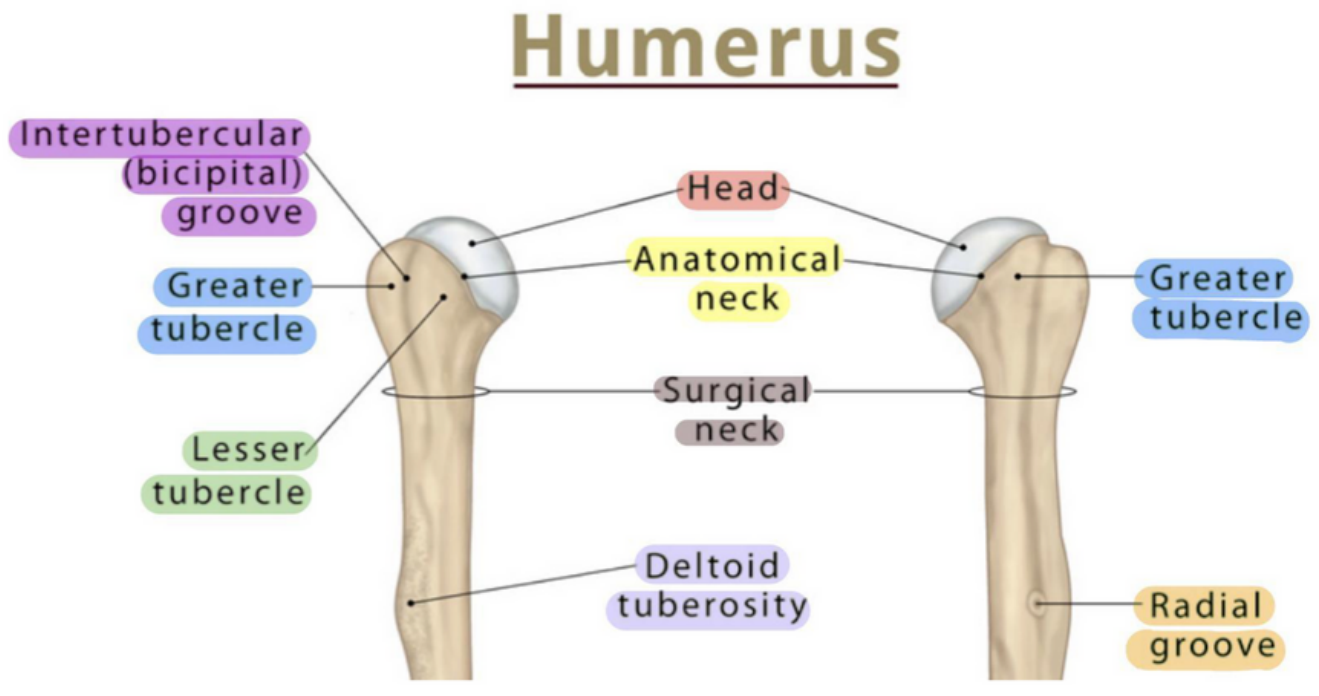
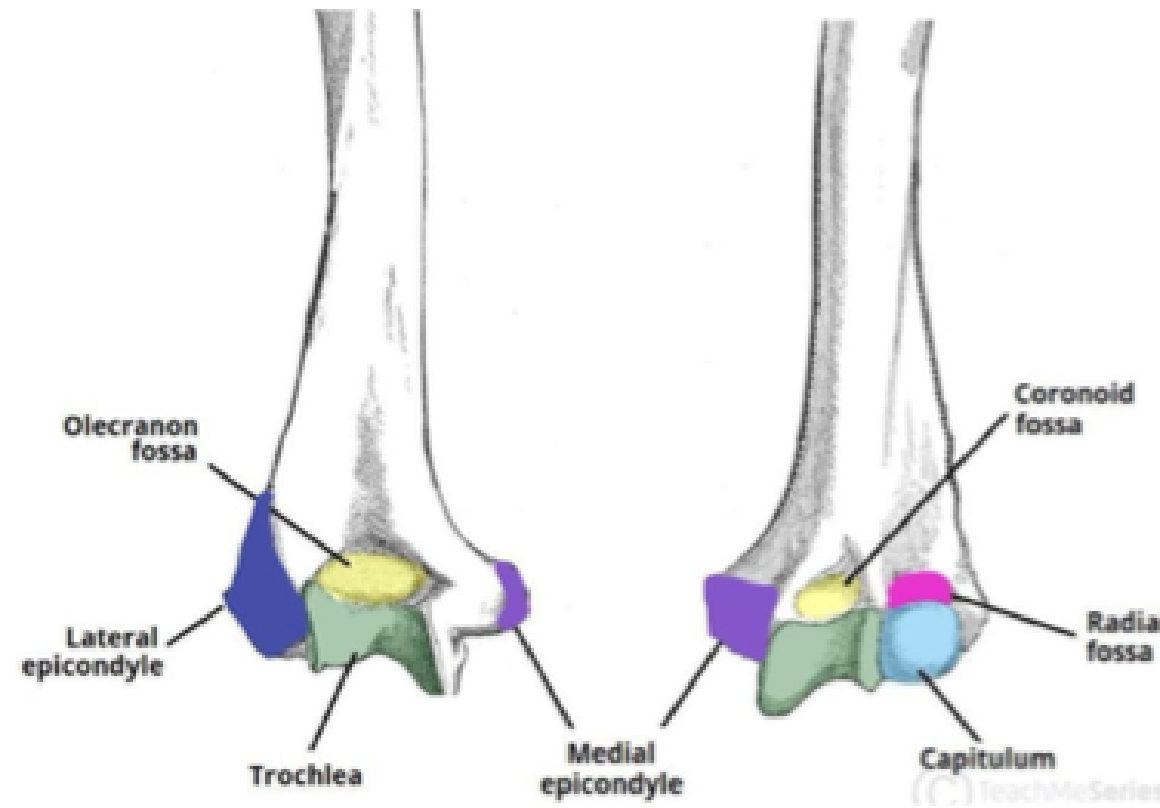
It is a triangular flat bone that **extends between the 2nd and 7th ribs.**

Three Process	Three Borders	Three Angles	Two Surface
1-Spine 2-Acromion 3-Coracoid	1-Superior border 2-medial border (Vertebral) 3-Lateral border (Axillary)	1-Superior 2-Lateral (Forms the glenoid cavity): Here is the articulation between humerus and scapula. 3-Inferior	1-Convex posterior: Divided into <ul style="list-style-type: none"> <li>• <b>Supraspinous fossa</b> :smaller in above the spine procces.</li> <li>• <b>infraspinous fossa</b>: larger and blow the spine procces.</li> </ul> 2-Concave Anterior ( <b>Costal</b> ): <ul style="list-style-type: none"> <li>• <b>Subscapular fossa</b></li> </ul>
			



# Bone of the Arm

Humerus → typical long bone

<p><b>Proximal End</b></p>	<p><b>1-Head:</b> Articulates with the scapula at the glenohumeral joint (Shoulder joint).</p> <p><b>2-Anatomical neck:</b> Formed by a groove separating the head from the tubercles.</p> <p><b>3-Greater Tubercles</b></p> <p><b>4-Lesser Tubercles</b></p> <p><b>5-Intertubercular groove</b> → Inter = between (consist of lateral lip and medial lip and floor)</p> <p><b>6-Surgical neck:</b> A narrow part distal to the tubercles. (Most frequently <b>fractured</b> and it <b>leads to axillary nerve damage</b> and the fracture is usually treated by surgery)</p>	 <p style="text-align: center;"><b>Humerus</b></p>
<p><b>Shaft (body)</b></p>	<p>Two prominent features:</p> <p>1-<b>Deltoid tuberosity</b> (Insertion of deltoid muscle) (in Lateral border).</p> <p>2-<b>Radial groove</b> (Bound to radial nerve) (in Posterior border).</p>	
<p><b>Distal End</b></p>	<p>The Sides:</p> <p>1-<b>Lateral epicondyle</b></p> <p>2-<b>medial epicondyle</b></p> <p><b>Anterior:</b></p> <p>-<b>Trochlea</b> (medial): For articulation with the <b>ulna</b>.</p> <p>-<b>Coronoid fossa:</b> Above the trochlea process of ulna.</p> <p>-<b>Capitulum</b> (lateral): For articulation with the <b>radius</b>.</p> <p>-<b>Radial fossa:</b> Above the capitulum articulate with radius.</p> <p><b>Posterior:</b></p> <p>1-<b>Olecranon fossa:</b> Above the trochlea and articulate with Olecranon process of the ulna.</p>	



Most common fractures of the **humerus** is in the **surgical neck**, especially in older people with osteoporosis. It results from falling on hand.

# Bones of the Forearm

**Ulna** (medial)  
(in this slide)

Radius (Lateral)

## Ulna:

It is the **stabilizing bone of the forearm**, and also the longer and **medial** bone of the two forearm bones.

<p><b>Proximal End</b></p>	<p>1-Olecranon process (articulates with olecranon fossa)</p> <p>2-Coronoid process (articulates with Coronoid fossa)</p> <p>3-Tuberosity of ulna</p> <p>4-Trochlear notch</p> <p>5-Radial notch</p>	
<p><b>Shaft body</b></p>	<p>-<b>Thick &amp; cylindrical</b> superiorly but diminishes in diameter inferiorly</p> <p>-it has three surfaces:</p> <ul style="list-style-type: none"> <li>• Anterior</li> <li>• Medial</li> <li>• Posterior</li> </ul> <p>-<b>Sharp Lateral Interosseous border</b></p>	
<p><b>Distal End</b></p>	<p>-Small rounded</p> <p>1-<b>Head</b>: lies distally at the rest.</p> <p>2-<b>Styloid process</b> : medial.</p>	

Helpful Note : The ulna is a medial bone it has a medial surface and a medial styloid process

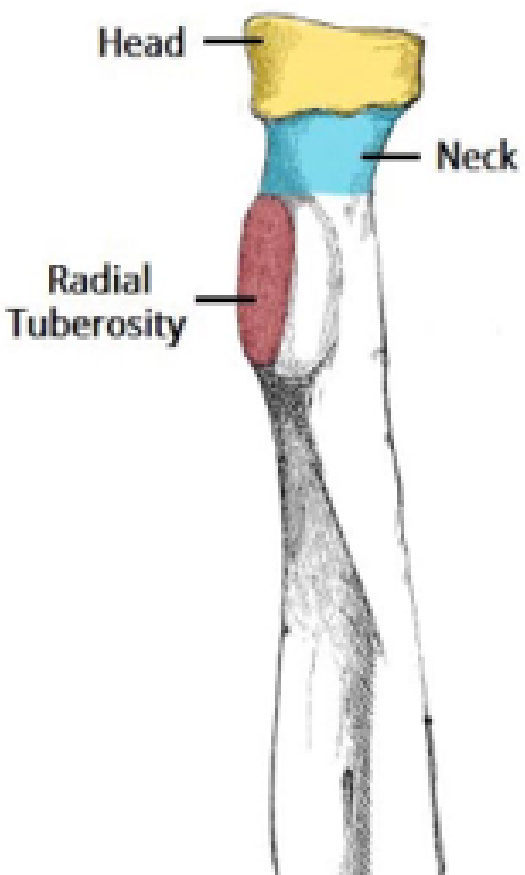
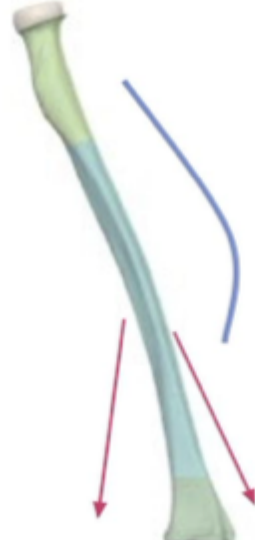
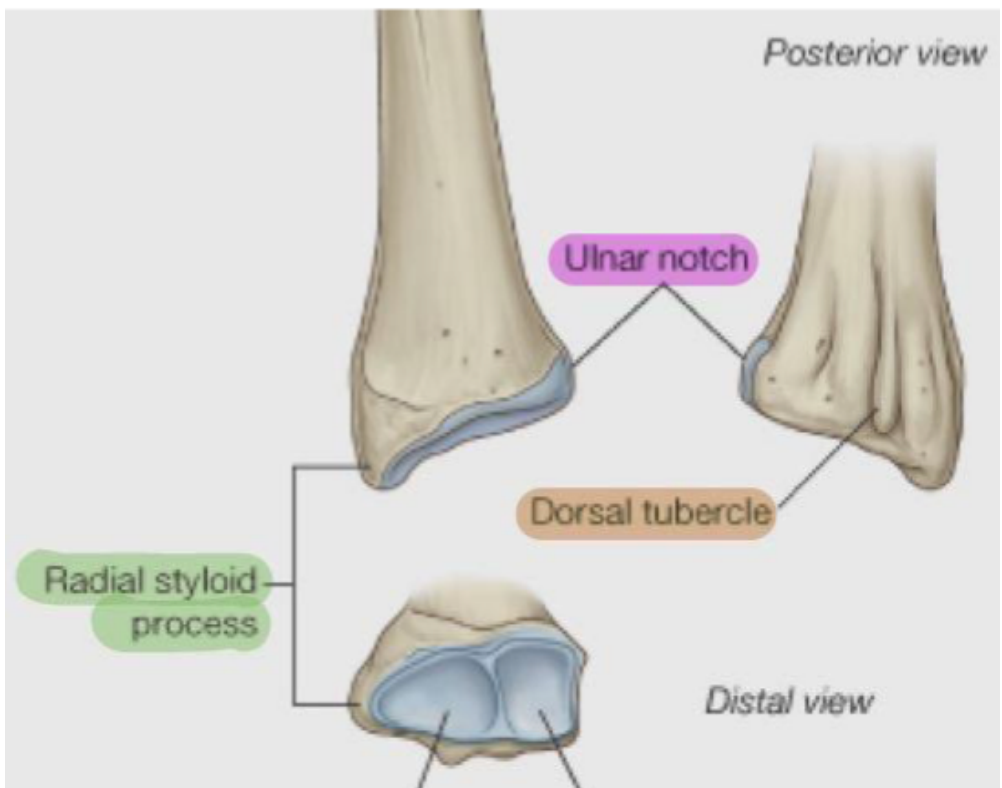
# Bones of the Forearm

Ulna (medial)

Radius (Lateral)  
(in this slide)

## Radius:

It is the shorter and **lateral** bone of the two forearm bones.

<p><b>Proximal End</b></p>	<p>1- <b>Head</b>: small and circular, its upper surface is concave for articulation with the capitulum.</p> <p>2- <b>Neck</b></p> <p>3- <b>Radial (bicipital) tuberosity</b>: medially directed and separated the proximal end from the body</p>	
<p><b>Shaft (body)</b></p>	<p>-It has <u>lateral convexity</u>.</p> <p>-It gradually <u>enlarges</u> as it passes distally.</p>	
<p><b>Distal End</b></p>	<p>-It is <b>rectangular</b> (مستطيلي)</p> <p>1- <b>Ulnar Notch</b>: a medial concavity to accommodate the head of the ulna.</p> <p>2- <b>Radial Styloid Process</b>: extends from the lateral aspect.</p> <p>3- <b>Dorsal tubercle</b>: projects dorsally.</p>	

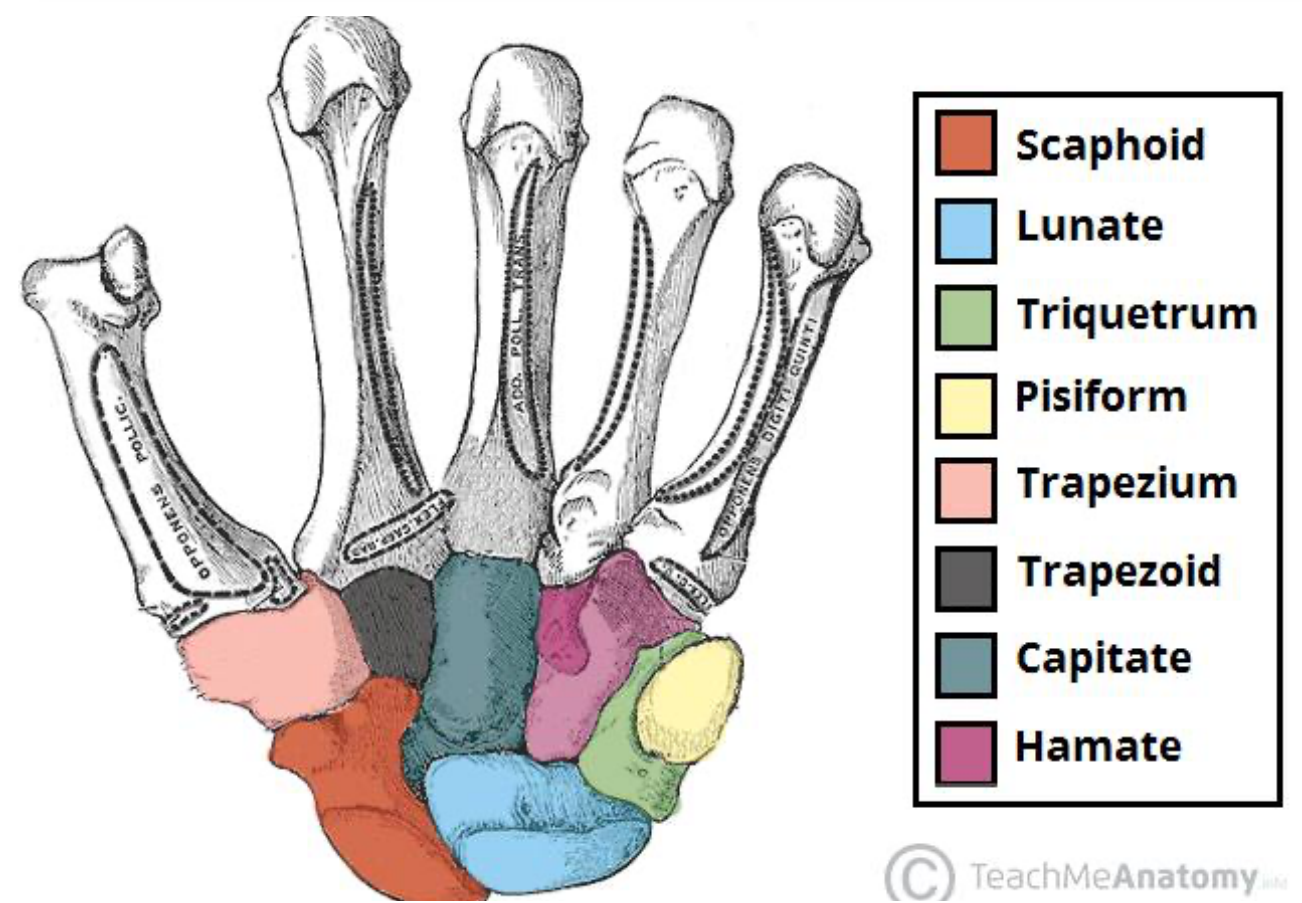
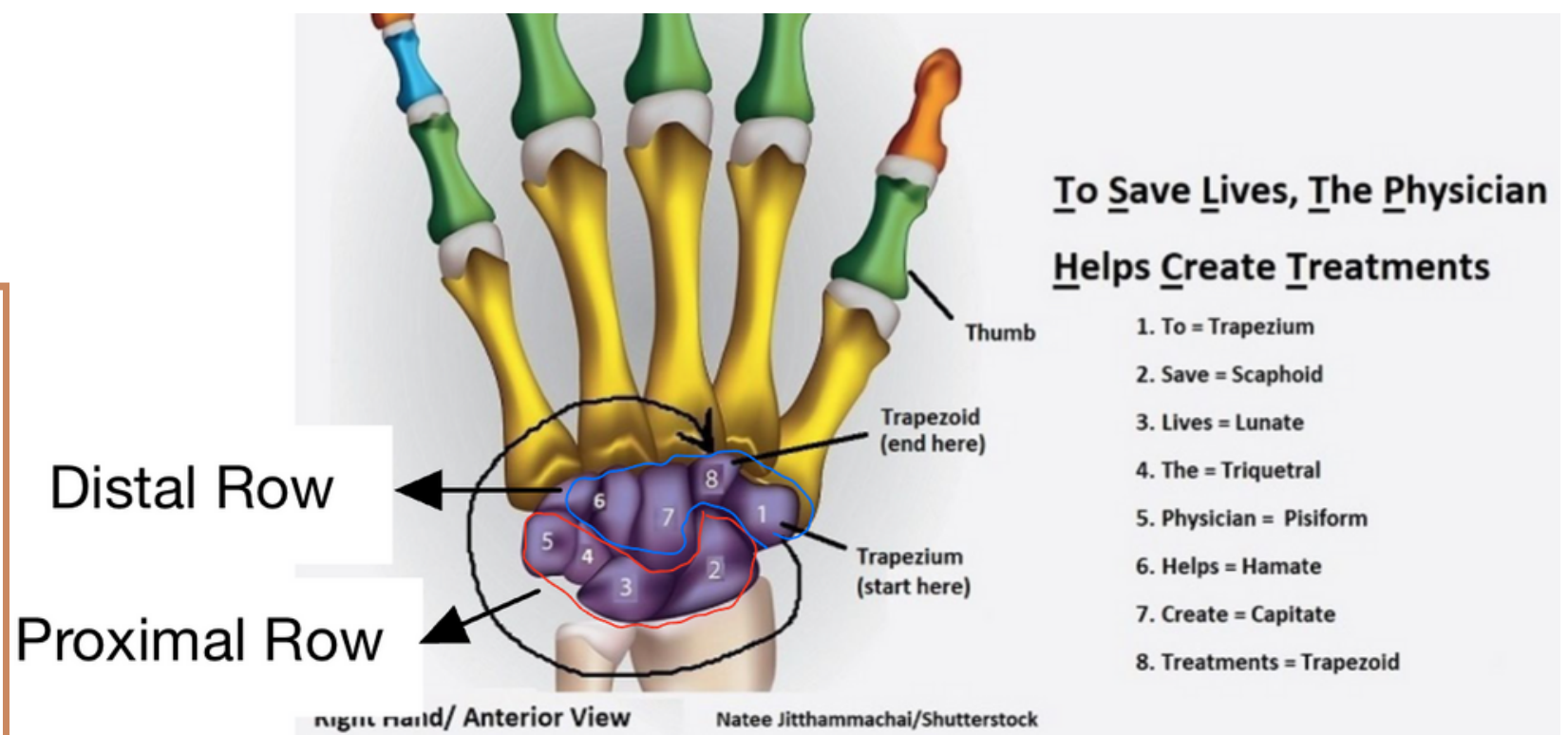


# Bone of the the Wrist and the Hand

## Carpal Bones (Bone of the Wrist):

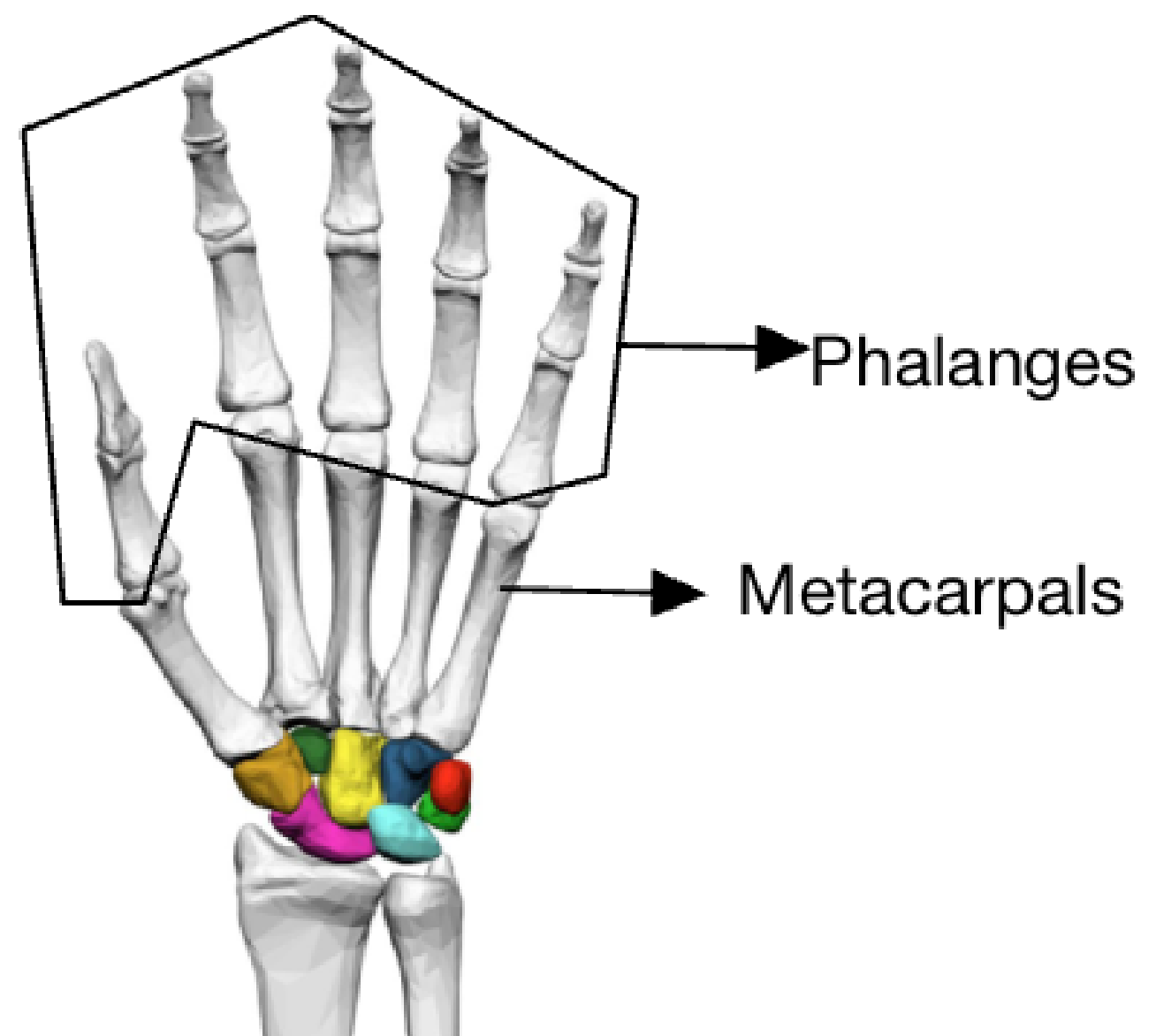
- composed of 8 Short Bones
- Divided into:

<b>Proximal Row</b>	<p><b>From Lateral to medial:</b></p> <ul style="list-style-type: none"> <li>-Scaphoid</li> <li>-Lunate</li> <li>-Triquetral</li> <li>-Pisiform</li> </ul>
<b>Distal Row</b>	<p><b>From Lateral to medial:</b></p> <ul style="list-style-type: none"> <li>-Trapezium</li> <li>-Trapezoid</li> <li>-Capitate</li> <li>-Hamate</li> </ul>



## Bones of the Hand:

<b>Metacarpal</b>	<p><b>5 metacarpal bones:</b></p> <p>Each has a</p> <ul style="list-style-type: none"> <li>• base (Proximal)</li> <li>• shaft</li> <li>• head (Distal)</li> </ul>
<b>Phalanges bones</b>	<p><b>14 phalanges</b></p> <p>Each digit has 3 phalanges, <b>except for the thumb</b>, which has only 2.</p>



# Bones of the Lower Limbs

## 1- Pelvic Girdle

Hip bone  
Sacrum

## 2- Thigh

Femur  
Patella

## 3- Leg

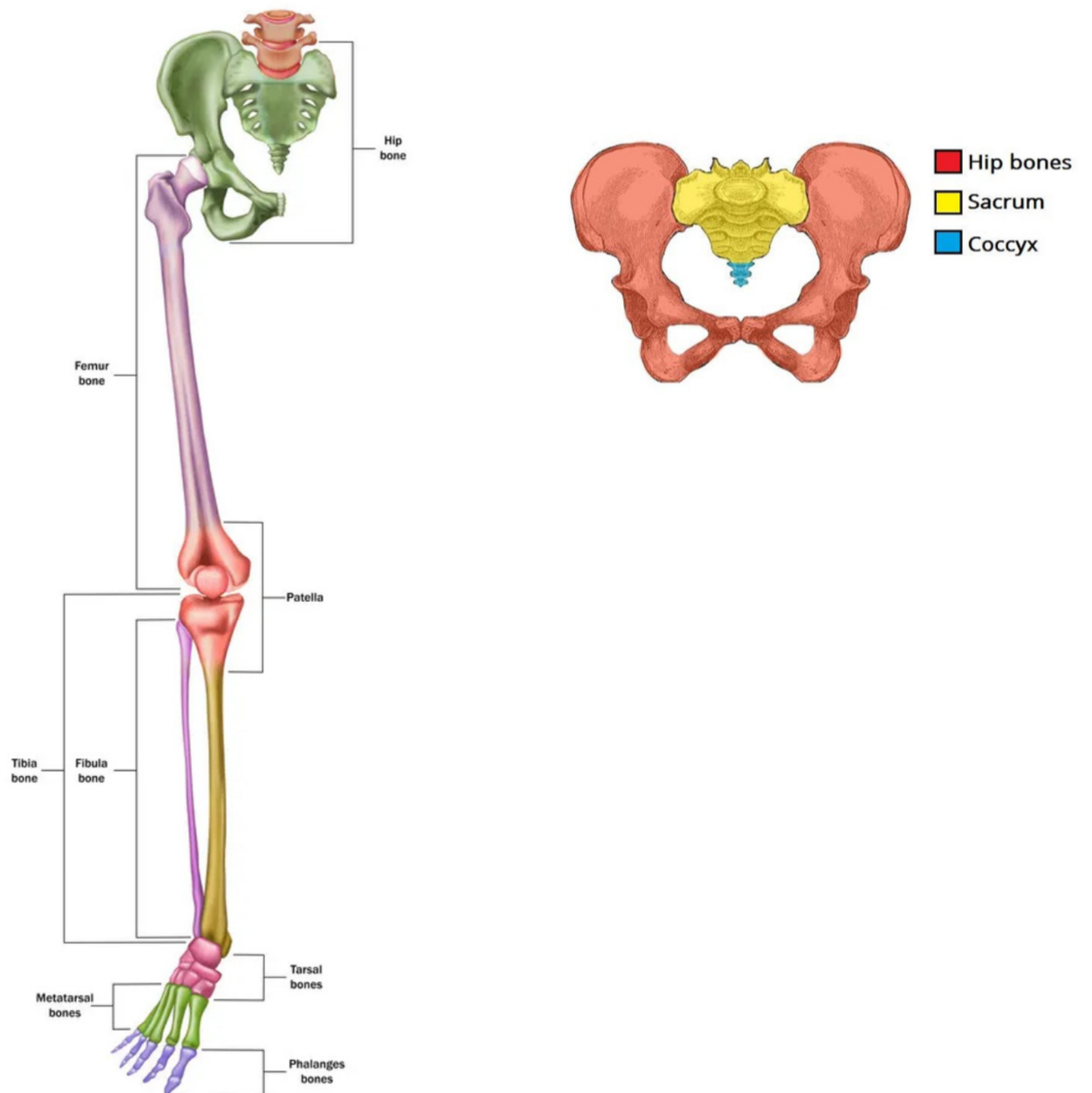
Tibia  
Fibula

## 4- Ankle

Tarsal bones

## 5- Foot

Metatarsals  
Phalanges



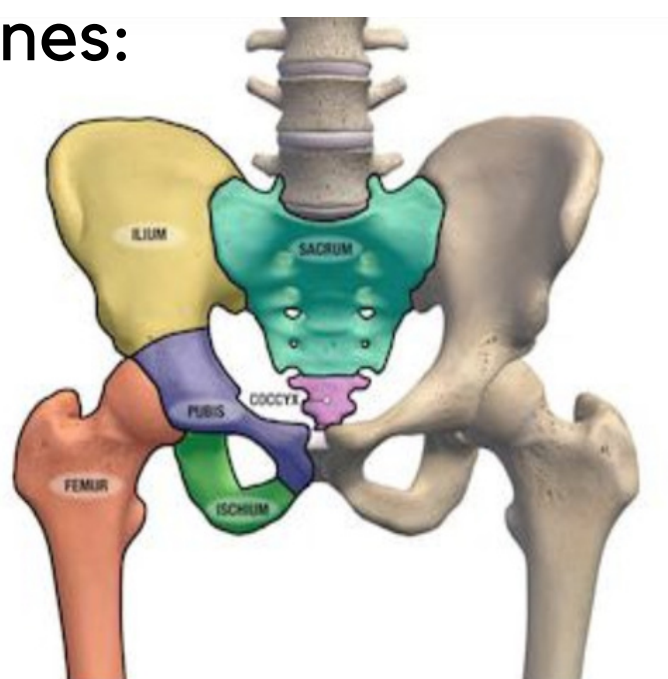
# Pelvic Girdle ☆



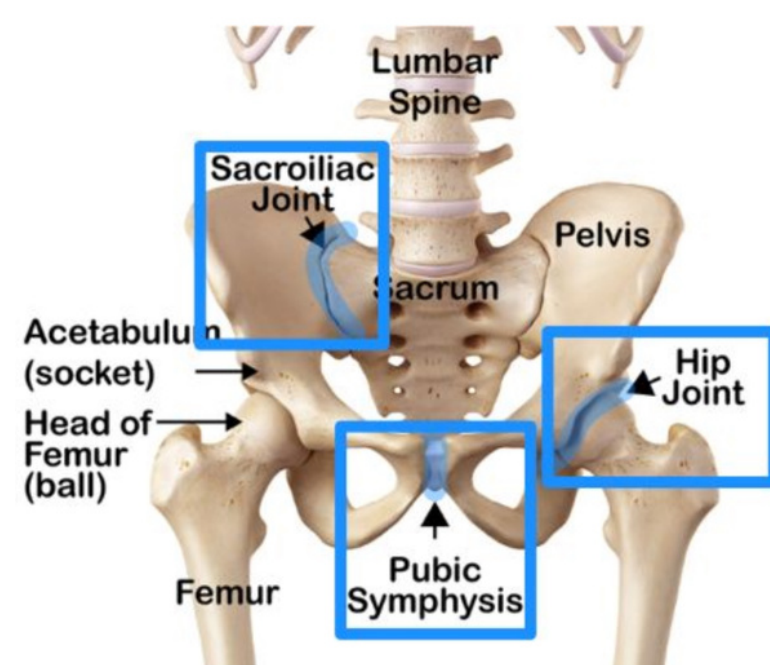
The pelvis is made of:

2 Hip (pelvic) bones:

- Ilium
- Pubis
- Ischium
- Sacrum
- Coccyx



## Hip bone



Sacroiliac joint  
(medial)

Pubic symphysis  
(between pubic bone)

Hip joint  
(with head of femur)

Thanks 442!

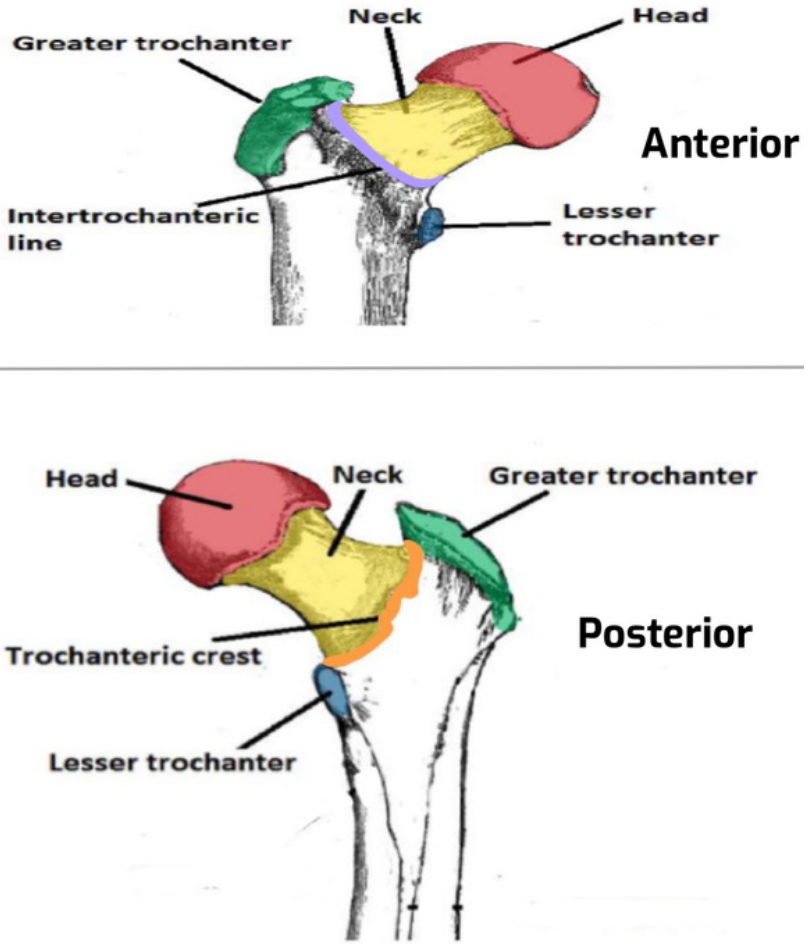
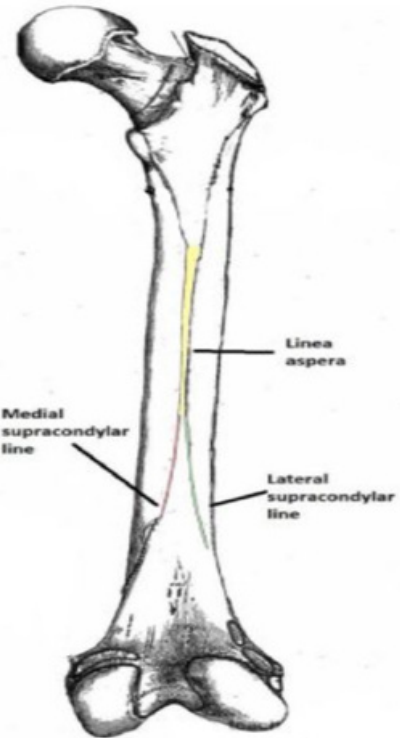
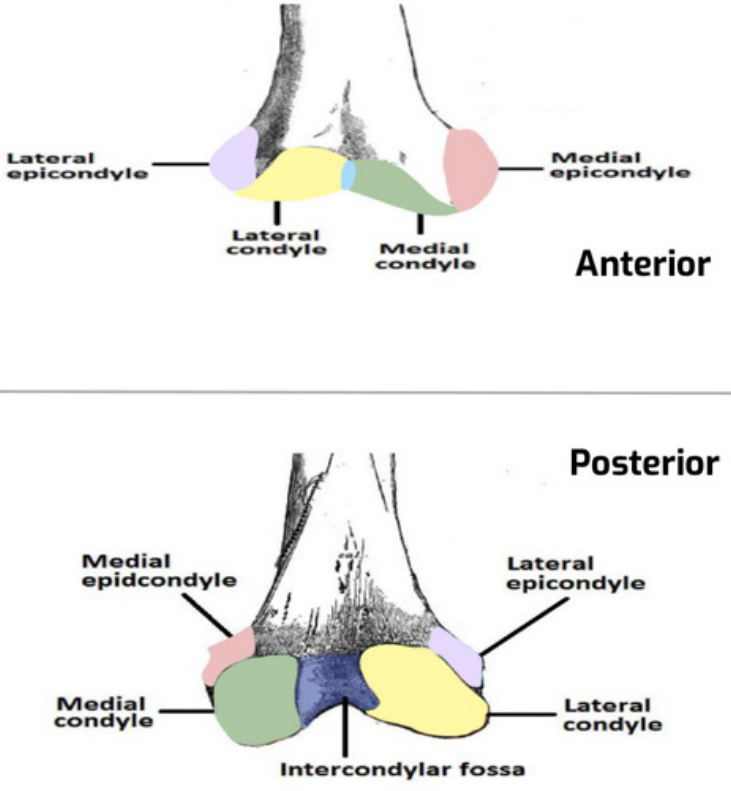


# Bones of the Thigh

## Femur

Articulates **above** with **acetabulum** of hip bone to form hip joint

Articulates **below** with **Tibia & Patella** to form knee joint (Fibula does Not Articulate in knee joint)

<p><b>Upper end (Proximal)</b></p>	<p><b>Head</b> : it articulates with <b>acetabulum</b> of hip bone to form hip joint.</p> <p><b>Neck</b> : it connects head to the shaft <b>greater trochanters</b> &amp; <b>lesser trochanters</b></p> <p><b>Anteriorly</b>, connecting the 2 trochanters, the <b>intertrochanteric line</b> where the <b>iliofemoral ligament attaches</b></p> <p><b>Posteriorly</b>, the <b>intertrochanteric crest</b> on which is the quadratus femoris muscle)</p>	
<p><b>Shaft ( body )</b></p>	<p>It has three surfaces: <b>Anterior</b> <b>Medial</b> <b>Lateral</b></p> <p>It has three borders: Two rounded: <b>medial and lateral</b> One thick posterior border of ridge called <b>linea aspera</b></p>	
<p><b>Lower end (Distal)</b></p>	<p>Has <b>lateral condyles</b> and <b>medial condyles</b>,</p> <ul style="list-style-type: none"> <li>-separated anteriorly by articular <b>patellar surface</b>,</li> <li>-posteriorly by <b>intercondylar notch or fossa</b></li> </ul> <p>The two condyles take part in the <b>knee joint</b>.</p> <p>Above the condyles are the: <b>medial epicondyles</b> &amp; <b>lateral epicondyles</b></p> <p><b>Facets:</b> For attachment of the anterior and posterior cruciate ligament.</p>	



Fractures of the **neck** of Femur are common



# Fracture of Femur

- It is a bone fracture that involves the femur.
- They are typically sustained in high-impact trauma, such as car crashes, due to the large amount of force needed to break the bone
- Fractures of the diaphysis, or middle of the femur, are managed differently from those at the head, neck, and trochanter.
- The fracture may be classed as open, which occurs when the bone fragments protrude through the skin, or there is an overlying wound which penetrates to the bone.
- These types of fracture cause more damage to the surrounding tissue, are less likely to heal properly, and are at much greater risk of infection.

# Bones of the Thigh

## Patella

The largest sesamoid bone

Lies inside the **quadriceps tendon** in front of the **knee joint**.

**Anterior surface:**

Rough & subcutaneous (تحت الجلد مباشرة)

**Posterior surface:**

Articulates with condyles of femur to form **knee joint**.

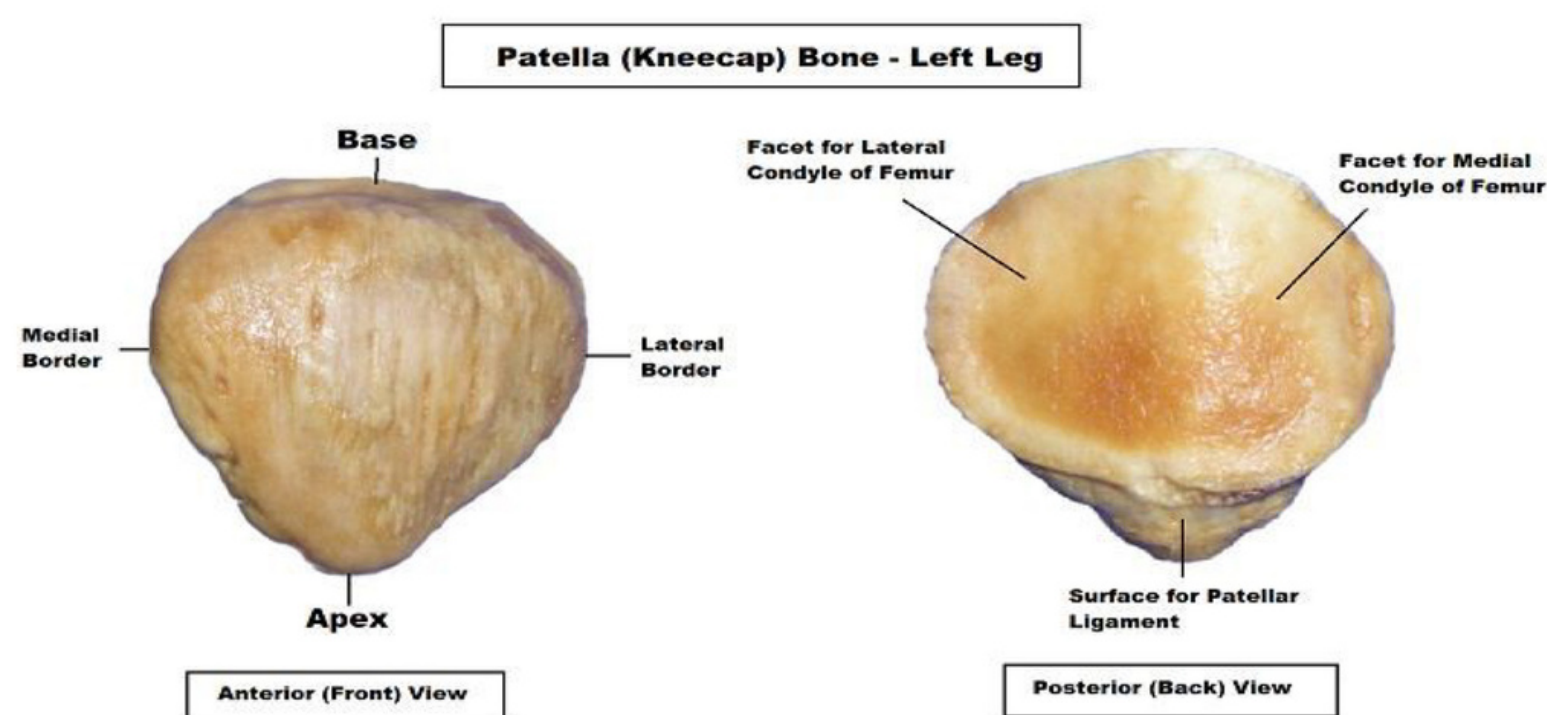
**Apex:**

Lies inferiorly

Connected to tuberosity of tibia by **ligamentum patellae**

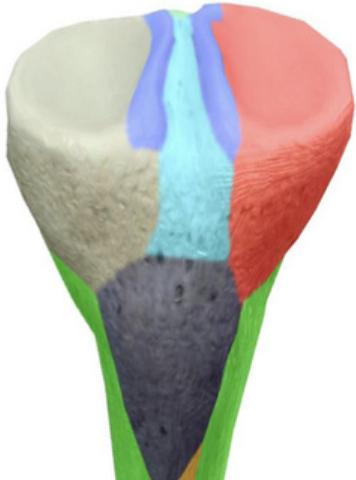





**Upper, lateral, & medial margins:**

Gives attachments to **quadriceps femoris muscle**.



# Bones of the Leg

**Tibia** → The medial bone of the leg.

Upper end (Proximal)	Shaft (Body)	Lowr End (Distal)
<p>1. <b>Medial condyle</b>: Larger and articulate with medial condyle of femur. Has a <b>groove</b> on its <b>posterior surface for semimembranosus muscle</b></p> <p>2. <b>Lateral condyle</b>: is smaller and articulates with lateral condyle of femur.</p> <p>3. Has <b>facet</b> on its <b>lateral side</b> for articulation with head of fibula to form <b>proximal tibiofibular joint</b></p> <p>4. <b>Intercondylar area</b>: is rough and has <b>intercondylar eminence</b></p>  <p>Anterior view of R. Tibia</p>  <p>Lateral view of R. Tibia</p>	<p><b>Tibial tuberosity</b>: Upper smooth part gives attachment to <b>ligamentum patellae</b> Lower rough part is <b>subcutaneous</b></p> <p>Has 3 borders:</p> <ol style="list-style-type: none"> <li>1. <b>Anterior border</b> (sharp and subcutaneous)</li> <li>2. <b>Medial border</b></li> <li>3. <b>Lateral border</b> (interosseous border)</li> </ol> <p>Has 3 surfaces</p> <ol style="list-style-type: none"> <li>1. Medial (subcutaneous)</li> <li>2. Lateral</li> <li>3. Posterior (has oblique line, <b>soleal line</b> for attachment of soleus muscle)</li> </ol> <p>443# Dr's Note: Interosseous border lateral in medial bone and medial in lateral bone. It's where the interosseous membrane attaches</p>  <p>Anterior view of R. Tibia</p>  <p>Posterior view of R. Tibia</p>	<p>Articulates with talus for formation of ankle joint</p> <ol style="list-style-type: none"> <li>1. <b>Medial malleolus</b>: Its <b>medial surface</b> is subcutaneous Its <b>lateral surface</b> articulate with talus</li> <li>2. <b>Fibular notch</b>: lies on its lateral surface of lower end to form <b>distal tibiofibular joint</b></li> </ol>  <p>Anterior view of R. Tibia</p>  <p>Lateral view of R. Tibia</p>



**Note:** Tibia fractures are normally caused by trauma, whether it was a sporting injury, a fall at home or a fall at work



# Bones of the Leg

## Fibula:

→ The slender lateral bone of the leg

→ Takes no part in knee joint articulation

### Upper end (Proximal)

1. **Head**: articulates with lateral condyle of tibia
- 2 **Apex of the head**: also known as styloid process
3. **Neck**



### Shaft ( body )

- Has 4 borders:** Its medial interosseous border gives attachment to **interosseous membrane**.
- Has 4 surfaces**



### Lower end (Distal)

1. **Lateral malleolus**: subcutaneous and has smooth medial surface for articulation with talus to form ankle joint.
2. **Malleolus groove**



# Bones of the Ankle and Foot

1

## Tarsal bones (bones of the ankle):

Composed of 7 short bones:

### 1. Calcaneum

is the largest bone of the foot. Forms the heel.

### 2. Talus

Only the **Talus** articulates with tibia & fibula at ankle joint with no muscle attachment.

### 3. Navicular

### 4. Cuboid

### 5. Medial Cuneiform

### 6. Intermediate Cuneiform

### 7. Lateral Cuneiform

2

## Metatarsal bones:

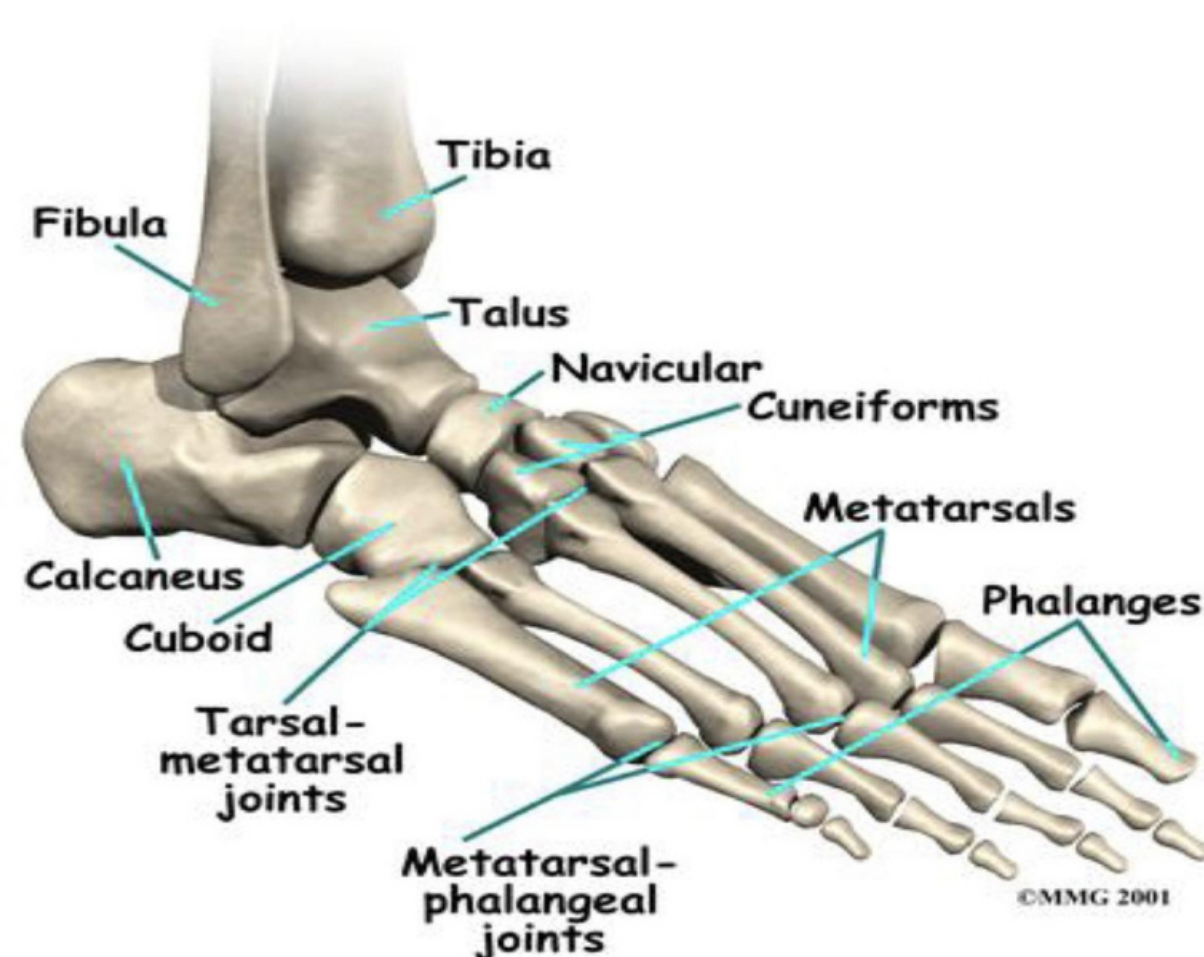
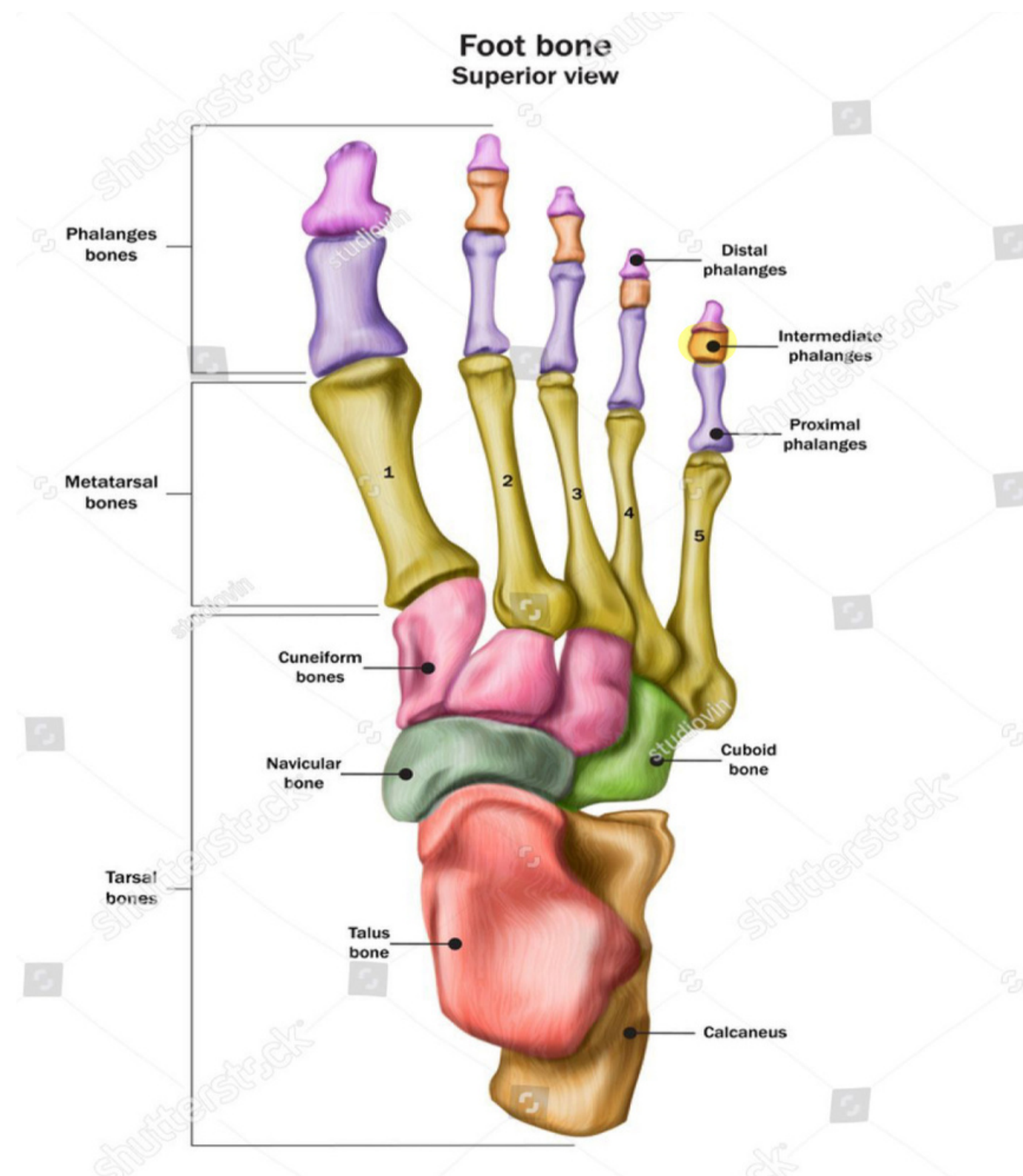
5 metatarsal bones:

- Numbered from medial (big toe) to lateral
- 1st metatarsal bone is large and is medial
- Each has a base (proximal), shaft (middle), and head (distal)

3

## Phalanges bones:

14, each toe has 3 phalanges (proximal, middle, distal), except for the big toe, which has only 2 (proximal & distal)



# MCQs

1

Which one of the distal end of humerus helps in articulation with radius ?

A) Trochlea

B) Capitulum

C) Radial fossa

D) Olecranon fossa

2

Which is the lateral-most carpal bone of the proximal row?

A) Trapezium

B) Hamate

C) Pisiform

D) Scaphoid

3

Which bony landmark is located on the lateral side of the proximal humerus?

A) Greater tubercle

B) Trochlea

C) Lateral epicondyle

D) Lesser tubercle

4

There are \_\_\_ carpal bones and tarsal \_\_\_ bones?

A) 9-8

B) 7-8

C) 8-7

D) 8-9

5

Which of the following is also called the heel bone?

A) Talus

B) Navicular

C) Calcaneus

D) Malleolus



1-B 2-D 3-A 4-C 5-C



# MCQs

6

Sharp and subcutaneous border found in the tibia?

A) Medial border

B) Lateral border

C) Anterior border

D) posterior border

7

The lateral bone of the leg is?

A) Tibia

B) Fibula

C) Femur

D) Radius

8

The shape of the distal end of the radius is?

A) Rounded

B) Triangular

C) Rectangular

D) Flat

9

the most common place of fractures in humerus is?

A) Head

B) Trochlea

C) Surgical neck

D) Medial epicondyle

10

Scapula extends between the?

A) 2nd and 7th ribs

B) 1st and 5th ribs

C) 2nd and 10th

D) 3rd and 7th ribs



6-C 7-B 8-C 9-C 10-A



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# SAQs

1

A woman has fallen in her home, and when she came to the hospital, we found out that she had a fractured bone in the leg. Which bone is the most likely to be fractured?

 Tibia

2

The largest sesamoid bone?

 Patella

3

Bones of Pectoral girdle?

 clavicle - scapula

4

An old man with osteoporosis has fallen on his hand and felt a great pain in his arm. When he came to the hospital, we found out that he had a fractured part in the arm bone. Which part is the most likely to be fractured?

 Surgical neck of humerus



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