

There are 32 bones found in the lower limb:

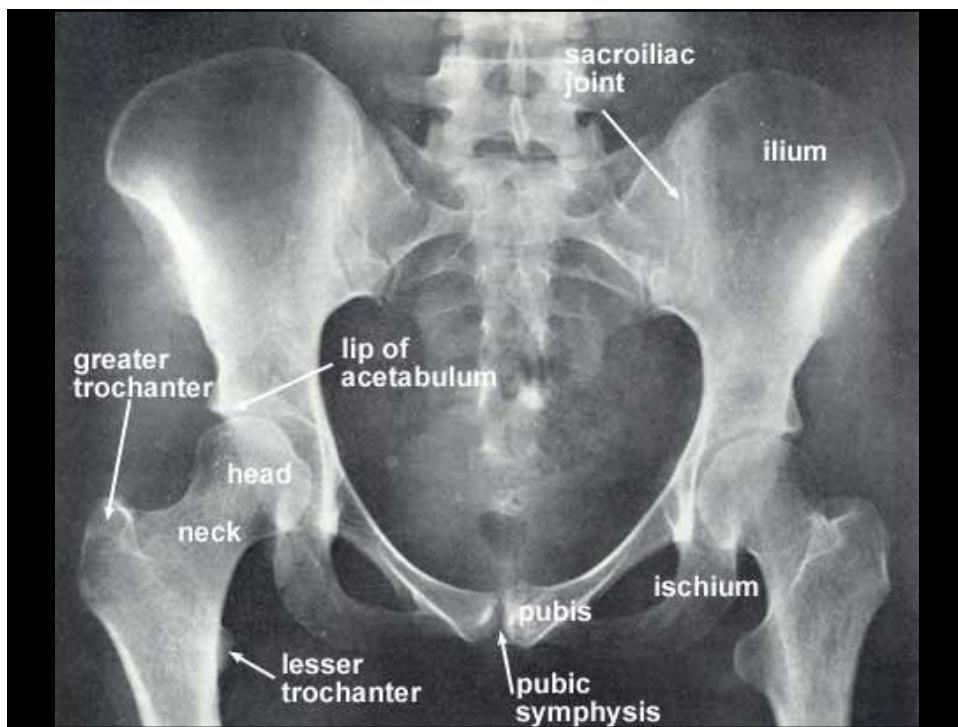
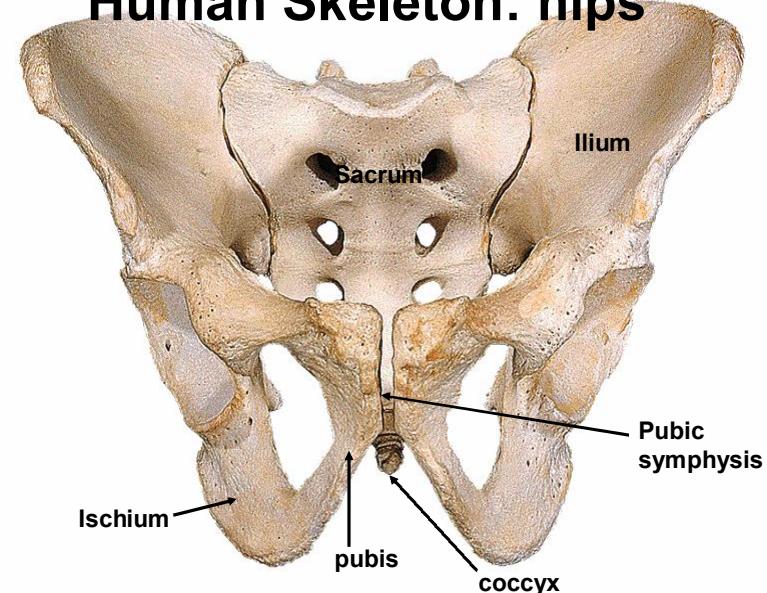
- hip bone (1)
- femur (1)
- patella (1)
- tibia (1)
- fibula (1)
- tarsals (8)
- metatarsals (5)
- proximal phalanges (5)
- intermediate phalanges (5)
- distal phalanges (4)

The big toe (hallux) only has 2 phalanges

There are also 2 extra bones in the foot, called sesamoid bones.

These small bones develop within the tendon of the flexor hallucis longus muscle to the big toe

Human Skeleton: hips



The hip bone is composed of three elements:

- the ilium
- ischium
- and pubis

which fuse at the acetabulum (the socket of the hip joint).

Pelvic Girdle (Hip)

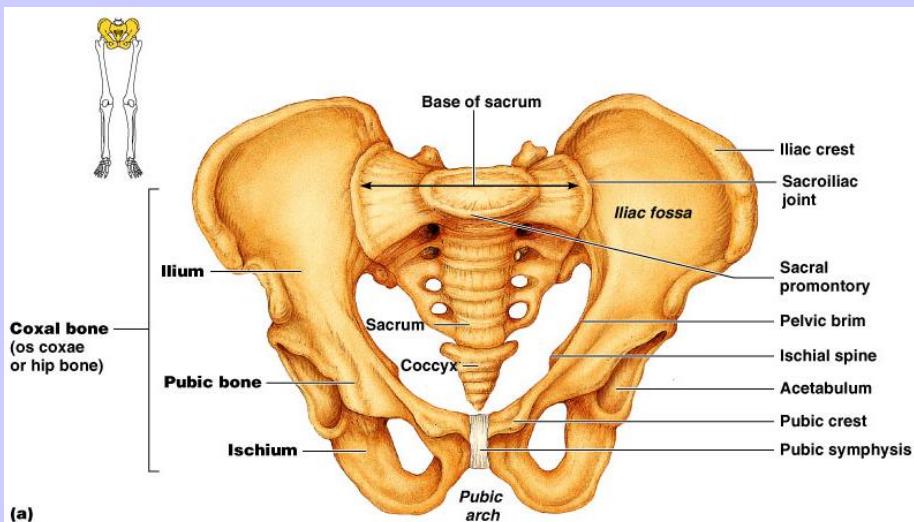
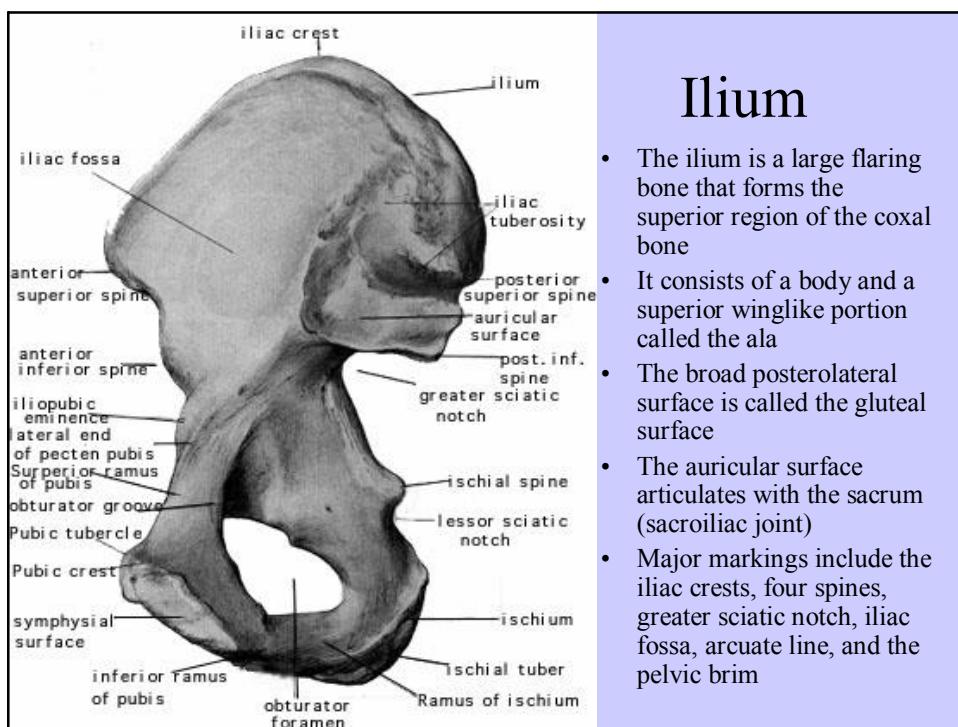
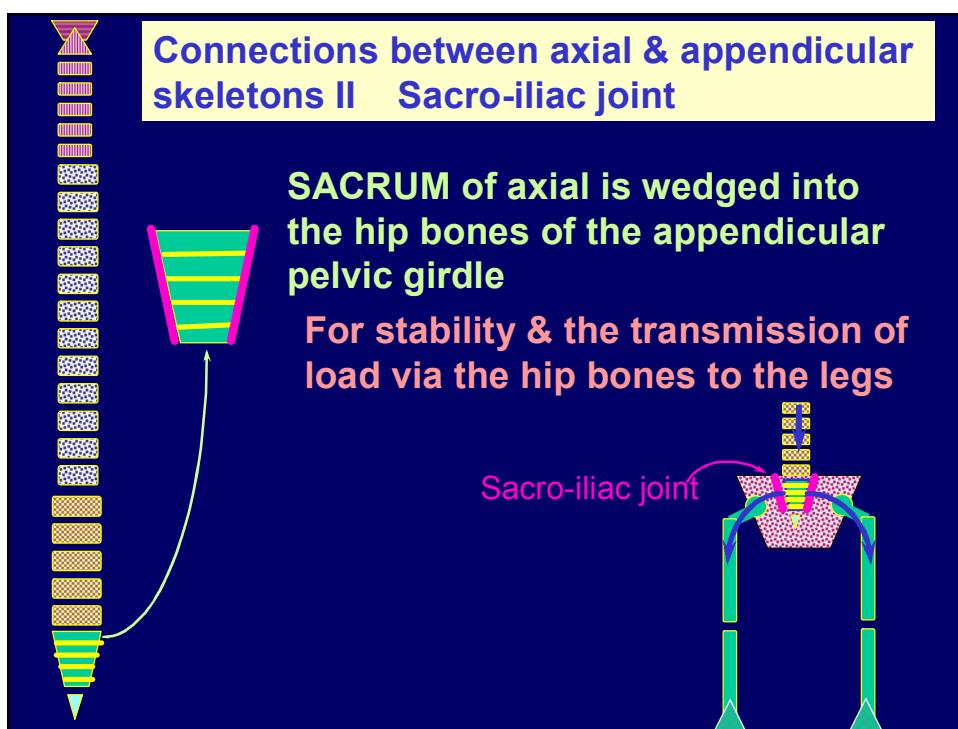


Figure 7.27a

Connections between axial & appendicular skeletons II Sacro-iliac joint

SACRUM of axial is wedged into the hip bones of the appendicular pelvic girdle

For stability & the transmission of load via the hip bones to the legs

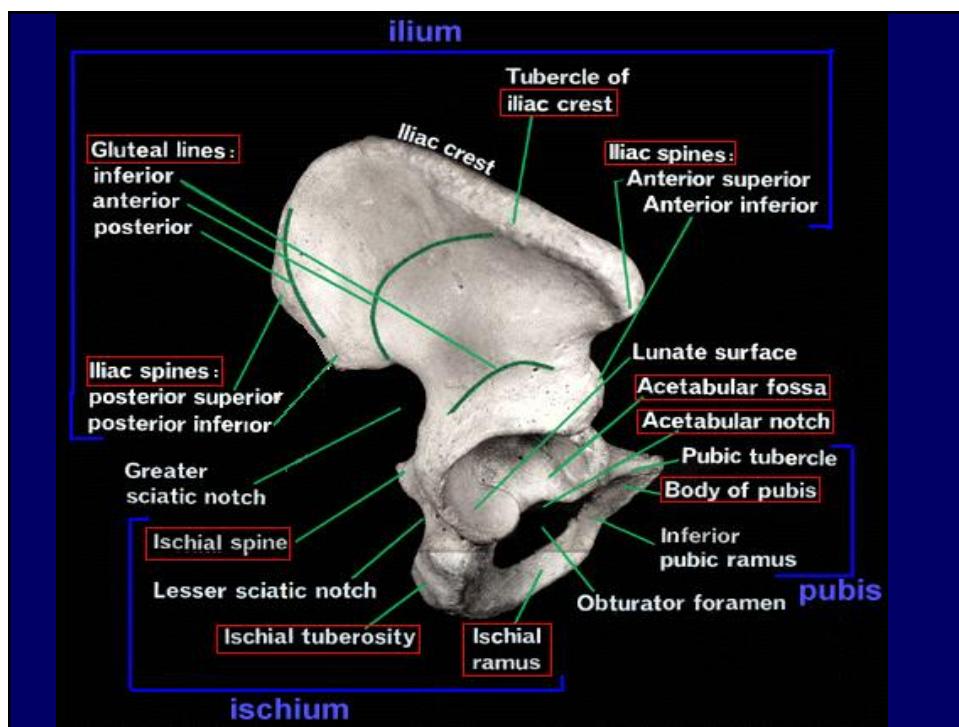


The ilium has four protuberances:

- i.the anterior superior
- ii.the anterior inferior
- iii.the posterior superior and
- iv.the posterior inferior iliac spines.

The anterior superior iliac spine is an attachment site for the inguinal ligament and the sartorius muscle.

The anterior inferior iliac spine is an attachment site for the capsule of the hip joint, especially the iliofemoral ligament.



Ilium: Lateral View

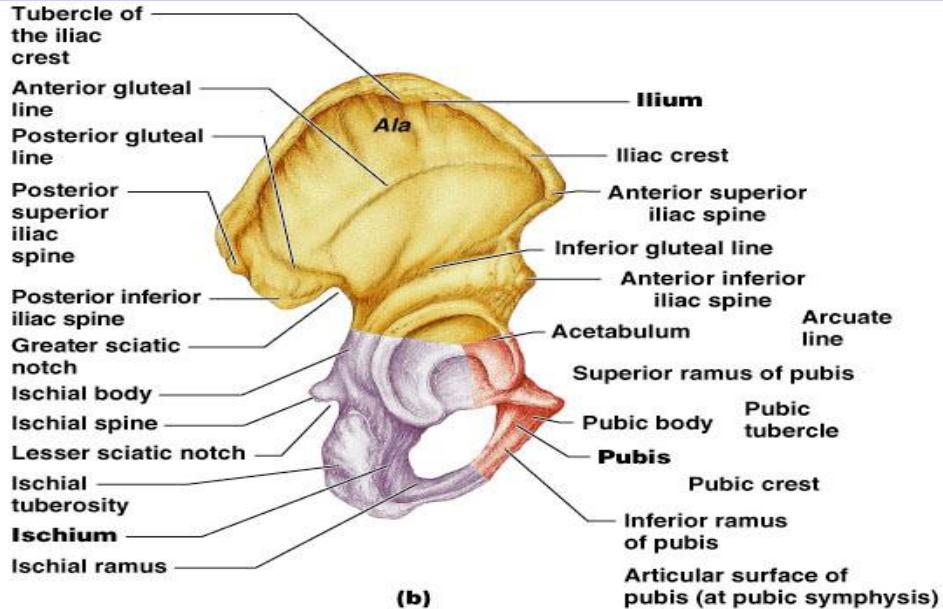
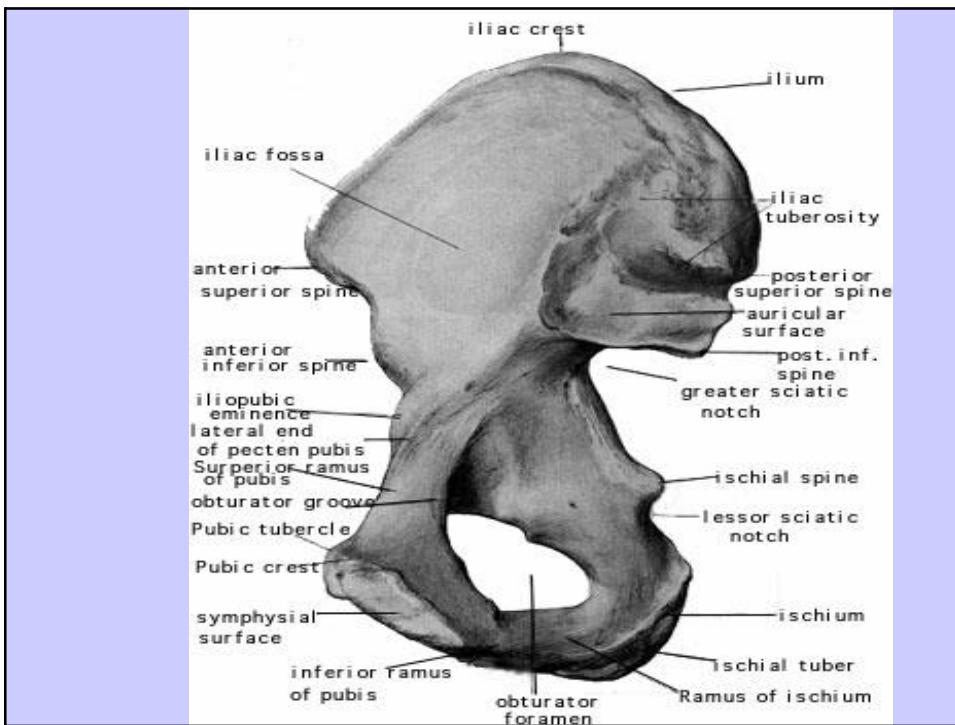


Figure 7.27b



Ilium: Medial View

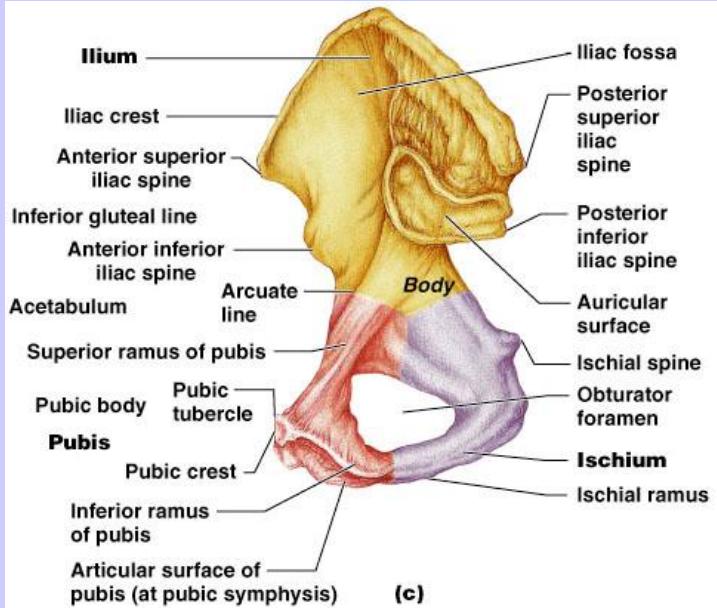
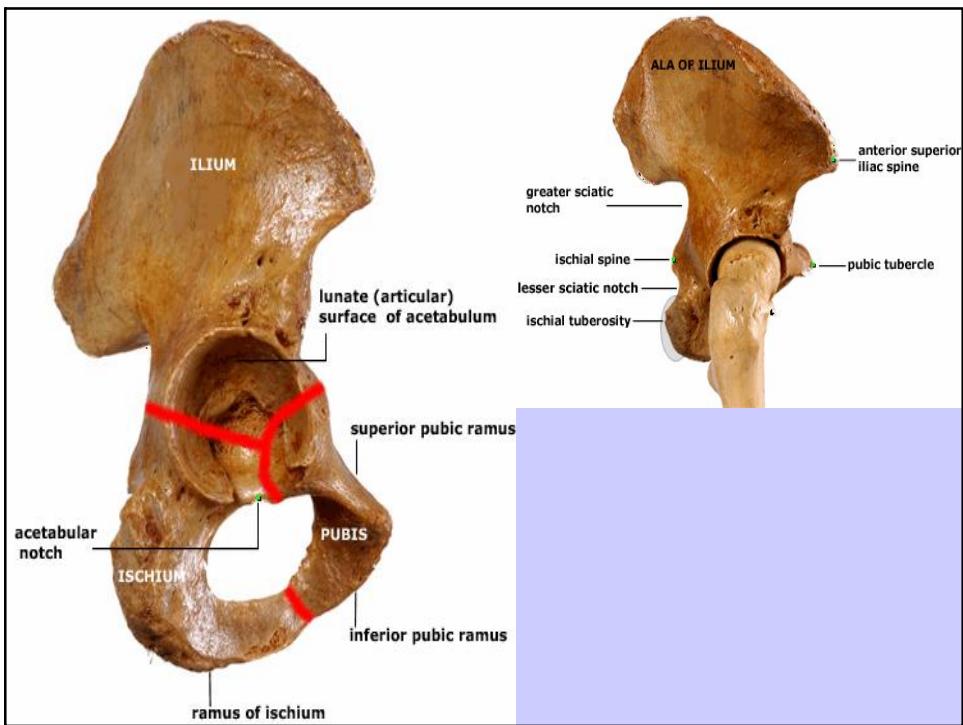
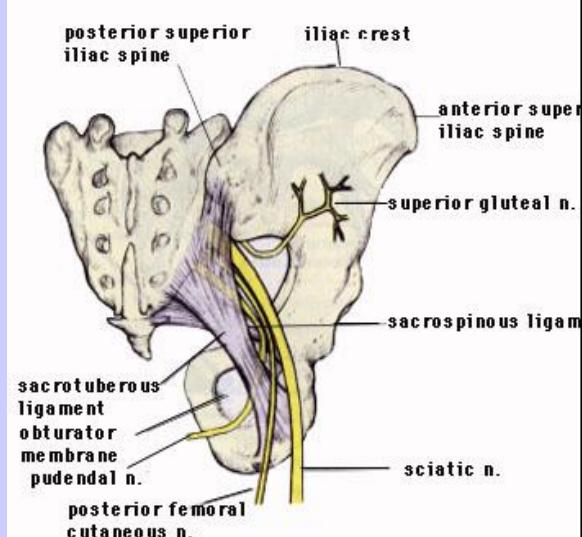


Figure 7.27c



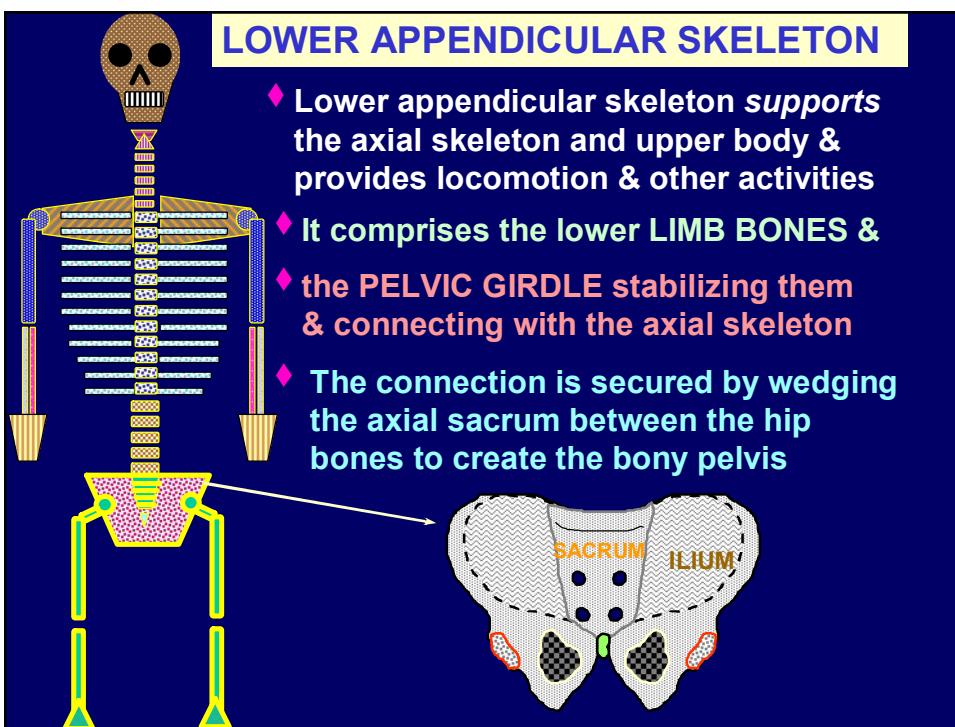
- The ischium forms the posteroinferior part of the hip bone
- The thick body articulates with the ilium, and the thinner ramus articulates with the pubis
- Major markings include the ischial spine, lesser sciatic notch, and the ischial tuberosity

Ischium



LOWER APPENDICULAR SKELETON

- ♦ Lower appendicular skeleton *supports* the axial skeleton and upper body & provides locomotion & other activities
- ♦ It comprises the lower LIMB BONES &
- ♦ the PELVIC GIRDLE stabilizing them & connecting with the axial skeleton
- ♦ The connection is secured by wedging the axial sacrum between the hip bones to create the bony pelvis



Pubis

- The pubic bone forms the anterior portion of the hip bone
- It articulates with the ischium and the ilium
- Major markings include superior and inferior rami, the pubic crest, pubic tubercle, pubic arch, pubic symphysis, and obturator foramen (along with ilium and ischium)

Pubis: Lateral View

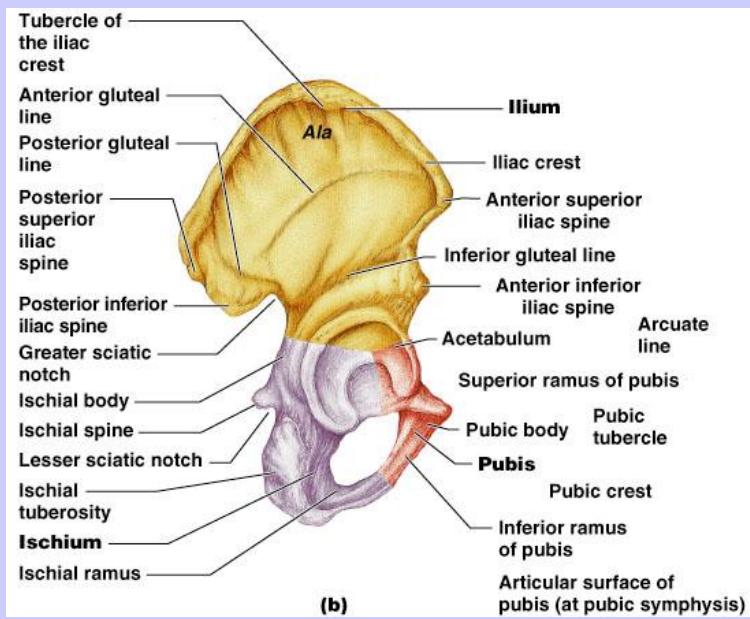


Figure 7.27b

Pubis: Medial View

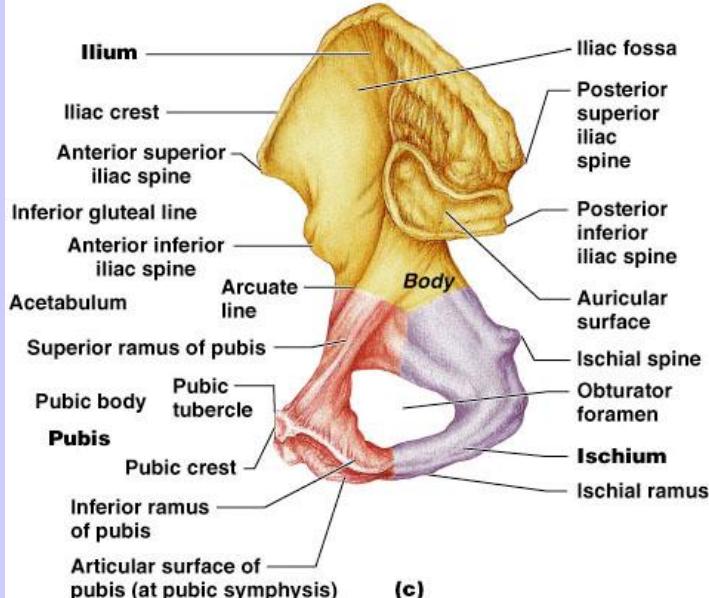


Figure 7.27c

Comparison of Male and Female Pelvis

TABLE 7.4 Comparison of the Male and Female Pelves

CHARACTERISTIC	FEMALE	MALE
Sacrum	Wider; shorter; sacral curvature is accentuated	Narrow; longer; sacral promontory more ventral
Coccyx	More movable; straighter	Less movable; curves ventrally
Left lateral view		
Pelvic inlet (brim)		
Pelvic outlet	Wider; oval from side to side	Narrow; basically heart shaped
Posteroinferior view	Wider; ischial tuberosities shorter, farther apart and everted	Narrower; ischial tuberosities longer, sharper and point more medially

Table 7.4.2

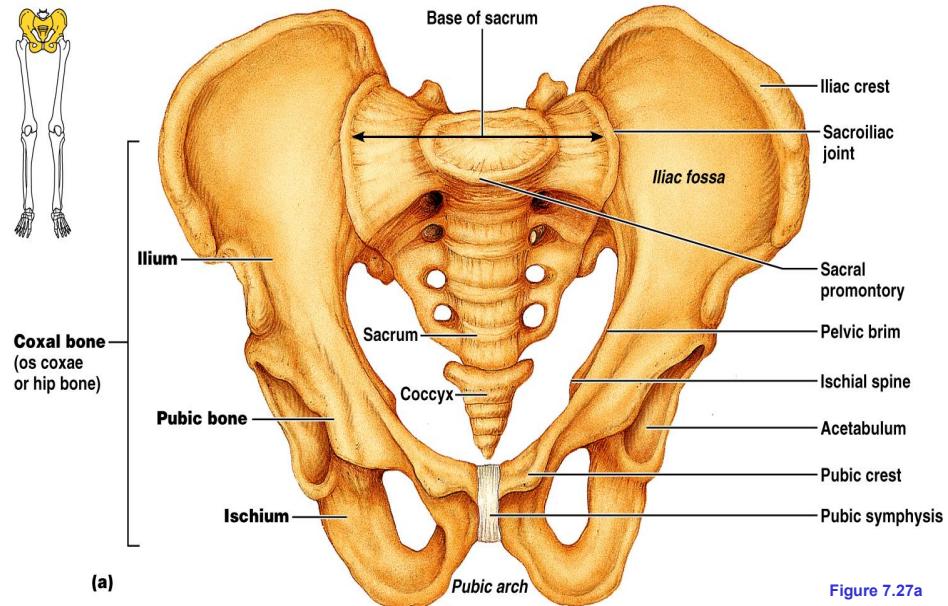
Pelvic Girdle (Hip)

- The hip is formed by a pair of hip bones (os coxae, or coxal)
- Together with the sacrum and the coccyx, these bones form the bony pelvis

Pelvic Girdle (Hip)

- The pelvis
 - Attaches the lower limbs to the axial skeleton with the strongest ligaments of the body
 - Transmits weight of the upper body to the lower limbs
 - Supports the visceral organs of the pelvis

Pelvic Girdle (Hip)

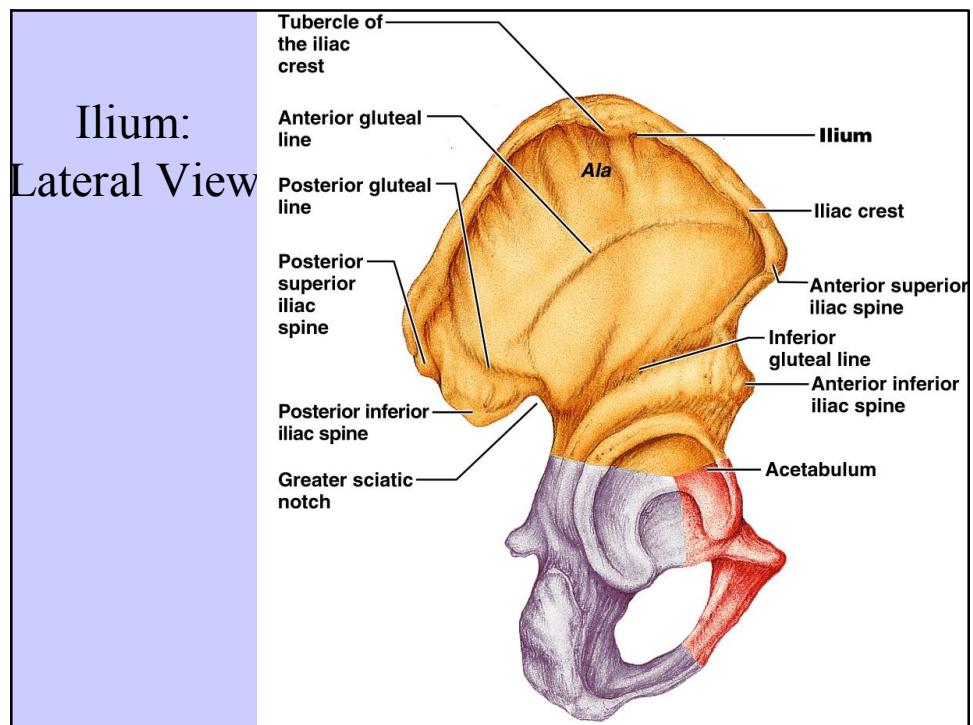


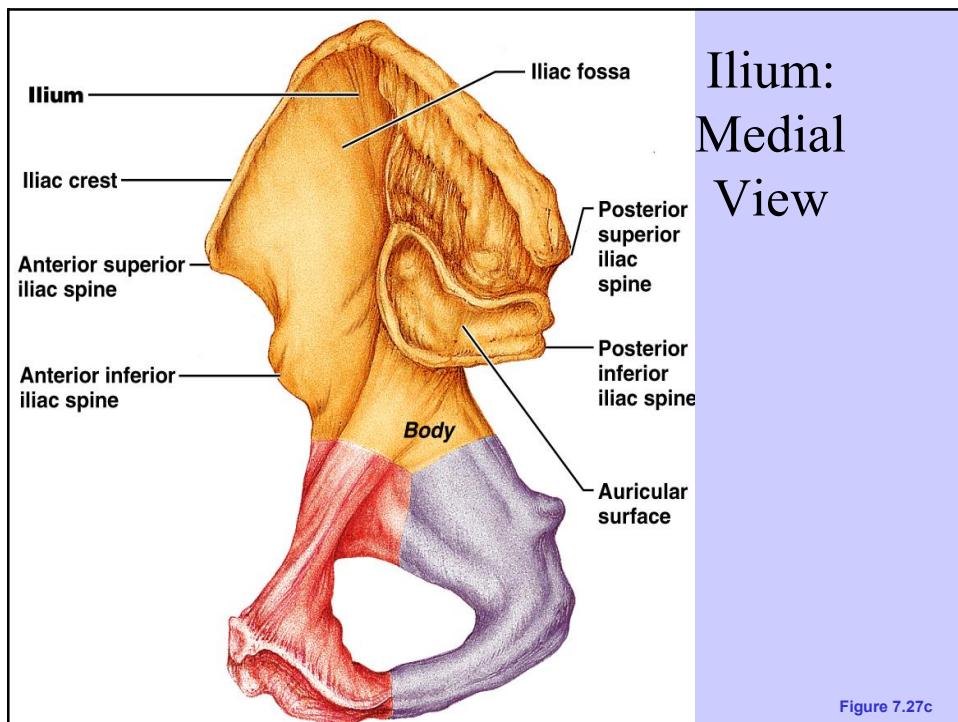
Ilium

- The ilium is a large flaring bone that forms the superior region of the coxal bone
- It consists of a body and a superior winglike portion called the ala
- The broad posterolateral surface is called the gluteal surface

Ilium

- The auricular surface articulates with the sacrum (sacroiliac joint)
- Major markings include the iliac crests, four spines, greater sciatic notch, iliac fossa, arcuate line, and the pelvic brim



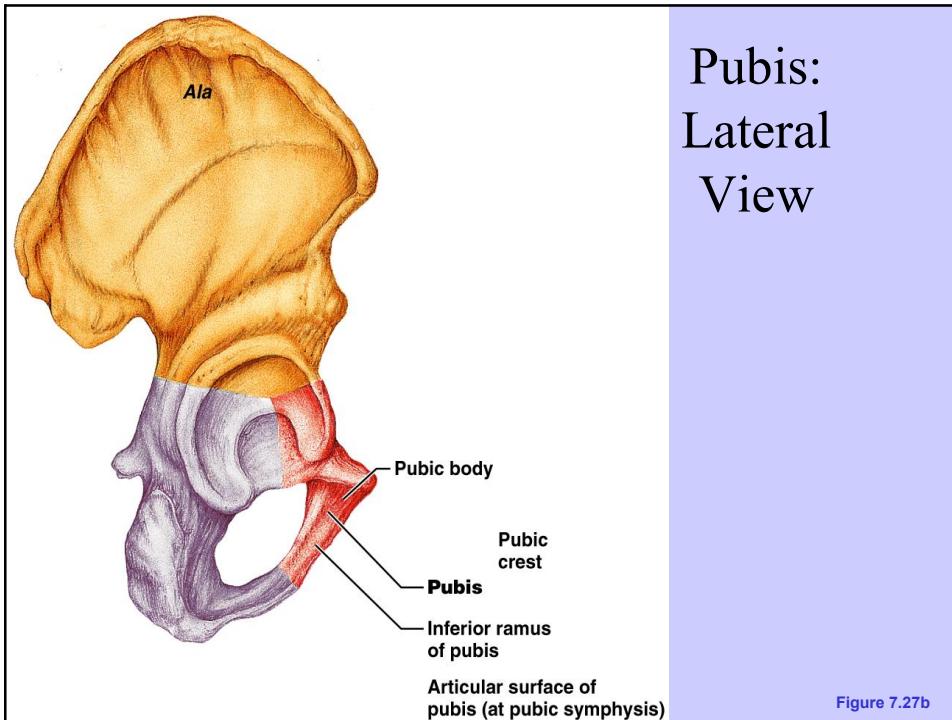


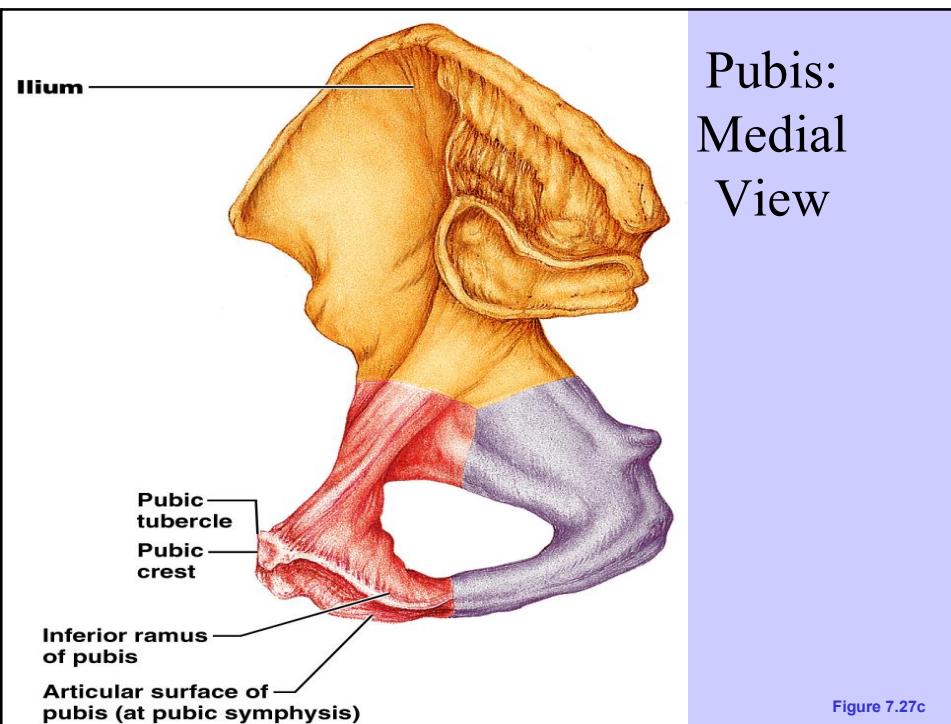
Ischium

- The ischium forms the posteroinferior part of the hip bone
- The thick body articulates with the ilium, and the thinner ramus articulates with the pubis
- Major markings include the ischial spine, lesser sciatic notch, and the ischial tuberosity

Pubis

- The pubic bone forms the anterior portion of the hip bone
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Pubis:
Medial
View

Figure 7.27c

Comparison of Male and Female Pelvic Structure

- Female pelvis
 - Tilted forward, adapted for childbearing
 - True pelvis defines birth canal
 - Cavity of the true pelvis is broad, shallow, and has greater capacity

Comparison of Male and Female Pelvic Structure

- Male pelvis
 - Tilted less forward
 - Adapted for support of heavier male build and stronger muscles
 - Cavity of true pelvis is narrow and deep

Comparison of Male and Female Pelvic Structure

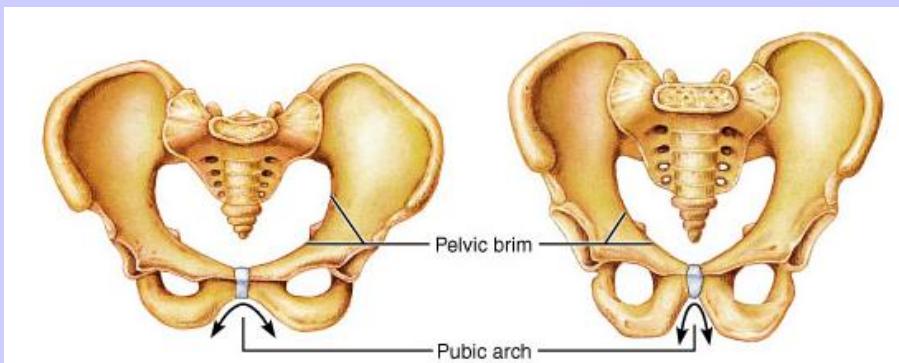


Image from Table 7.4

Comparison of Male and Female Pelvis

TABLE 7.4 Comparison of the Male and Female Pelves

CHARACTERISTIC	FEMALE	MALE
General structure and functional modifications	Tilted forward; adapted for childbearing; true pelvis defines the birth canal; cavity of the true pelvis is broad, shallow, and has a greater capacity	Tilted less far forward; adapted for support of a male's heavier build and stronger muscles; cavity of the true pelvis is narrow and deep
Bone thickness	Less; bones lighter, thinner, and smoother	Greater; bones heavier and thicker, and markings are more prominent
Acetabula	Smaller; farther apart	Larger; closer
Pubic arch/angle	Broader (80–90°); more rounded	More acute (50–60°)

Anterior view

Table 7.4.1

Comparison of Male and Female Pelvic Structure

- Female pelvis
 - Tilted forward, adapted for childbearing
 - True pelvis defines birth canal
 - Cavity of the true pelvis is broad, shallow, and has greater capacity

Comparison of Male and Female Pelvic Structure

- Male pelvis
 - Tilted less forward
 - Adapted for support of heavier male build and stronger muscles
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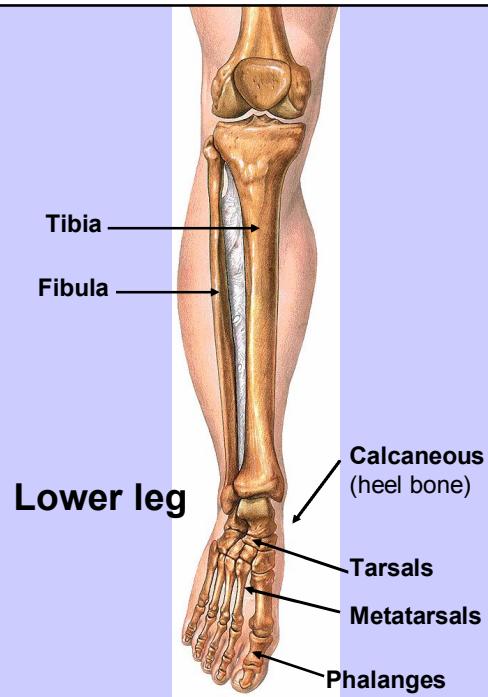
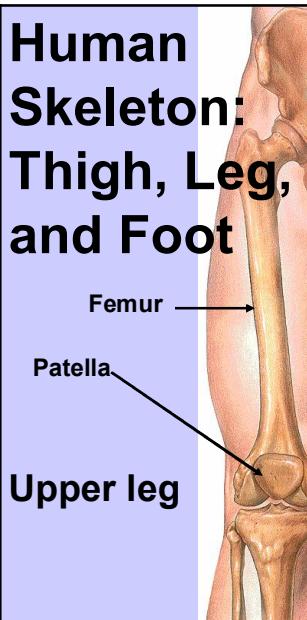
Comparison of Male and Female Pelvic Structure

Characteristic	Female	Male
Bone thickness	Lighter, thinner, and smoother	Heavier, thicker, and more prominent markings
Pubic arch/angle	80°–90°	50°–60°
Acetabula	Small; farther apart	Large; closer together
Sacrum	Wider, shorter; sacral curvature is accentuated	Narrow, longer; sacral promontory more ventral
Coccyx	More movable; straighter	Less movable; curves ventrally

Comparison of Male and Female Pelvic Structure

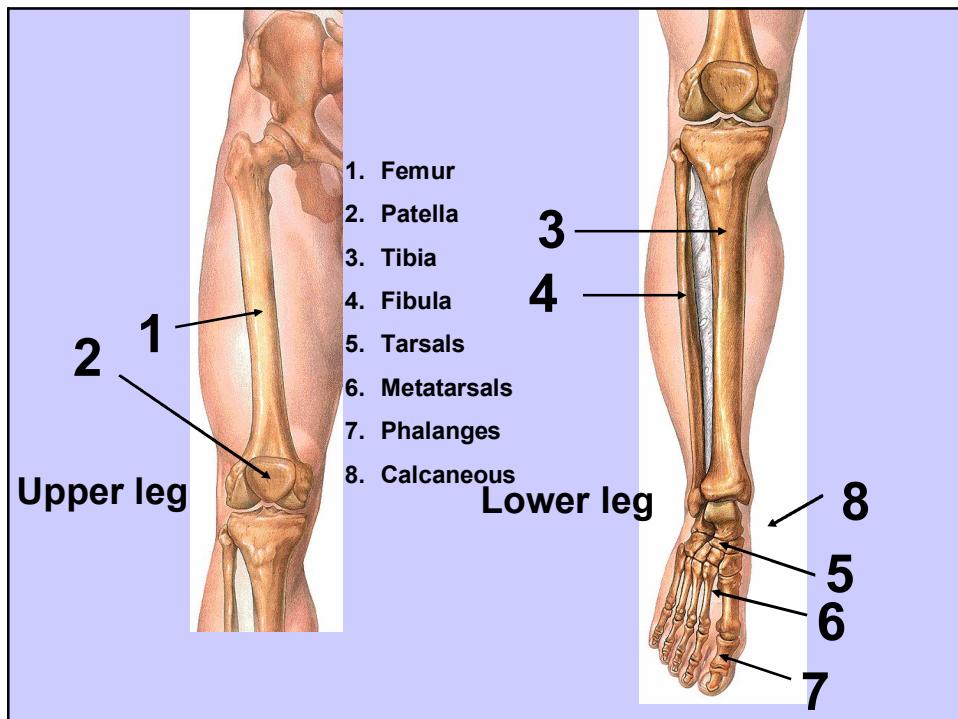


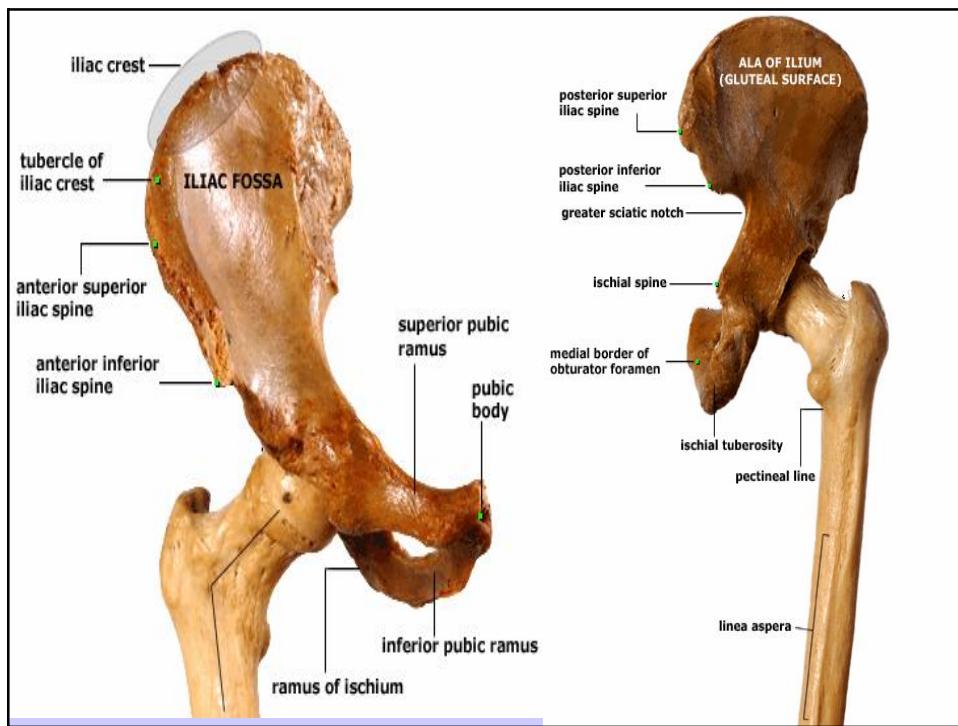
Image from Table 7.4



The Lower Limb

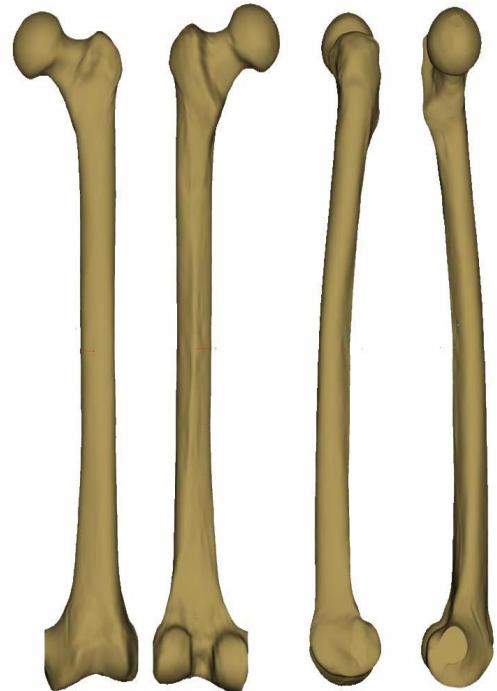
- The three segments of the lower limb are the thigh, leg, and foot
- They carry the weight of the erect body, and are subjected to exceptional forces when one jumps or runs

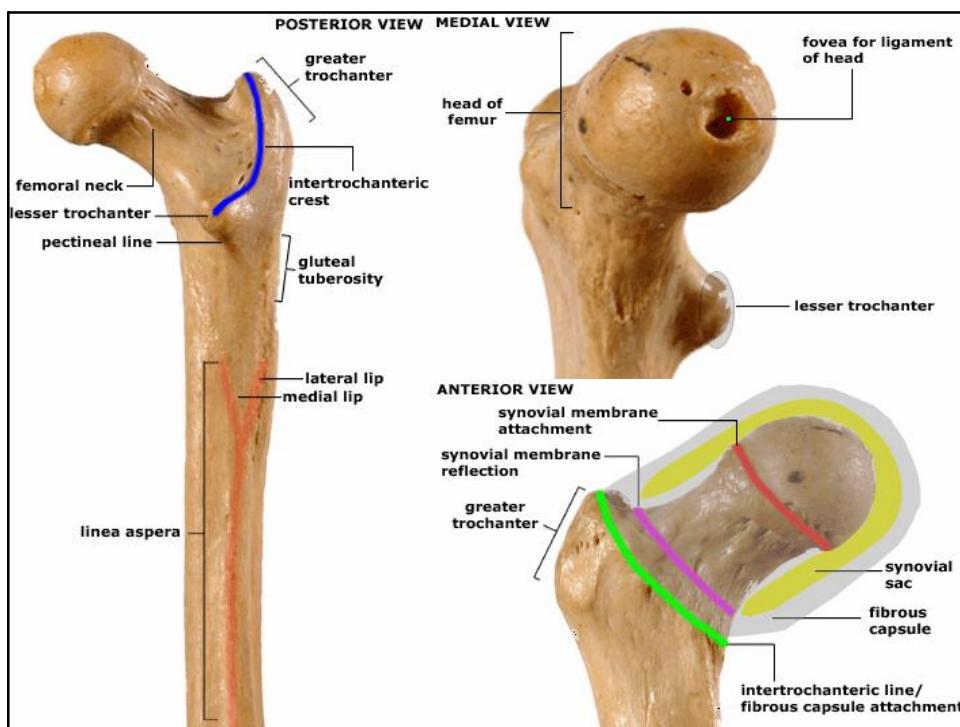
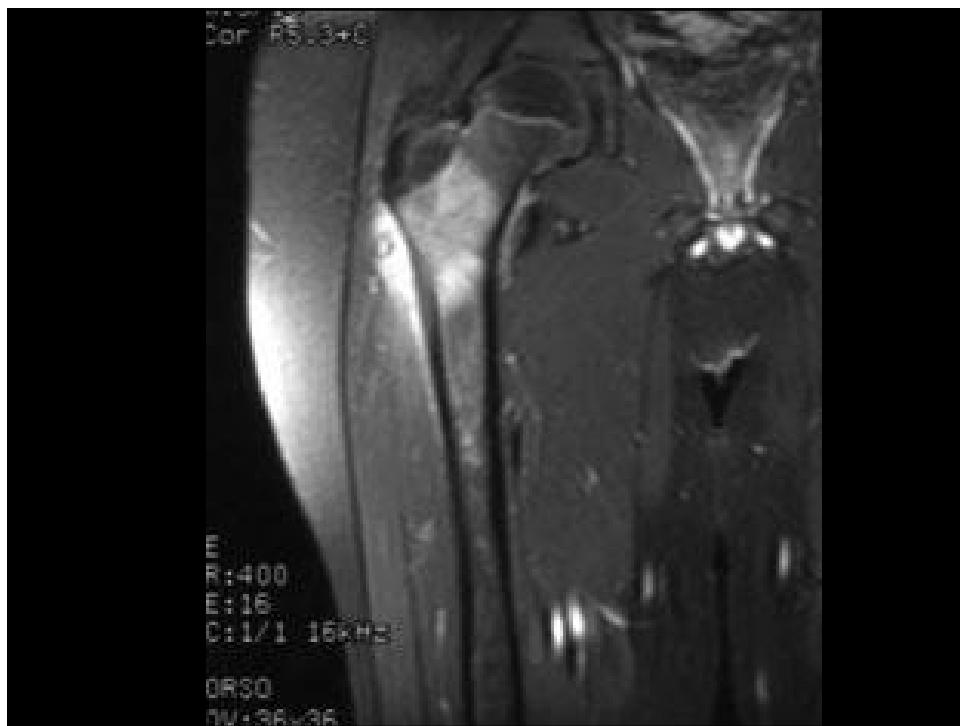




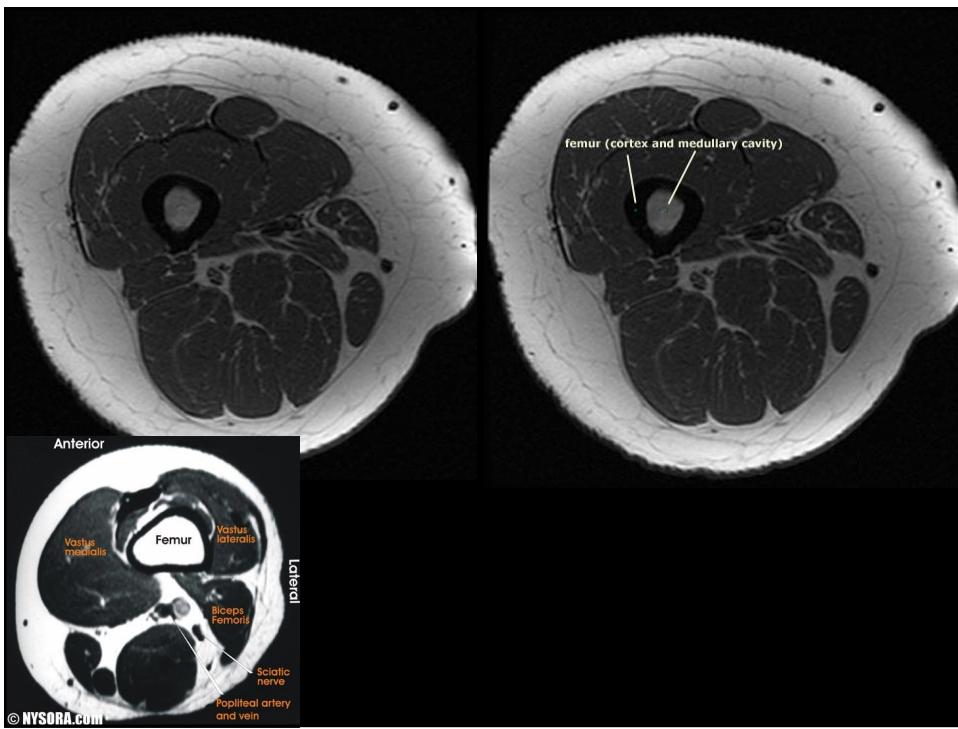
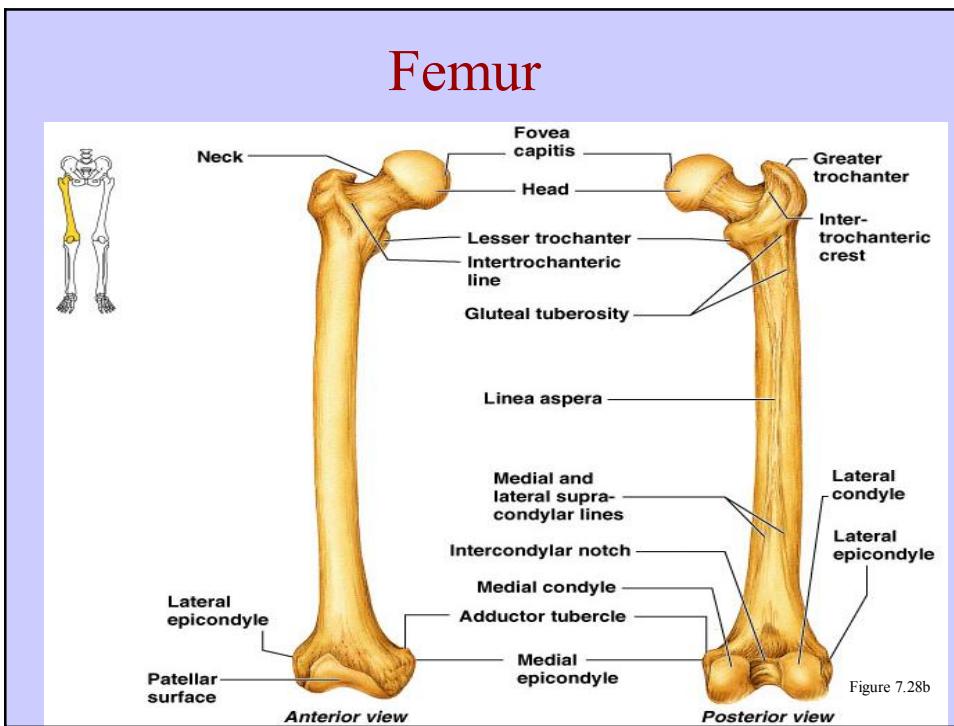
Femur

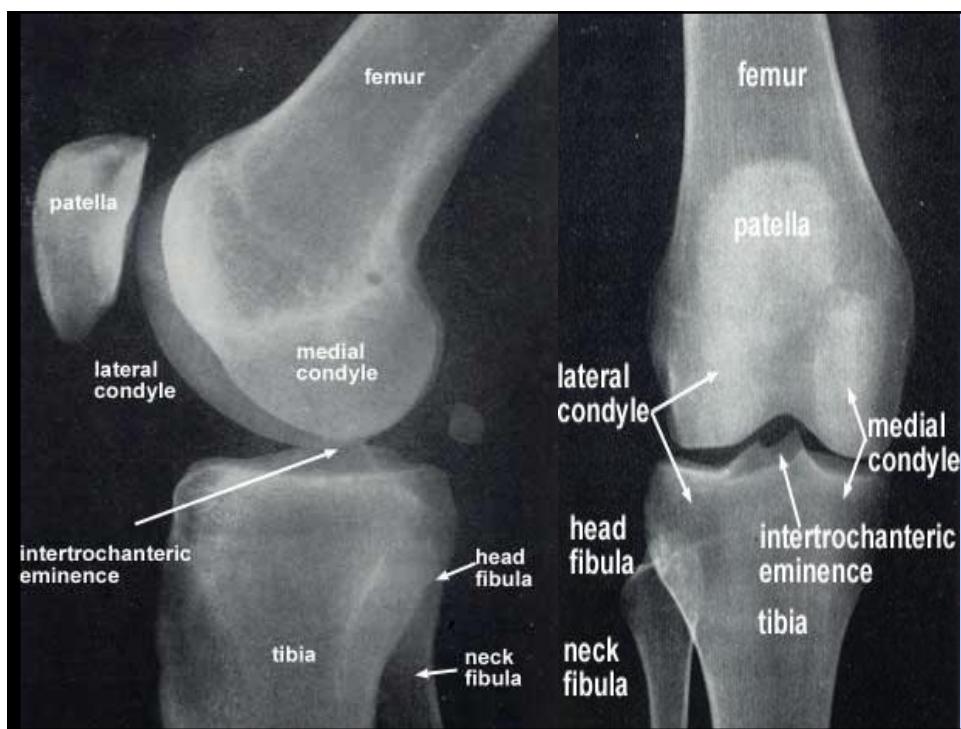
- The sole bone of the thigh is the femur, the largest and strongest bone in the body
- It articulates proximally with the hip and distally with the tibia and fibula
- Major markings include the head, fovea capitis, greater and lesser trochanters, gluteal tuberosity, lateral and medial condyles and epicondyles, linea aspera, patellar surface, and the intercondylar notch





Femur





Leg

- The tibia and fibula form the skeleton of the leg
- They are connected to each other by the interosseous membrane
- They articulate with the femur proximally and with the ankle bones distally
- They also articulate with each other via the immovable tibiofibular joints

Tibia

- Receives the weight of the body from the femur and transmits it to the foot
- Major markings include medial and lateral condyles, intercondylar eminence, the tibial tuberosity, anterior crest, medial malleolus, and fibular notch

Tibia and Fibula

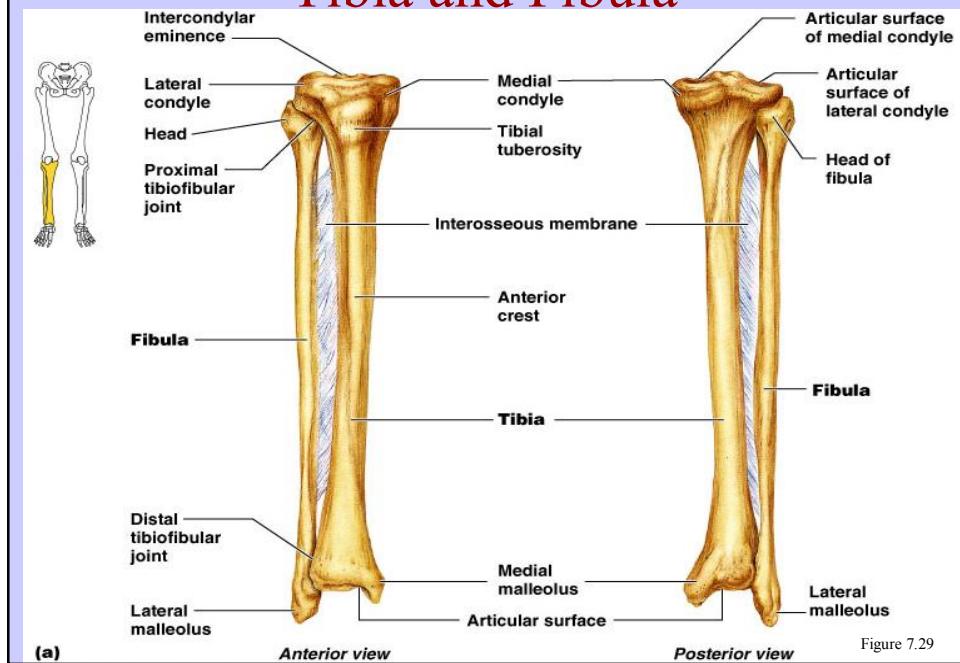


Figure 7.29

Fibula

- Sticklike bone with slightly expanded ends located laterally to the tibia
- Major markings include the head and lateral malleolus

Foot

- The skeleton of the foot includes the tarsus, metatarsus, and the phalanges (toes)
- The foot supports body weight and acts as a lever to propel the body forward in walking and running

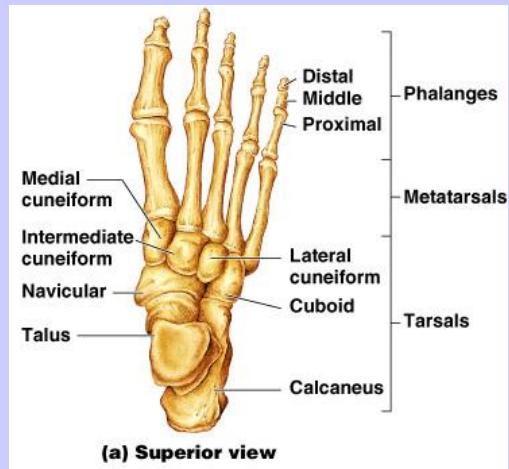
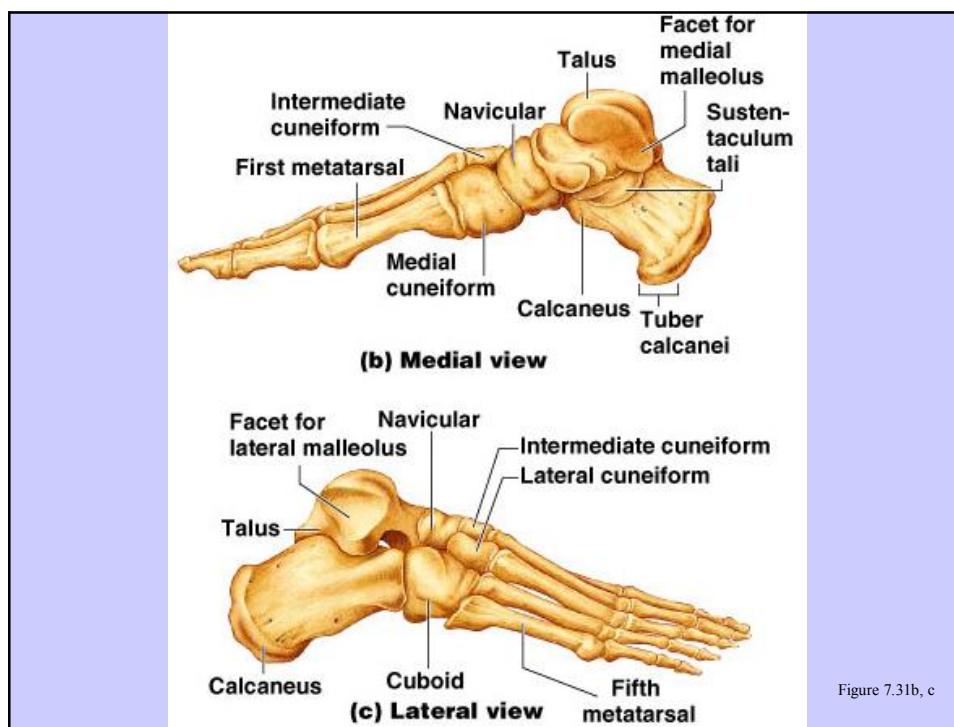
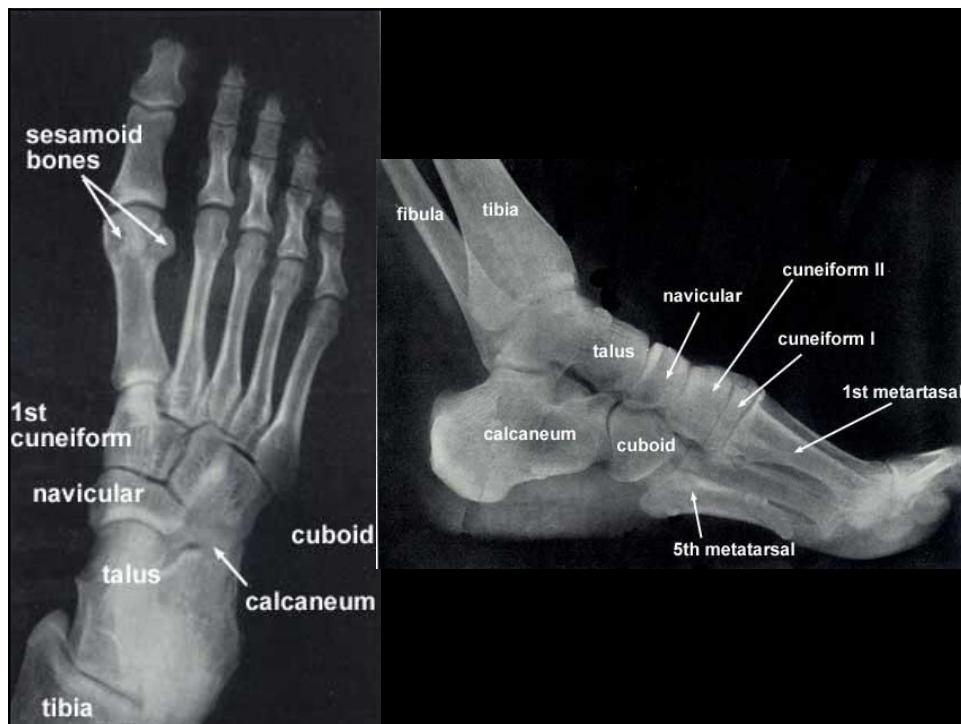


Figure 7.31a

Tarsus

- Composed of seven bones that form the posterior half of the foot
- Body weight is carried primarily on the talus and calcaneus
- Talus articulates with the tibia and fibula superiorly, and the calcaneus inferiorly
- Other tarsus bones include the cuboid and navicular, and the medial, intermediate, and lateral cuneiforms



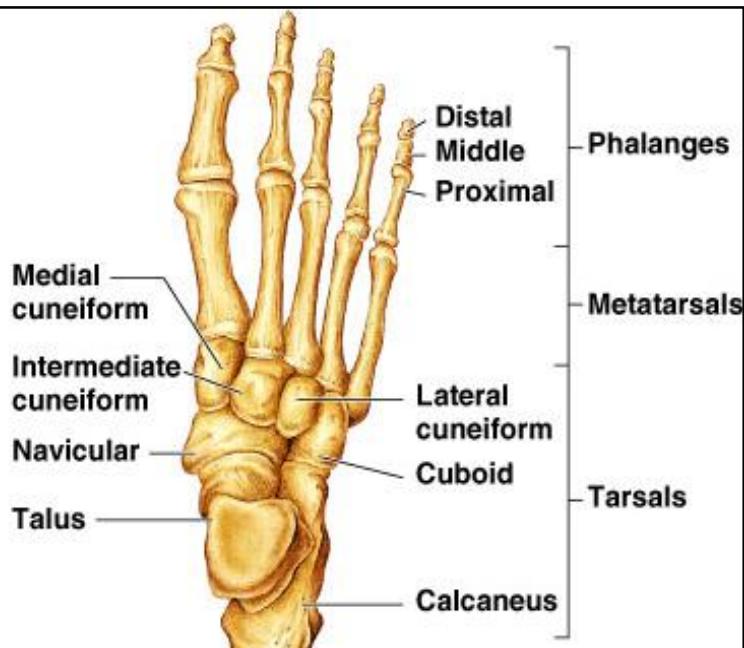
Calcaneus

- Forms the heel of the foot
- Carries the talus on its superior surface
- Point of attachment for the calcaneal (Achilles) tendon of the calf muscles

Metatarsus and Phalanges

- Metatarsals
 - Five (1-5) long bones that articulate with the proximal phalanges
 - The enlarged head of metatarsal 1 forms the “ball of the foot”
- Phalanges
 - The 14 bones of the toes
 - Each digit has three phalanges except the hallux, which has no middle phalanx

Metatarsus and Phalanges



(a) Superior view

Arches of the Foot

- The foot has three arches maintained by interlocking foot bones and strong ligaments
- Arches allow the foot to hold up weight
- The arches are:
 - Lateral longitudinal – cuboid is keystone of this arch
 - Medial longitudinal – talus is keystone of this arch
 - Transverse – runs obliquely from one side of the foot to the other

