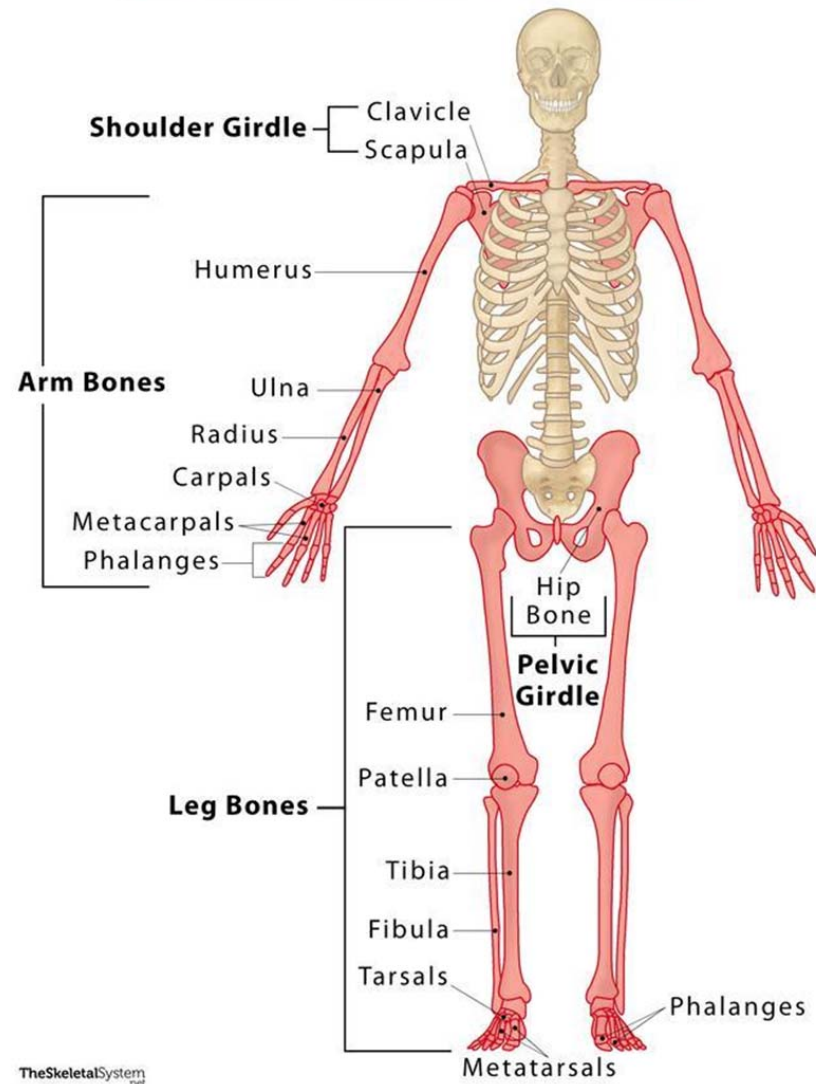


Appendicular Skeleton

Asst. Lec. Safa Jalil Al-Yassiri

Appendicular skeleton

*Department of occupational Therapy
Techniques*



Appendicular Skeleton

The appendicular skeleton consists of:

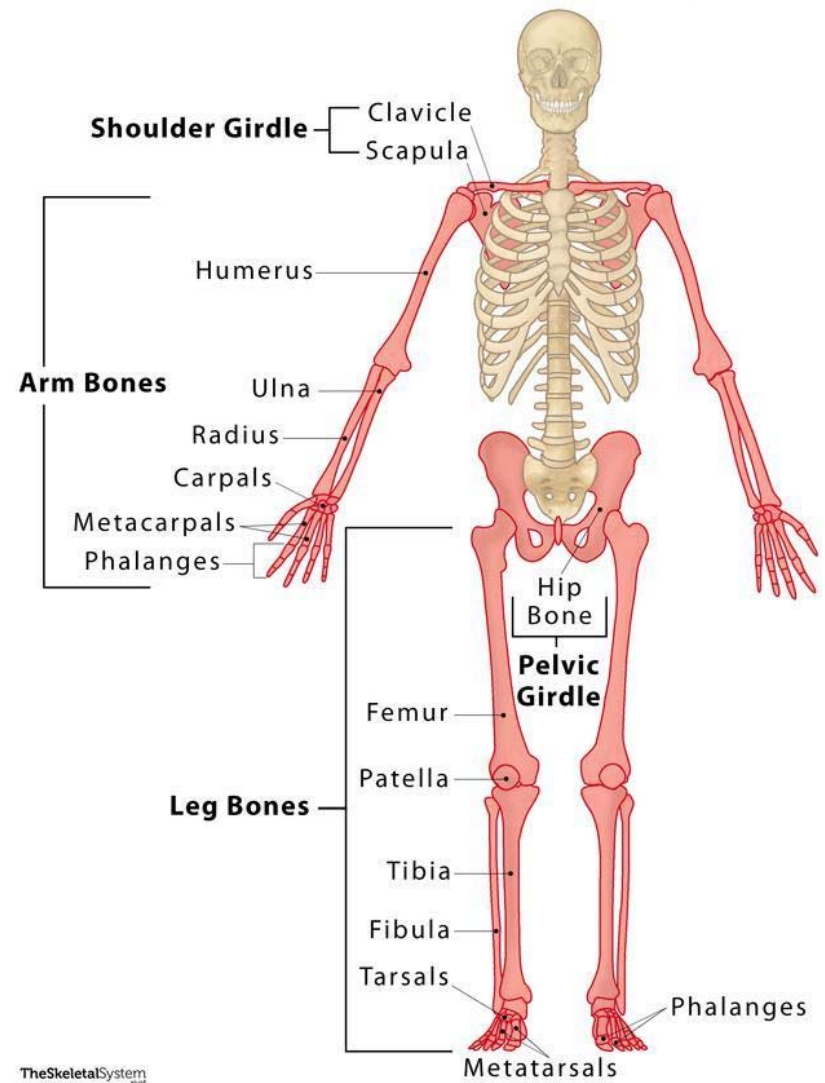
- ❑ The Shoulder girdle or pectoral with the upper limbs.
- ❑ The pelvic girdle with the lower limbs.

Each Shoulder girdle consists of:

- 1 clavicle
- 1 scapula.

Each upper limb consists of 30 bones:

- 1 humerus
- 1 radius and 1 ulna
- 8 carpal bones
- 5 metacarpal bones
- 14 phalanges.



❑ **The scapula or shoulder blade:** is a large, triangular, flat bone situated in the superior part of the posterior thorax between the levels of the second and seventh ribs.

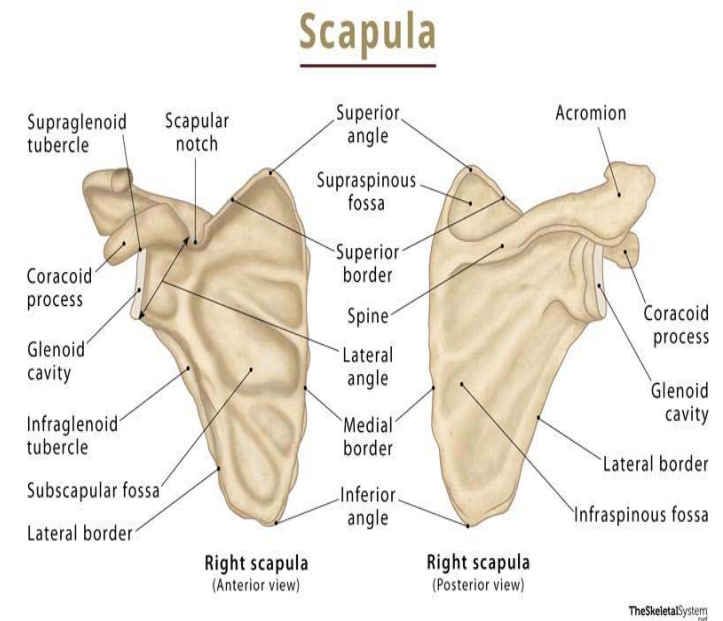
❑ A prominent ridge called the spine runs across the posterior surface of the scapula, the lateral end of the spine projects as a flattened, expanded process called **the acromion** articulates with the clavicle at the acromioclavicular joint

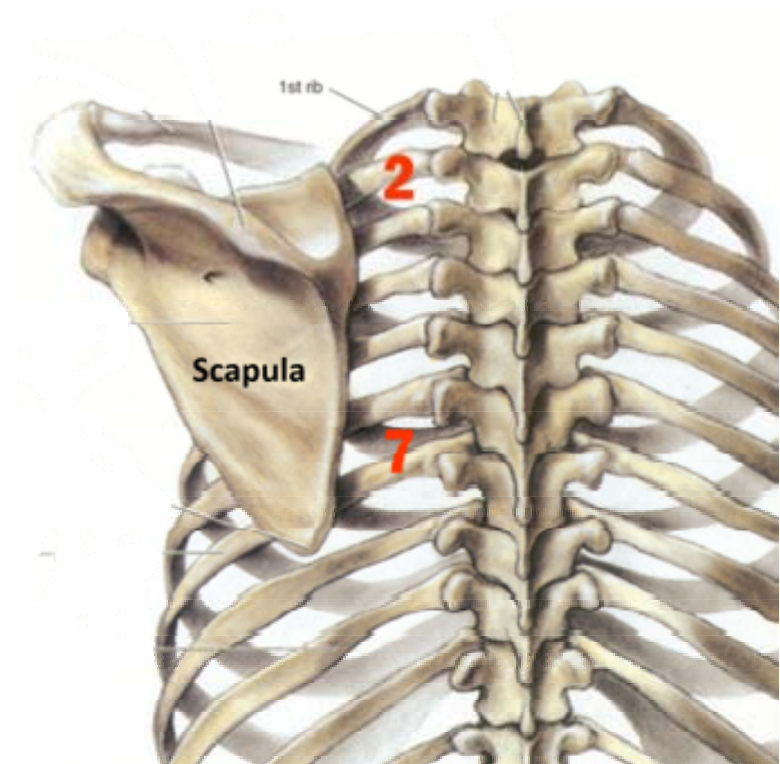
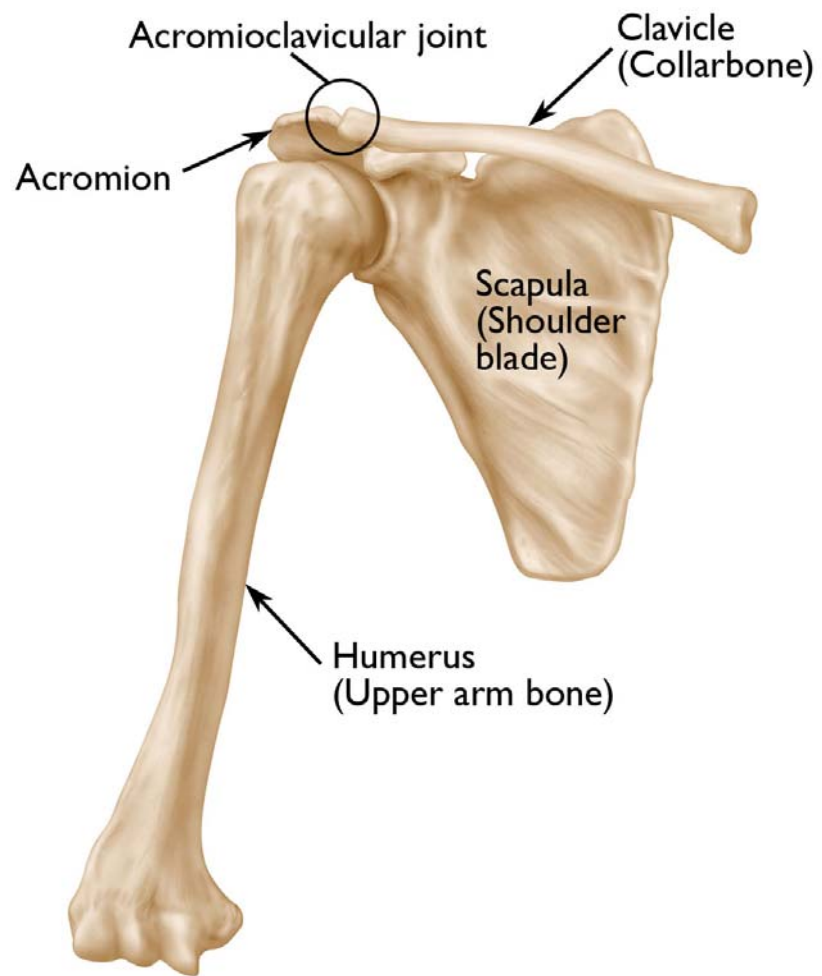
❑ Inferior to the acromion is a shallow depression, **the glenoid cavity**, that accepts the head of the humerus (arm bone) to form the glenohumeral (shoulder) joint.

❑ At the lateral end of the superior border of the scapula is a projection of the anterior surface called **the coracoid process**, to which the tendons of muscles (pectoralis minor, coracobrachialis, and biceps brachii) and ligaments (coracoacromial, conoid and trapezoid) attach.

❑ the posterior surface of the scapula are two fossae: The supraspinous and infraspinous fossa is a surface of attachment for muscle of the shoulder.

❑ On the anterior surface of the scapula is a slightly hollowed out area called the subscapular fossa, a surface of attachment for the subscapularis muscle





❑ Clavicle or collarbone:

- ❑ The clavicle or collarbone is an S-shaped bone lies horizontally across the anterior part of the thorax superior to the first rib.

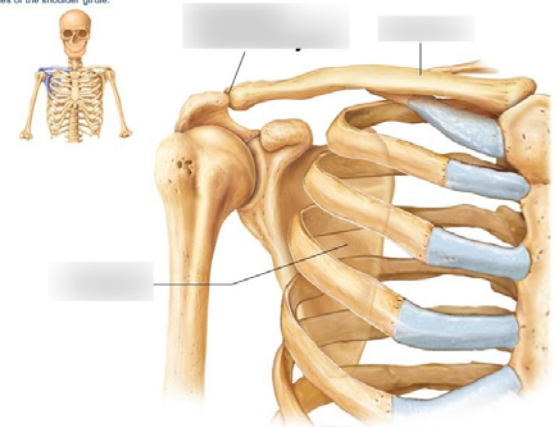
The clavicle has three functions:

- ❖ transmit forces from the upper limb to the axial skeleton
- ❖ act as a strut holding the arm free from the trunk, to hang supported principally by trapezius
- ❖ provide attachment for muscles.

- ❑ **The medial end: called the sternal end**, is rounded and articulates with the manubrium of the sternum to form the sternoclavicular joint.

- ❑ **The lateral end: called the acromial end** articulates with the acromion of the scapula to form the acromioclavicular joint.

Figure 5.23a Bones of the shoulder girdle.



(a) Articulated right shoulder (pectoral) girdle showing the relationship to bones of the thorax and sternum

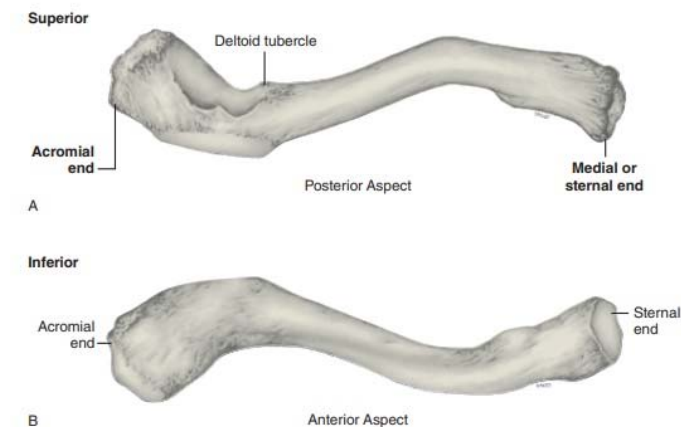


FIGURE 7-27 Right clavicle.

Upper Limb (Extremity):

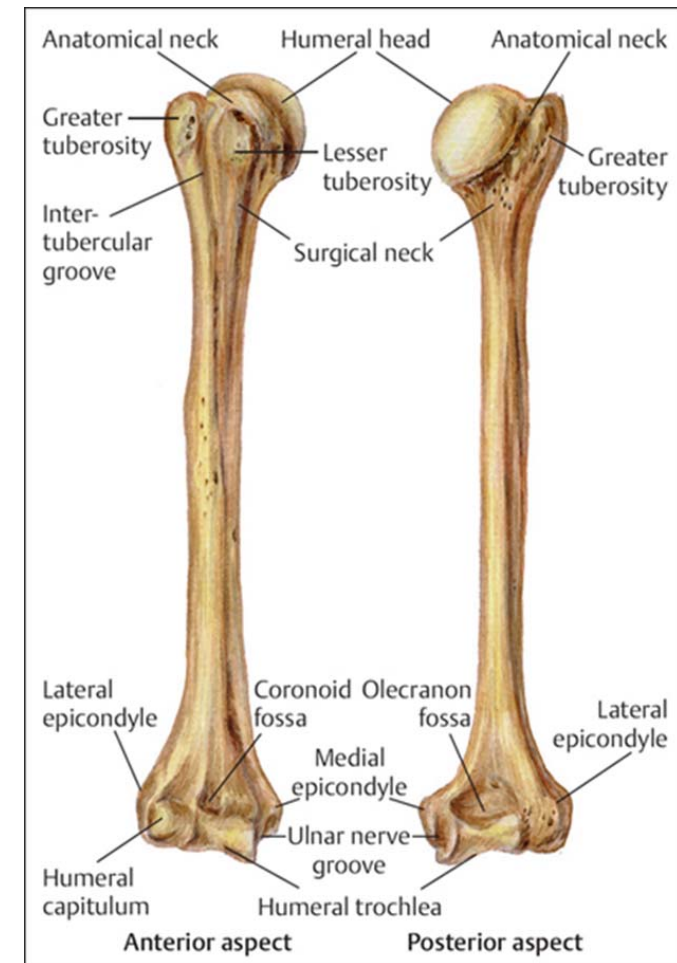
Humerus or arm bone: is the longest and largest bone of the upper limb.

The proximal end of the humerus features:

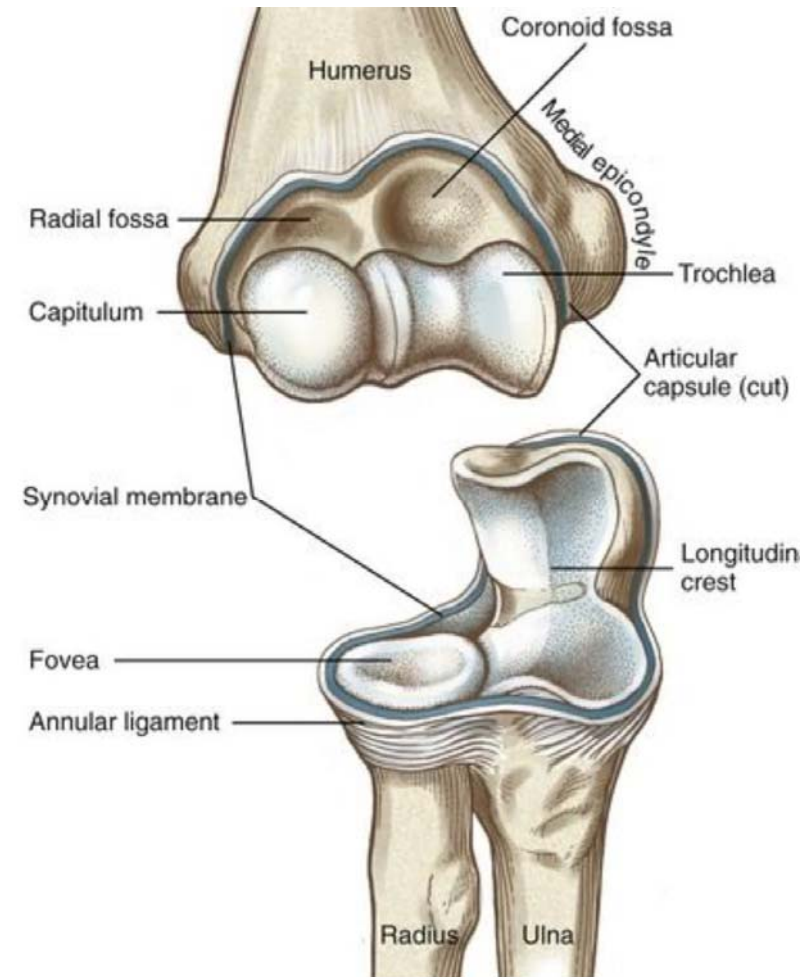
- ❑ A rounded head that articulates with the glenoid cavity of the scapula to form the glenohumeral (shoulder) joint.
- ❑ Distal to the head is the anatomical neck, which is visible as an oblique groove.
- ❑ There are two roughened projections of bone, the greater and lesser tubercles, and between them there is a deep groove, the bicipital groove or intertubercular sulcus, occupied by one of the tendons of the biceps muscle.
- ❑ The surgical neck is a constriction in the humerus just distal to the tubercles, where the head tapers to the shaft, it is so named because fractures often occur here.
- ❑ The distal end of the bone presents two surfaces that articulate with the radius and ulna to form the elbow joint.

The distal end of the humerus features:

- ❑ the rounded capitulum laterally that articulates with the head of the radius, and the spool-shaped trochlea medially, articulating with the trochlear notch of the ulna.
- ❑ The radial fossa is an anterior depression above the capitulum that articulates with the head of the radius when the forearm is flexed (bent)



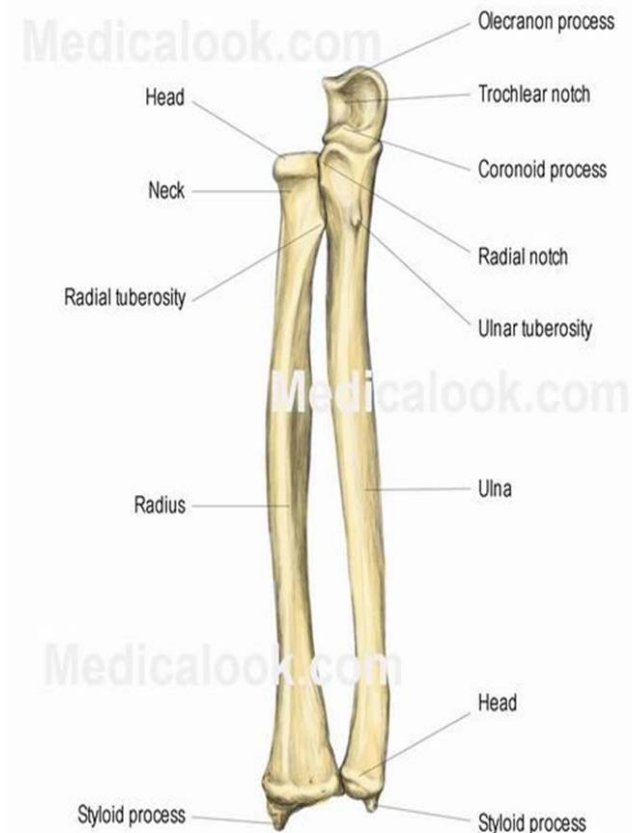
- ❑ The coronoid fossa is an anterior depression that receives the coronoid process of the ulna when the forearm is flexed.
- ❑ The olecranon fossa is a large posterior depression that receives the olecranon of the ulna when the forearm is extended (straightened).
- ❑ the medial epicondyle and lateral epicondyle are rough projections on either side of the distal end of the humerus to which the tendons of most muscles of the forearm are attached.
- ❑ Three important nerves thus come into close contact with the humerus the axillary, the radial and the ulnar; they may be damaged, respectively, in fractures of the humeral neck, midshaft and lower end.



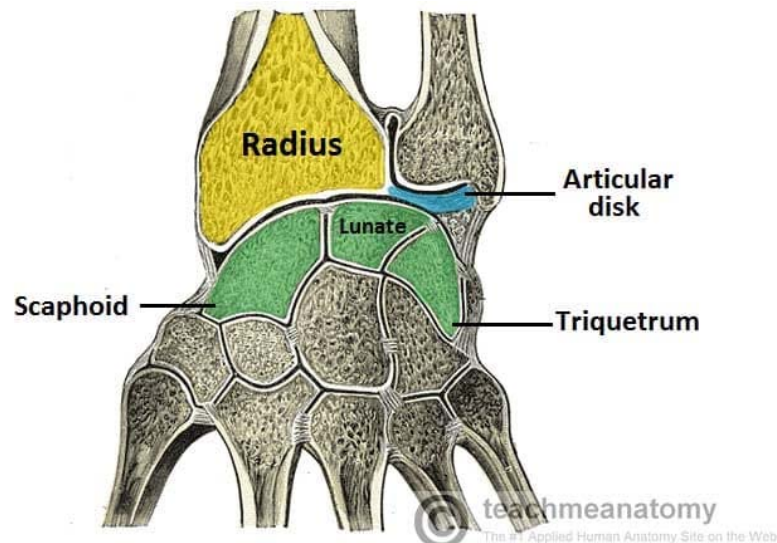
Radius and Ulna: are the two bones of the forearm. They articulate:

- ❖ With the humerus at the elbow joint.
- ❖ With the carpal bones at the wrist joint.

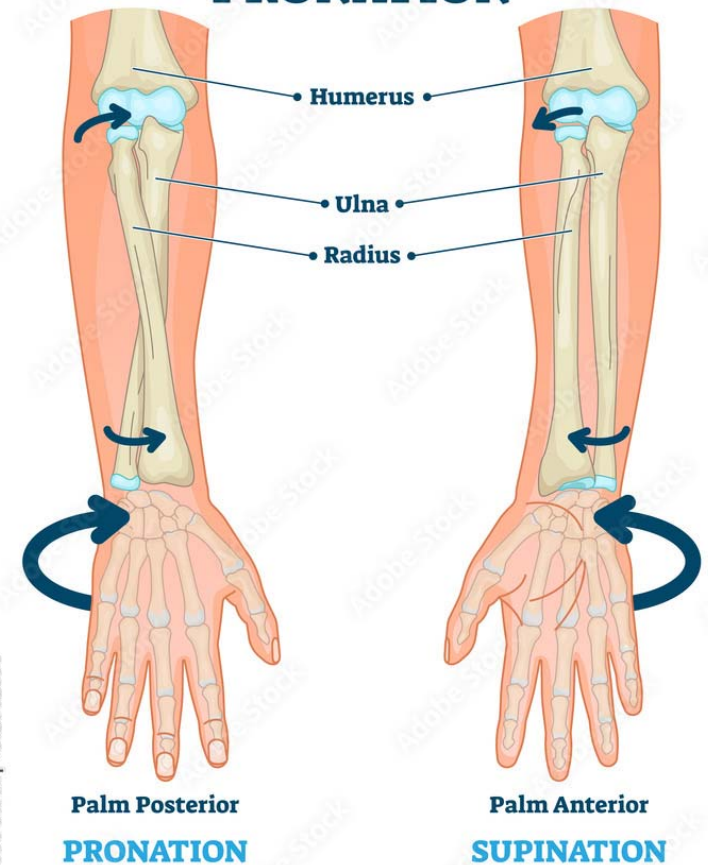
- ❑ The radius consists of the head, neck, shaft (with its radial tuberosity) and expanded distal end.
- ❑ The ulna comprises olecranon, trochlear fossa, coronoid process (with its radial notch for articulation with the radial head), shaft and small distal head, which articulates with the medial side of the distal end of the radius at the inferior radio-ulnar joint.
- ❑ **The distal end of the ulna** consists of a head that **is separated from the wrist by a disc of fibrocartilage**.
- ❑ A styloid process is located on the posterior side of the radius and ulna distal end. It provides attachment for the collateral ligament to the wrist.



- ❑ In pronation and supination, the head of the radius rotates against the radial notch of the ulna, the shaft of the radius swings round the relatively fixed ulnar shaft (the two bones being connected by a fibrous interosseous ligament) and the distal end of the radius rotates against the head of the ulna. This axis of rotation passes from the radial head proximally to the ulnar head distally.



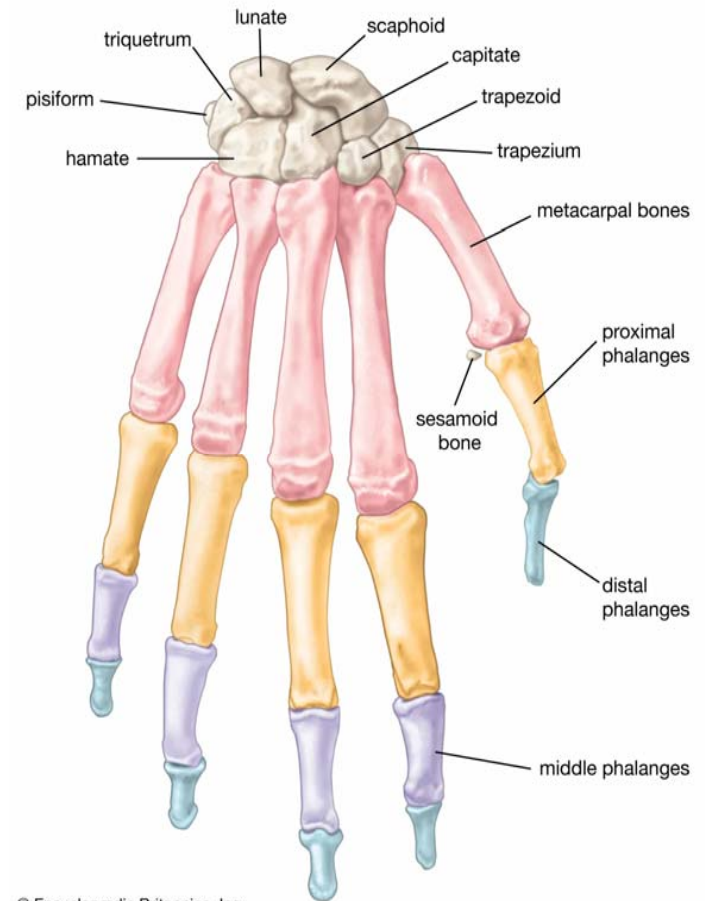
ARM SUPINATION AND PRONATION



Carpal or wrist bones:

The carpus is the proximal region of the hand made up of two rows each containing four bones, from the lateral to the medial side:

- In the proximal row, are the **scaphoid, lunate, triquetral and pisiform**
 - In the distal row, are the **trapezium, trapezoid, capitate and hamate.**
-
- These bones are closely fitted together and held in position by ligaments which allow a certain amount of movement between them.



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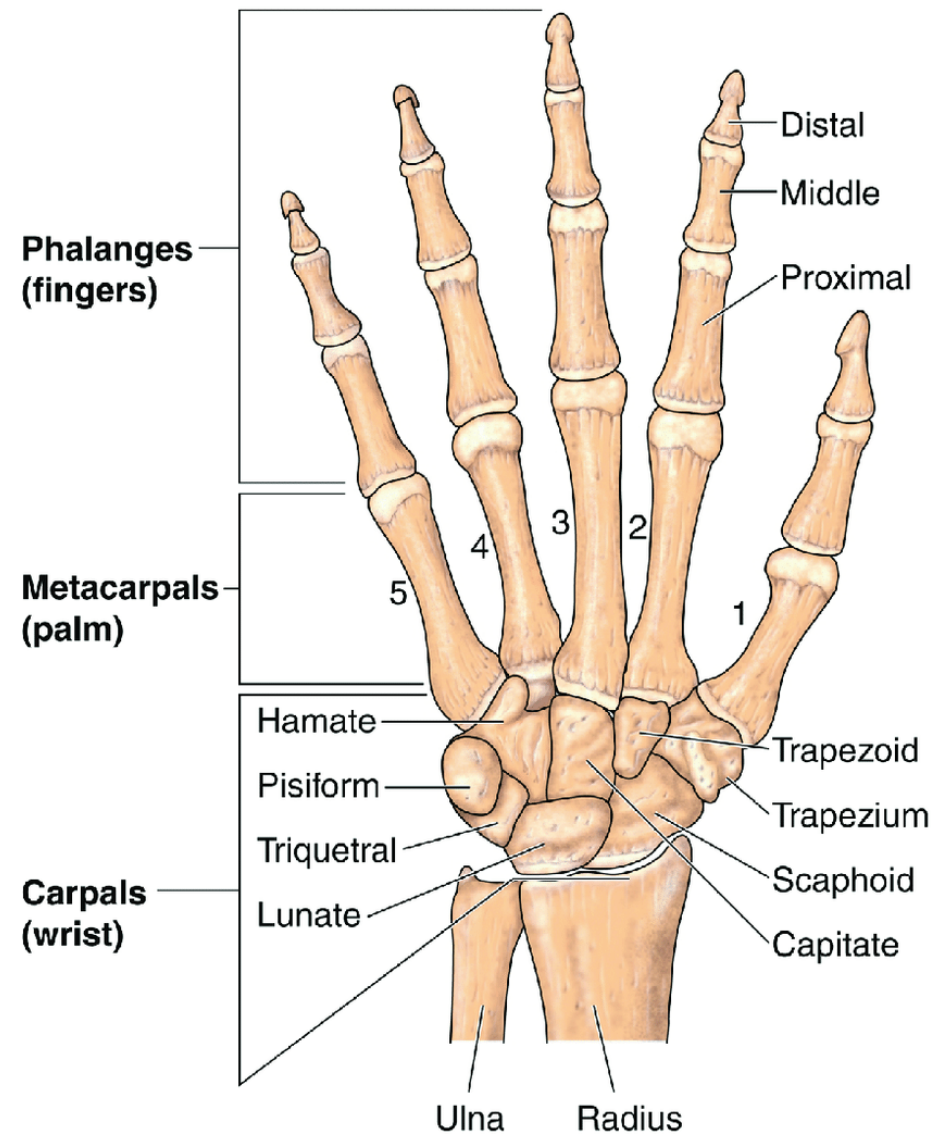
Metacarpal bones or the bones of the hand:

The five bones of the palm of the hand. The proximal ends articulate with the carpal bones and the distal ends with the phalanges.

All of the joints formed by the carpals and metacarpals make the hand very flexible at the wrist, but the thumb is more movable than the fingers because of its carpometacarpal joint.

Phalanges or finger bones:

There are 14 phalanges, three in each finger and two in the thumb. They articulate with the metacarpal bones and with each other.

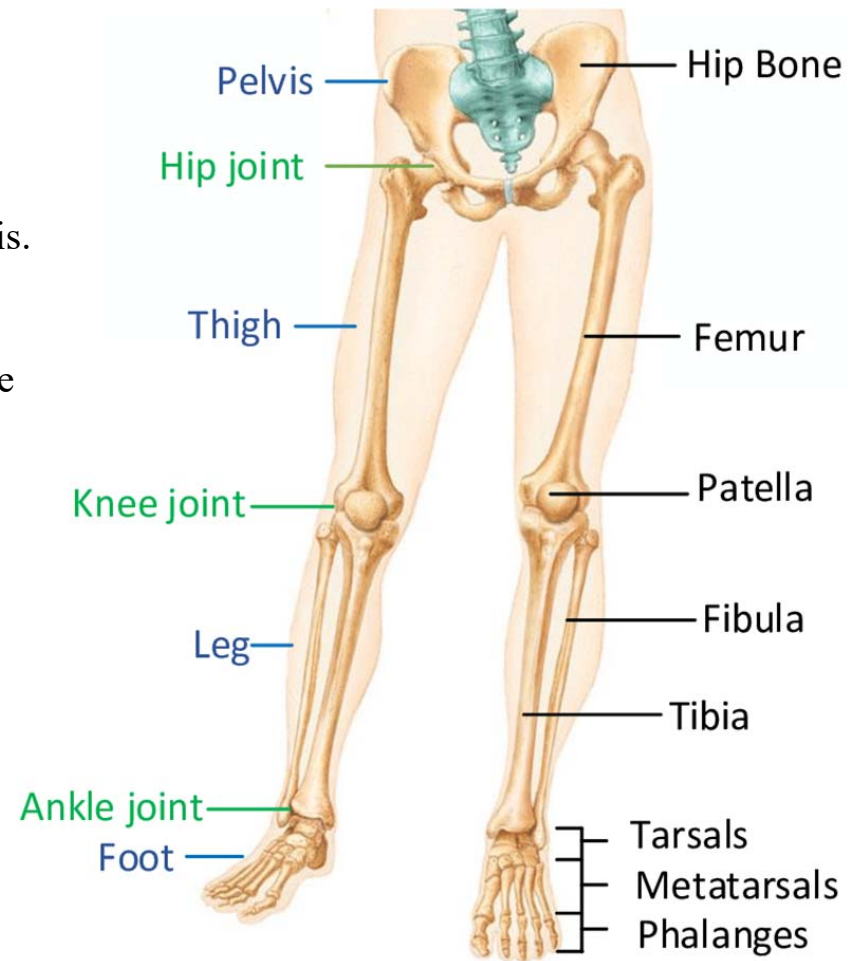


Pelvic girdle and lower limb:

- The pelvic girdle consists of two hip bones (os coxa or innominate bones), which articulate with the axial skeleton at the sacrum.
- The hip bones unite anteriorly at a joint called the pubic symphysis. They unite posteriorly with the sacrum at the sacroiliac joints.
- The pelvis is made up of the innominate bones, the sacrum and the coccyx, bound to each other by dense ligaments

Each lower limb (lower extremity) has 30 bones :

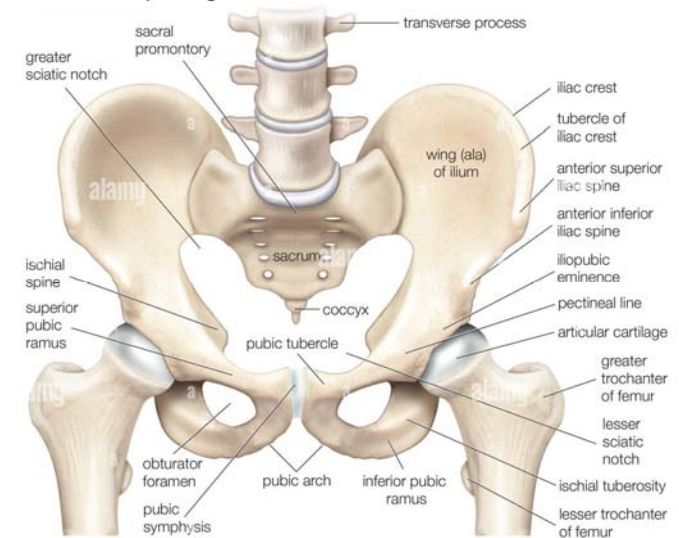
- ☐ The femur
- ☐ The patella (kneecap)
- ☐ The tibia and fibula in the leg.
- ☐ 7 tarsals in the (ankle).
- ☐ 5 metatarsals in the metatarsus.
- ☐ 14 phalanges (bones of the digits) in the foot



The functions of the pelvis:

- ❑ It protects the pelvic viscera.
- ❑ supports the weight of the body which is transmitted through the vertebrae, thence through the sacrum, across the sacroiliac joints to the innominate bones and then to the femora in the standing position or to the ischial tuberosities when sitting.
- ❑ The pelvis provides attachments for muscles.
- ❑ In the female it provides bony support for the birth canal
- ❑ The pelvic girdle of the bony pelvis also connects the bones of the lower limbs to the axial skeleton

Bones of the pelvic girdle



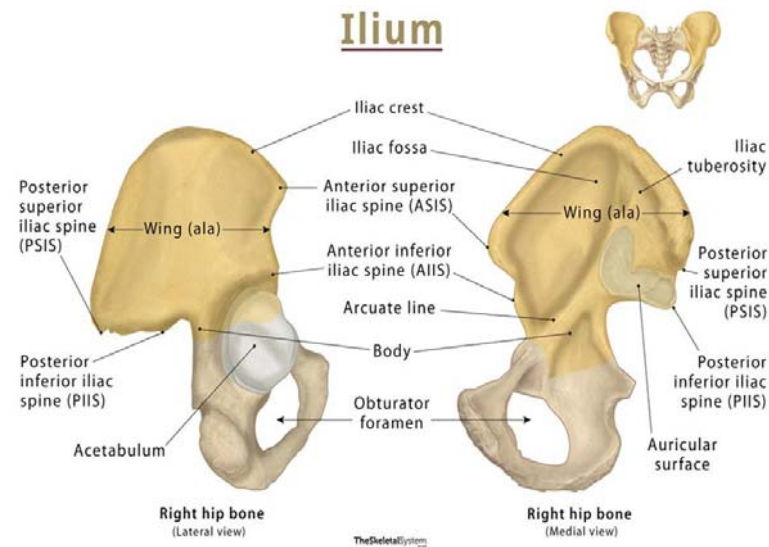
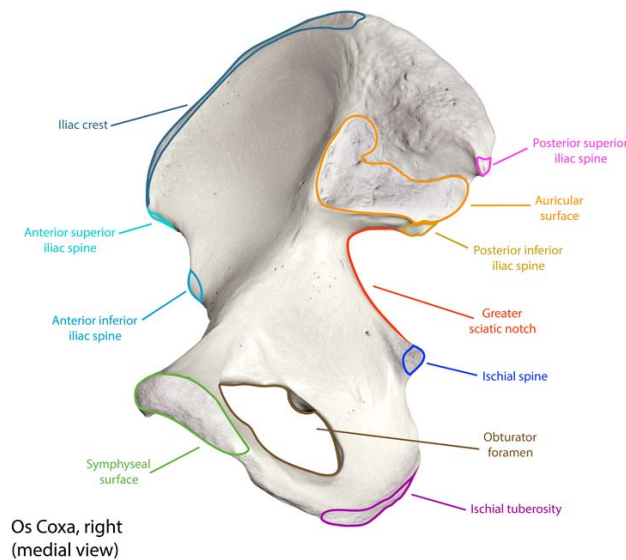
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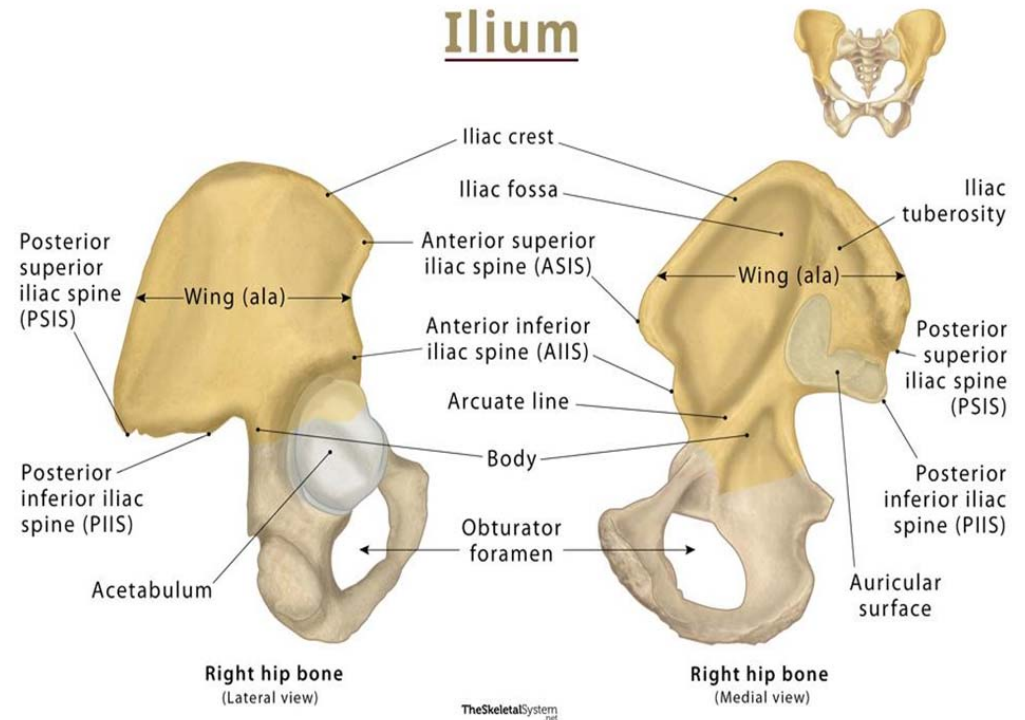
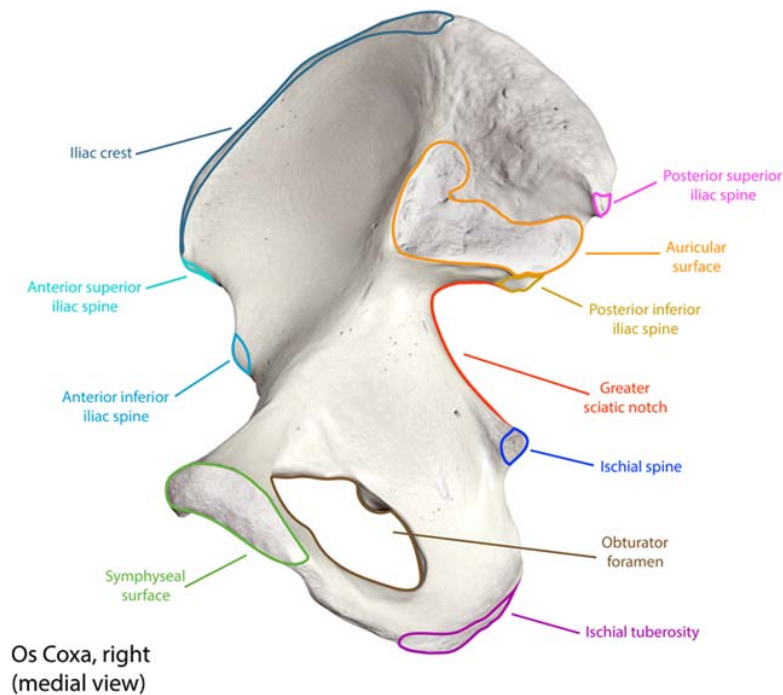
The os innominatum: consisting of three fused bones: the **ilium**, the **ischium**, and the **pubis**.

Ilium: the largest of the three components of the hip bone

- ❑ Is composed of a superior ala (wing) and an inferior body. The body is one of the components of the acetabulum, the socket for the head of the femur.
 - ❑ Iliac crest. The iliac crest ends:
 - Anteriorly in an anterior superior iliac spine and anterior inferior iliac spine.
 - Posteriorly, the iliac crest ends in a posterior superior iliac spine and posterior inferior iliac spine.
- The spines serve as points of attachment for the tendons of the muscles of the trunk, hip, and thighs.



- ❑ Greater sciatic notch , through which the sciatic nerve (the longest nerve in the body) passes, along with other nerve and muscles.
- ❑ The medial surface of the ilium contains the iliac fossa, a concavity where the tendon of the iliacus muscle attaches.
- ❑ Posterior to this fossa are the iliac tuberosity, a point of attachment for the sacroiliac ligament.
- ❑ the auricular surface, which articulates with the sacrum to form the sacroiliac joint.



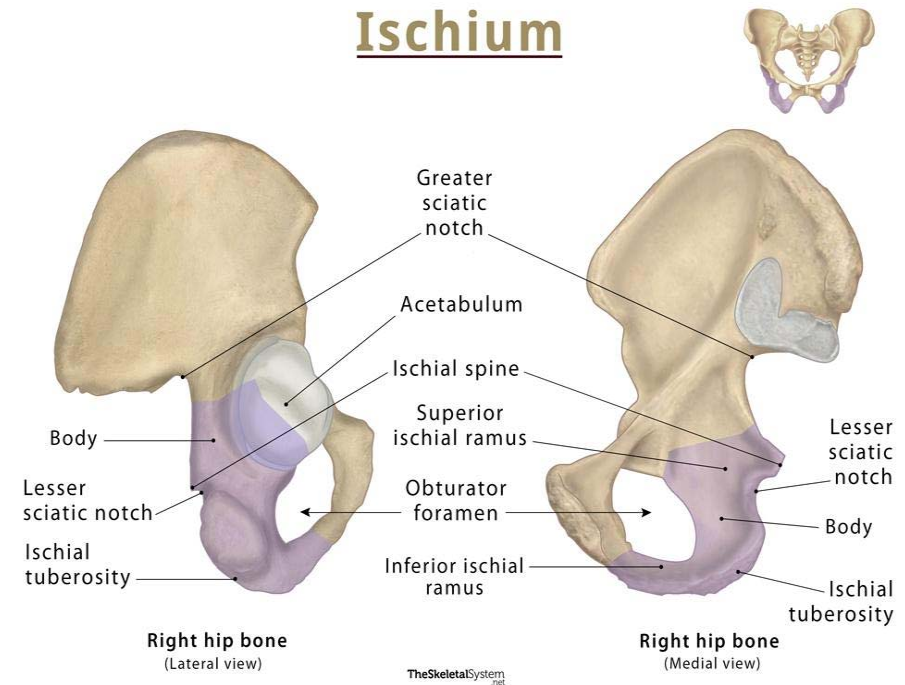
Ischium:

The ischium, the inferior, posterior portion of the hip bone, comprises a superior body and an inferior ramus .

The ramus is the portion of the ischium that fuses with the pubis.

Features of the ischium: include

- ☐ the prominent ischial spine.
- ☐ lesser sciatic notch below the spine,
- ☐ **rough and thickened ischial tuberosity**. Because this prominent tuberosity is just deep to the skin, it commonly begins hurting after a relatively short time when you sit on a hard surface.

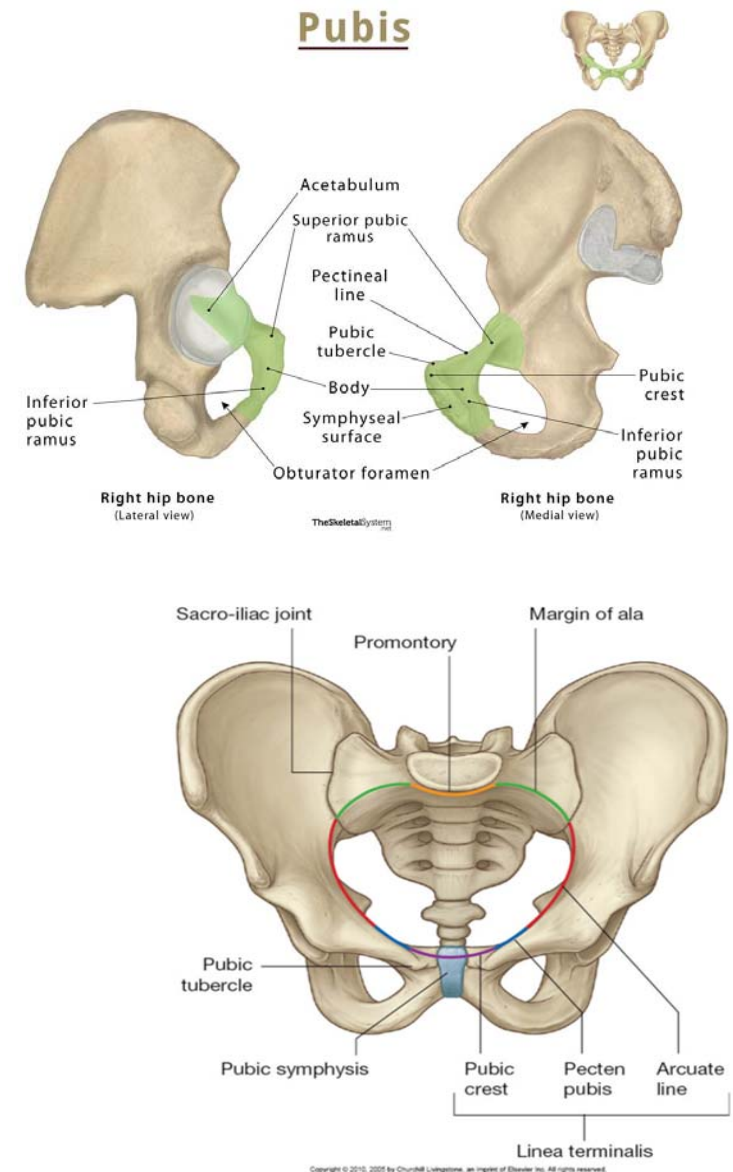


- ☐ Together, the ramus and the pubis surround the obturator foramen. The foramen is so named because, even though blood vessels and nerves pass through it, it is nearly completely closed by the fibrous obturator membrane.

Pubis:

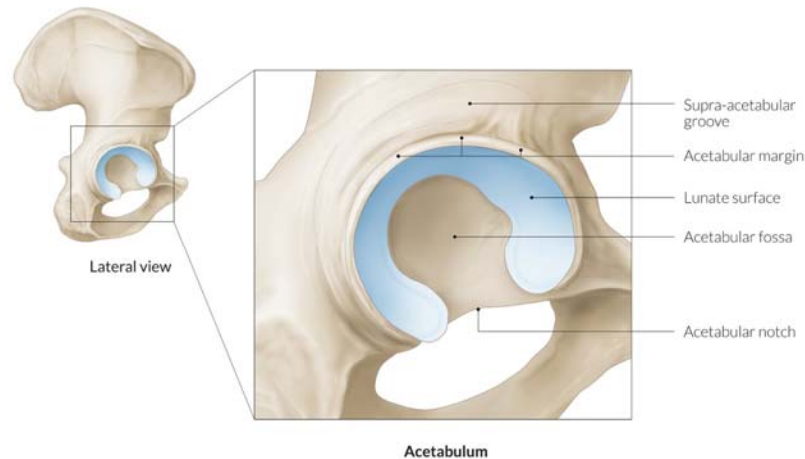
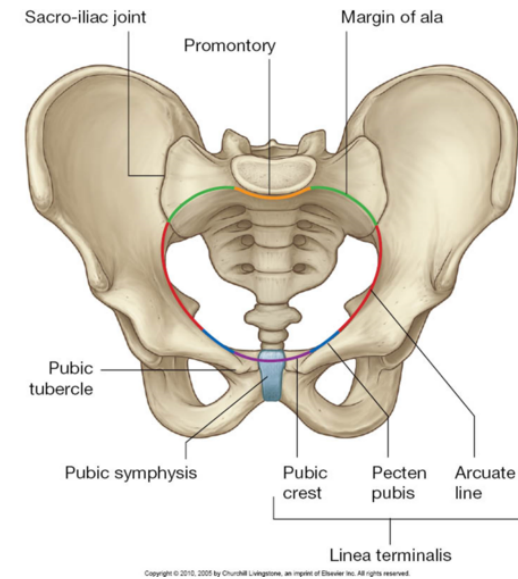
The pubis, meaning pubic bone, is the anterior and inferior part of the hip bone.

- ❑ A superior ramus, an inferior ramus, and a body between the rami make up the pubis.
- ❑ The anterior, superior border of the body is the pubic crest, and at its lateral end is a projection called the pubic tubercle. This tubercle is the beginning of a raised line, the pectineal line, which extends superiorly and laterally along the superior ramus to merge with the arcuate line of the ilium.
- ❑ These lines, are important landmarks for distinguishing the superior (false) and inferior (true) portions of the bony pelvis.
- ❑ The pubic symphysis is the joint between the two pubes of the hip bones. It consists of a disc of fibrocartilage.
- ❑ Inferior to this joint, the inferior rami of the two pubic bones converge to form the pubic arch



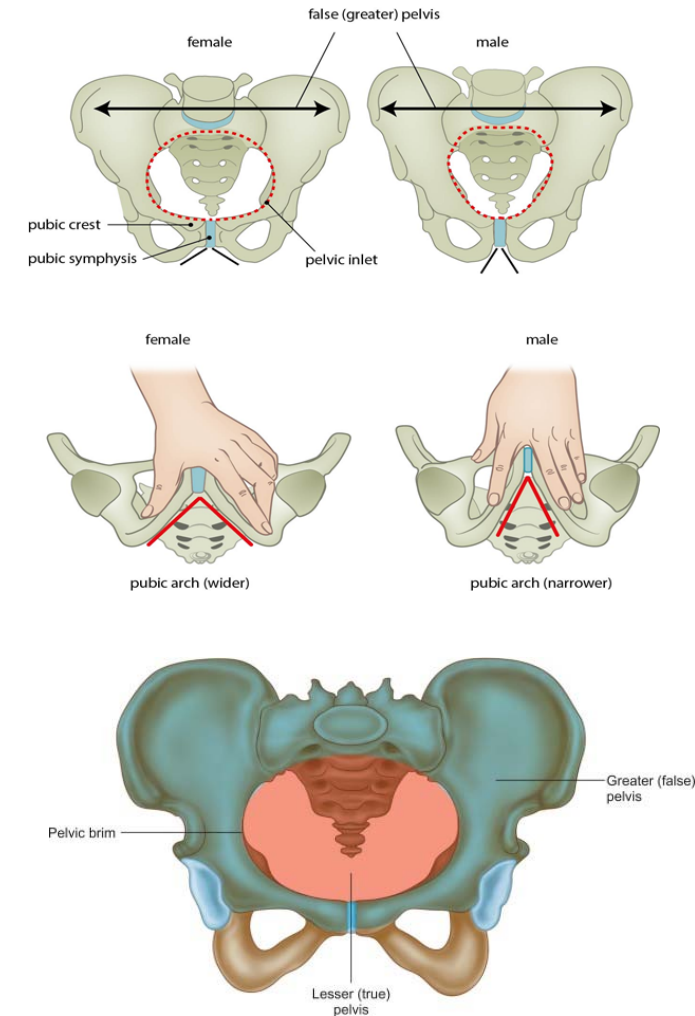
The acetabulum:

- ❑ Is a deep fossa formed by the ilium, ischium, and pubis.
- ❑ **Functions:** as the socket that accepts the rounded head of the femur to form the hip (coxal) joint.
- ❑ On the inferior side of the acetabulum is a deep indentation, the acetabular notch, that forms a foramen through which blood vessels and nerves pass and serves as a point of attachment for ligaments of the femur (for example, the ligament of the head of the femur).



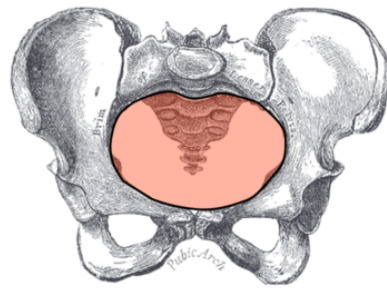
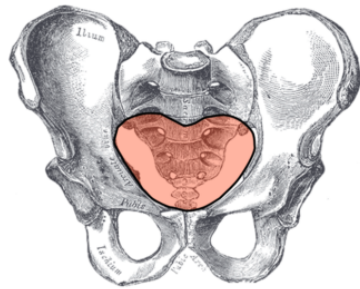
Comparison of male and female pelvis.

Point of comparison	Male	Female
General structure	Heavy and thick	Light and thin
False pelvis	Deep	Shallow
Pelvic inlet	Heart shaped	Oval
Pelvic outlet	Comparatively small	Comparatively large
Sacrum	Long, narrow, with smooth concavity	Short, wide, flat, curving forward in lower part
Acetabulum	Large	Small
Obturator foramen	Round	Oval
Pubic arch	Less than 90° angle	Greater than 90° angle
Iliac crest	More curved	Less curved.

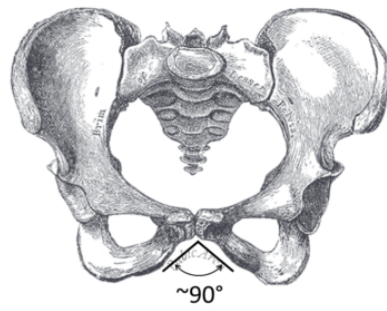
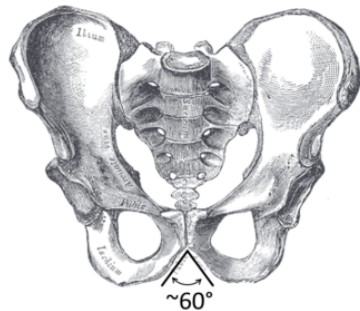


Male

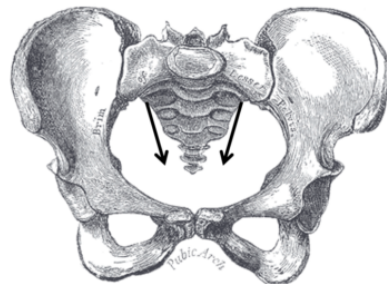
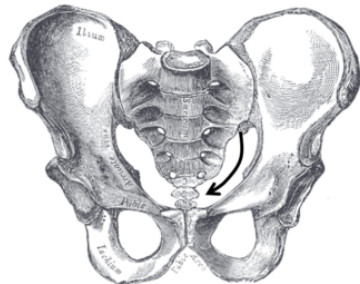
Female



Pelvic inlet



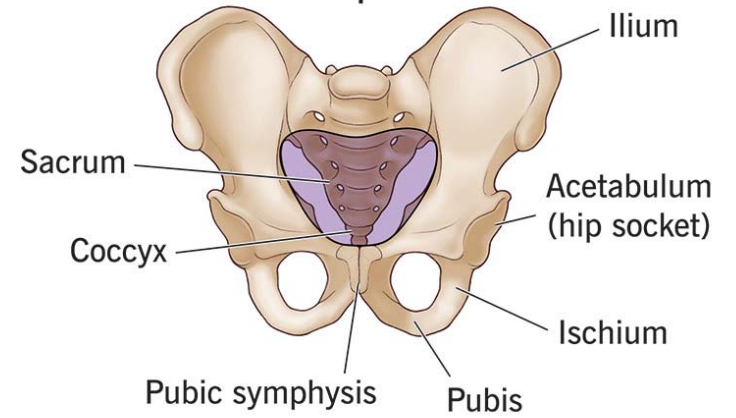
Pubic arch



Sacrum concavity

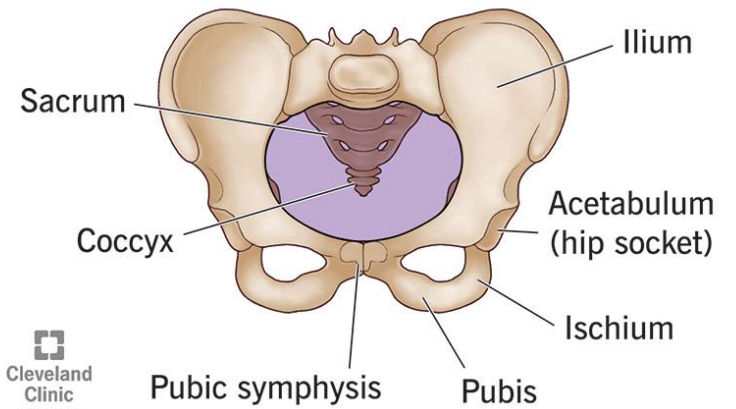
Pelvis

Male pelvis



Pelvic inlet

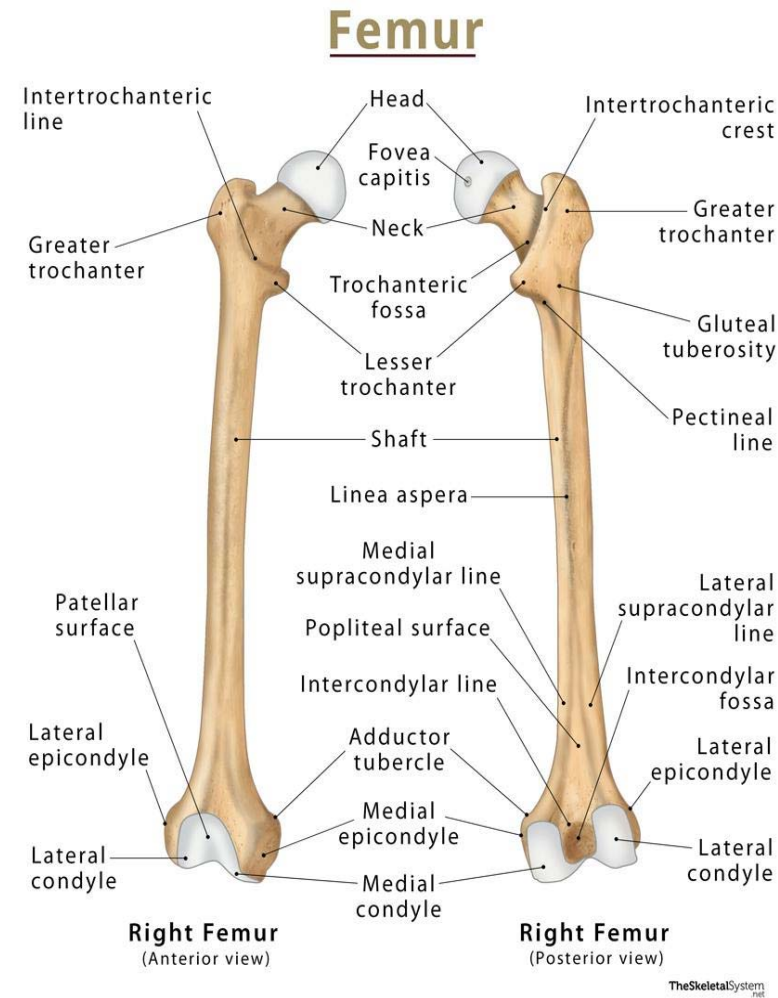
Female pelvis



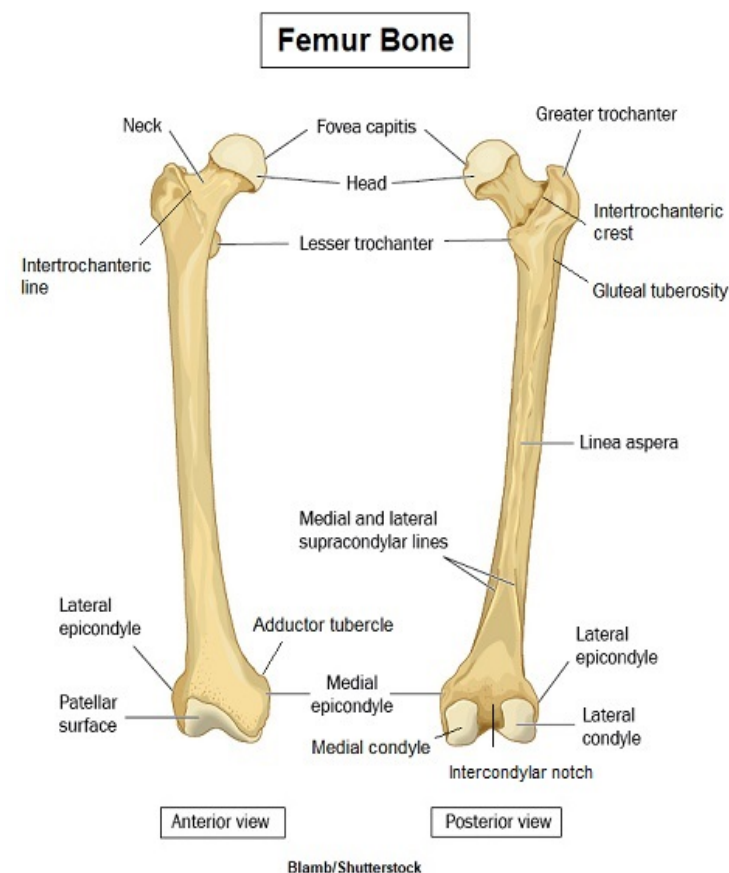
Lower Limbs:

Femur:

- ❑ The femur or thigh bone, is the longest, heaviest, and strongest bone in the body .
- ❑ Its proximal end consist of a rounded head that articulates with the acetabulum of the hip bone to form the hip (coxal) joint.
- ❑ The head contains a small central depression (pit) called the fovea capitis.
- ❑ The ligament of the head of the femur connects the fovea capitis of the femur to the acetabulum of the hip bone
- ❑ Its distal end articulates **with the tibia and patella.**
- ❑ The body (shaft) of the femur angles medially and, as a result, the knee joints are closer to the midline than the hip joints.
- ❑ The greater trochanter and lesser trochanter are projections from the junction of the neck and shaft that serve as points of attachment for the tendons of some of the thigh and buttock muscle

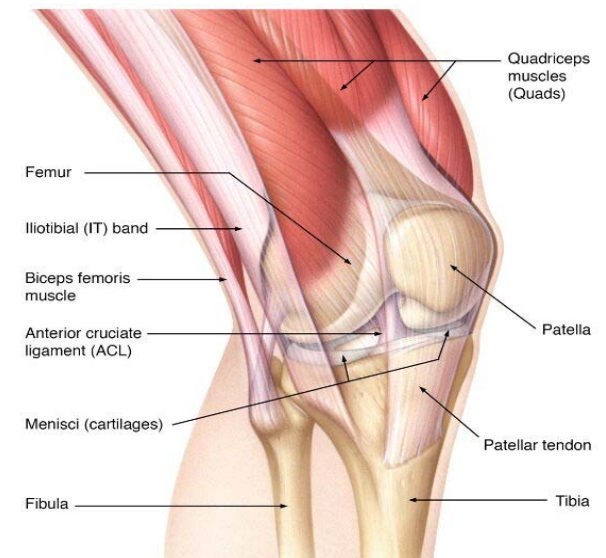
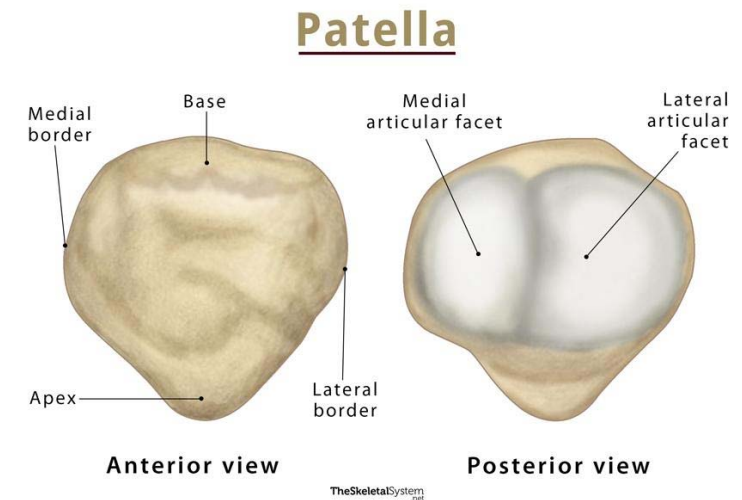


- ❑ Between the anterior surfaces of the trochanters is a narrow intertrochanteric line.
- ❑ A ridge called the intertrochanteric crest appears between the posterior surfaces of the trochanters.
- ❑ Inferior to the intertrochanteric crest on the posterior surface of the body of the femur is a vertical ridge called the gluteal tuberosity. It blends into another vertical ridge called the linea aspera.
- ❑ Both ridges serve as attachment points for the tendons of several thigh muscles.
- ❑ The expanded distal end of the femur includes the medial condyle and the lateral condyle.
- ❑ These articulate with the medial and lateral condyles of the tibia.
- ❑ Superior to the condyles are the medial epicondyle and the lateral epicondyle, to which ligaments of the knee joint attach.
- ❑ A depressed area between the condyles on the posterior surface is called the intercondylar fossa.
- ❑ Just superior to the medial epicondyle is the adductor tubercle, a roughened projection that is a site of attachment for the adductor magnus muscle



Patella

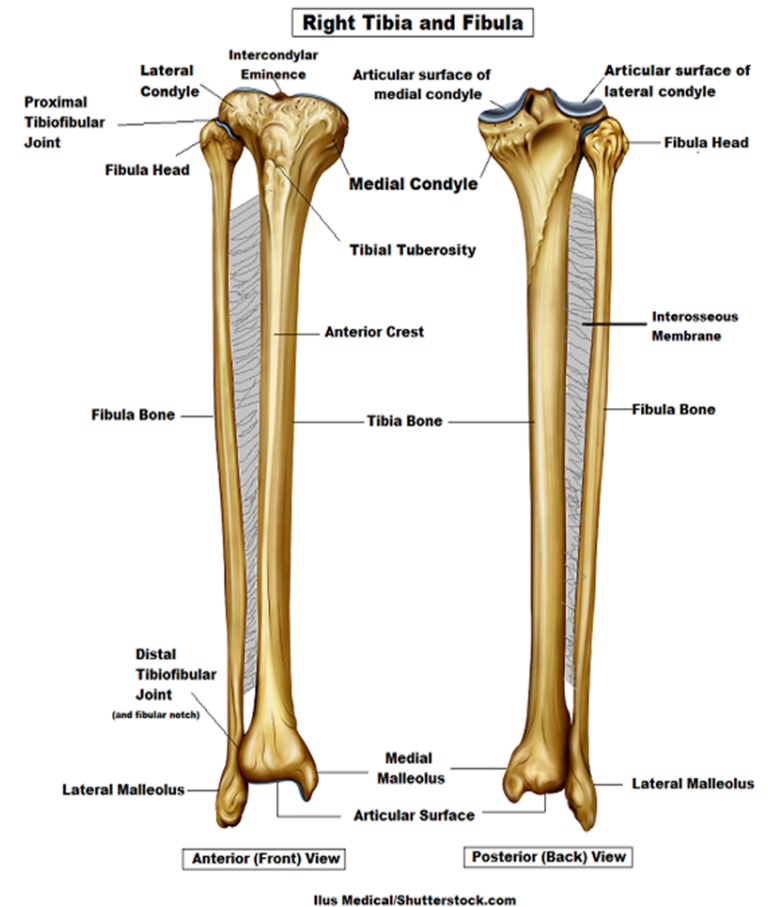
- ❑ The patella or kneecap: is a small, triangular bone located anterior to the knee joint.
- ❑ The broad proximal end of this sesamoid bone, which develops in the tendon of the quadriceps femoris muscle, is called the base.
- ❑ the pointed distal end is referred to as the apex.
- ❑ The posterior surface contains two articular facets, one for the medial condyle of the femur and another for the lateral condyle of the femur.
- ❑ The patellar ligament attaches the patella to the tibial tuberosity.
- ❑ **The patella increases the leverage of the tendon of the quadriceps femoris muscle, maintains the position of the tendon when the knee is bent (flexed), and protects the knee joint.**



The Leg (Tibia and Fibula):

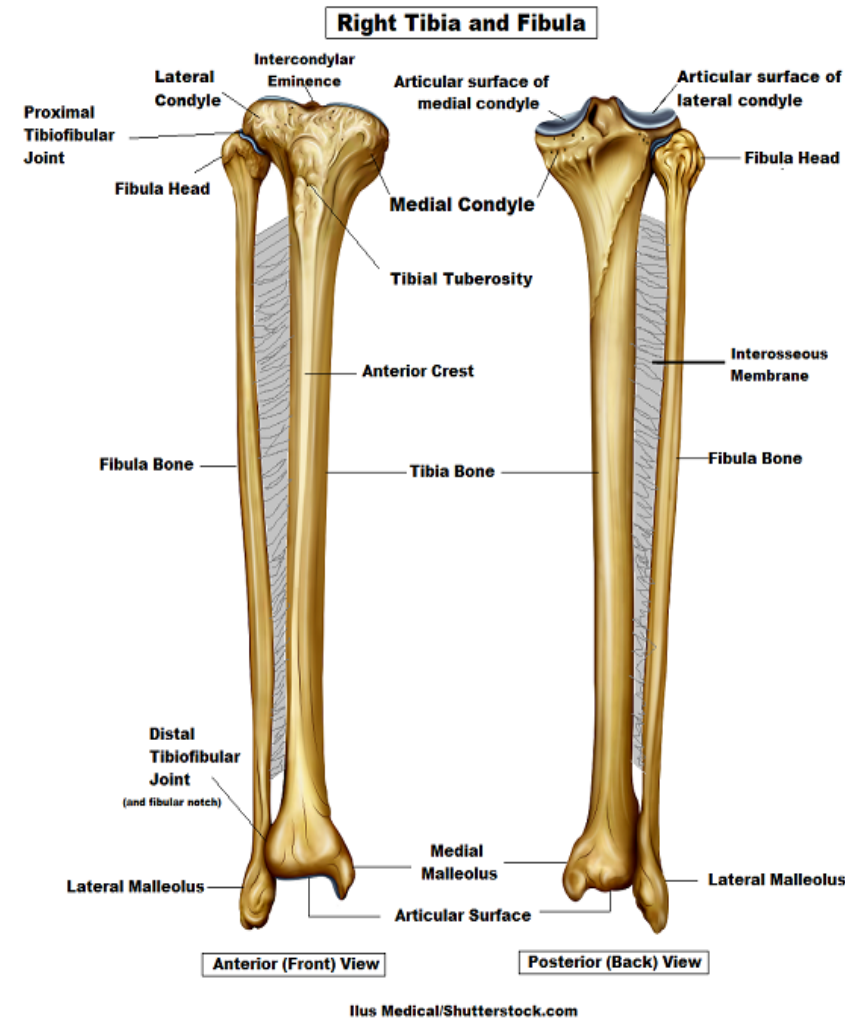
Tibia:

- ❑ The tibia or shin bone is the larger, medial, weight-bearing bone of the leg.
- ❑ The proximal end of the tibia is expanded into a lateral condyle and a medial condyle. These articulate with the condyles of the femur to form the lateral and medial tibiofemoral (knee) joints.
- ❑ The inferior surface of the lateral condyle articulates with the head of the fibula.
- ❑ The tibial tuberosity on the anterior surface is a point of attachment for the patellar ligament.
- ❑ The medial surface of the distal end of the tibia forms the medial malleolus. This structure articulates with the talus of the ankle and forms the prominence that can be felt on the medial surface of the ankle.



Fibula:

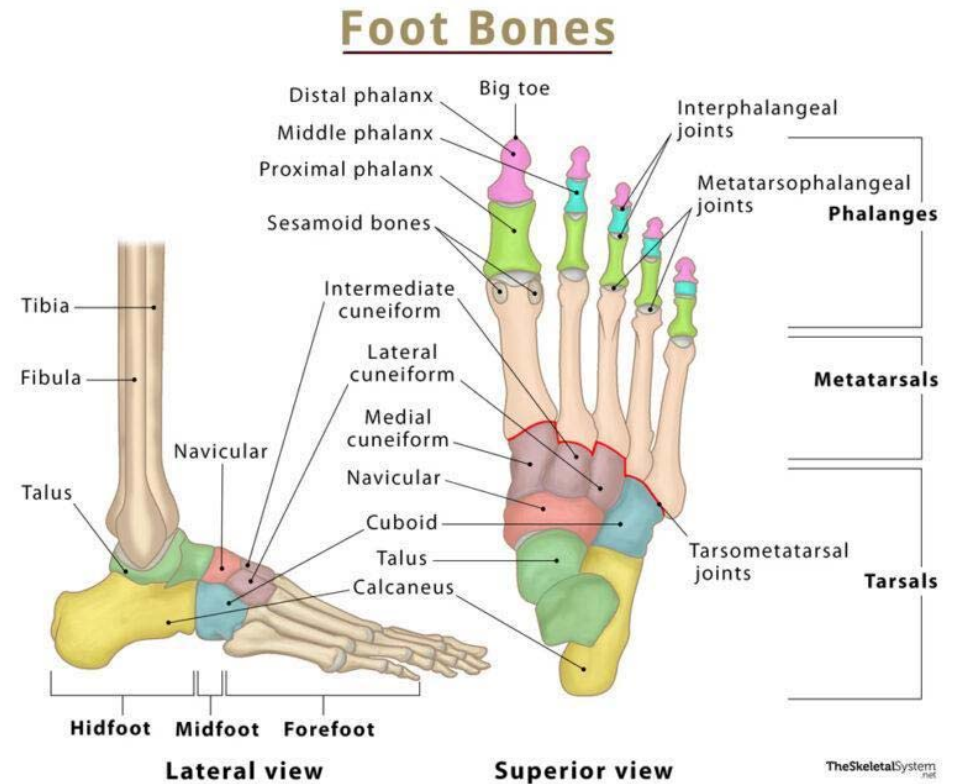
- ❑ The fibula is parallel and lateral to the tibia, but it is considerably smaller.
- ❑ Unlike the tibia, **the fibula does not articulate with the femur, but it does help stabilize the ankle joint.**
- ❑ The head of the fibula, the proximal end, articulates with the inferior surface of the lateral condyle of the tibia below the level of the knee joint to form the proximal tibiofibular joint.
- ❑ The distal end is more arrowhead shaped and has a projection called the **lateral malleolus that articulates with the talus of the ankle.** This forms the prominence on the lateral surface of the ankle.
- ❑ the fibula also articulates with the tibia at the fibular notch to form the distal tibiofibular joint.



The Foot-Tarsals, Metatarsals, and Phalanges:

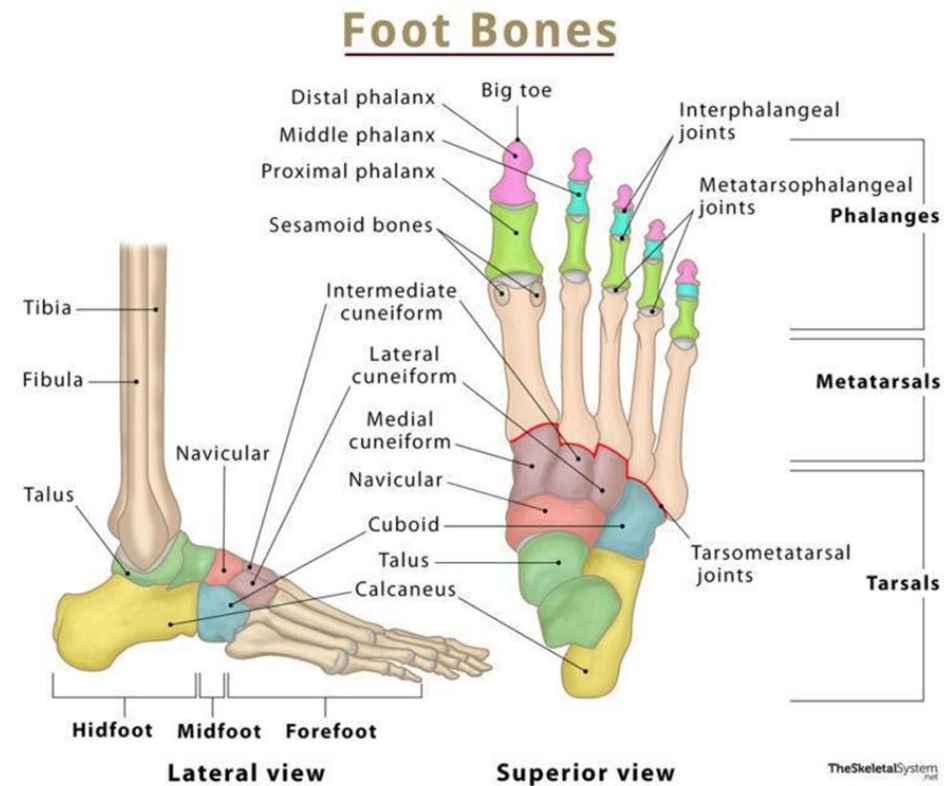
Tarsals:

- ❑ The tarsus (ankle) is the proximal region of the foot and consists of seven tarsal bones. they are larger and stronger than the carpals of the wrist .
- ❑ They include:
 - **Talus (ankle bone)** articulates with the tibia and fibula at the ankle joint
 - **Calcaneus:** forms the heel of the foot. It is the largest and strongest tarsal bone.
 - **Navicular**
 - Three **cuneiform** bones called the third (lateral), second (intermediate), and first (medial) cuneiforms.
 - **Cuboid.**
- ❑ Joints between tarsal bones are called intertarsal joints



The metatarsus:

- ❑ the intermediate region of the foot, consists of five metatarsal bones numbered from the medial to lateral position.
- ❑ The metatarsals articulate proximally with the first, second, and third cuneiform bones and with the cuboid to form the tarsometatarsal joints.
- ❑ Distally, they articulate with the proximal row of phalanges to form the metatarsophalangeal joints.



The phalanges:

- ❑ comprise the distal component of the foot and resemble those of the hand both in number and arrangement. The toes are numbered (1–5) beginning with the great toe, from medial to lateral.
- ❑ The great or big toe has two large, heavy phalanges called proximal and distal phalanges.
- ❑ Joints between phalanges of the foot, like those of the hand, are called interphalangeal joints.