MED439
KING SAUD UNIVERSITY

Bones of the Upper and Lower limb

Musculoskeletal Block - Lecture 1

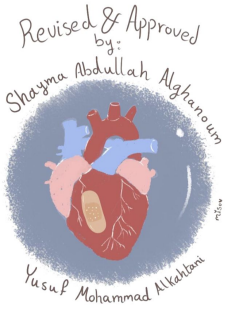
Objective:

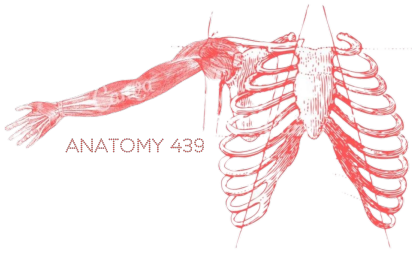
Classify the bones of the three regions of the lower limb (Thigh, leg and foot).

Memorize the main features of the
- Bones of the thigh (femur & patella)
- Bones of the leg (tibia & Fibula)
- Bones of the foot (tarsals, metatarsals and phalanges)

Recognize the side of the bone.

Color index:
Important
In male's slides only
In female's slides only
Extra information, explanation





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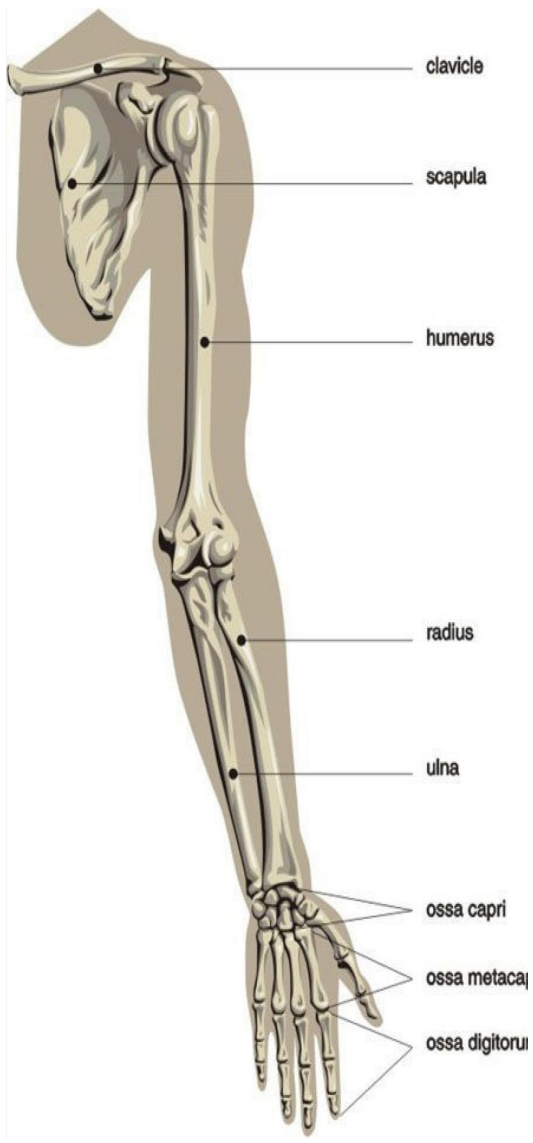
Please make sure that you're familiar with these terms

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 humorous) and it 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

Bones of the upper limb

- Pectoral Girdle:
  - **Clavicle**
  - **Scapula**
- Arm:
  - **Humerus**
- Forearm:
  - **Ulna**
  - **Radius**
- Wrist:
  - **Carpal bones**
- Hand:
  - **Metacarpal**
  - **Phalanges**



Pectoral Girdle:

- Very light
- Allows the upper limb to have exceptionally free movement

1) Clavicle: It's a double curved **long bone** lying horizontally across the root of the nick.

Unusual features

- No medullary (Bone marrow) cavity.
- It's the first bone to Ossify in the fetus (5th-6th week) and it's the last one to complete.
- It develops in membrane (NOT IT CARTILAGE).
- Most commonly fractures bone in the body.
- It is subcutaneous throughout its length.
- It's the only horizontal bone

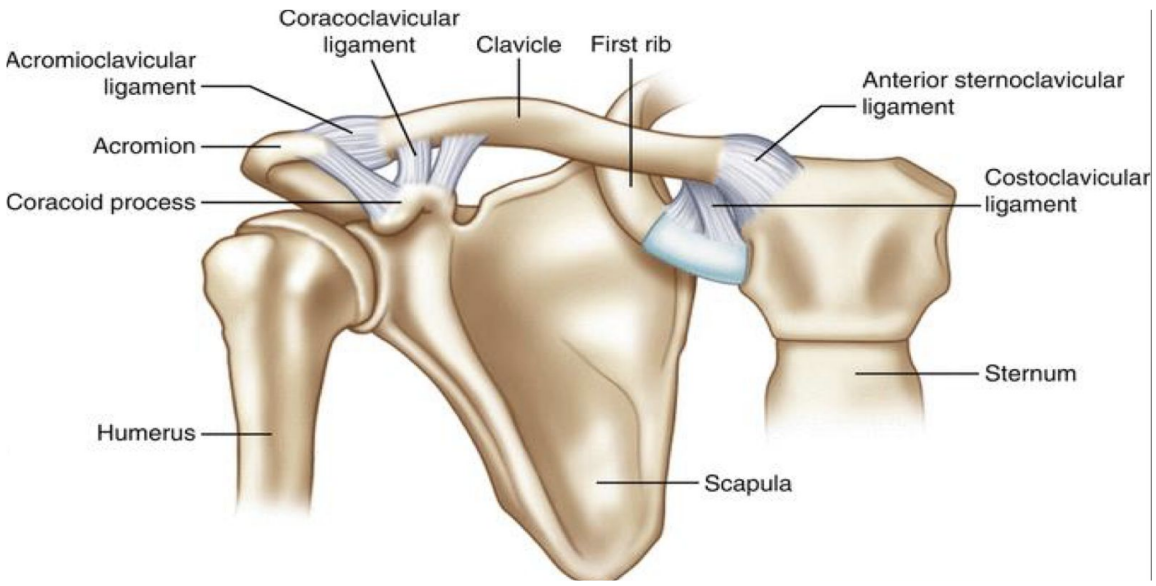
Ossify: Turn into a bone

Functions

- Transmits forces from the upper limb to the axial skeleton.
- Act as a strut holding the arm free from the trunk.
- Provides attachment for Muscle. all bones provide attachment to muscles except Talus bone.
- Forms a boundary of the cervicoaxillary canal for protection of the neurovascular bundle of the upper limb.

Articulation

- **Medialy:** Sternoclavicular joint. (Articulation with Manubrium)
- **Inferiorly:** Costoclavicular joint. (Articulation with 1st rib)
- **Laterally:** Acromioclavicular joint. (Articulation with Acromion)



Two ends

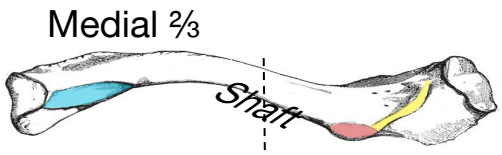
Medial (Sternal):
it's enlarged & Triangular.

Lateral (Acromial): Flattened.

Body (Shaft)

The **medial** ⅔ of the body (shaft) is convex forward.
(Its convex to allow the neurovascular bundle coming from the neck to reach the upper limb)
The **lateral** ⅓ is concave forward.

Convex: محدب
Concave: مقعر



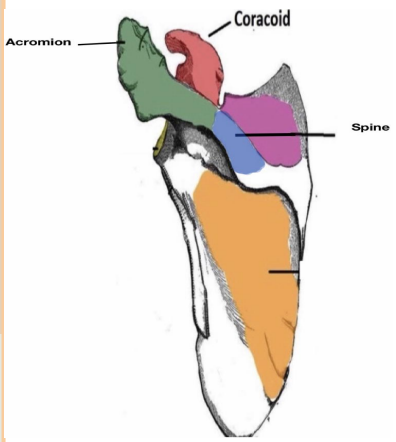
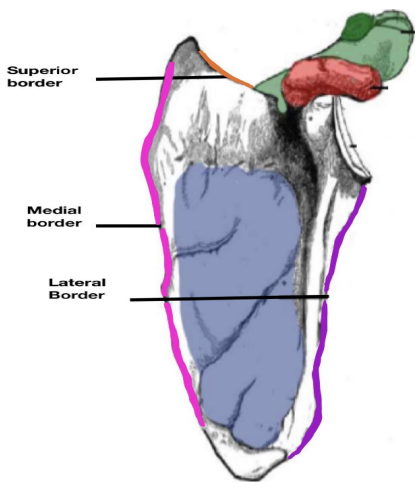
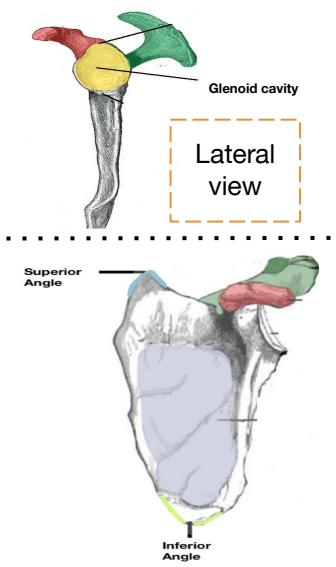
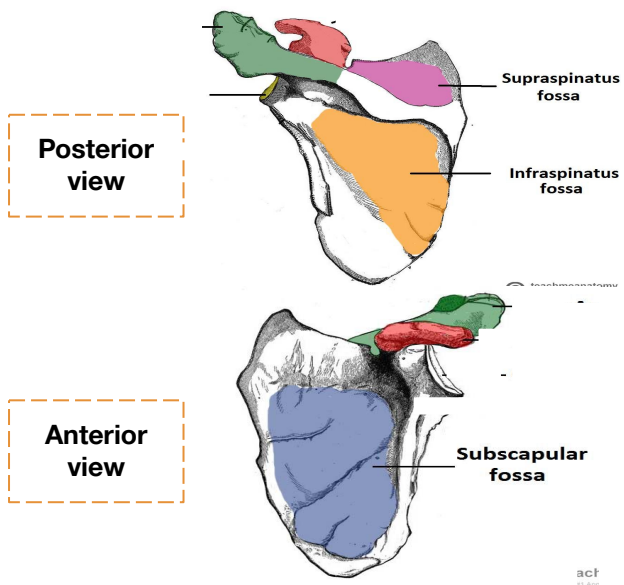
Two surfaces

Superior: Smooth as it lies just deep to the skin (Subcutaneous).

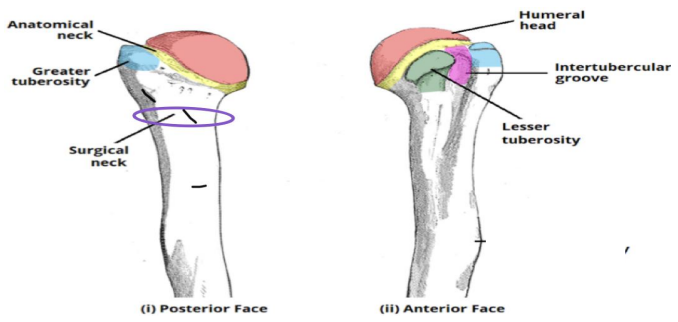
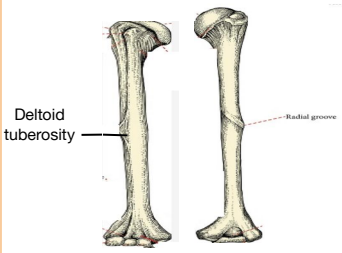
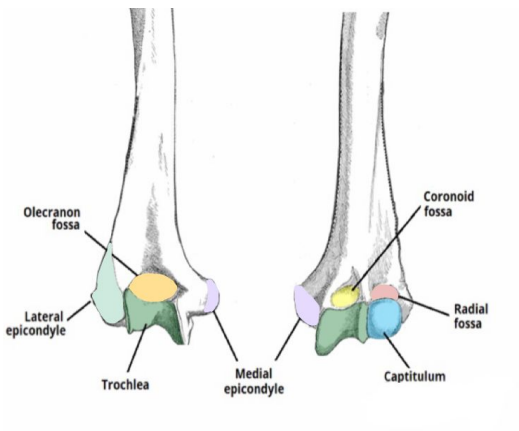
Inferior: Rough because strong ligaments bind it to the 1st rib.

2) Scapula: It's a triangular, **flat bone** that extends between the **2nd** and **7th** ribs.

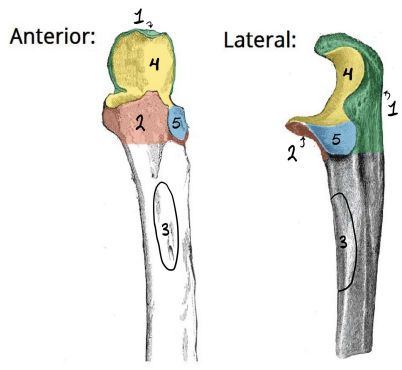
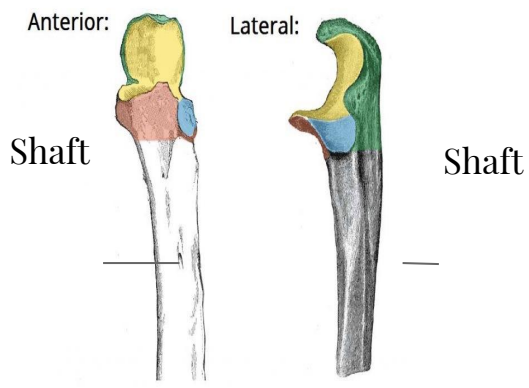
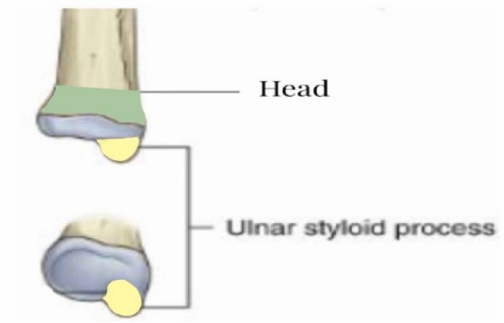
Function: 1) Attachment to muscles.
2) The Glenoid Cavity forms the socket of the shoulder to form glenohumeral joint

Three Processes	Three Borders	Three Angles	Two Surfaces
1- Spine **2- Acromion** **3- Coracoid.**	**1- Superior** **2- Medial** (Vertebral) **3- Lateral** (Axillary).	**1- Superior** **2- Lateral** (Forms the **Glenoid cavity**) **3- Inferior.**	**1- Convex posterior divided into:** **-Supraspinous Fossa:** (Above the spine) **-Infraspinous Fossa:** (Below the spine) **2- Concave Anterior** (Costal) **Subscapular fossa.**
			

Humerus: It's a typical **long bone**

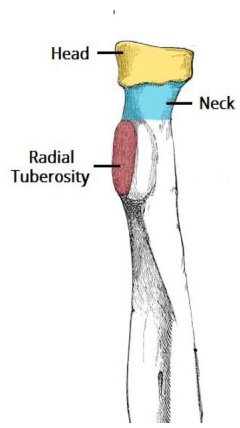
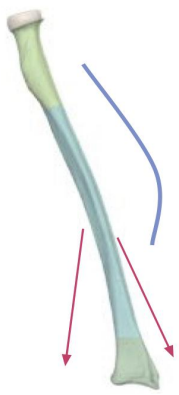
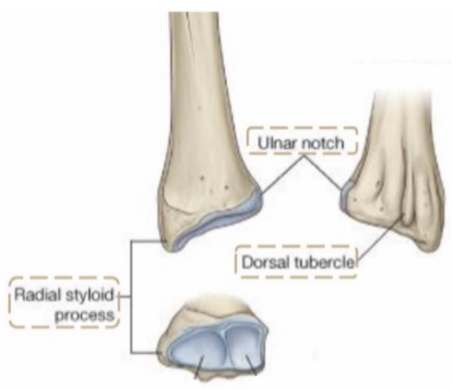
	Two Ends	Shaft (Body)
Proximal	**1- Head:** Articulates with the Scapula at the glenohumural joint. **2- Anatomical Neck:** Formed by a groove separating the head from the tubercles. **3- Surgical Nick:** A narrow part distal to the tubercles, common site of fracture and in contact with axillary nerve and post circumflex features. **4- Greater Tubercles** **5- Lesser Tubercles** **6- Intertubercular Groove.** 	It has two prominent features: 1- **Deltoid tuberosity** 2- **Spiral** (Radial) **groove** contains radial nerve. 
Distal	**Anteriorly** **Trochlea:** (medial) for articulation with Ulna. **Capitulum:** (lateral) for articulation with the Radius. **Coronoid fossa:** above the Trochlea. **Radial fossa:** above the the capitulum. **Posteriorly** **Olecranon fossa:** above the trochlea. **Medial epicondyle:** (can be left) **Lateral epicondyle** 	

Ulna :It is the stabilizing bone of the forearm and it is the medial & longer of two bones of the forearm

Proximal end	Shaft (body)	Distal end
1- olecranon process **2- Coronoid process** **3- Tuberosity of ulna** **4- Trochlear notch** **5-Radial notch**	Thick & cylindrical superiorly but diminishes in diameter inferiorly it has three surfaces • **Anterior** • **Medial** • **Posterior** Sharp Lateral Interosseous border (Lateral)	Small rounded 1- **Head** : lies distally at the wrist 2- **Styloid process** : medial *the articulation between the ulna & humerus at the elbow joint allows primarily only flexion & extension with small amount of adduction and abduction
		

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

Radius : It is the **shorter** and **lateral** of the two forearm bones

Proximal end	Shaft (body)	Distal end
1- **Head** ; small & circular. it's upper surface is concave for articulation with the capitulum. 2- **Neck** 3- **Radial (bicipital) tuberosity** ; medially directed and separates the proximal end from the body	• Has a **lateral convexity** • It **gradually enlarges** as it passes distally	• It is rectangular 1. **Ulnar Notch:** a medial concavity to accommodate the head of the ulna 2. **Radial Styloid Process:** extends from the lateral aspect 3. **Dorsal tubercle:** projects dorsally
		

Bones of the wrist and hand

1) Carpal bones

Composed of **eight short bones**

- Proximal row (from lateral to medial) ;
- **Scaphoid**, **Lunate**, **Triquetral** & **Pisiform** bones.

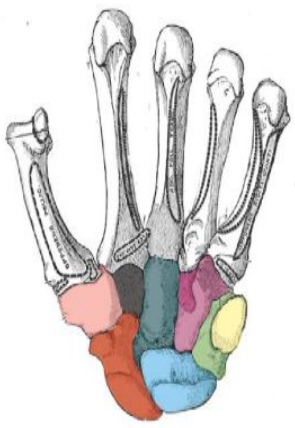
- Distal row (from lateral to medial) ;
- **Trapezium, Trapezoid, Capitate & Hamate**

2) Metacarpal bones

Five metacarpal bones, each has a base, shaft, and head

3) Phalanges bones

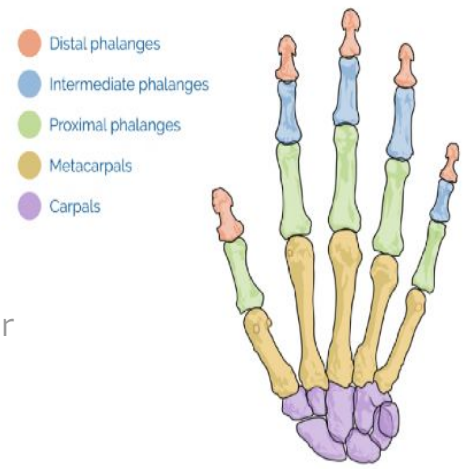
Fourteen each digit has three phalanges except the thumb which has only two



Don't forget we start from thumb always.

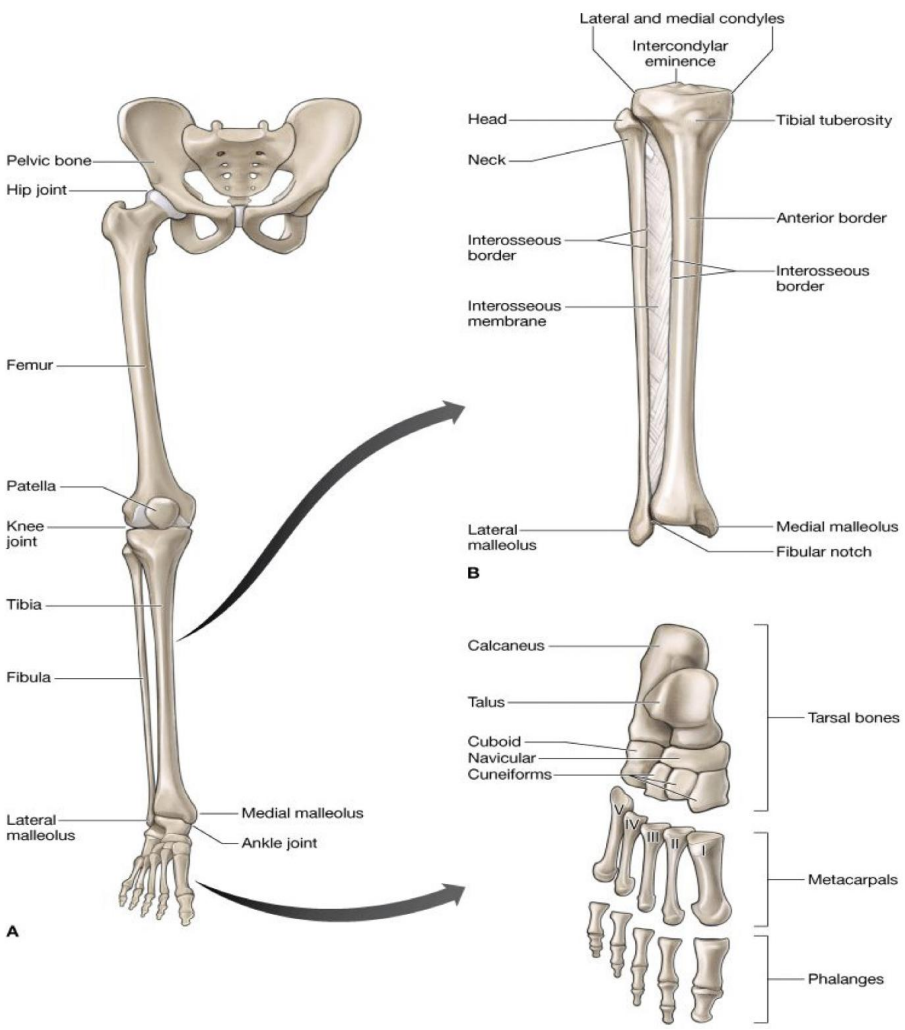
To help you memorize

- **S**ally **L**eft **T**he **P**arty **T**o **T**ake **C**athy **H**ome
- **S**he **L**ooks **T**oo **P**retty **T**ry **T**o **C**atch **H**er
- **S**am **L**ikes **T**o **P**ush **T**he **T**oy **C**ar **H**ard
- **S**ally **L**ikes **T**ea , **T**om **T**akes **C**heese **H**amburger
- سلوى لازم تلعب بوكر تكسب تخسر كله هلس



- To remember that the carpal bones are in the hand:
Drive a **Car** with your **Car**pals

The lower limbs :



The bones of Lower limbs are :

Pelvic Girdle: **Hip** bone & **Sacrum**

↓

Thigh: **Femur** & **Patella**

↓

Leg: **Tibia** & **Fibula**

↓

Ankle: **Tarsal** bone

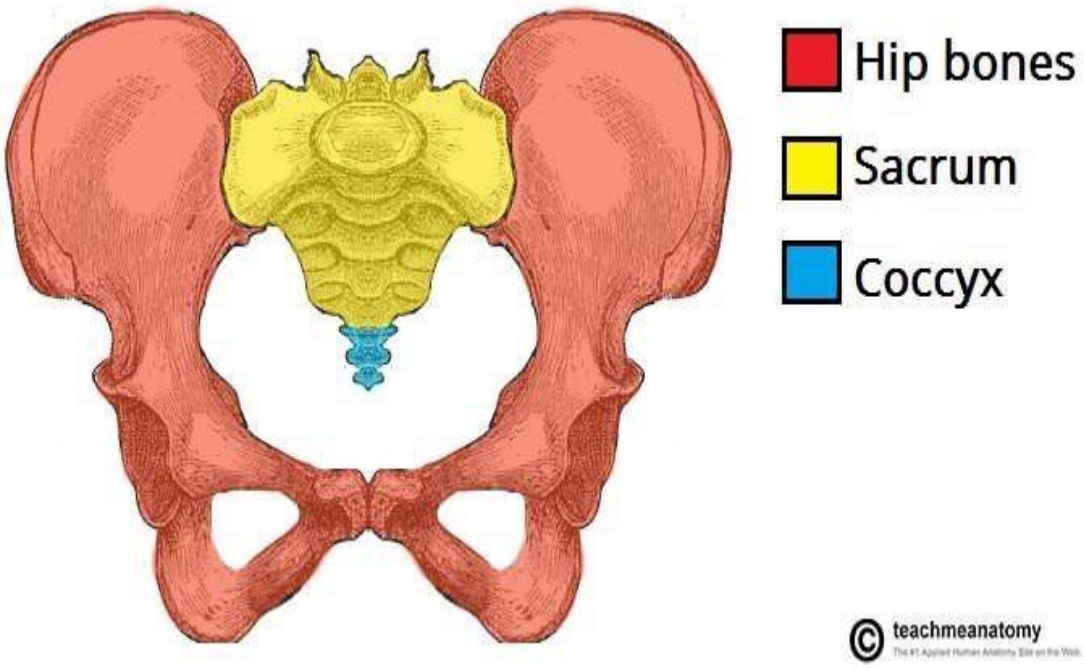
↓

Foot: **Metatarsal** & **Phalanges**

The bony pelvis:

Consists of the following:

- Two pelvic bones
- Sacrum
- Coccyx

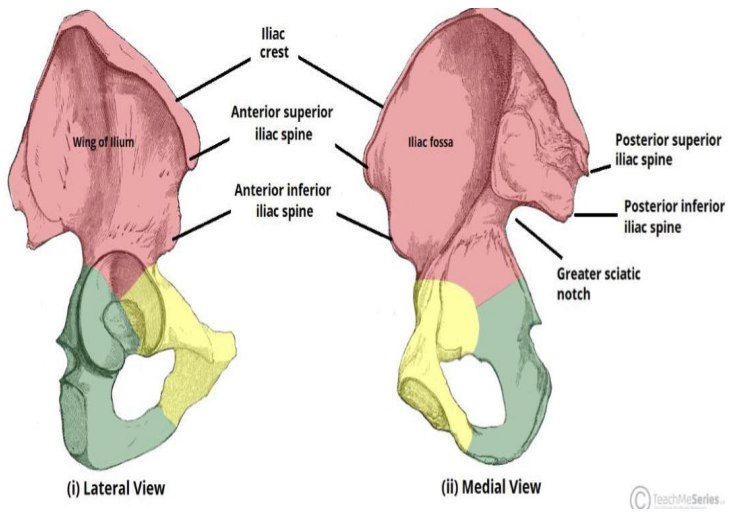


The hip bone

Composed of

Its comprised of three bones:

1-Ilium
2-pubis
3-Ischium

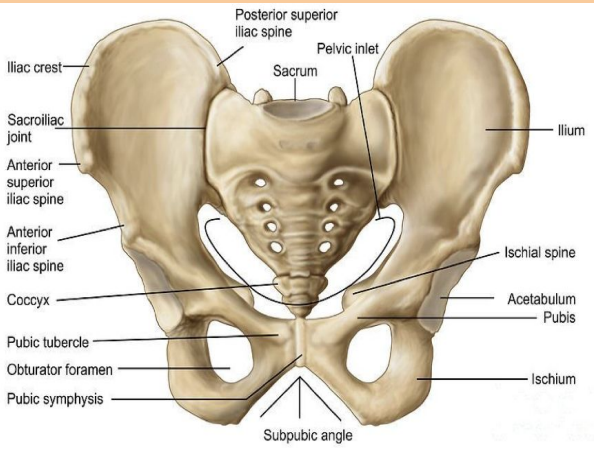


Articulates with

1-Sacroiliac joint
***Medial**

2-pubic symphysis
***between the two Pubic bones**

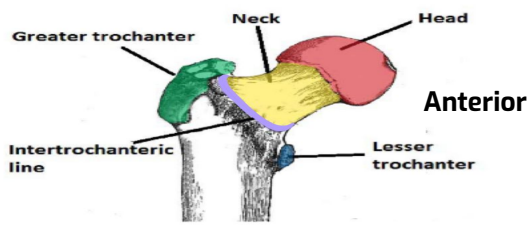
3-hip joint
***with the head of femur**

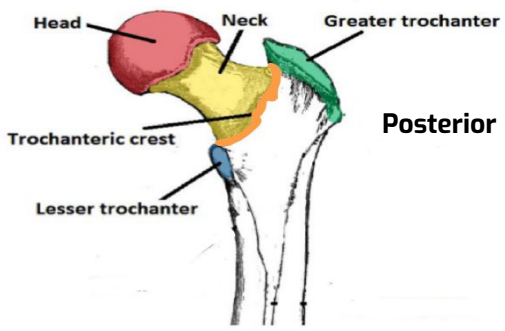


- **Femur :** - Articulates above with **acetabulum** of hip bone to form the **hip joint**.
  - Articulates below with **tibia and patella** to form the **knee joint**. ... Consists of:

Upper end

- **Head** : it articulates with acetabulum of hip bone to form hip joint.
- **Neck** : it connects head to the shaft **greater trochanters** & **lesser trochanters** .
- **Anteriorly**, connecting the 2 trochanters, the **intertrochanteric line** where the iliofemoral ligament attaches
- **Posteriorly**, the **intertrochanteric crest** on which is the quadrate tubercle (quadratus femoris muscle)





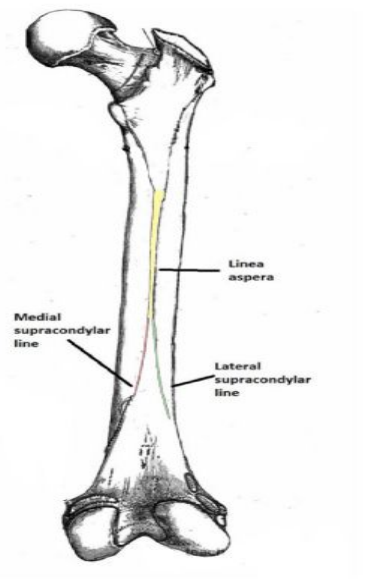
Shaft (body)

It has three surfaces:

- **Anterior**
- **Medial**
- **Lateral**

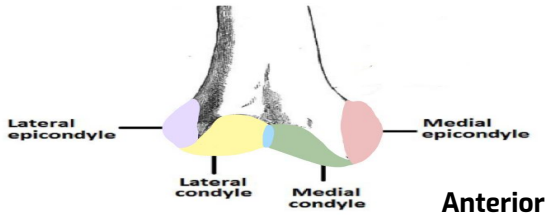
It has three borders:

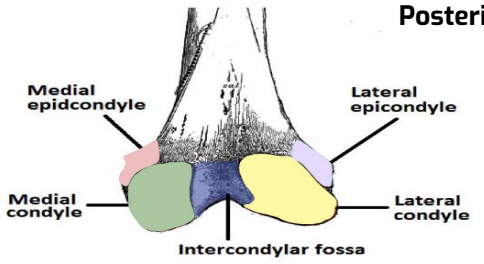
- Two rounded: **medial** and **lateral**
- One thick posterior border of ridge called **linea aspera**



Lower end

- Has **lateral condyles** and **medial condyles**, separated **anteriorly by articular patellar surface**, and **posteriorly by intercondylar notch or fossa**
- The two condyles take part in the knee joint.
- Above the condyles are the **medial epicondyles** & **lateral epicondyles**





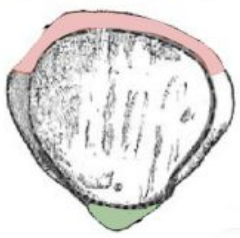
Patella

It's the largest **sesamoid** bone	It lies inside the **quadriceps tendon** in front of the **knee** joint	It's **anterior** surface is **rough** and **subcutaneous**	It's **posterior** surface articulates with the condyles of the femur to form the knee joint	It's **apex** lies inferiorly and is connected to the tuberosity of the tibia by **ligamentum patellae**	It's **upper, lateral** and **medial** margins gives attachments to **quadriceps femoris** muscle

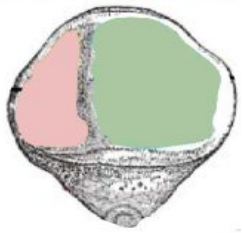
Functions of patella:

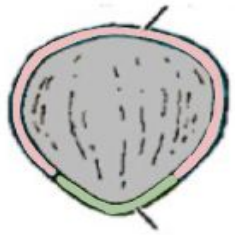
- To obviate wear and attrition on the quadriceps tendon
- To increase the angle of the pull of the quadriceps femoris thereby magnifying its power

i) Anterior Surface



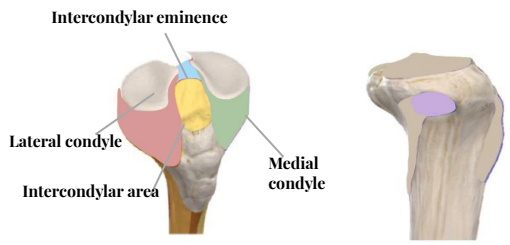
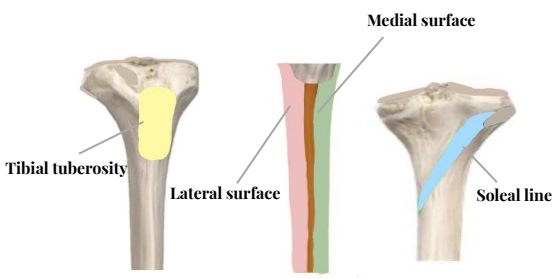
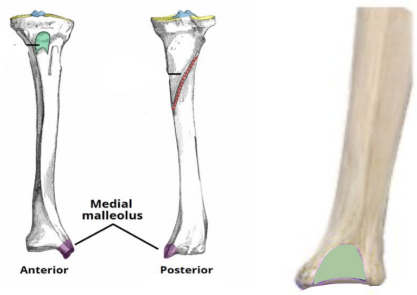
ii) Posterior Surface





Bones of leg (Tibia and Fibula): Each of them has upper end, shaft, and lower end.

1)Tibia : It is the medial bone of leg.

Upper end	Shaft (body)	Lower end
• **Medial condyle**: is larger and articulate with medial condyle of femur. It has a groove on its posterior surface for semimembranosus muscle. • **Lateral condyle**: is smaller and articulates with lateral condyle of femur. • it has **facet on its lateral** side for articulation with head of fibula to form proximal tibiofibular joint. • **Intercondylar area**: is rough and has **intercondylar eminence**	**Tibial tuberosity** • Its upper smooth part gives attachment to ligamentum patellae. • Its lower rough part is subcutaneous. **It has three borders** • **Anterior** border (sharp and subcutaneous) • **Medial** border. • **Lateral** border interosseous border). **It has three surfaces** • **Medial** (subcutaneous) • **Lateral** • **Posterior** (has oblique line, **soleal line** for attachment of soleus line)	• Articulates with talus for formation of ankle joint. • **Medial malleolus:** - its medial surface is subcutaneous. - Its lateral surface articulate with talus. • **Fibular notch:** lies on its lateral surface of lower end to form distal tibiofibular joint.
		

2)Fibula: It is the lateral bone of leg .

It is the slender lateral bone of the leg
It takes no part in articulation of knee joint

Proximal end	Shaft (body)	Distal end
1- **Head**: articulates with lateral condyle of tibia 2- **Apex of the head (STYLOID PROCESS)** 3- **Neck**	• **4 borders:** it's medial **interosseous border** gives attachment to interosseous membrane • 4 surfaces.	• **Lateral malleolus:** It's subcutaneous, it's medial surface is smooth for articulation with talus to form ankle joints • **Malleolus Groove**
		

Bones of the Ankle and Foot

7 Tarsal Bones

1. **Calcaneum**

2. **Talus**

3. **Navicular:** Boat shaped between the talus and the 3 cuneiformes

4. **Cuboid:** serves as keystone of the lateral longitudinal arch

5. **Medial cuneiform**
6. **Intermediate cuneiform**
7. **Lateral cuneiform**

5 Metatarsal Bones

- They are numbered from medial (big toe) to lateral.

- 1st metatarsal bone is large and lies medially.

- Each metatarsal bone has: a base (proximal), a shaft, and a head (distal).

14 Phalanges

2 phalanges for the big toe (proximal & distal)

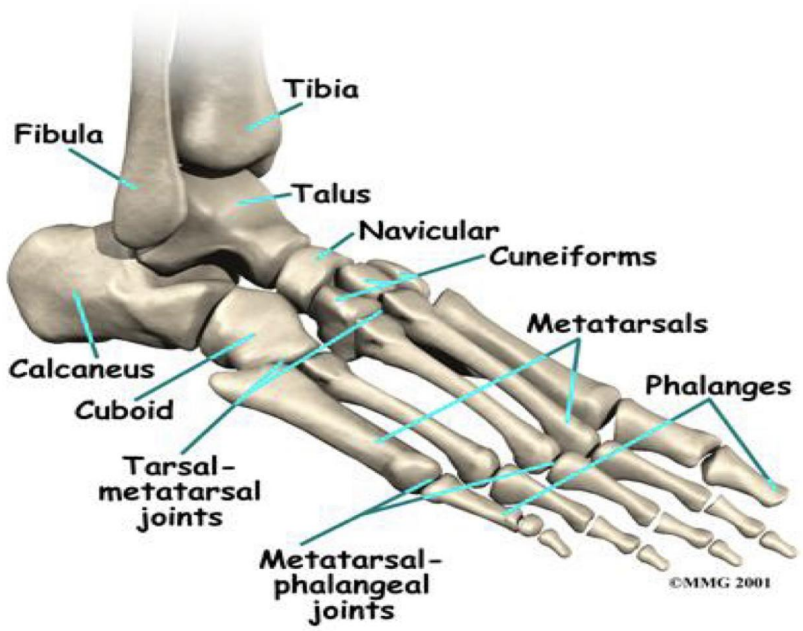
3 phalanges for each of the lateral 4 toes (proximal, middle, and distal).

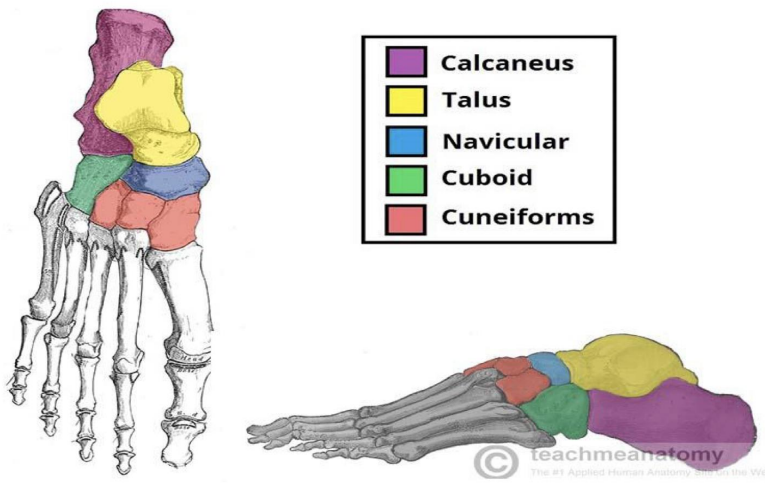
- Only **Talus** articulates with the tibia & fibula at ankle joint with no muscle attachment
  - The only bone in the body that's not attached to a muscle
  - Transmit weight from the tibia to the foot
  - Has head neck and body

- **Calcaneum** is the largest bone of the foot, it forms the heel

Cute Tigers Need Milc

Cute : calcaneum
Tigers : talus
Need : navicular
Milc : M (medial cuneiform) , I (intermediate cuneiform)
L (lateral cuneiform) , C (cuboid)





MCQs

Q1: which one of these has no medullary ?

A) Scapula
B) Ulna
C) Radius
D) Clavicle

Q2: Scapula extends between the ?

A) 2nd and 7th ribs
B) 1st and 5th ribs
C) 2nd and 10th
D) 3rd and 7th ribs

Q3: Which one of the distal end of humerus helps in articulation with radius ?

A) Trochlea
B) Capitulum
C) Radial fossa
D) Olecranon fossa

Q4: the most common place of fractures in humerus is ?

A) Head
B) Medial epicondyle
C) Trochlea
D) Surgical neck

Q5: The shortest bone of the forearm is ?

A) Humerus
B) Radius
C) Ulna
D) Tibia

Q6: The medial bone of the forearm is ?

A) Ulna
B) Radius
C) Humerus
D) Femur

Q7: The shape of the distal end of the radius is ?

A) Rounded
B) Flat
C) Triangular
D) Rectangular

Q8: Which one of the following form the fingers ?

A) Carpals
B) Metacarpals
C) Phalanges
D) Tarsals

Q9: A thick border found posteriorly in the femur ?

A) Linea aspera
B) Medial border
C) Axillary border
D) Medial styloid

Q10: The lateral bone of the leg is ?

A) Tibia
B) Fibula
C) Femur
D) Radius

Q11: Sharp and subcutaneous border found in the tibia ?

A) Medial border
B) Lateral border
C) Anterior border
D) posterior border

Q12: Apex of the patella lies inferiorly and is connected to the tuberosity of the tibia by ?

A) Ligamentum patellae
B) Quadriceps femoris
C) Anterior surface
D) posterior surface

Check out our MQ TEAM QUESTIONS!
Click here

1) D
2) A
3) B
4) D
5) B
6) A

7) D
8) C
9) A
10) B
11) C
12) A

SAQs:

Q1: what part of the hip articulates with the head of femur?

Q2: What separates the greater trochanter from the lesser trochanter ANTERIORLY?

Q3: The clavicle articulates inferiorly with?

Q4: Name the three processes of scapula

Q5: the trochlea of the humerus is located in the distal part of the humerus and articulates with?

Q6: which one of the tarsals articulates with the tibia and fibula to form the ankle joint

6) Talus

1) Acetabulum
2) intertrochanteric line and its where the iliofemoral ligament join
3) The costoclavicular joint (with 1st rib)
4) Spine, acromion and coracoid processes
5) The ulna at the trochlear notch

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SPECIAL THANKS TO THE AMAZING
#MED438 ANATOMY TEAM