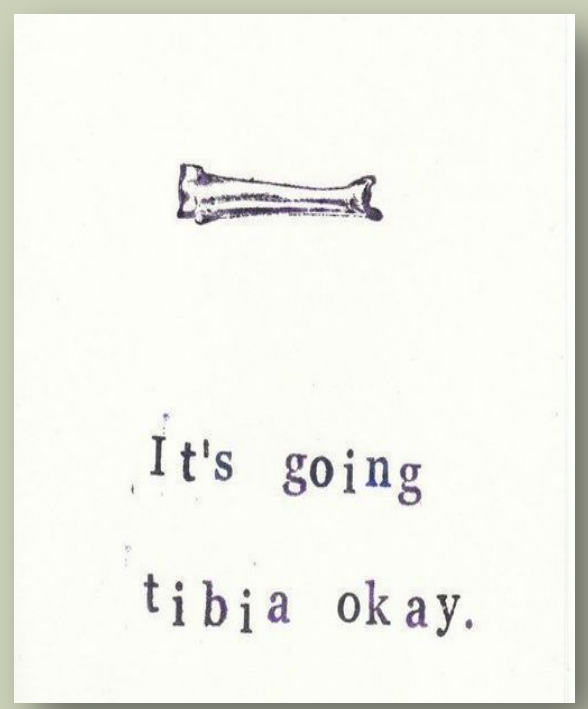
INTRODUCTION TO ANATOMY

Course Break Down

- What will we learn?
  - Anatomical position
  - Anatomical planes and motions
  - Overview of Skeletal System
  - Overview of Muscular System
  - Overview of Nervous System

- Evaluations
  - 1 Quiz (10%)
  - 1 Final Exam (70%)



TIPS FOR LEARNING ANATOMY

- Repetition is key!
  - utilize your textbook, print outs, course materials & the internet to practice & learn
- Self-directed learning
  - the course moves quickly & we have a lot of content to cover
  - set aside time outside of class to review & study your anatomy
- Study buddies!
  - friends & family make perfect study buddies
  - they may not have a clue what you are talking about - but it is always funny to hear them try to pronounce anatomical landmarks, bones, muscles, etc…
- Lean on each other
  - no one else knows what you are going through except for the people in this room, talk to each other, support each other, learn together!
- Ask questions
  - please reach out to me if you have any questions/comments/concerns

Gentle Reminders…

- Cell phones; please use them on your own time
- We will have breaks!
- Let's keep cross talk to a minimum during lecture time, peer questions, etc…
- If you are late or cannot make it to class please let administration know

Contact info:

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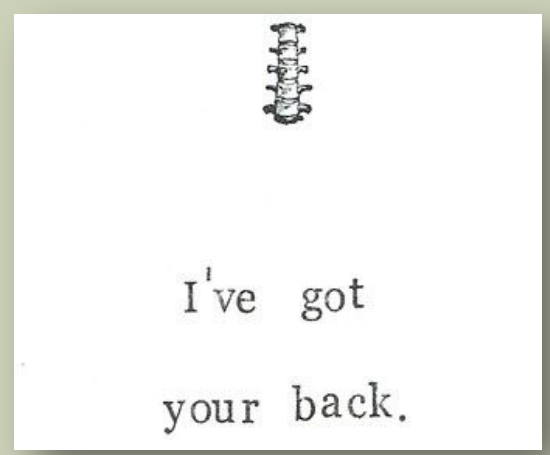


Defining Anatomy

Crash Course

Extremely helpful tool for anatomy & physiology; found on YouTube

Meet Hank….

Introduction to Anatomy & Physiology: Crash Course Anatomy & Physiology #1

Definitions

- Anatomy – the science of body **structure; think 'what'**

-what are we made of?
-what are our body systems?

- Physiology – the study of the **function** of the body; **think 'how'**

-how do systems work together?
-how does the body work as a whole?

Studies

- Macroscopic anatomy or gross anatomy
  - think LARGE
    - osteology
    - arthrology
    - myology
    - neurology
- Surface anatomy
  - the study of landmarks
  - Palpating
- Microscopic anatomy
  - histology (anatomy at the cellular/tissue level)
  - helps us understand pathologies
- Embryology
  - study of development before birth
- Neurosciences
  - Study of the nervous system (central & peripheral)

Anatomy Approaches:

Systemic anatomy

- understanding the body as organ systems
- there are 12 anatomical systems
- For us our major concern in intro:
  - skeletal system
  - muscular system
  - articular System

Regional anatomy

- understanding the regions of the body
  - Ex: upper extremity: arm → forearm
  - Ex: lower extremity: thigh → leg

Clinical anatomy

- understanding the aspects of structure and function that are pertinent to clinical practice
  - Ex: RMTs, PTs, MDs, etc…

Anatomy: Introduction to Anatomy Terms

ANATOMICAL POSITION

What is it?

- standing erect (upright), facing forward, arms at the side, palms facing forward

Why is it important?

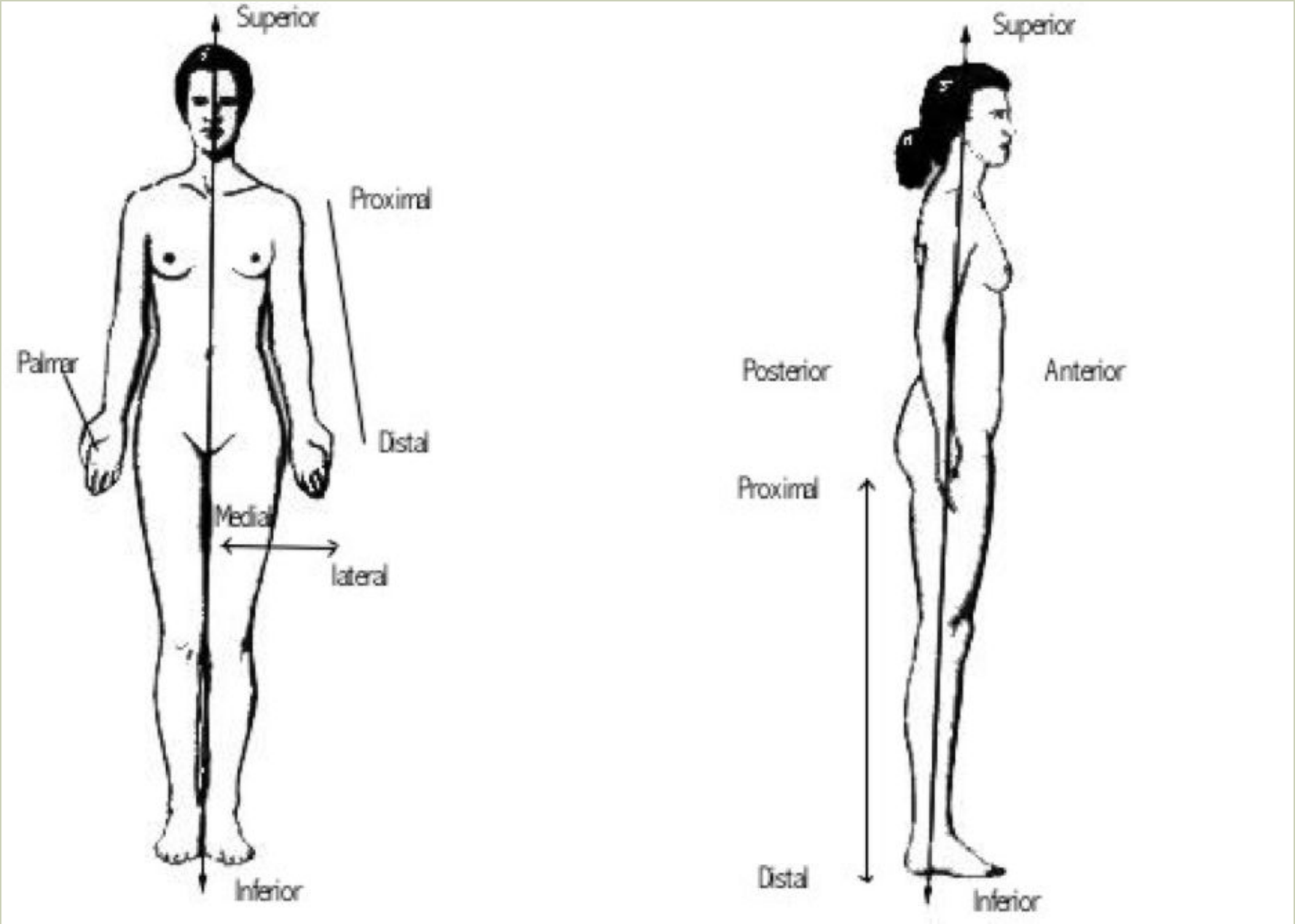
- utilized as a standard point of reference (across health professions)
- gives us insight to the physical location of structures & points of the body

Why do you think this would be important in our profession?

Locational/Directional Terminology
Where am I?

Terms & Definitions

Anterior (Ventral) → farther to the front
Posterior (Dorsal) → farther to the back
Superior → above (toward the head)
Inferior → below (away from the head)
Medial (Internal) → towards midline (imaginary line that divides body into left & right halves)
Lateral (External) → farther from midline
Proximal → closer to the axial body (axial vs appendicular)
Distal → farther from the axial body
Superficial → closer to the surface of the body
Deep → farther from the surface of the body (more internal)
Plantar/Dorsal → sole of foot (plantar or bottom surface)/dorsum of foot (top of foot)
Palmar (Volar)/Dorsal→ palm of hand (palmar surface of hand)/dorsum of hand (back of hand)
Cranial → towards the head
Caudal → towards the tail


Superior
Proximal
Palmar
Distal
Medial
lateral
Inferior
Superior
Posterior
Anterior
Proximal
Distal
Inferior

Remember!

- Always identify where something is in reference to anatomical position
- Location = Direction
- Directional terms always come in pairs; each with opposite functions
- Combining directional terms:
  - ex: anterolateral (anterior & lateral)
  - connect with an “O”
  - will typically see anterior/posterior first (not a concrete rule)
- You have the ultimate cheat sheet!!
  - use & move your body to practice your directional/locational terms

The Cardinal Planes

- Planes:
  - best described as sheets of glass that pass through & divide the body
  - used to provide orientation when observing the body as a whole or its parts as well as the body in motion
  - three major planes also known as the “cardinal” planes

- Sagittal (mid-sagittal) plane
  - divides the body into equal left and right portions

- Frontal (coronal) plane
  - divides the body into front and back portions

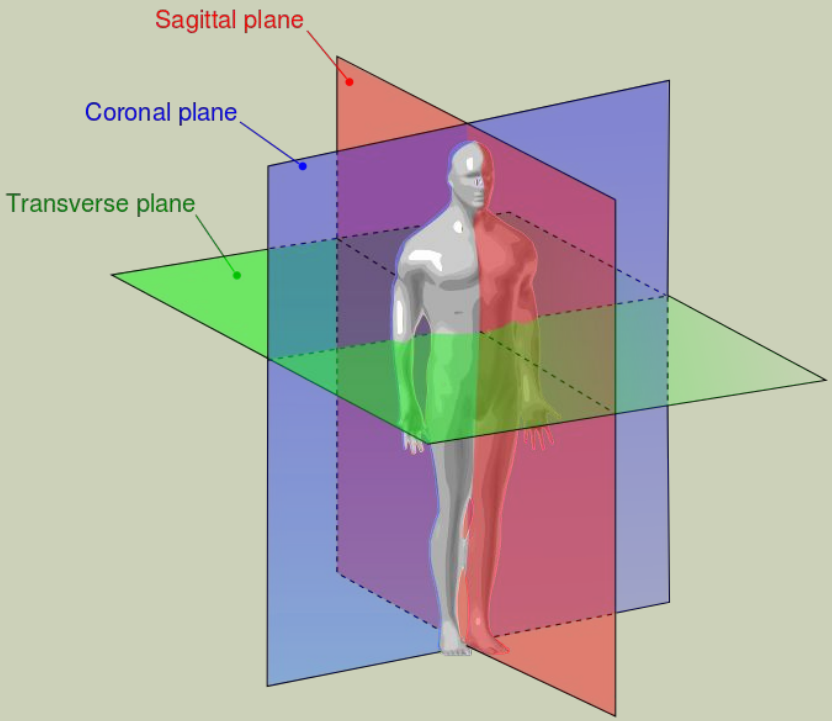
- Transverse (horizontal) plane
  - divides the body into upper and lower portions

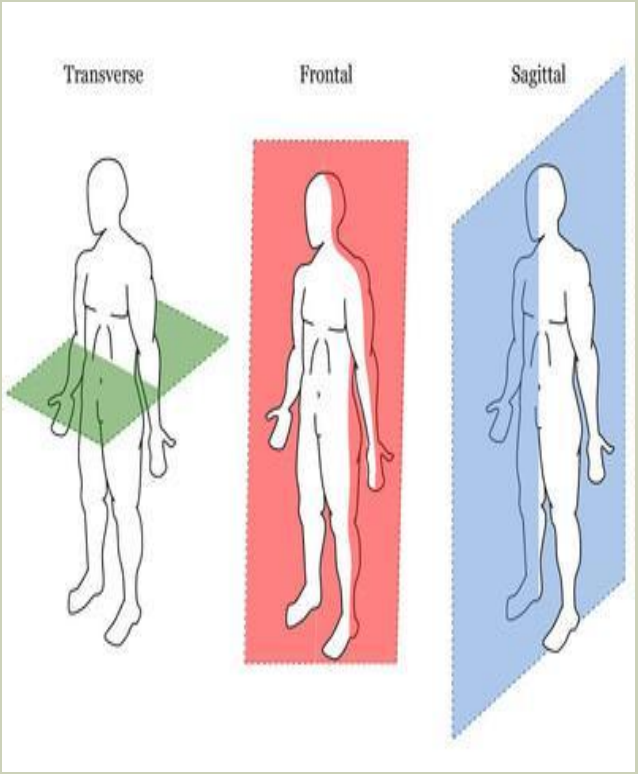
You may also see:

- Parasagittal plane
  - divides the body into unequal left and right portions

- Oblique plane
  - Anything that isn’t perfectly sagittal, frontal, transverse

ANATOMICAL PLANES





Planes of Movement

Where does movement occur?

- articulations or joints

Planes of movement:

- the body part (limb) that is moving will always move **parallel to/with** the plane
- all movement is always in reference to anatomical position

Sagittal plane movements:

- occur front to back

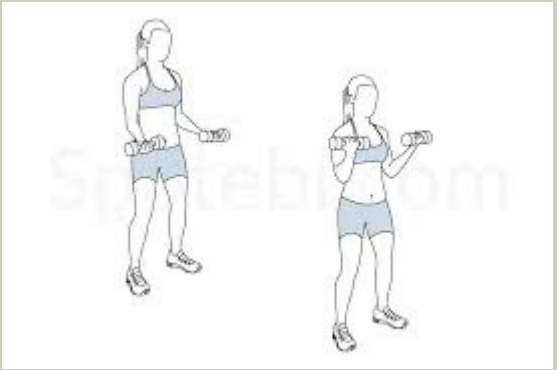
Frontal plane movements:

- occur side to side

Transverse plane movement:

- occur in twisting/rotational

Examples?



Axes of Movement

What is an axis of movement?

- the axis or the pivot around which a limb will move
- the axis will be named according to the respective plane or more descriptive of the direction of the axis
- the axis is always **perpendicular** to the movement

Sagittal (anterior/posterior) axis

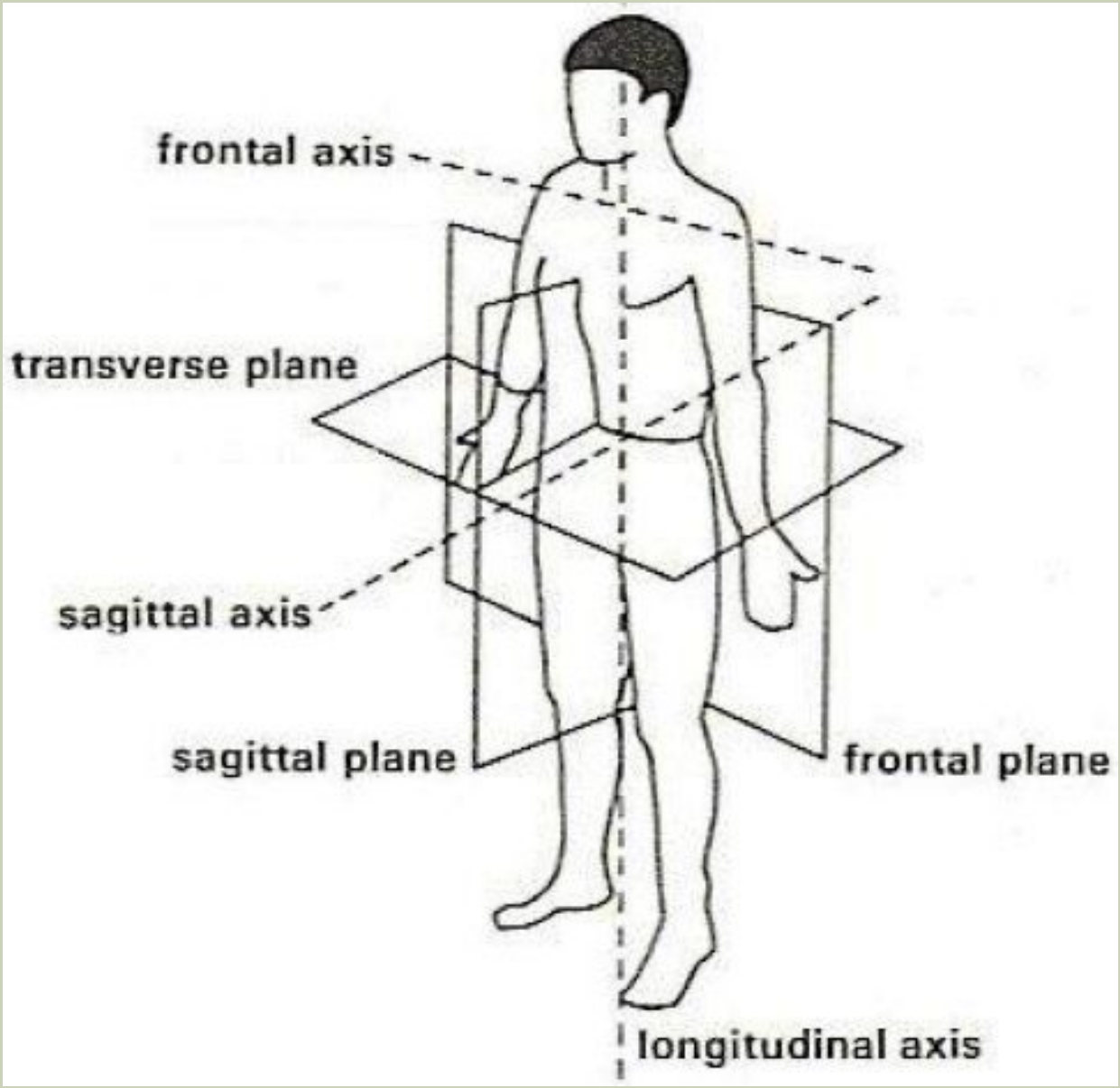
- corresponds with movement in the frontal plane
- ex: shoulder abduction

Coronal (left/right) axis

- corresponds with movement in the sagittal plane
- ex: shoulder flexion

Longitudinal axis

- corresponds with movement in the transverse plane
- ex: medial rotation of the shoulder


frontal axis
transverse plane
sagittal axis
sagittal plane
frontal plane
longitudinal axis

Dynamic
Movement

Dynamic Movement

- Dynamic movement aka: joint actions refer to a direction of motion
- Motion is always made in reference to anatomical position
- Joint actions come in oppositional pairs
- In anatomy, we always name the motion as well as the joint it is occurring about
  ex: flexion of the elbow

Flexion & Extension

Flexion

- decreases the angle between two bones
- typically occurs as an anterior motion
- occurs in the sagittal plane
- examples?

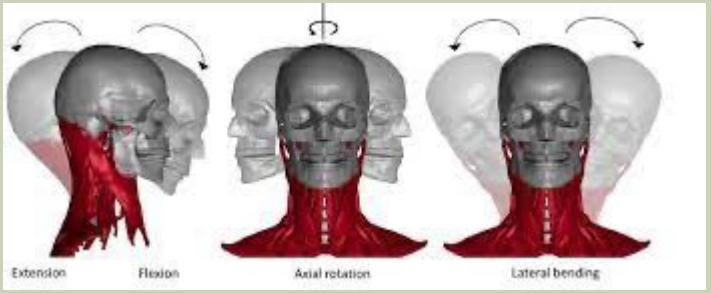
Extension

- increases the angle between two bones
- typically occurs as a posterior motion
- occurs in the sagittal plane
- examples?

Lateral Flexion

Lateral flexion

- side-bending movement of the head, neck, and/or trunk toward the right or the left side
- occurs in the frontal plane



Hyperflexion & Hyperextension

Hyperflexion

- flexion of a limb/joint beyond what is normal or healthy

Hyperextension

- extension of limb/joint beyond what is normal or healthy

Abduction & Adduction

Abduction

- lateral movement away from the midline of the body
- occurs in the frontal plane
- think “abduction”
- examples?

Adduction

- medial movement towards the midline of the body
- occurs in the frontal plane
- think “adding”
- examples?

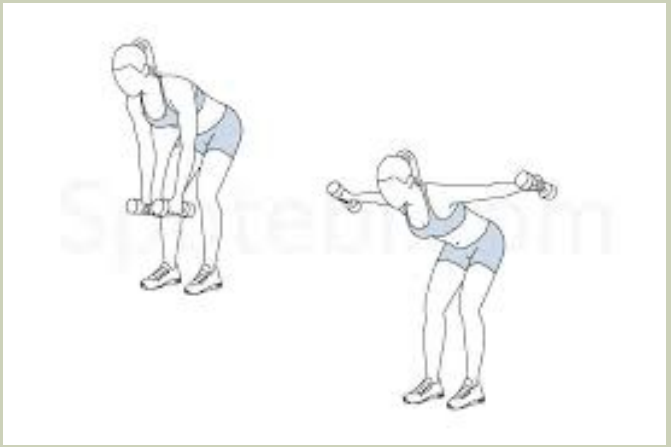
Horizontal Abduction & Adduction

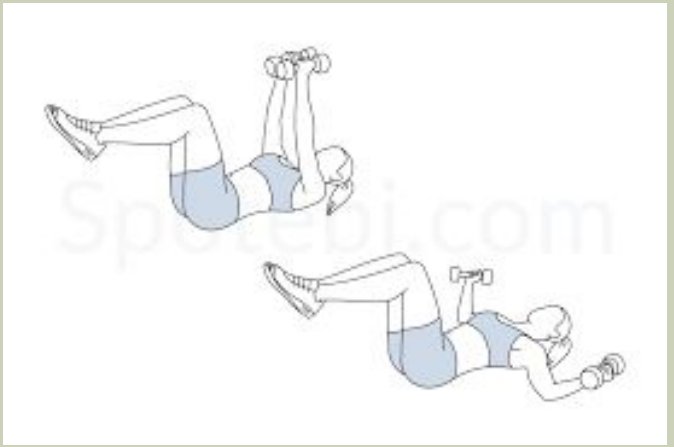
Horizontal abduction

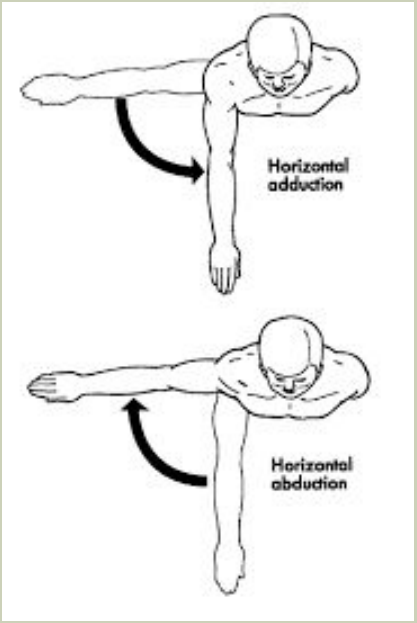
- aka: horizontal extension
- the limb will start in a horizontal position (abducted to 90 degrees)
- the limb will then move **posteriorly & away from** the midline of the body

Horizontal adduction

- aka: horizontal flexion
- the limb will start in a horizontal position (abducted to 90 degrees)
- the limb will then move **anteriorly & toward** the midline of the body






Horizontal adduction
Horizontal abduction

Right & Left Rotation

Rotation

- when the anterior surface of the body moves to face more right or left
- occurs in the transverse plane

Medial & Lateral Rotation

Medial Rotation

- aka: internal rotation
- a rotational movement towards midline
- occurs in the transverse plane
- examples?

Lateral Rotation

- aka: external rotation
- a rotational movement away from midline
- occurs in the transverse plane
- examples?

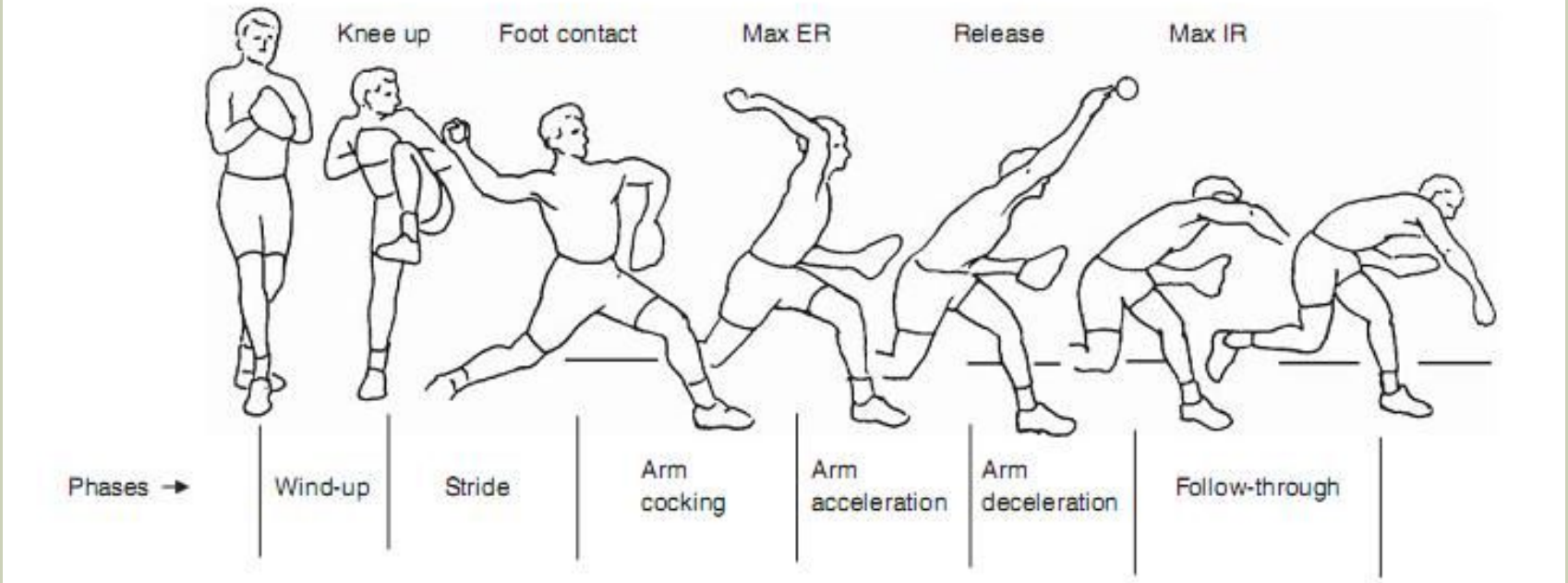


Fig. 1. Pitching phases and key events (adapted from Fleisig et al.,[12] with permission). **ER** = external rotation; **IR** = internal rotation; **max** = maximum.

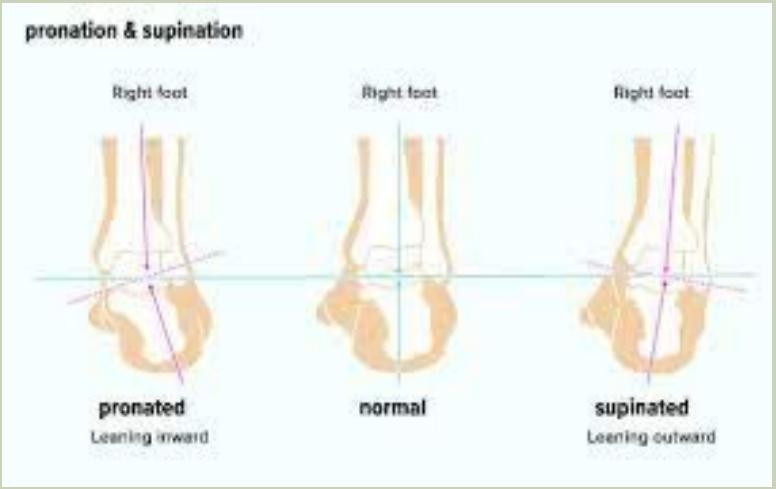
Pronation & Supination

Pronation

- rotational movement that places the hand down (forearm); thumb moves towards the body in anatomical position
- decreased arch (foot)

Supination

- rotational movement that places the hand up (forearm); thumb moves away from the body in anatomical position
- increased arch (foot)


pronation & supination
Right foot
Right foot
Right foot
pronated
Leaning inward
normal
supinated
Leaning outward

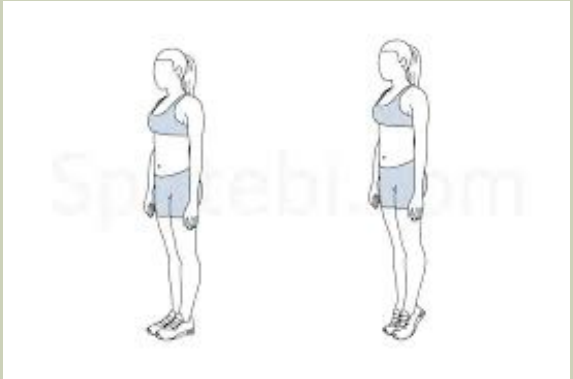
Plantarflexion & Dorsiflexion

Dorsiflexion

- flexion at the ankle
- moving the toes toward the shin

Plantarflexion

- extension at the ankle
- toes to floor



Inversion & Eversion

Inversion
- rotation of the foot so the soles face medially (towards each other)

Eversion
- rotation of the foot so the soles face laterally (away from each other)

Opposition & Reposition

Opposition
- brings the pad of the thumb and the pad of another finger together

Reposition
- Moving the thumb back to anatomical position

Figure 26

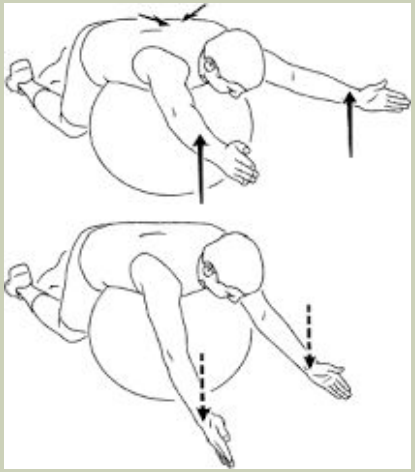
Scapular Motions

Shoulder Elevation

- superior movement of a body part
- shoulder shrug
- ex: lifting heavy item onto a table

Shoulder Depression

- inferior movement of a body part
- sigh of relief
- ex: carrying a grocery bag



Scapular Motions

Scapular protraction

- anterior movement of a body part
- giving a hug

Scapular Retraction

- posterior movement of a body part
- pushing away from a wall

Scapular Motions

Upward Rotation

- when the inferior angle of the scapula is moving upward and away from the spine
- ex: putting a box on a high shelf

Downward Rotation

- when the inferior angle of the scapula is moving downward and toward the spine
- ex: pulling a book off of a high shelf

Scapular Motions

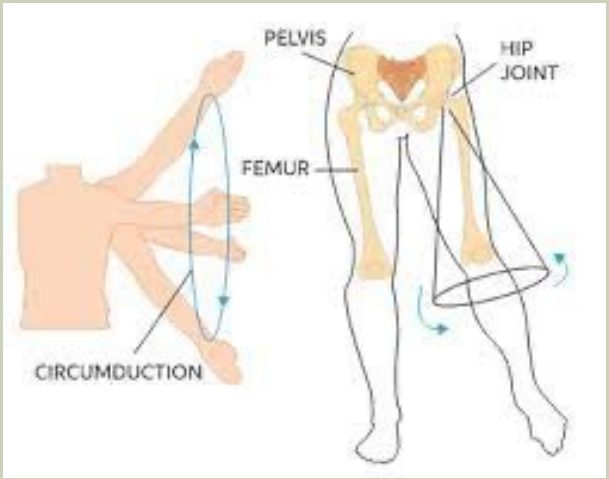
Scaption

- flexion in the scapular plane
- lifting arms from sides in an anterior position of about 30-45 degrees
- helpful to build rotator cuff/shoulder girdle strength to enhance shoulder stability

Circumduction

Circumduction

- not considered a single joint action
- It is a combination or sequence of four joint actions performed one after the other, ultimately creating a circular motion
- flexion, abduction, extension, adduction
- occurs at any joint that allows for motion in two or more planes
- ex: shoulder & hip



Putting it all together…

The Easiest Way to Learn Directional Terms - Anatomy Basics | Corporis

Joint Movements

Lab 1

- Complete Handout
- Perform dynamic movements
  - active & passive

Introduction to the Skeletal System

Definition

Osteology = the study of bones

- Used in the functional study of anatomy, forensic medicine, and archeology
- How many bones do you think the human skeletal system is composed of?
- Why is osteology important for RMTs?

Bone Function

- Bone is active and/or living and has 6 major functions:

Support

- supports soft tissues and provide attachment for skeletal muscle

Movement

- our muscles attach to bone and create levers for movement

Protection

- provides protection for our internal organs (bones of the rib cage, vertebral column, pelvis, & skull)

Production & storage of blood cells

- produced in red bone marrow

Storage of minerals

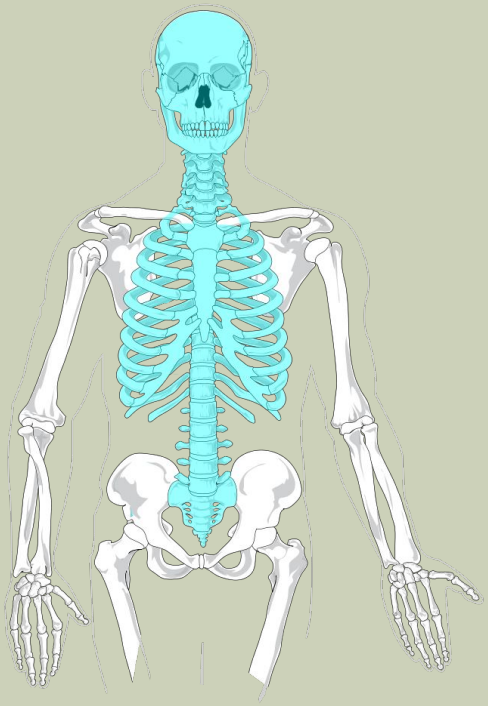
- mainly calcium

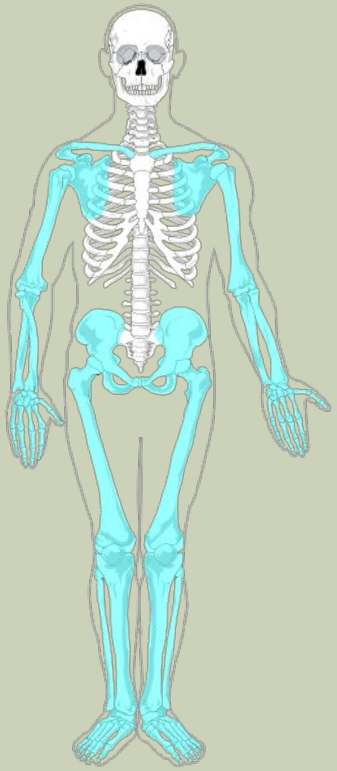
Energy storage

- yellow bone marrow; fat

The Human Skeleton

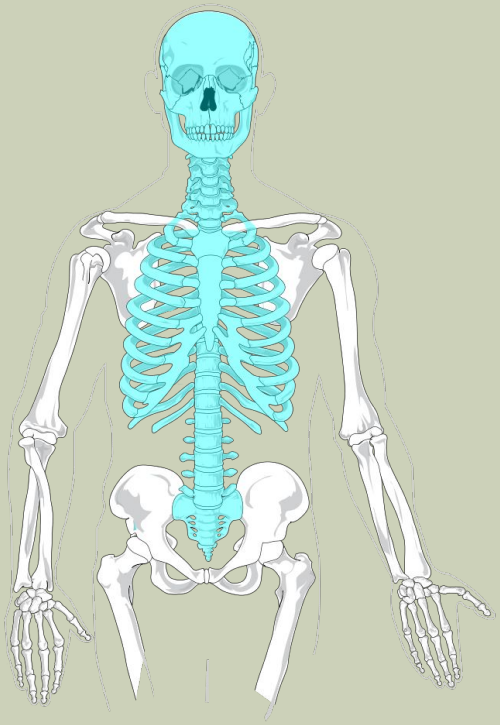
- The human body is composed of approximately 206 bones
- The body is divided based on **location** into either bones of the **axial** skeleton or bones of the **appendicular** skeleton





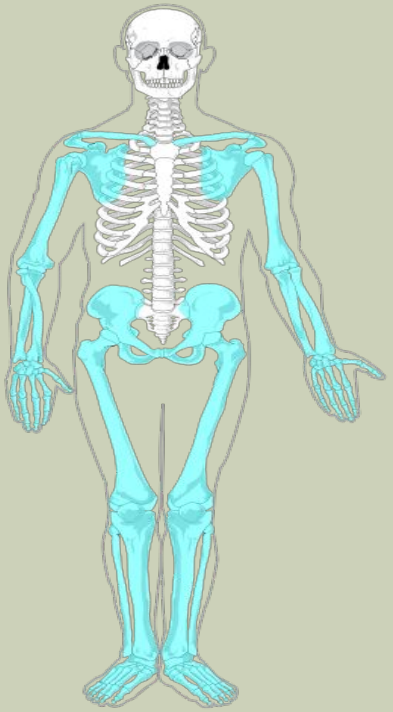
The Axial Skeleton

- The axial skeleton is made up of the bones that run down the central axis of the body
- That's approximately **80** bones!
- This group of bones include:
  - Bones of the skull
  - Hyoid bone
  - Ossicles of the middle ear,
  - Rib cage
  - Vertebral column
  - Sacrum
  - Coccyx
- Provide the anchor for movement
  - support & protect



The Appendicular Skeleton

- The appendicular skeleton includes the bones that are **attached** or **appended** to the axial skeleton
- That's about **126** bones!
- This group of bones include:
  - bones of the upper and lower limbs, hands & feet
  - the pectoral (shoulder) girdle
  - the pelvic (hip) girdle
- Responsible for movement



Bone Types

There are 5 bone types, named based on shape

- Long bones
- Short bones
- Irregular bones
- Flat bones
- Sesamoid bones

Long Bones

Location:

- located mostly in appendicular skeleton

Structure:

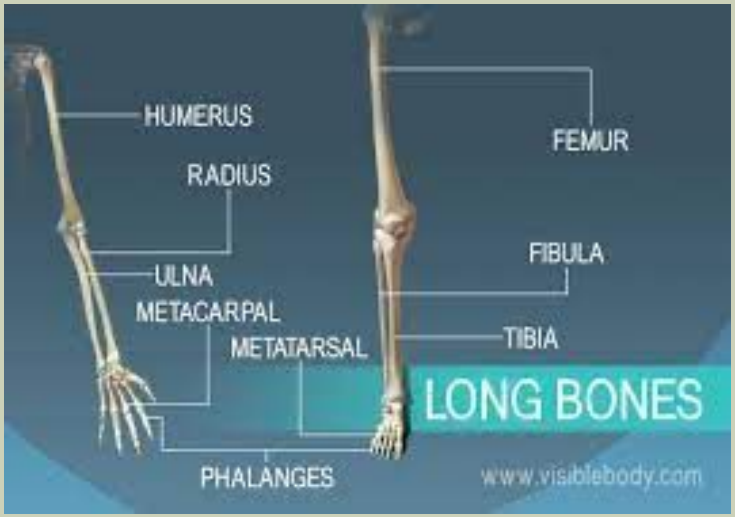
- have a base, head and shaft, can be long or short

Function:

- support the body weight
- facilitate movement

Examples include:

- femur, phalanges, radius, tibia



Short (Cube) Bones

Location:

- in the hands & feet

Structure:

- about the same length and width

Function:

- provide stability over function (movement

Examples include:

- carpals & tarsals

Irregular Bones

Location:

- found in the axial skeleton

Structure:

- vary in size & shape, typically complex in shape

Function:

- typically used for protection

Examples include:

- vertebrae, sacrum

Flat Bones

Location:

- found in the axial skeleton

Structure:

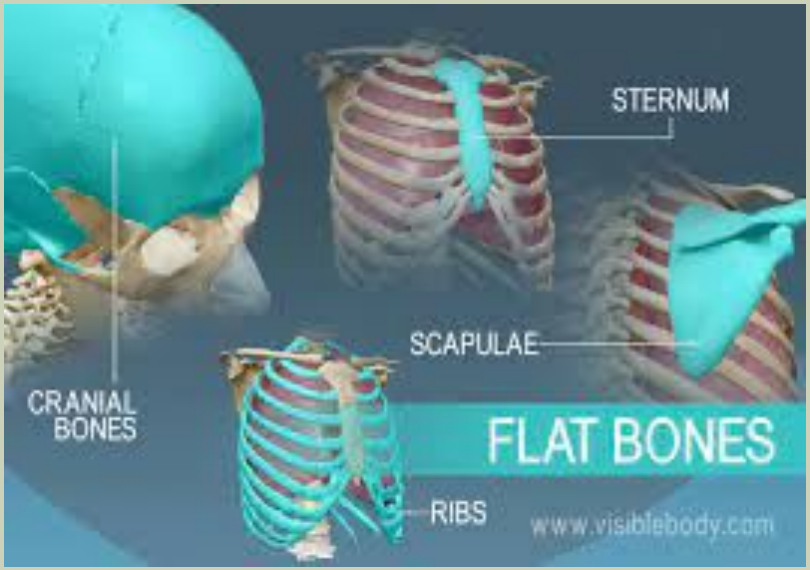
- flattened in shape

Function:

- typically used for protection for internal organs & large area for muscle attachment

Examples include:

- skull, sternum, ribs, pelvis



Sesamoid Bones

Location:

- found within tendons

Structure:

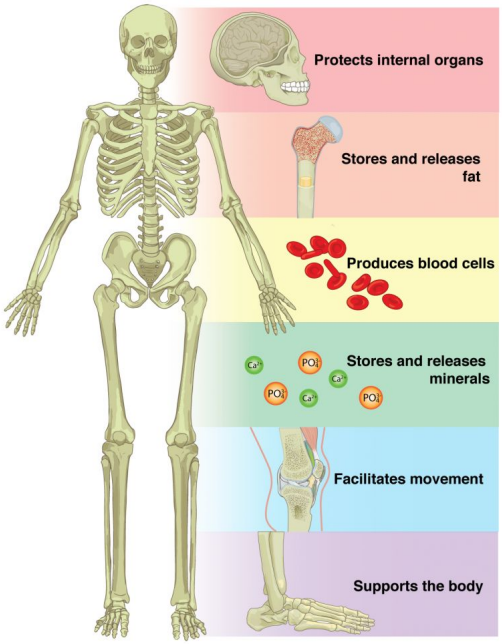
- small & round

Function:

- protects tendons from stress & breakdown

Examples include:

- patella (knee cap)



[The Skeletal System: Crash Course Anatomy & Physiology #19]

Putting it all together …

Lab 2

- Complete Handout

Bony Landmarks

More Terminology!

BONY LANDMARKS

Bony Landmarks

- an important point of reference when learning anatomy
- primarily used to define muscle attachment points
- can also be used as passageways for blood vessels and nerves to pass through
- learning bony landmarks before muscles makes it easier to understand where muscles attach later in the course
  - ie: muscle origins & insertions

How to Memorize Bony Landmarks Quickly and Easily! - Human Anatomy | Kenhub

Parts of a Bone

- Head
  - epiphysis
  - the rounded portion found at the end of a bone
- Neck
  - metaphysis
  - the widest part of a long bone, between the head and the shaft
- Body
  - diaphysis
  - the central shaft running from proximal to distal ends of a bone
- Articular surface
  - the part of the bone that comes into close contact with another bone
- Margin/border
  - an edge, or border of a bone
  - Ex: medial & lateral scapular border

Depressions & Openings

Depressions & Openings

- bony landmarks in this area typically form basins or channels that house blood vessels, nerves, muscles, and tendons

Fissures

- open slits, grooves, or depressions in a bone
- typically where blood vessels or nerves pass through
- ex: superior orbital fissure

Foramen

- holes or openings in a bone
- typically where blood vessels or nerves pass through
- ex: foramen magnum of the skull, obturator foramen of the pelvis

Meatus

- a short tube like structure that extends into the bone
- provides passage and protection of nerves passing through a bone
- ex: external auditory meatus of the temporal bone

Sinus

- a cavity within a bone
- ex: paranasal sinuses

Depressions & Openings ct'd

Groove/Sulcus

- A furrow or a fissure in a bone that trace the length of nerves or vessels in order to provide protection from external forces
- Ex: bicipital groove of the humerus

Notch

- Indentations at the edge of a structure, can be V-like in shape
- scapular notch, radial notch of the ulna

Fossa

- a depression on the bone surface, often broad and shallow
- ex: iliac fossa

Fovea

- A pit or a depression; similar to a fossa, but much smaller
- ex: fovea capitis of the femur

Processes & Projections

Projections & processes

- areas of bone that project passed the surface of the bone
- attachment sites for tendons and ligaments
- size will vary based on the force exerted through the attachment of the bone

Condyle

- rounded knobs that form articulations with other bones
- provides structural support to a joint which helps to absorb force in a movement
- ex: lateral condyle of the femur

Epicondyle

- a bony area on or above a condyle
- typically for a muscle or a ligament attachment
- Ex: medial epicondyle of the humerus

Process

- A bulging, bony, outgrowth of a larger bone
- ex: mastoid process

Processes & Projections ct'd...

Protuberance

- similar to a process, it is a swelling, bulging, or protruding parts of a bone
- ex: external occipital protuberance

Tuberosity

- a large rounded prominence, found in varying shapes and often rough in texture
- ex: ulnar tuberosity

Tubercle

- a small rounded prominence, often a site for tendon or ligament attachment
- ex: adductor tubercle of the femur

Processes & Projections ct'd...

Trochanter

- only present in the femur
- large, irregular shaped process on the femur
- utilized for muscle and ligament attachments
- ex: greater and lesser trochanter of the femur

Spine

- sharp and slender projection of a bone
- utilized for muscle or ligament attachments
- ex: spine of scapula

Line/Linea

- a subtle, long, narrow impression which distinguishes itself in elevation, colour, and texture from surrounding tissues
- ex: linea aspera of the femur

Process & Projections ct'd

Facet

- A flat smooth surface of a bone that acts as an articulating surface
- ex: acromial facet of the clavicle

Crests/Ridges

- Prominent, raised edges of bone
- Ex: iliac crest/lateral supracondylar ridge of the humerus

Angle

- a corner or a feature of a bone
- ex: inferior angle of the scapula

Ramus

- A curved portion of a bone
- Ex: inferior pubic ramus

Bones of the Upper Extremity

Regional Anatomy: Upper Extremity

- The upper extremity is part of the appendicular skeleton
- each upper limb contains 32 bones
- the pectoral girdle is more stable, whereas the upper limb → hand is more freely moveable

Regions:

- Pectoral girdle = scapula and clavicle
- Upper limb = arm (humerus) & forearm (radius & ulna)
- Hand = carpals, metacarpals, phalanges

The Clavicle

- aka: the collar bone
- 2 on either side

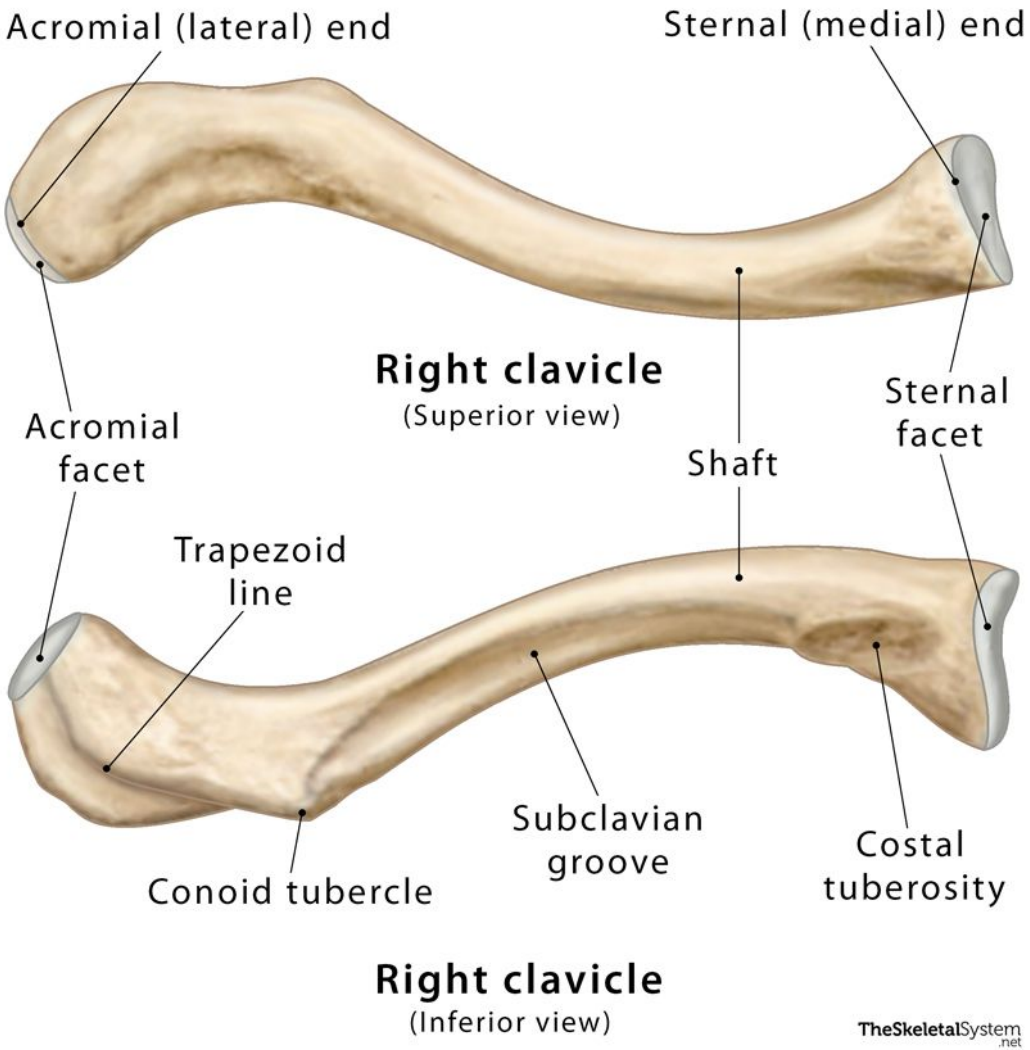
Structure:

- has an “S” shape
- it is **convex** in shape medially, near the sternal junction
- it is **concave** in shape laterally, near the acromion process of the scapula

Features:

- medial end = sternal end as it articulates with sternum
- lateral end = acromial end as it articulates with acromion process of scapula

Clavicle


Acromial (lateral) end
Sternal (medial) end
Right clavicle
(Superior view)
Acromial facet
Shaft
Sternal facet
Trapezoid line
Subclavian groove
Costal tuberosity
Conoid tubercle
Right clavicle
(Inferior view)
TheSkeletalSystem.net

The Scapula

- aka: the shoulder blade
- 2 on either side

Structure
- flat bone
- triangular in shape
- medial border = the vertebral border
- lateral border = axillary border

Features:
- medial border = the vertebral border
- lateral border = axillary border
- superior angle = the most superior portion of the scapula
- inferior angle = the most inferior portion of the scapula

Features ct'd

Spine

- a large process on the posterior side of the scapula that ends laterally as the acromion

Acromion

- found on the lateral end of the scapula, flat in shape

Coracoid process

- a protruding projection on the anterior surface of the scapula

Glenoid cavity

- shallow concavity that articulates with the head of the humerus

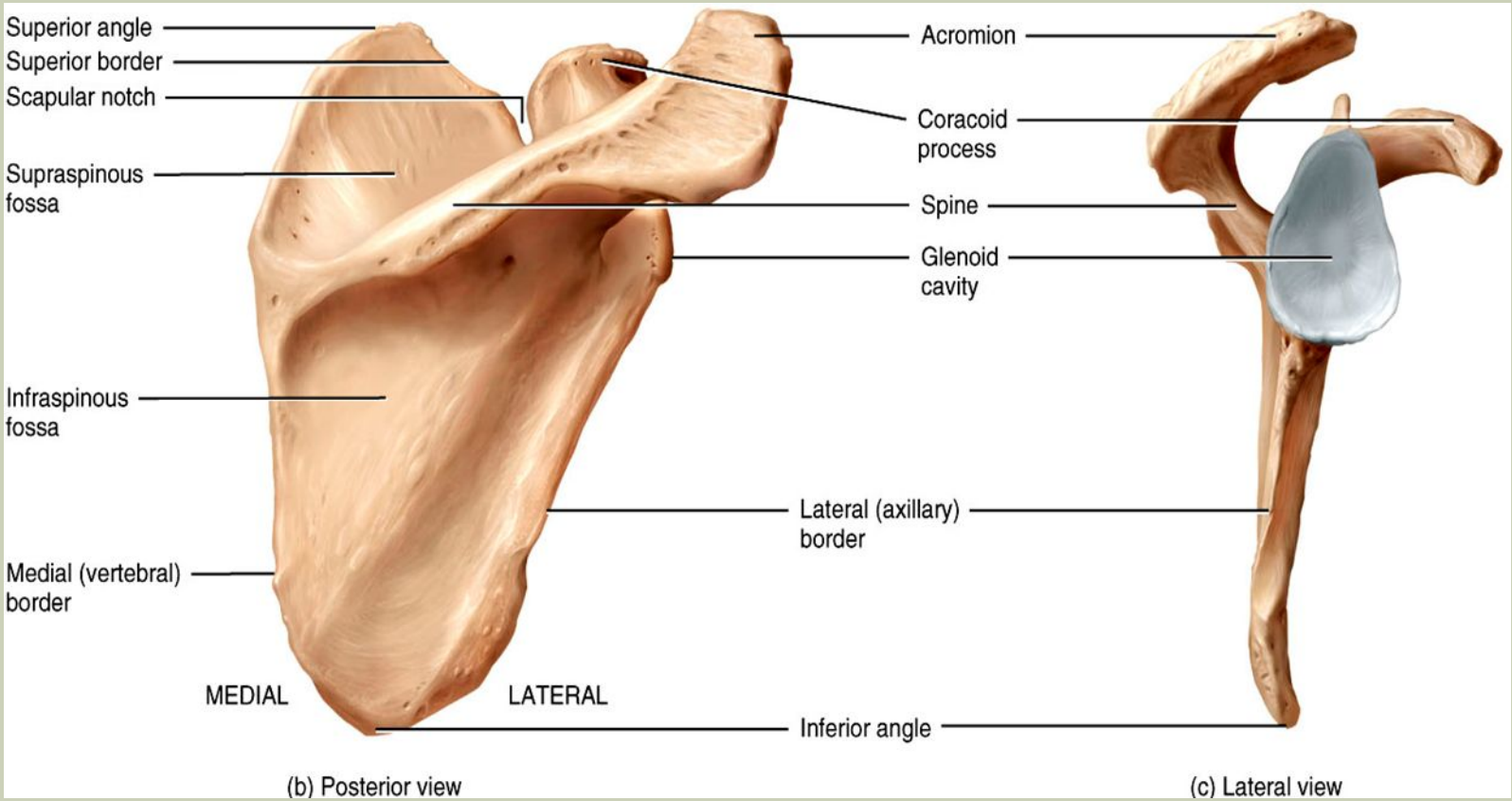
Features ct'd

Subscapular fossa
- anterior concavity where the subscapularis muscle attaches

Supraspinous fossa
- posterior concavity superior to the scapular spine
- attachment site for supraspinatus muscle

Infraspinous fossa
- posterior concavity inferior to the scapular spine, site of infraspinatus muscle

SCAPULA


Superior angle
Superior border
Scapular notch
Supraspinous fossa
Infraspinous fossa
Medial (vertebral) border
MEDIAL
LATERAL
Acromion
Coracoid process
Spine
Glenoid cavity
Lateral (axillary) border
Inferior angle
(b) Posterior view
(c) Lateral view

The Humerus

- aka: the arm
- 2 on either side
- longest and largest bone of the upper limb
- runs between the shoulder and the elbow
- the proximal head articulates with glenoid cavity of scapula
- the distal condyles articulates articulate with radius and ulna of the forearm

Features

Head
- round projection that sits in the glenoid fossa of the scapula to form the shoulder joint
- has two unequal sized projections

Greater tubercle
- lies more laterally on the humeral head

Lesser tubercle
- lies more anteriorly on the humeral head

Intertubercular groove or sulcus
- found between the tubercles lies
- aka: bicipital groove
- where the long head of the biceps brachii tendon is located

Features ct'd...

Anatomical neck
- found distal to the head

Surgical neck
- where the tubular shaft begins
- is a common area of fracture

Deltoid tuberosity
- found about mid-shaft on the lateral aspect of the humerus
- it is a roughened area where the deltoid tendon attaches

Capitulum
- a round knob-like process on the lateral distal humerus

Trochlea
- medial to the capitulum
- is a spool-shaped projection on the distal humerus

Features ct'd…

Coronoid fossa

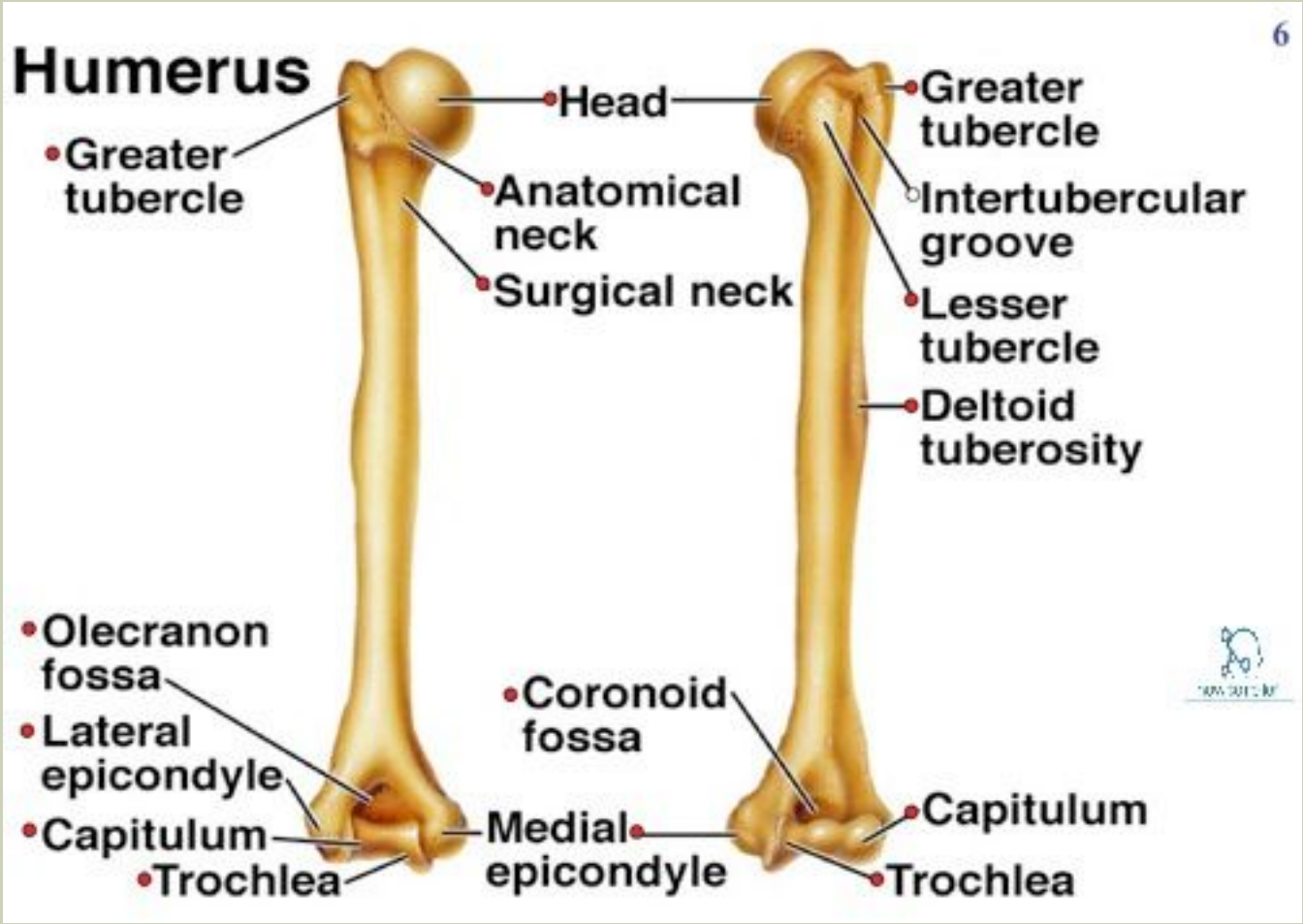
- anterior depression that receives the coronoid process of the ulna during forearm flexion

Olecranon fossa

- posterior depression that receives the olecranon of the ulna during forearm extension

Medial and lateral epicondyles

- bony projections to which the forearm muscles attach


Humerus
Greater tubercle
Head
Anatomical neck
Surgical neck
Greater tubercle
Intertubercular groove
Lesser tubercle
Deltoid tuberosity
Olecranon fossa
Lateral epicondyle
Capitulum
Trochlea
Coronoid fossa
Medial epicondyle
Capitulum
Trochlea

The Radius

The radius is one of two bones that form the forearm of the appendicular skeleton
- it lies lateral to the ulna on the **thumb side of the forearm**

Features
- Head (disc-shaped) and neck
  - located at the proximal end of the bone shaft
  - the head articulates with the capitulum of the humerus and the radial notch of the ulna
- Radial tuberosity
  - located medial and inferior to neck
  - attachment site for biceps brachii muscle
- Styloid process
  - large distal projection on lateral side of radius

The Ulna

The ulna is the second of two bones that make up the forearm of the appendicular skeleton

- longer of the two forearm bones
- lies on the medial side of the forearm (pinky side)

Olecranon

- the large, prominent proximal end of the ulna
- the tip of your elbow

Coronoid process

- the anterior lip of the proximal ulna

Trochlear notch

- the deep fossa that receives the trochlea of the humerus during elbow flexion

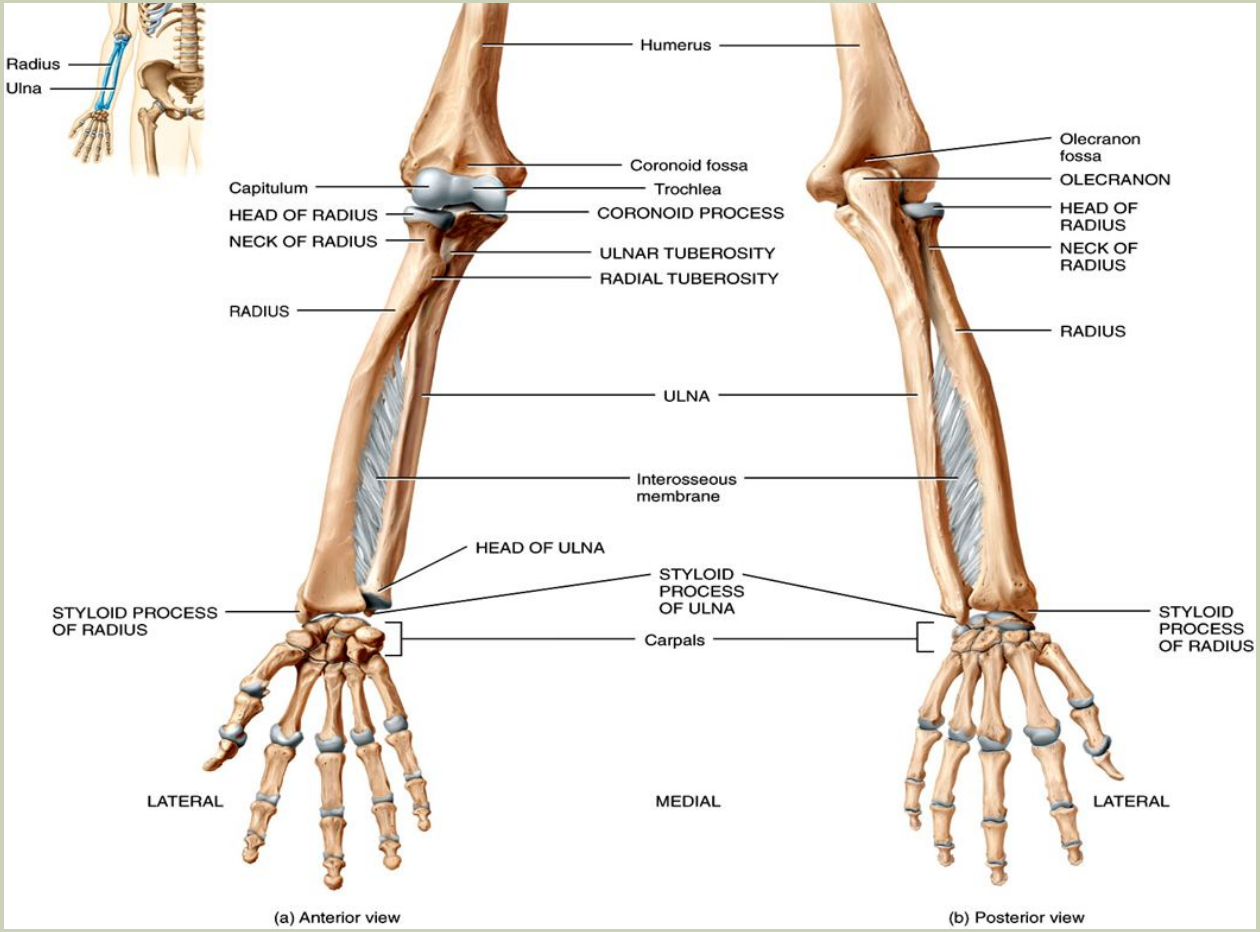
Styloid process

- the thin cylindrical projection on the posterior side of the ulna's head

The Forearm

- The shaft of the radius and the ulna are connected by connective tissues called the interosseous membrane
- There are two joints within the forearm
  - the proximal radioulnar joint
  - distal radioulnar joint
- Proximally
  - the head of the radius articulates with the radial notch of the ulna
- Distally
  - the head of the ulna articulates with the ulnar notch of the radius

RADIUS AND ULNA



Bones of the Hand

The wrist
- aka: he carpus (wrist)
- consists of 8 small bones (carpals)

Features:

There are two rows of carpal bones:
- proximal row
  - scaphoid, lunate, triquetrum, pisiform
  - (Sally, Likes, To Party)
- Distal row
  - trapezium, trapezoid, capitate, hamate
  - (Try, To, Call, Her)
- Scaphoid - most commonly fractured

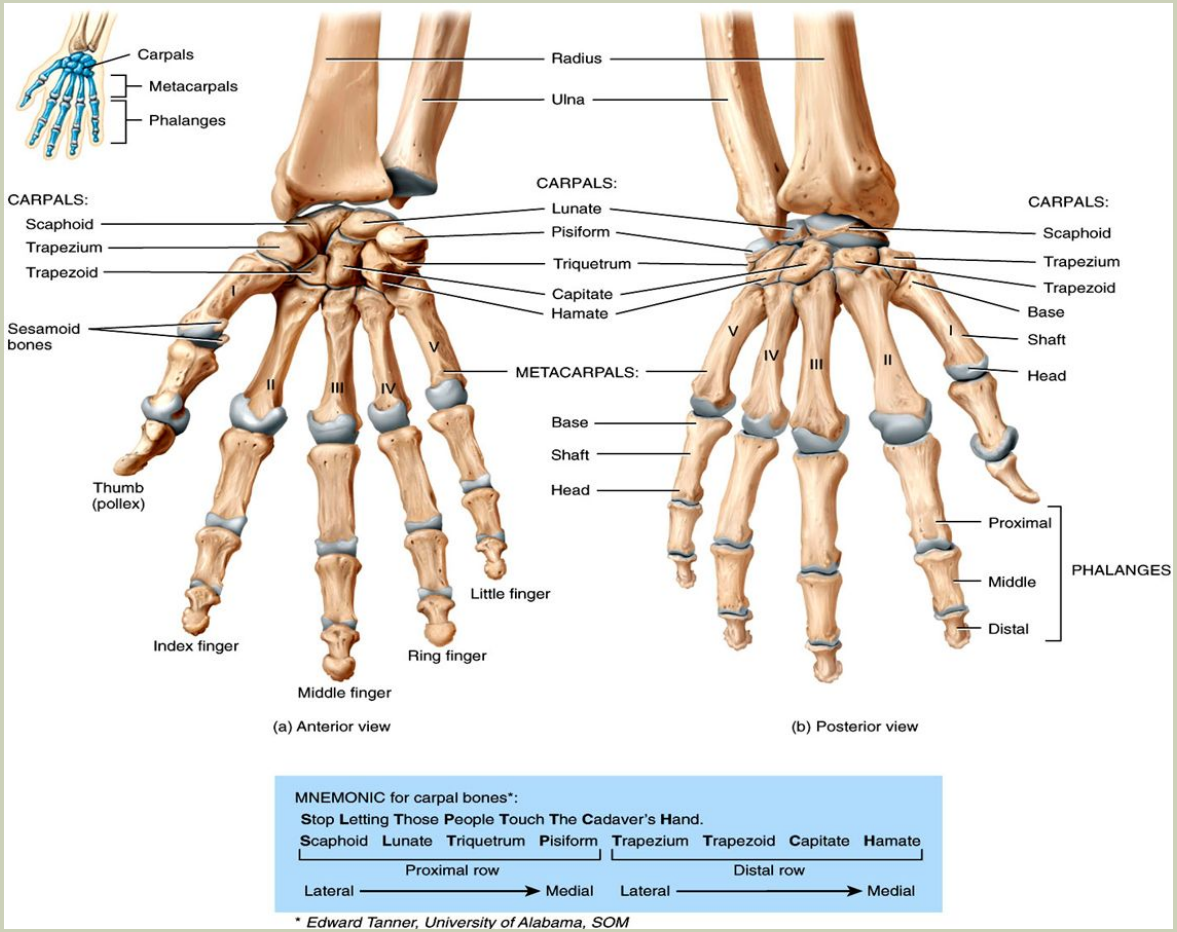
- Carpal tunnel
  - space between carpal bones and flexor retinaculum

Bones of the hand ct'd

Digits
- aka: fingers

Features:
- 5 metacarpals (beyond the carpals)
  - numbered I-V, lateral to medial
- 14 phalanges
  - two in the thumb and three in each of the other fingers
- each phalanx has a base, shaft, and head

THE HAND


Carpals
Metacarpals
Phalanges
Radius
Ulna
CARPALS:
Scaphoid
Trapezium
Trapezoid
Sesamoid bones
Lunate
Pisiform
Triquetrum
Capitate
Hamate
METACARPALS:
Base
Shaft
Head
Thumb (pollex)
Index finger
Middle finger
Ring finger
Little finger
I
II
III
IV
V
Proximal
Middle
Distal
PHALANGES
(a) Anterior view
(b) Posterior view
MNEMONIC for carpal bones*:
Stop Letting Those People Touch The Cadaver's Hand.
Scaphoid Lunate Triquetrum Pisiform Trapezium Trapezoid Capitate Hamate
Proximal row
Distal row
Lateral → Medial
Lateral → Medial
* Edward Tanner, University of Alabama, SOM

Putting it all together…

Video:

upper limb skeleton

The Skull

The Skull

The skull is made up of cranial & facial bones

Cranium (skull) - 8 bones

- the cranial bones create the superior aspect of the skull
- encloses the brain, meninges, cerebral vasculature
- frontal bone, parietal bones (2), temporal bones (2), occipital bone, sphenoid, ethmoid
- held together by sutures
- no significant movement

Facial skeleton - 14 bones

- supports the tissues of the face
- house the orbits of the eyes, the nasal and oral cavities, and the sinuses
- zygomatic (2), lacrimal (2), nasal (2), inferior nasal concahe (2), palatine (2), maxilla (2), vomer, mandible

The Skull ct'd

Sutures

- fibrous joints unique to the skull
- they are immovable and fuse completely around age 20

Sagittal suture

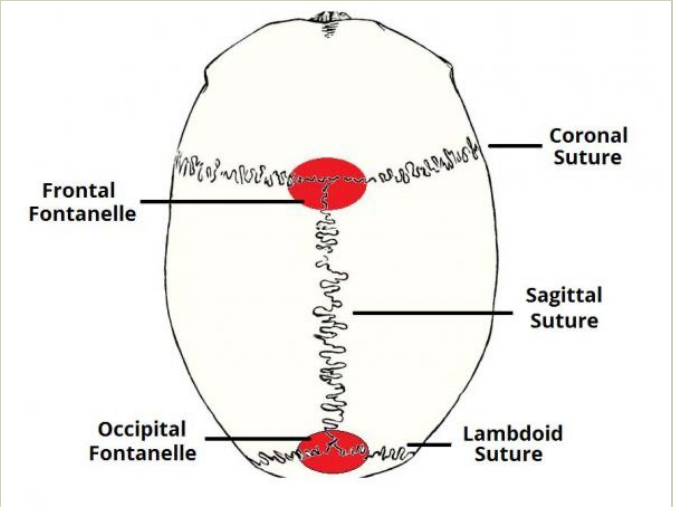
- runs front to back
- fuses the parietal bones to each other

Coronal suture

- runs side to side, anteriorly
- fuses the frontal bone to the parietal bones

Lambdoid suture

- runs side to side, posteriorly
- fuses the occipital bone to the parietal bones



The Skull ct'd

Fontanelles

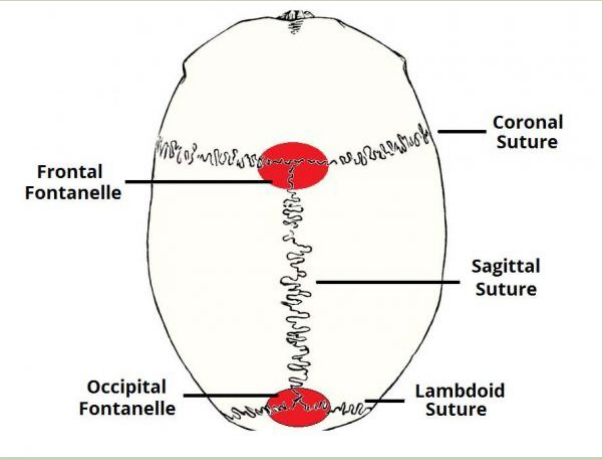
- there are two soft spots on the skull before it completely matures

Frontal fontanelle

- located at the junction of the coronal and sagittal sutures

Occipital fontanelle

- located at the junction of the sagittal and lambdoid sutures



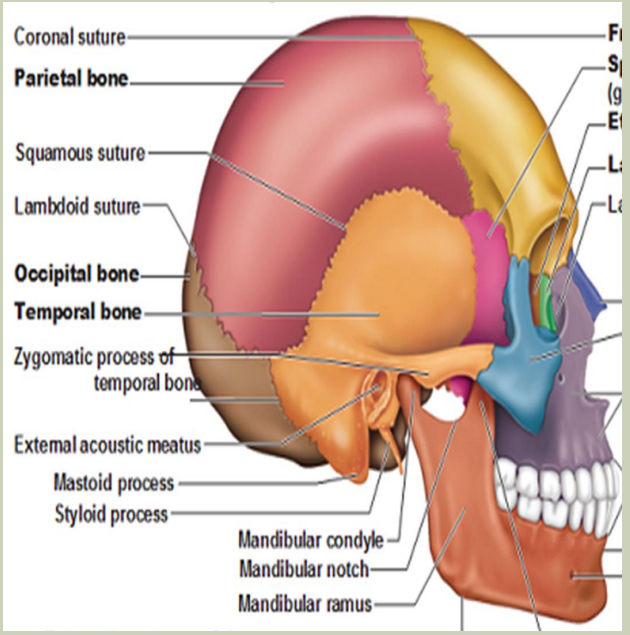
Cranial Bones

Temporal bones

- make up the lateral walls of the skull
- 2 on either side of the skull

Bone Markings of the Temporal Bone:

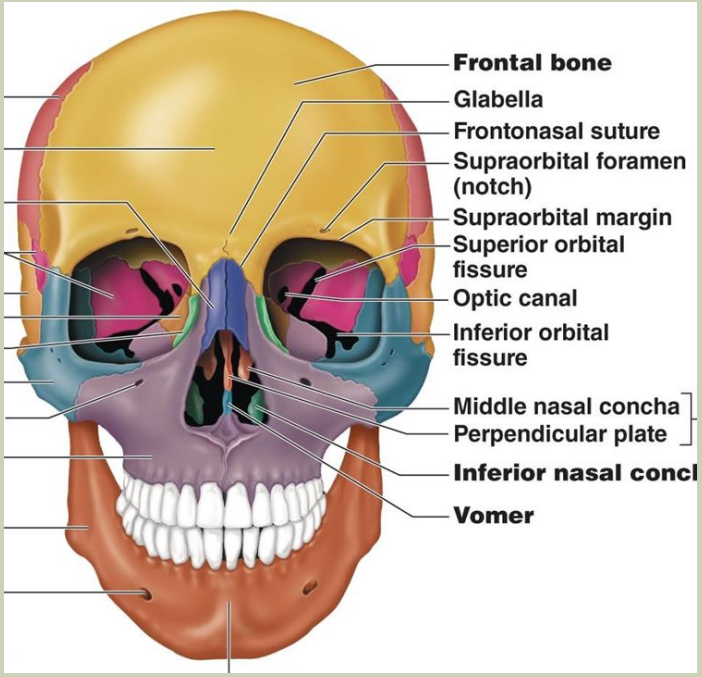
- external auditory meatus
  - ear opening
- zygomatic process
- styloid process
  - attachment point for muscles of tongue and larynx
- mastoid process
  - attachment point for some neck muscles



Cranial Bones

Frontal Bone

- makes up the anterior wall of the skull



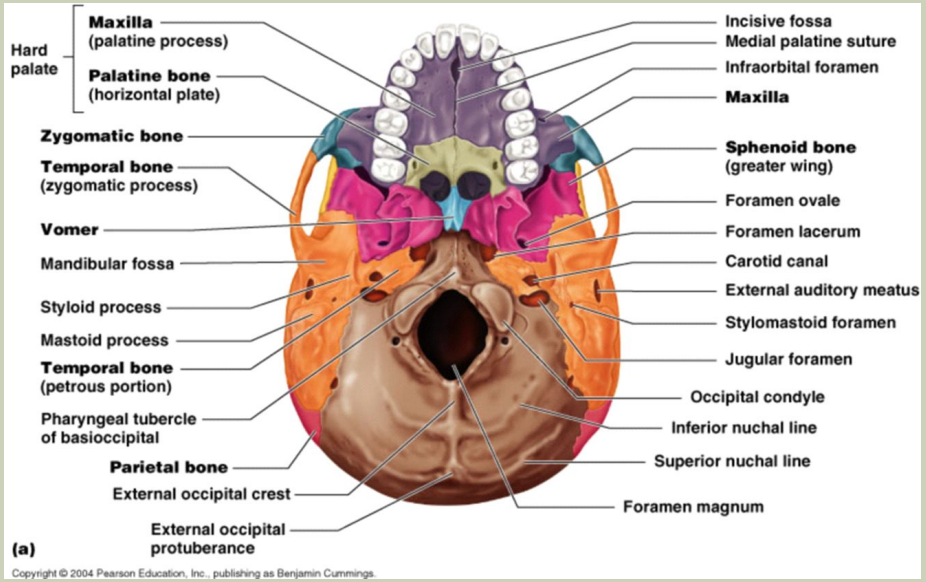
Cranial Bones

Occipital Bone

- makes up the posterior wall of the skull

Features:

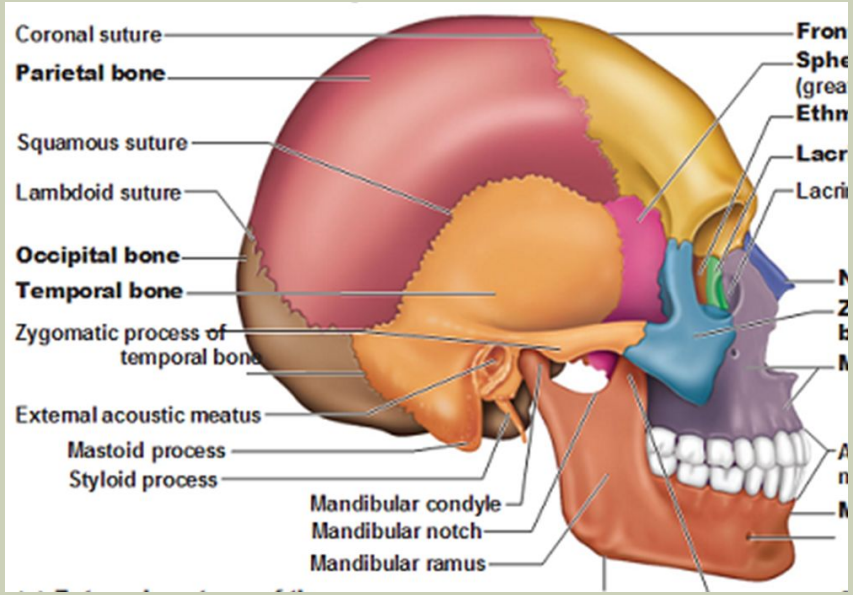
- External occipital protuberance
- Foramen magnum
- Superior nuchal line
- Inferior nuchal line



Cranial Bones

Parietal bones

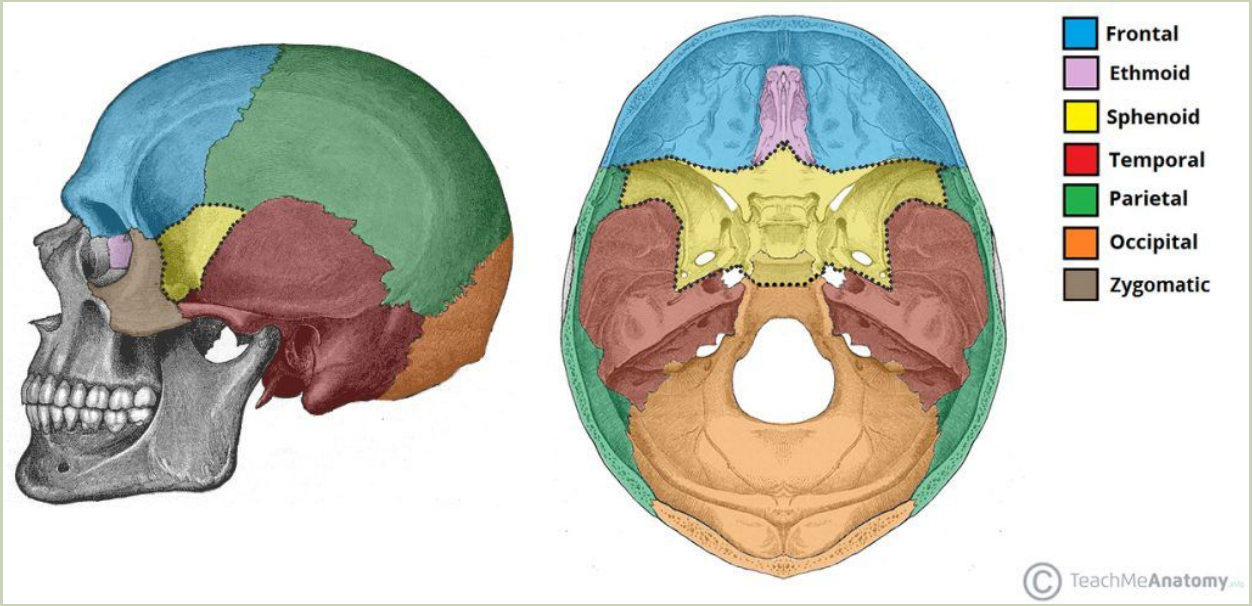
- 2 on each side of the skull
- make up the superolateral walls of the skull



Cranial Bones

Sphenoid bone

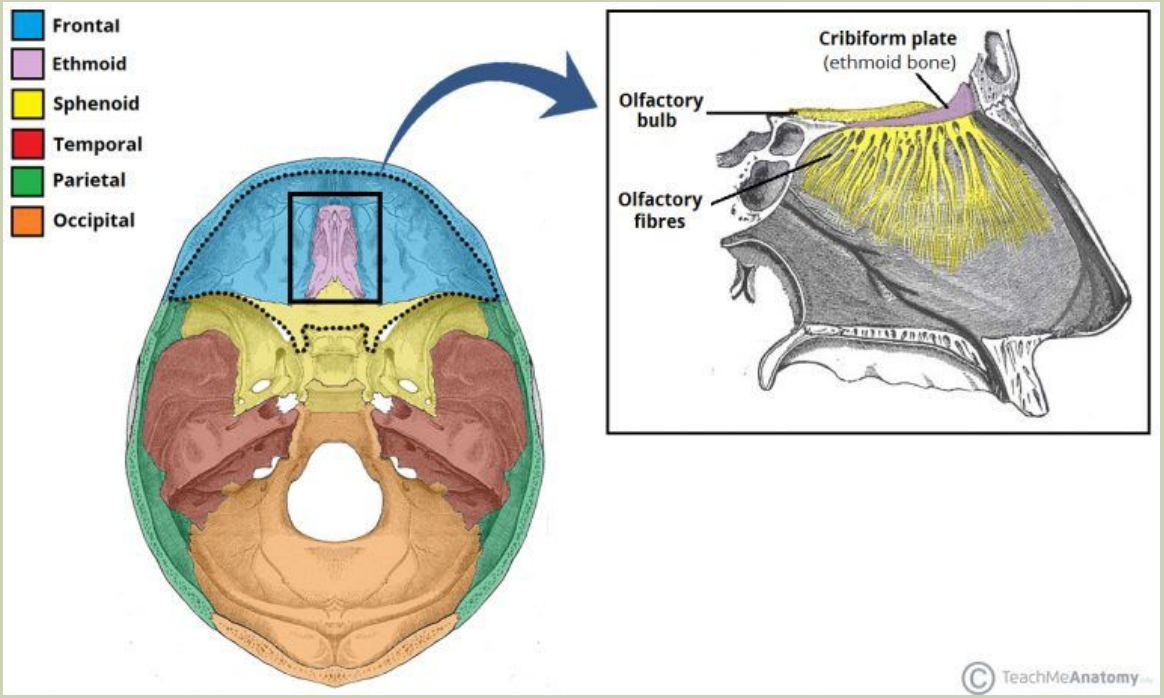
- located in the superior aspect of the skull



Cranial Bones

Ethmoid bone

- located at the roof the nasal cavity & between the orbital cavities



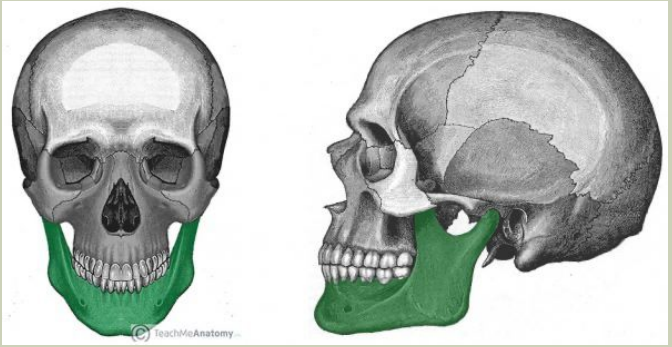
Facial Bones

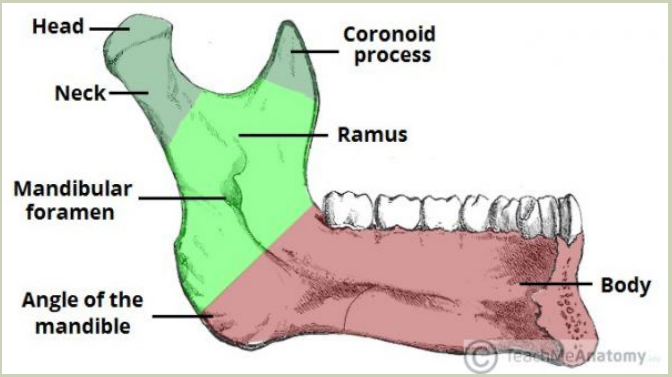
Mandible (1)

- the largest and strongest bone of the face

Features

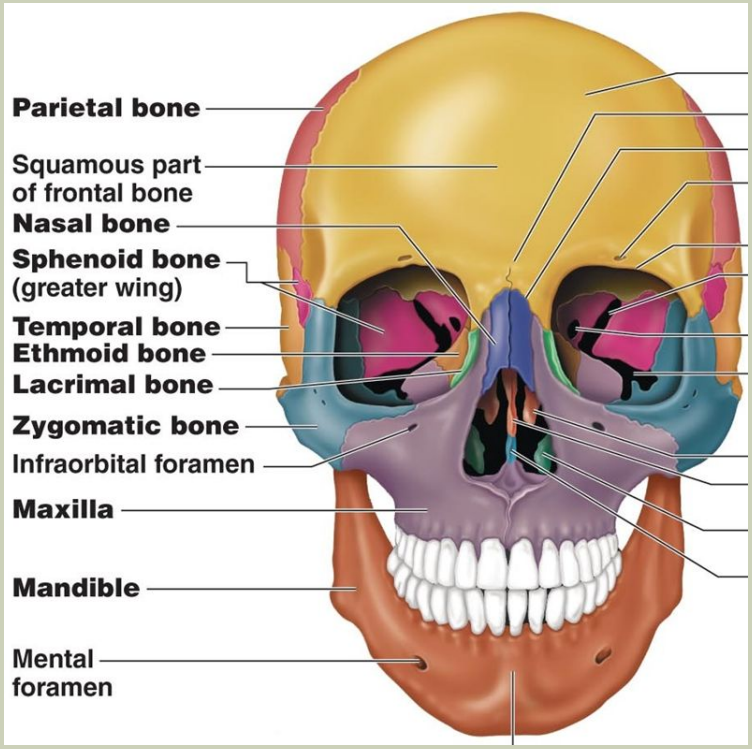
- Head
- Coronoid process
- Angle of the mandible
- Body
- Ramus





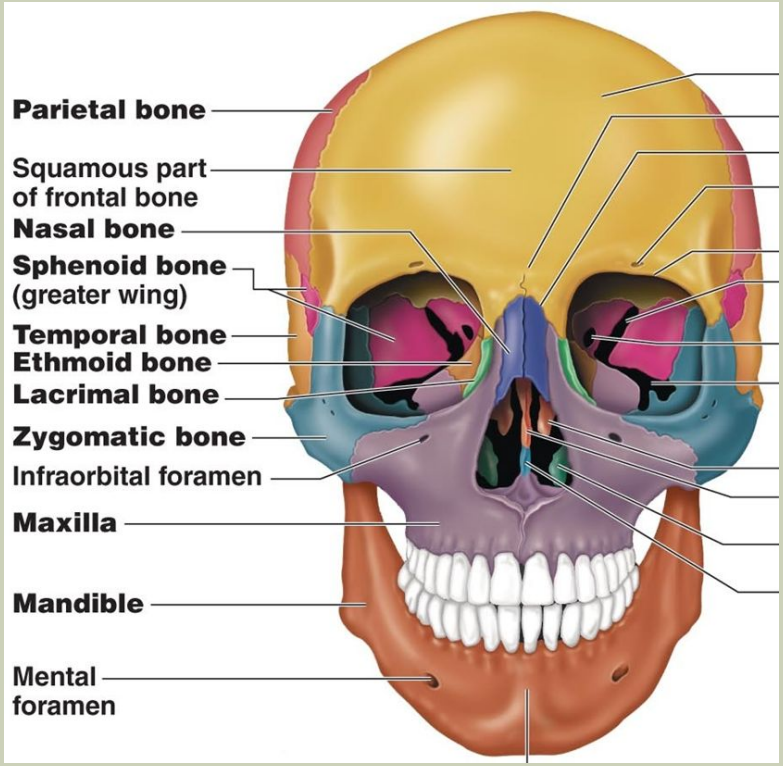
Facial Bones

Maxilla (2)



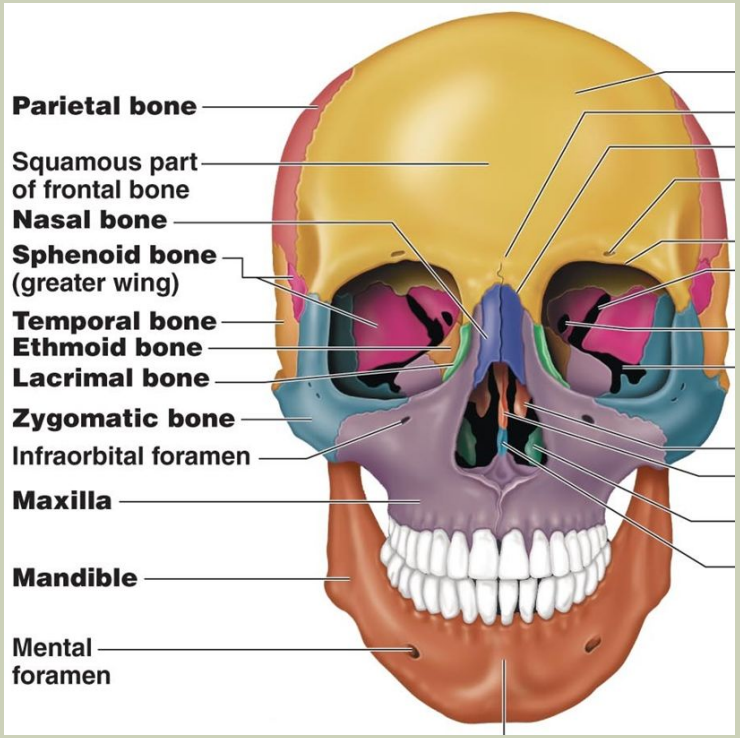
Facial Bones

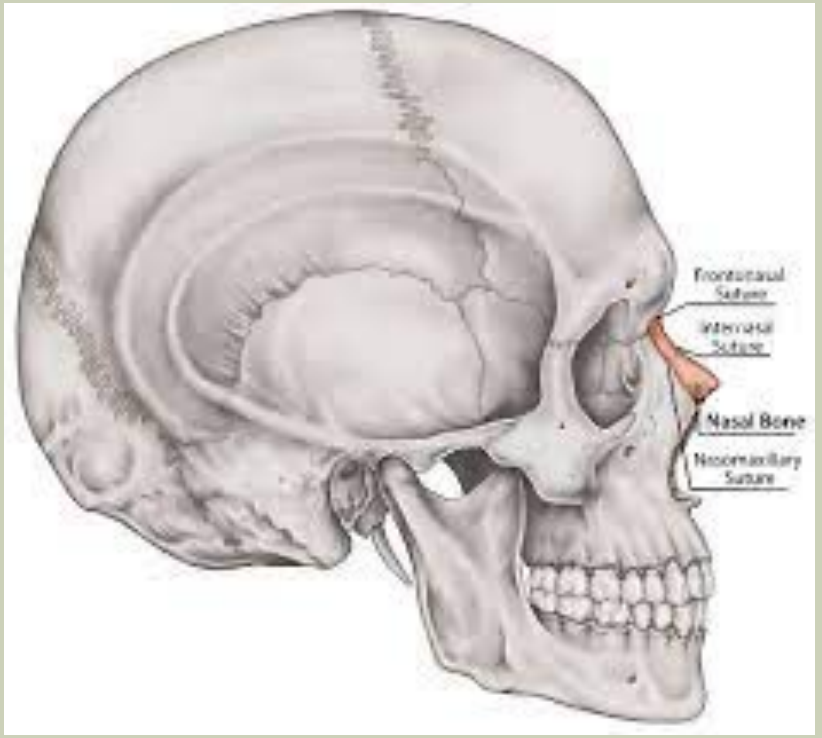
Zygomatic (2)



Facial Bones

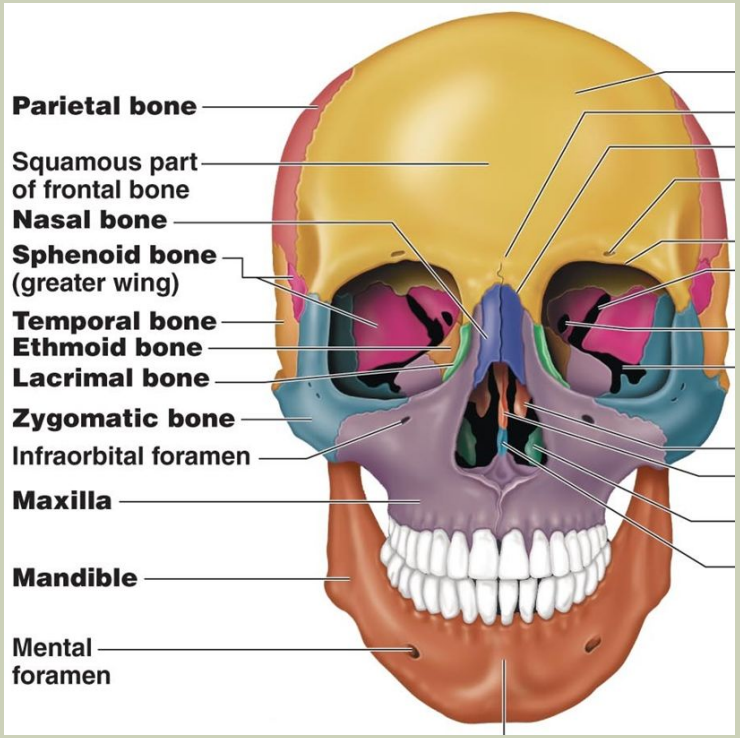
Nasal bones (2)

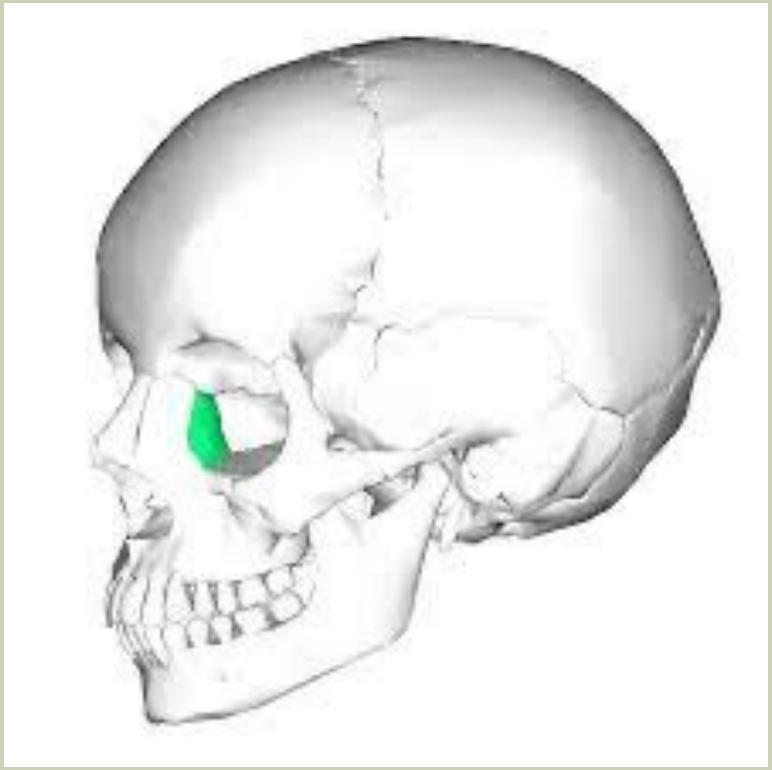




Facial Bones

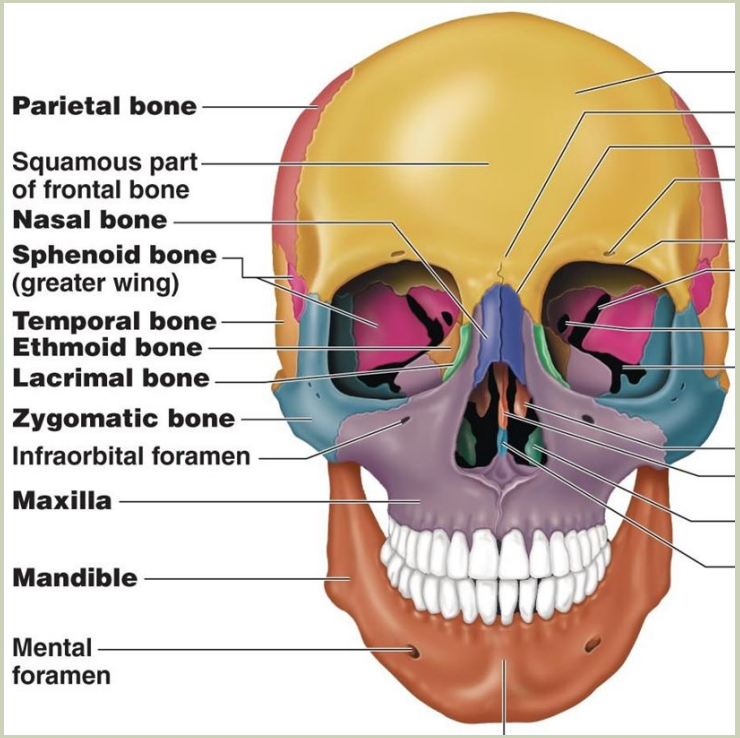
Lacrimal bones (2)

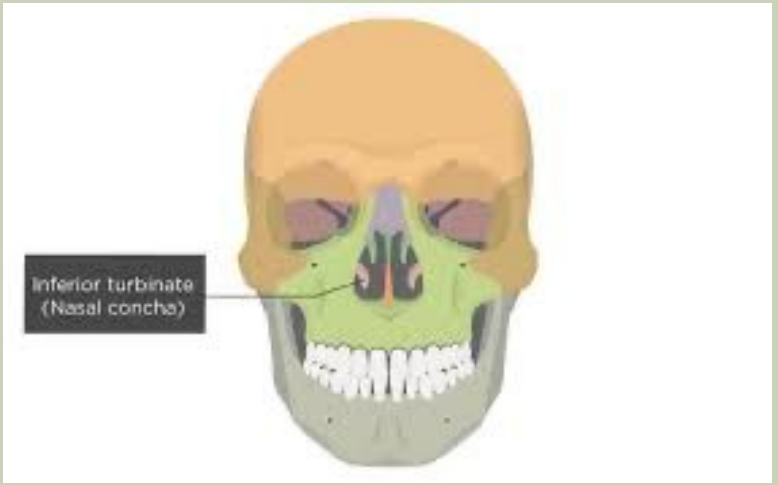




Facial Bones

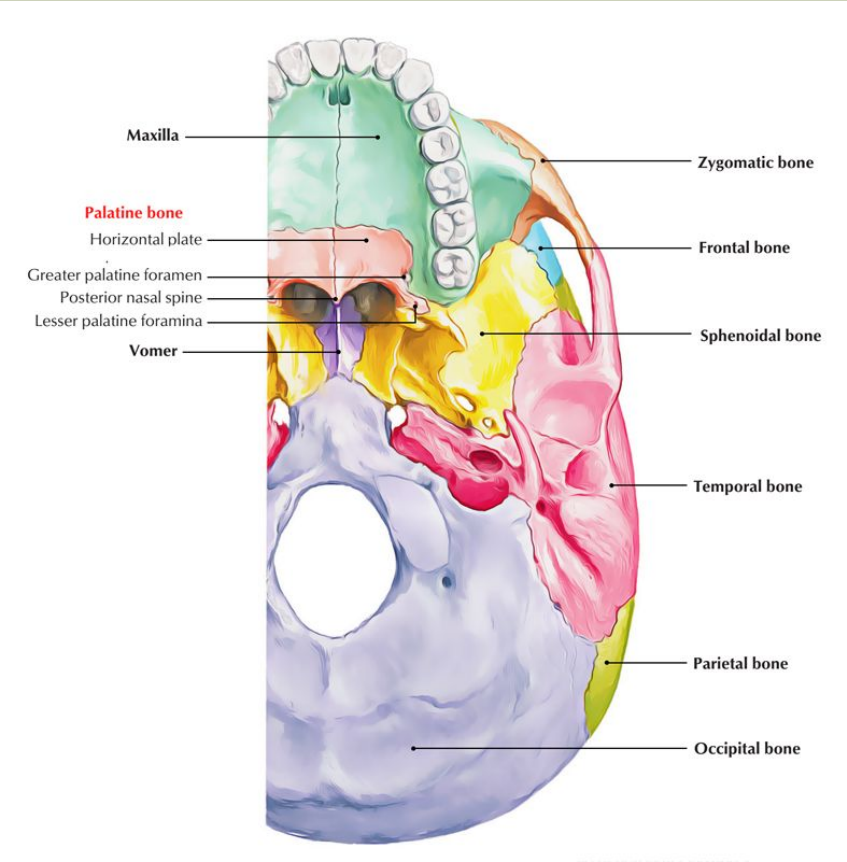
Inferior nasal conchae (2)

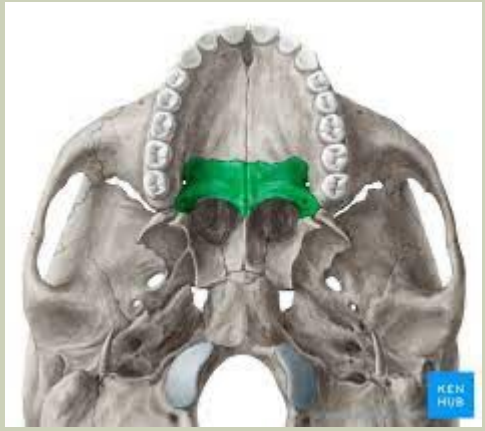




Facial Bones

Palatine

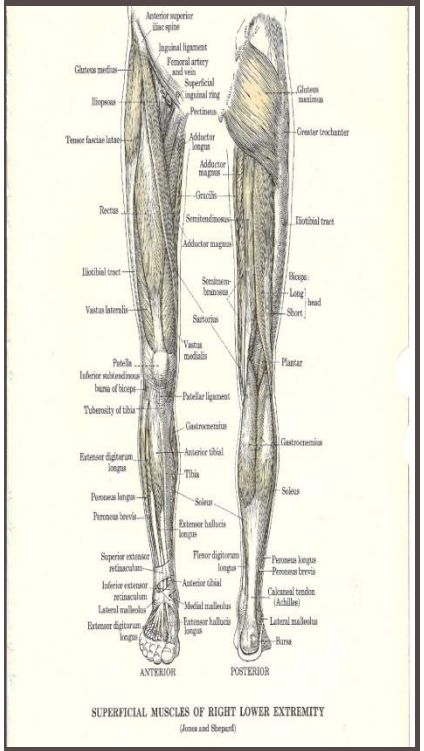




Facial Bones

Vomer

LOWER EXTREMITY

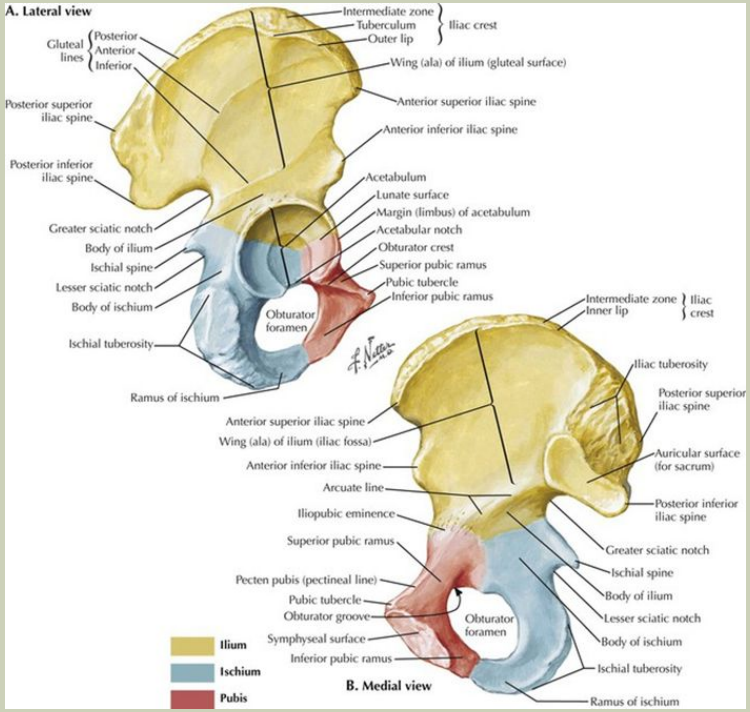


SUPERFICIAL MUSCLES OF RIGHT LOWER EXTREMITY
(Jones and Shepard)

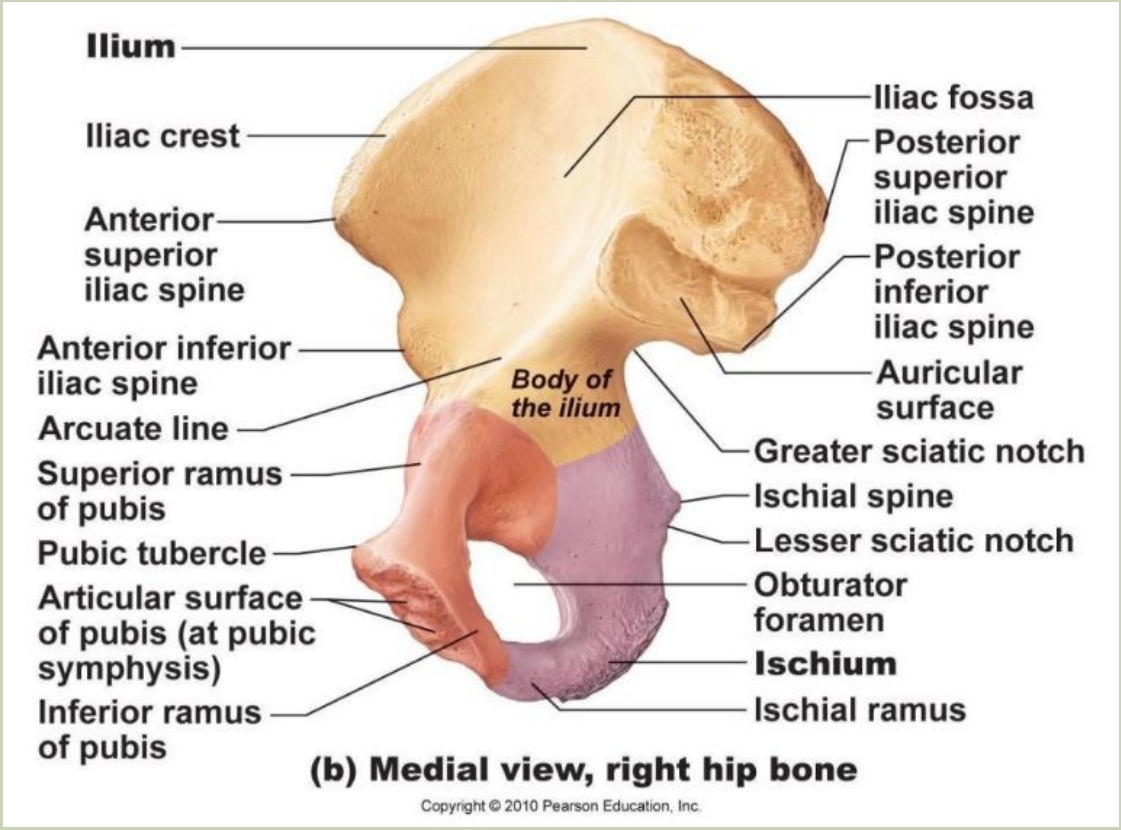
Innominate Bone

Innominate bones (2) aka: os coxa/coxal bone

- together make up the pelvis
- 3 Parts
  - Ilium
  - Ischium
  - Pubis



Medial View


Ilium
Iliac crest
Anterior superior iliac spine
Anterior inferior iliac spine
Arcuate line
Superior ramus of pubis
Pubic tubercle
Articular surface of pubis (at pubic symphysis)
Inferior ramus of pubis
Body of the ilium
Iliac fossa
Posterior superior iliac spine
Posterior inferior iliac spine
Auricular surface
Greater sciatic notch
Ischial spine
Lesser sciatic notch
Obturator foramen
Ischium
Ischial ramus
(b) Medial view, right hip bone
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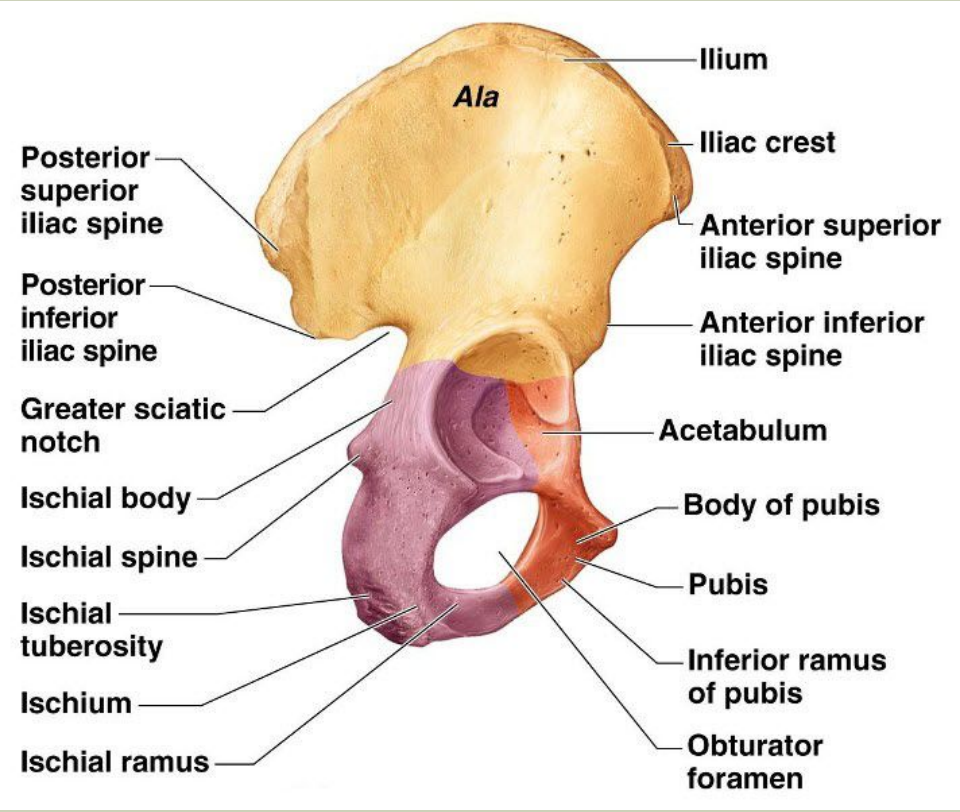
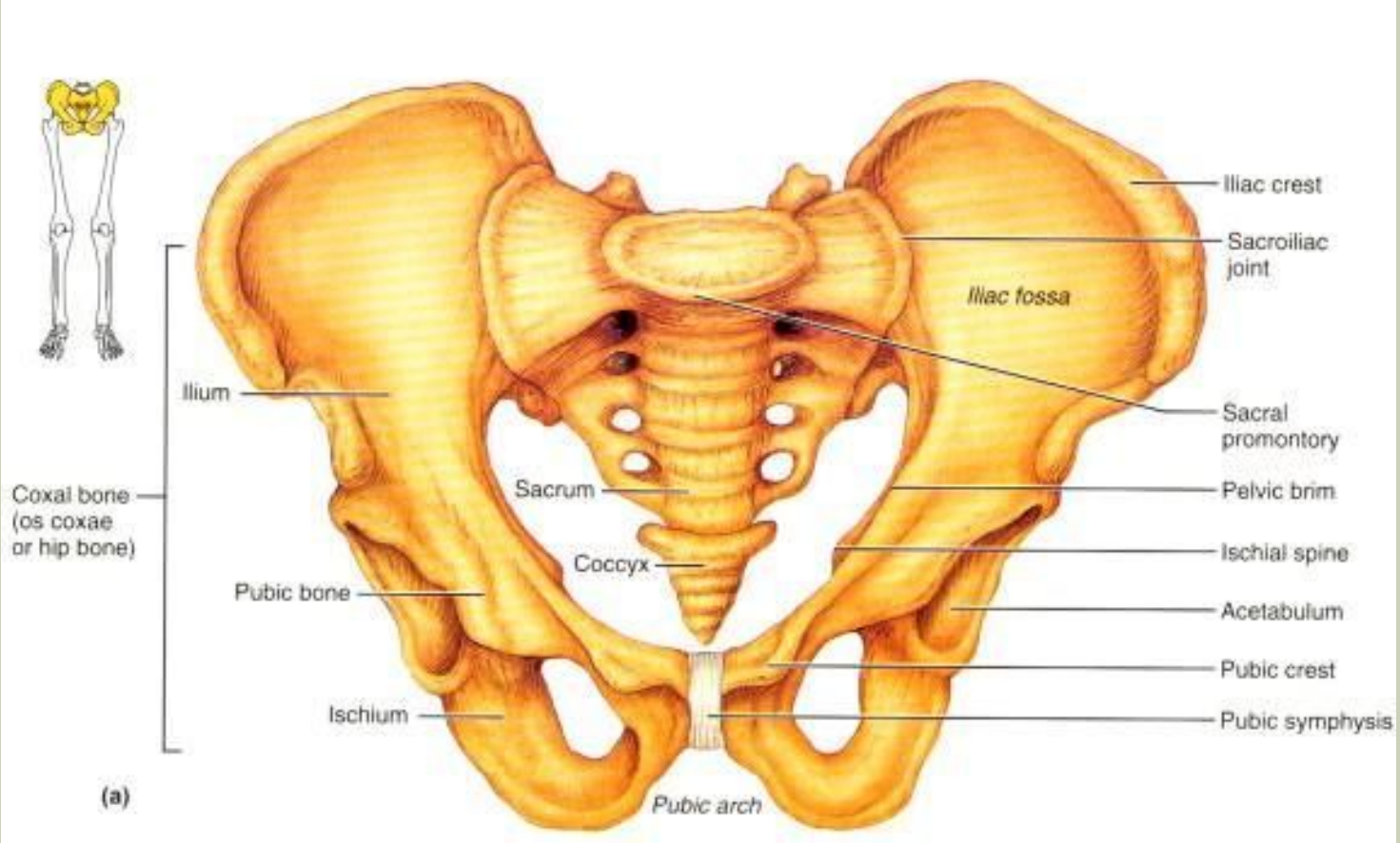
Lateral View



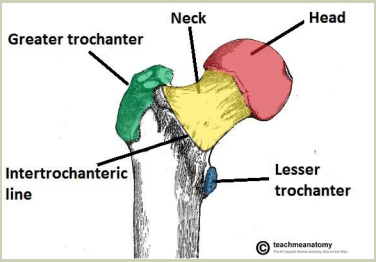
Anterior View

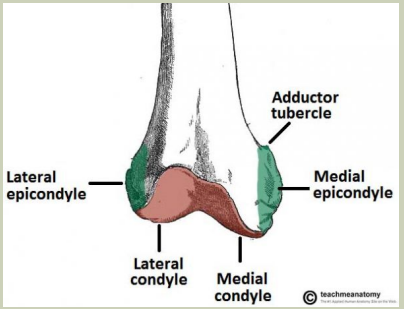


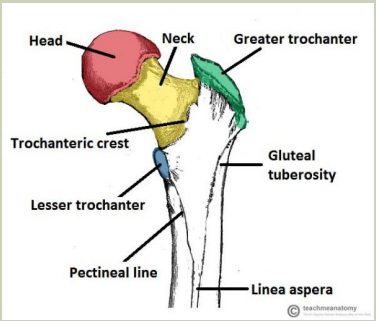
The Femur

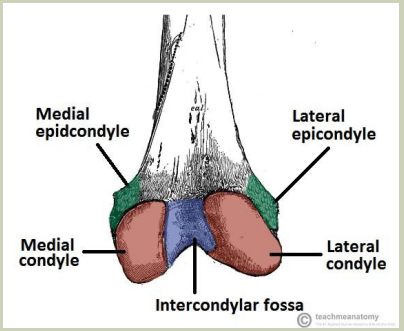
The femur
- the only bone in the thigh
- falls between the innominate bone and the tibia
- the largest bone in the body

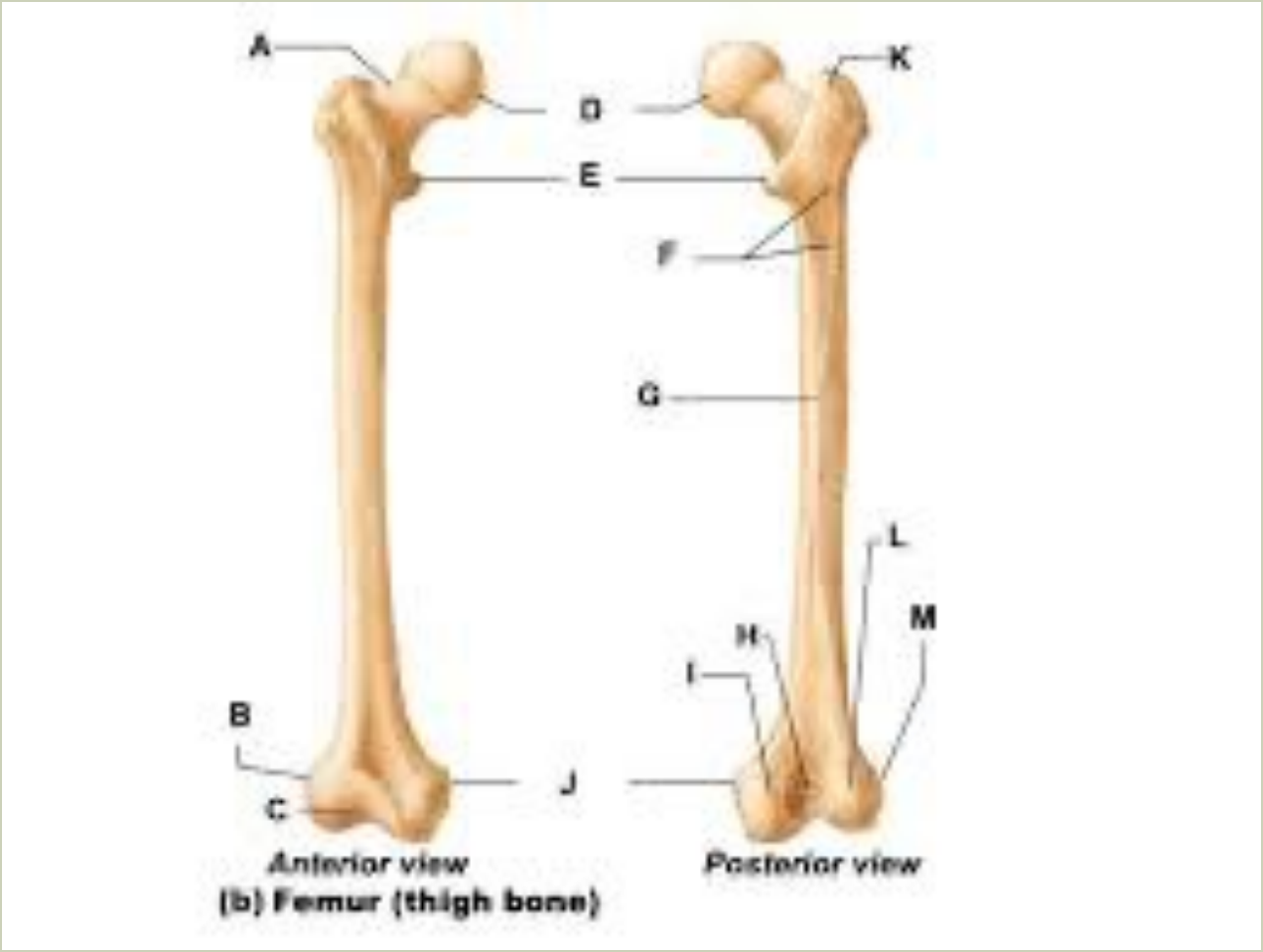
Features:
- head
- neck
- greater and lesser trochanters
- intertrochanteric line
- shaft
- trochanteric crest
- gluteal tuberosity
- pectineal line
- linea aspera
- medial supracondylar line
- lateral supracondylar line
- adductor tubercle
- medial epicondyle
- lateral epicondyle
- lateral condyle
- medial condyle
- intercondylar fossa
- patellofemoral groove











(b) Femur (thigh bone)

The Patella

The patella

aka: the knee cap

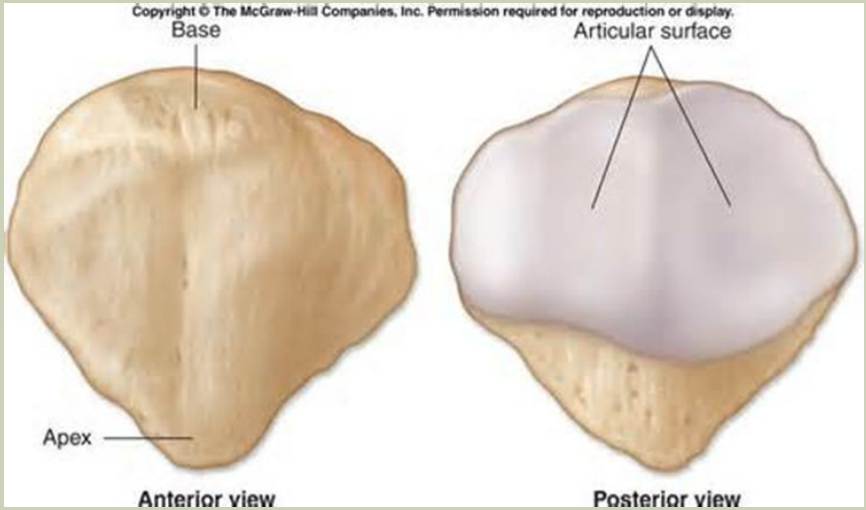
- located at the front of the knee joint & anterior to the tibia
- sesamoid bone as it rests between tendons
- shaped like an upside down triangle

Features:

Superior = base

Inferior = apex

Posterior = articular surface



The Tibia

The tibia
aka: the shin bone

- one of two bones in the lower leg
- the primary weight bearing bone of the tibia and fibula
- the tibia is on the medial side of the two lower limb bones
- the second largest bone in the body

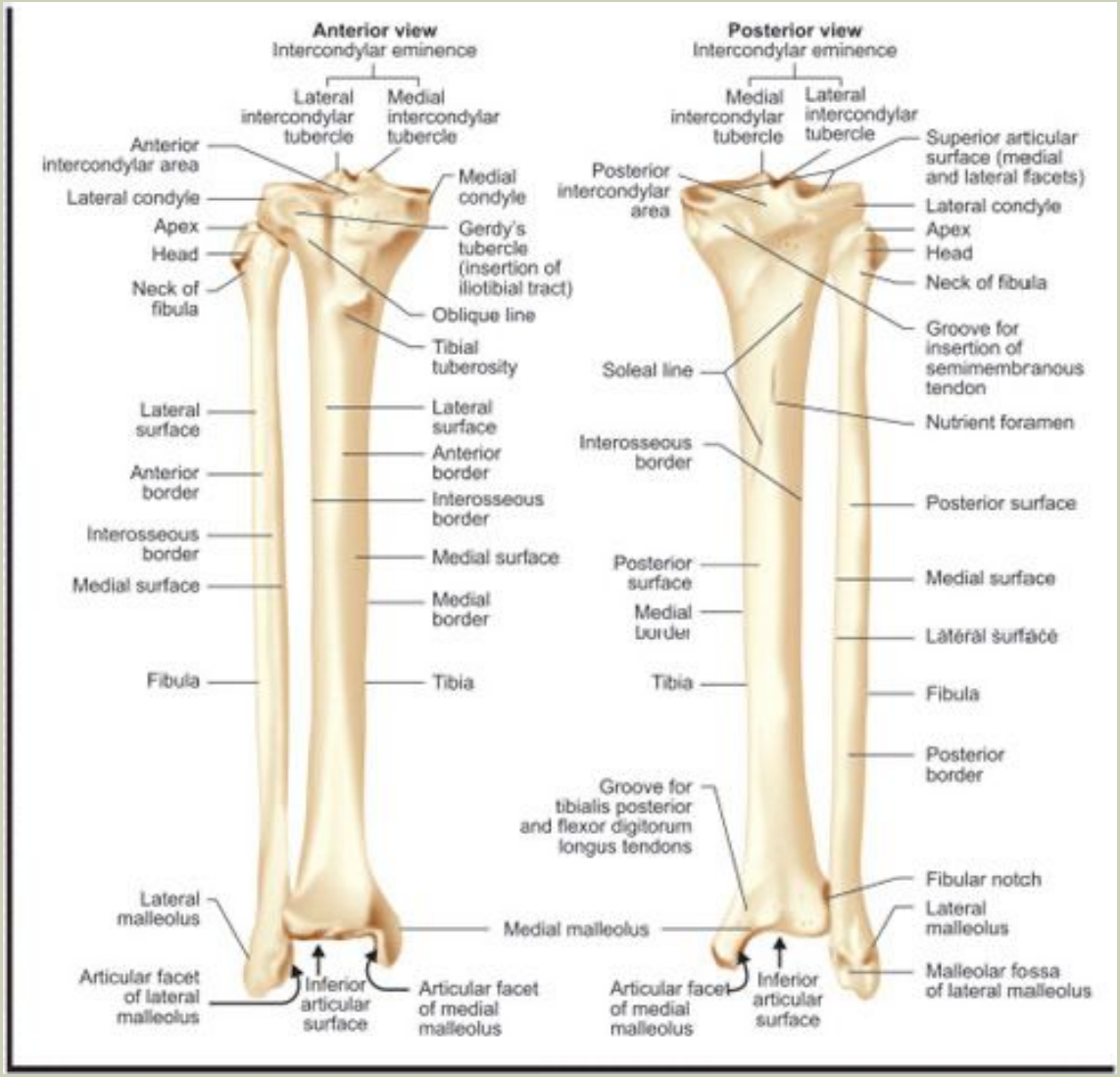
Features:

Proximal

- medial and lateral condyles
  - articulates with femur and fibula
- tibial tuberosity
- intercondylar eminence
- medial & lateral intercondylar tubercle
- Gerdy's tubercle
- soleal line (posterior)

Distal

- medial malleolus
  - articulates with tarsal bones (talus) = the ankle joint and also with the fibula
- inferior articular surface
- fibular notch of the tibia


Anterior view
Intercondylar eminence
Lateral intercondylar tubercle
Medial intercondylar tubercle
Anterior intercondylar area
Lateral condyle
Apex
Head
Neck of fibula
Medial condyle
Gerdy's tubercle (insertion of iliotibial tract)
Oblique line
Tibial tuberosity
Lateral surface
Anterior border
Interosseous border
Medial surface
Fibula
Lateral surface
Anterior border
Interosseous border
Medial surface
Medial border
Tibia
Lateral malleolus
Articular facet of lateral malleolus
Inferior articular surface
Articular facet of medial malleolus
Medial malleolus
Posterior view
Intercondylar eminence
Medial intercondylar tubercle
Lateral intercondylar tubercle
Posterior intercondylar area
Superior articular surface (medial and lateral facets)
Lateral condyle
Apex
Head
Neck of fibula
Groove for insertion of semimembranous tendon
Soleal line
Nutrient foramen
Interosseous border
Posterior surface
Posterior surface
Medial surface
Medial border
Lateral surface
Tibia
Fibula
Posterior border
Groove for tibialis posterior and flexor digitorum longus tendons
Fibular notch
Lateral malleolus
Malleolar fossa of lateral malleolus
Articular facet of medial malleolus
Inferior articular surface

The Fibula

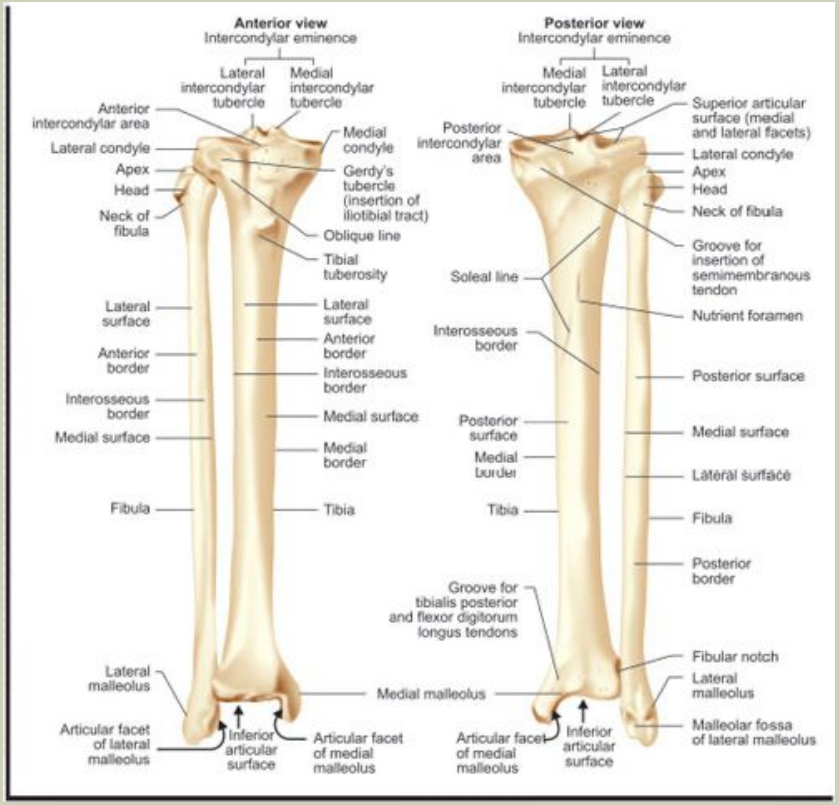
The fibula
- non-weight bearing leg bone; main function is to act as an attachment site for muscles
- sits laterally to the tibia

Features:

Proximal:
- apex and head
  - articulates with tibia

Shaft

Distal:
- lateral malleolus
  - articulates with tibia and talus



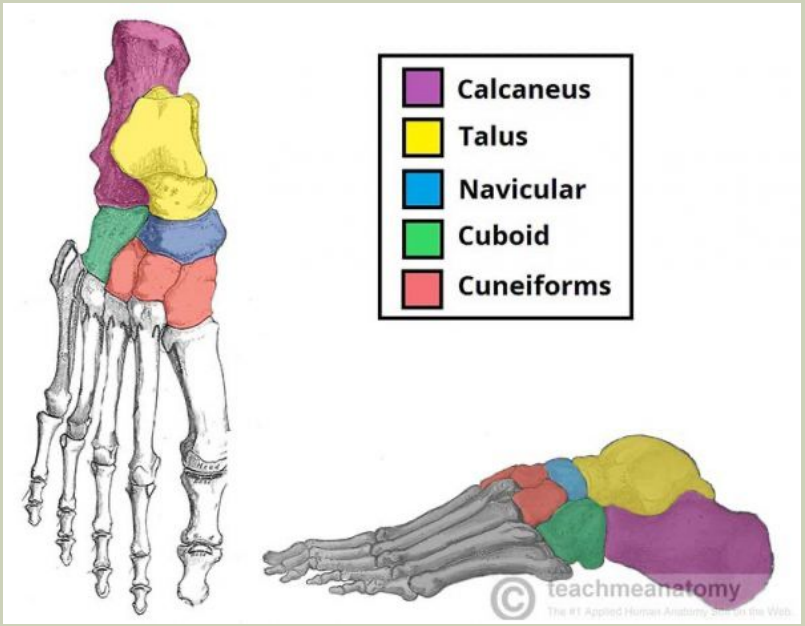
The Foot

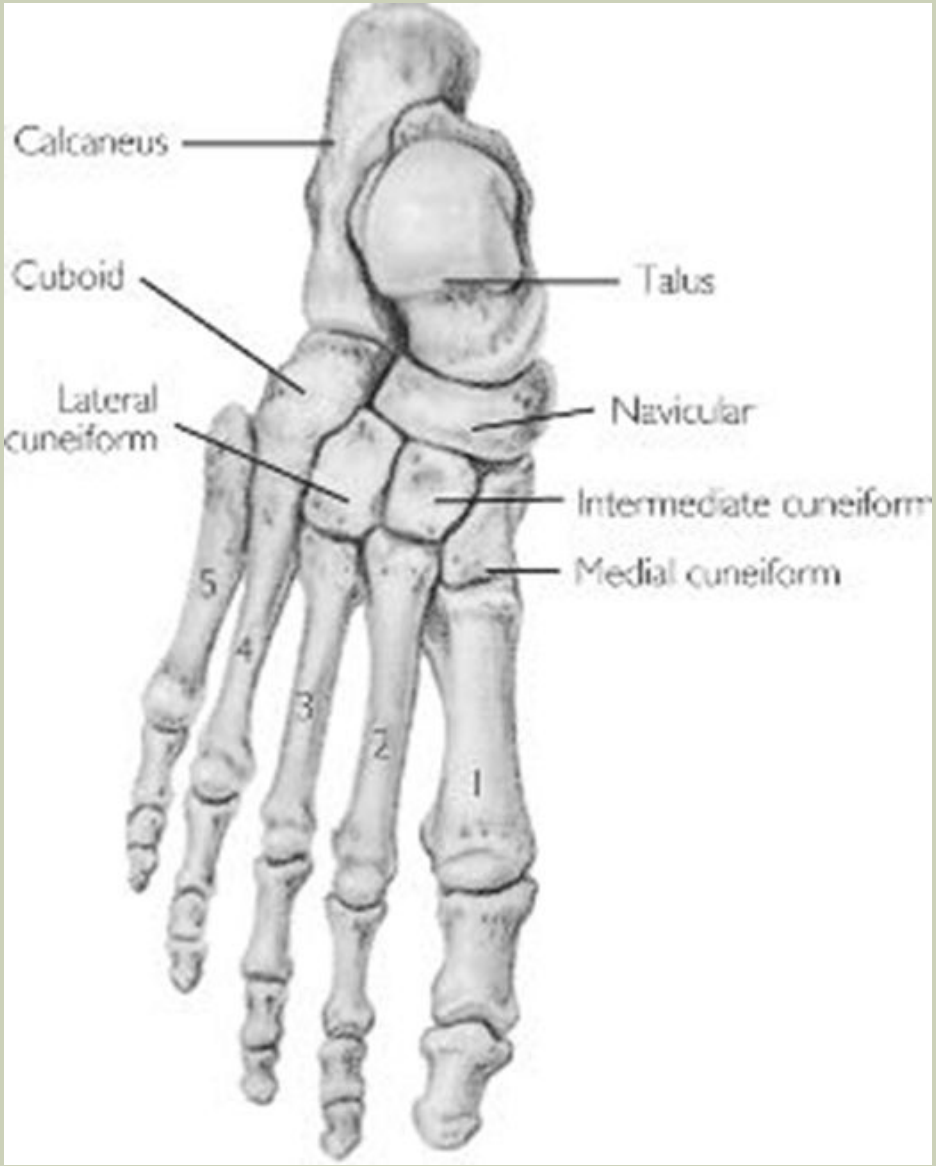
Bones of the foot
- provide mechanical support for soft tissues

Tarsals
- made of 7 irregularly shaped bones
- located proximally in the foot & create the ankle

Metatarsals
- five long bones
- labelled I-V

Phalanges
- 14 long bones
- base, shaft, head



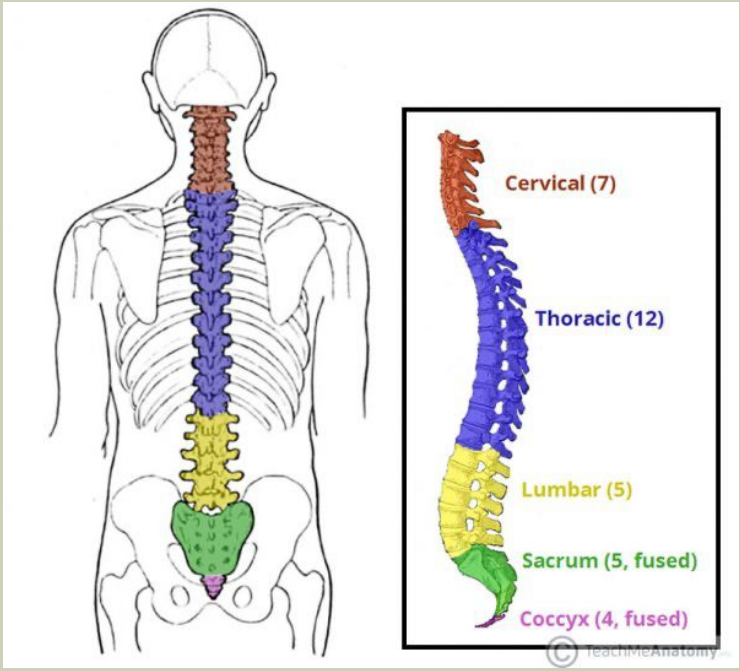

Calcaneus
Cuboid
Talus
Lateral cuneiform
Navicular
Intermediate cuneiform
Medial cuneiform
5
4
3
2
1

The Spinal Column

The Spinal Column

aka: the vertebral column

- made up of 33 bones in total
- separated into 5 different regions
  - Cervical (7)
  - Thoracic (12)
  - Lumbar (5)
  - Sacrum (5, fused)
  - Coccyx (4, fused)
- Function to:
  - protect
  - support
  - creates a central axis for the body
  - movement



Cervical Vertebrae

Cervical spine
- C-spine, the neck
- “eat breakfast at 7”

There are 7 cervical vertebrae
- 7 Cervical Vertebra
- features will get larger as they get further down the spine

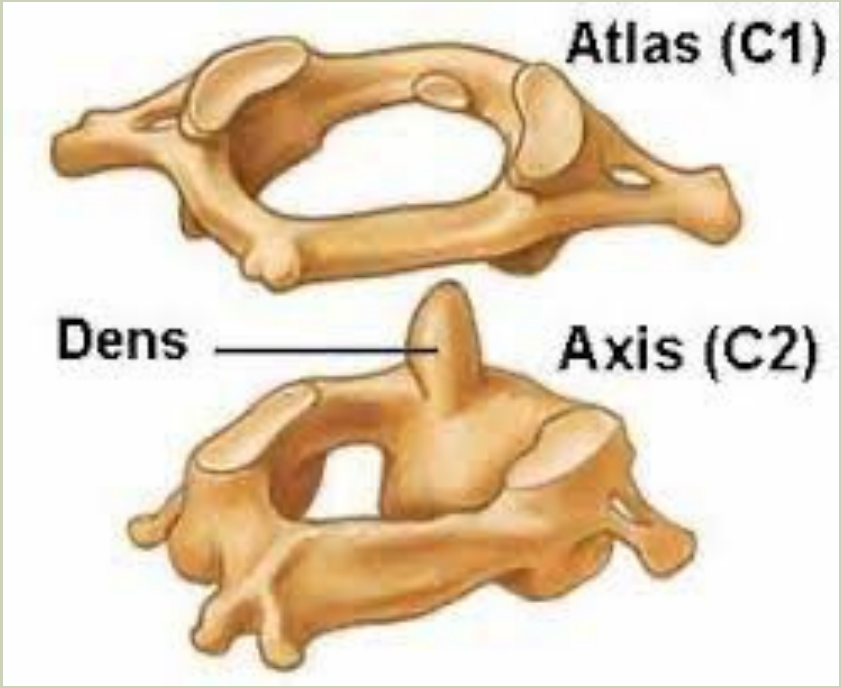
C1 & C2 differ from the rest of the cervical vertebrae

C1 = atlas

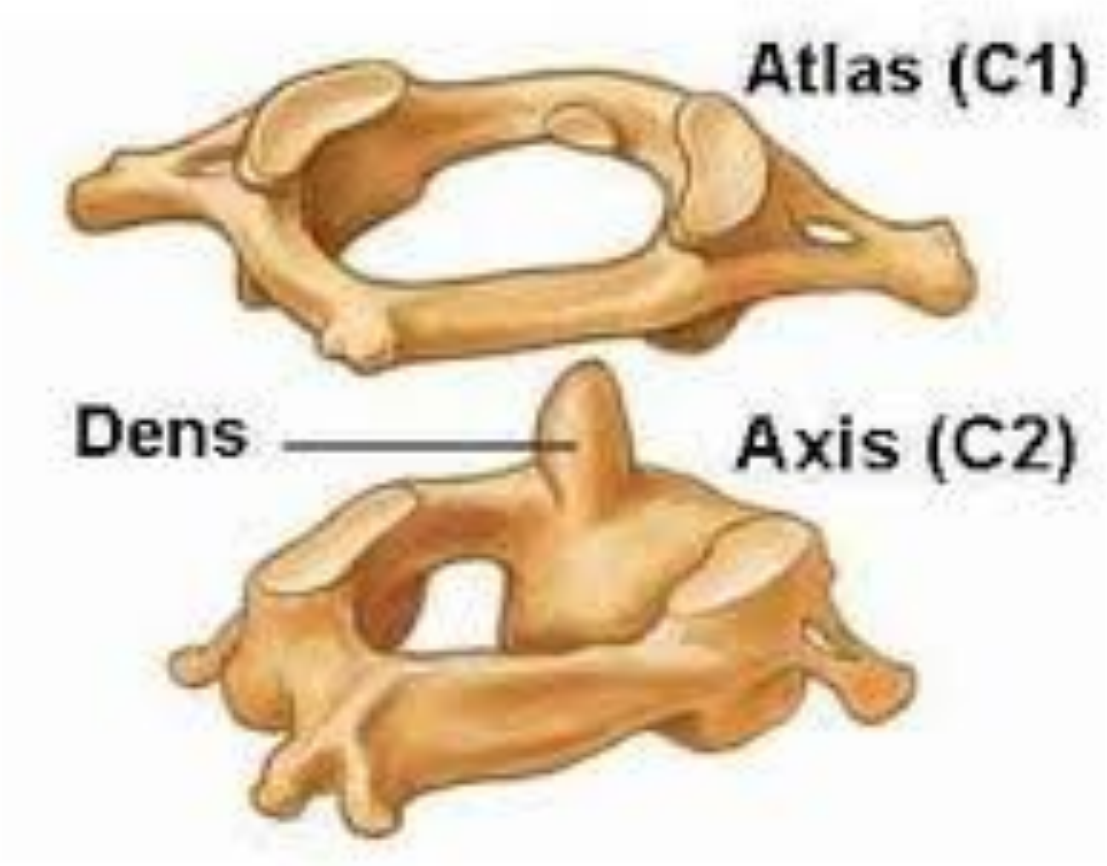
C2 = axis

- The atlas lacks a body and the axis contains a projection (odontoid process) to create a joint (atlantoaxial) that allows for a rotational movement

Atlas (C1) & Axis (C2)



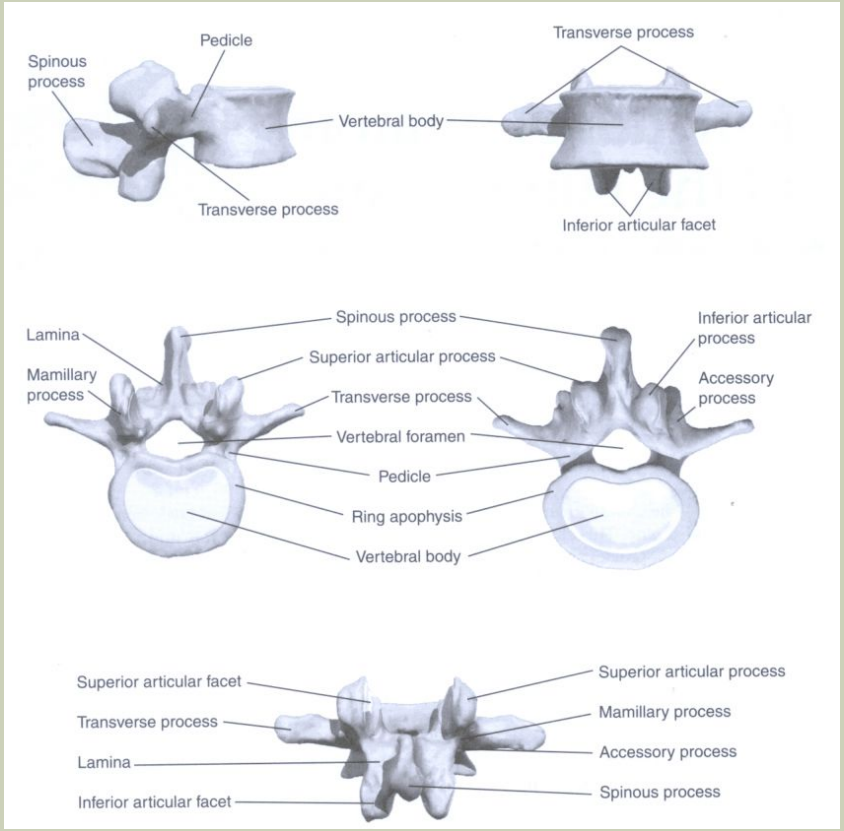
C1 AND C2 TOGETHER



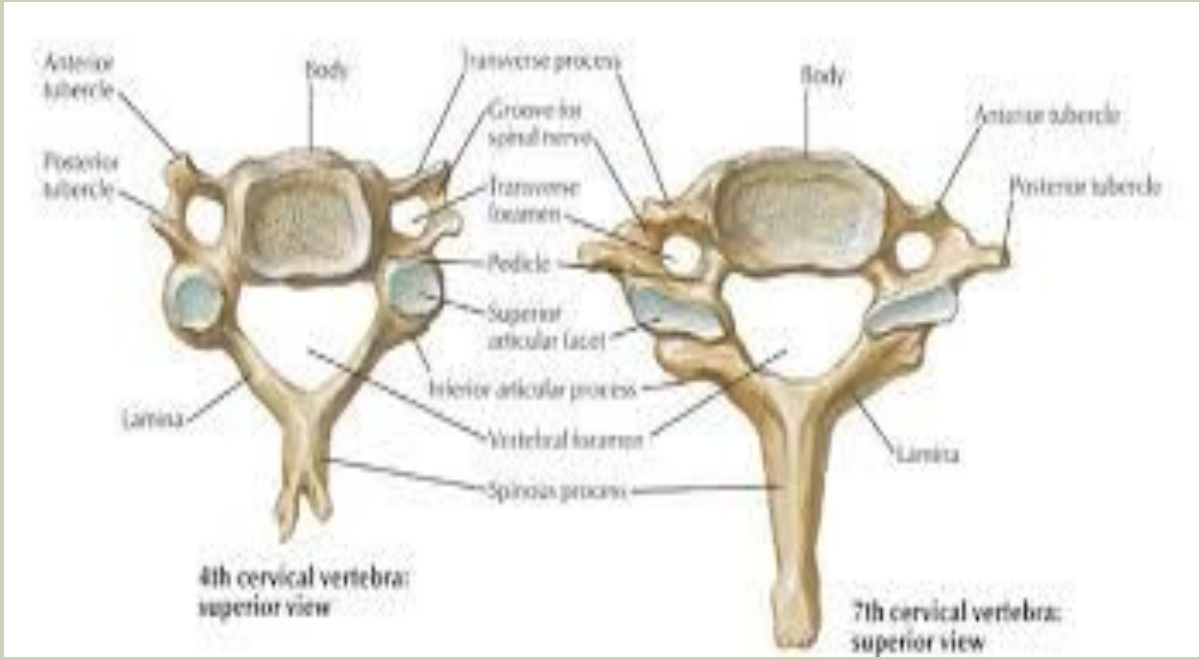
C3-C6 Vertebrae

Features:

- body
- transverse process
  - transverse foramen
- spinous process
- vertebral foramen



C7 VERTEBRA


Anterior tubercle
Body
Transverse process
Groove for spinal nerve
Posterior tubercle
Transverse foramen
Pedicle
Superior articular facet
Inferior articular process
Lamina
Vertebral foramen
Spinous process
4th cervical vertebra: superior view
Body
Anterior tubercle
Posterior tubercle
Lamina
7th cervical vertebra: superior view

Cervical Vertebra: Distinguishing Features

- Smallest vertebral bodies
  - C1 doesn't have one
- Largest vertebral foramen
- Transverse foramen in the transverse process
  - for passage of vertebral artery
- Bifid spinous process
  - (except C1 and C7)

Thoracic Vertebrae

The thoracic vertebrae
- T-spine, thoracic spine, thorax
- “Eat lunch at 12”

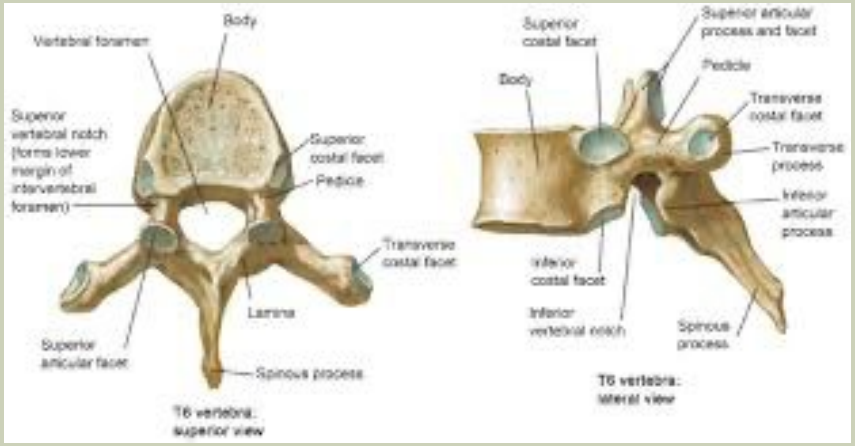
There are 12 thoracic vertebrae
- Will increase in size as they move down the spine

Features:
- body
- transverse process
- spinous process
- superior & inferior costal facets
- vertebral foramen

Thoracic Vertebrae: Distinguishing Features

- The spinous process
  - is longer & more inferior
  - NOT bifid
- Superior and inferior costal facets on the vertebral body
- Transverse costal facets on transverse processes
- NO TRANSVERSE FORAMEN
- Bodies are heart shaped
- Articulate with the ribs

Thoracic Vertebrae



The Lumbar Vertebrae

The lumbar vertebrae

- L-spine, lumbar spine, low back
- “Eat dinner at 5”

There are 5 Lumbar Vertebrae

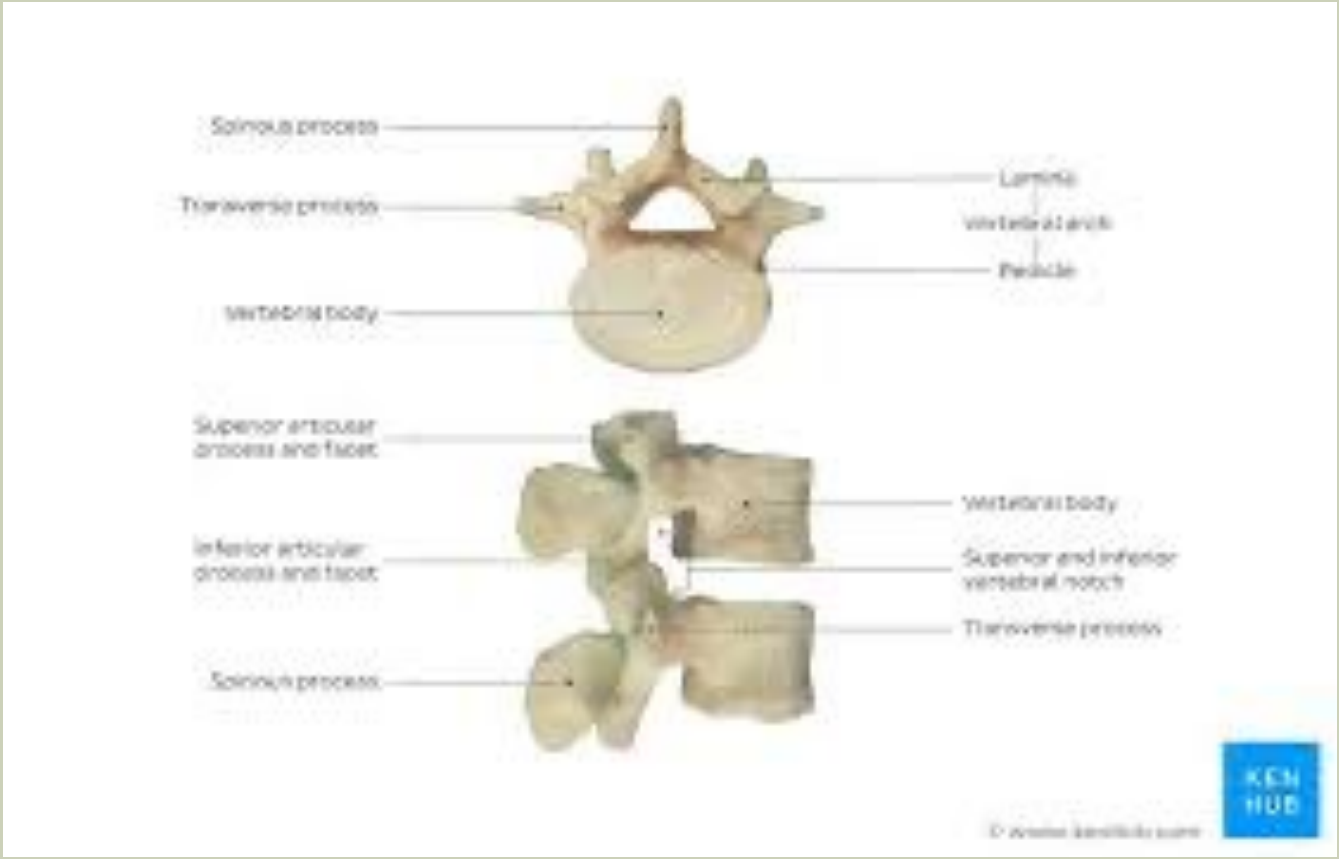
Features:

- body
- transverse process
- spinous process

Lumbar Vertebrae: Distinguishing Features

- Spinous processes are shorter and flatter
- Superior and inferior articular facets are longer
- Bodies and the largest and kidney bean shaped
- Smallest Vertebral Foramen
- Spinous processes are not BIFID
- NO TRANSVERSE FORAMEN

The Lumbar Vertebrae



Types of Vertebrae

Cervical

The 7 vertebrae in the neck, they are the lightest in the spine. They allow for the neck's flexibility and the head's range of motion.

Thoracic

The 12 vertebrae composing the middle segment of the spine. Along with the sternum and ribs, they form part of the thoracic cage.

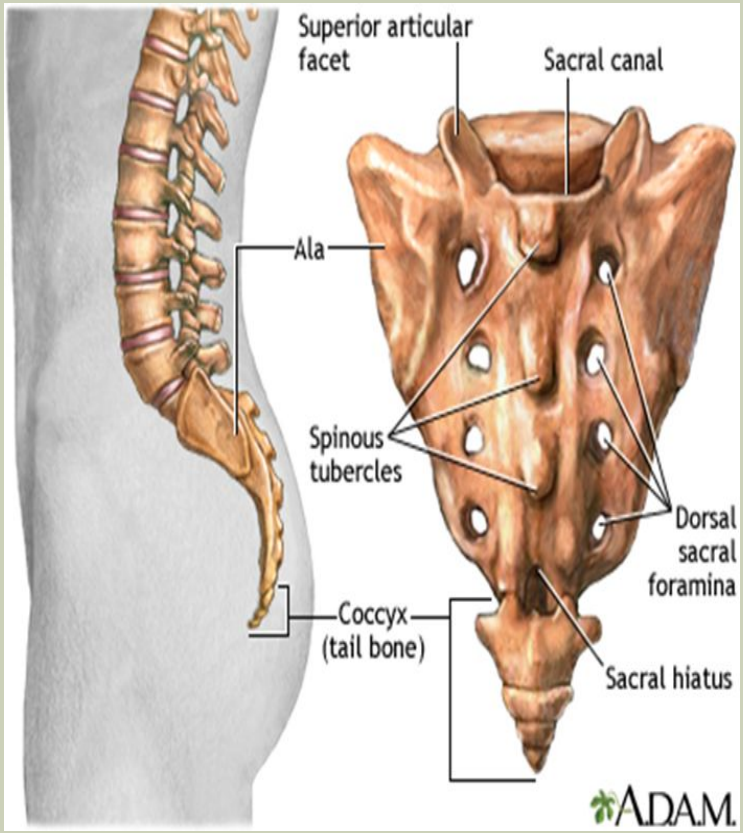
Lumbar

The 5 vertebrae in the lower back region. They carry the upper body's weight.

The Sacrum

The sacrum

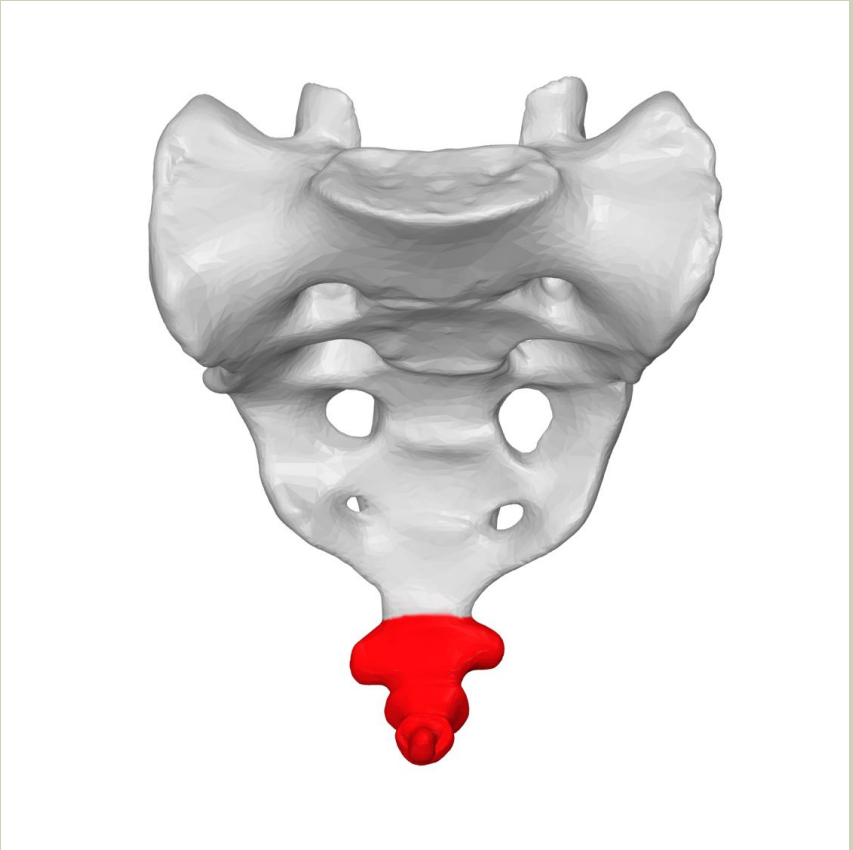
- 1 bone
  - fusion of 5 bones
  - maturation occurs between 18 and 30 years of age



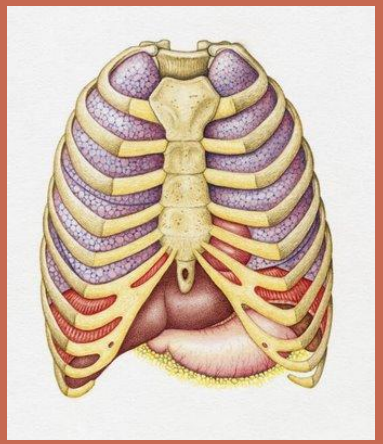
The Coccyx

The coccyx:
aka: the tail bone

- 4 fused Vertebrae



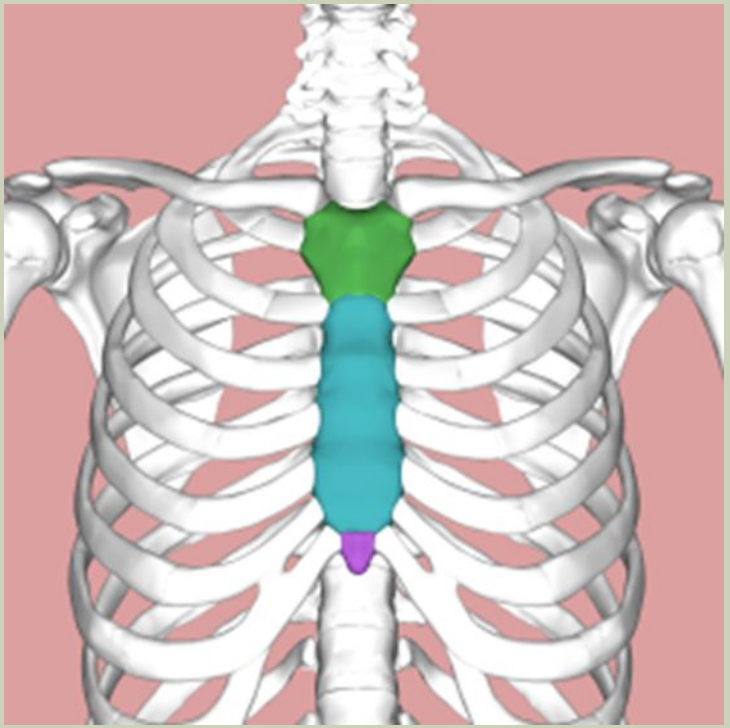
The Ribs & Sternum



The Sternum

aka: the breast bone

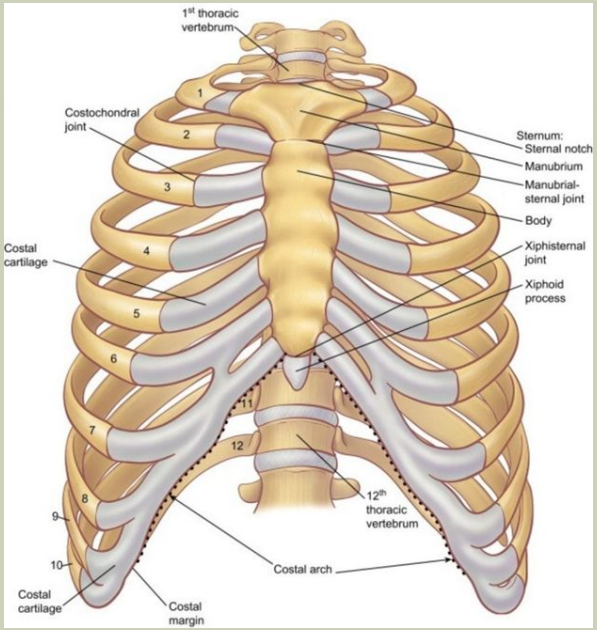
- articulates with clavicles & ribs 1-7
- 3 parts:
  - manubrium (superior)
  - body
  - xiphoid process (inferior)

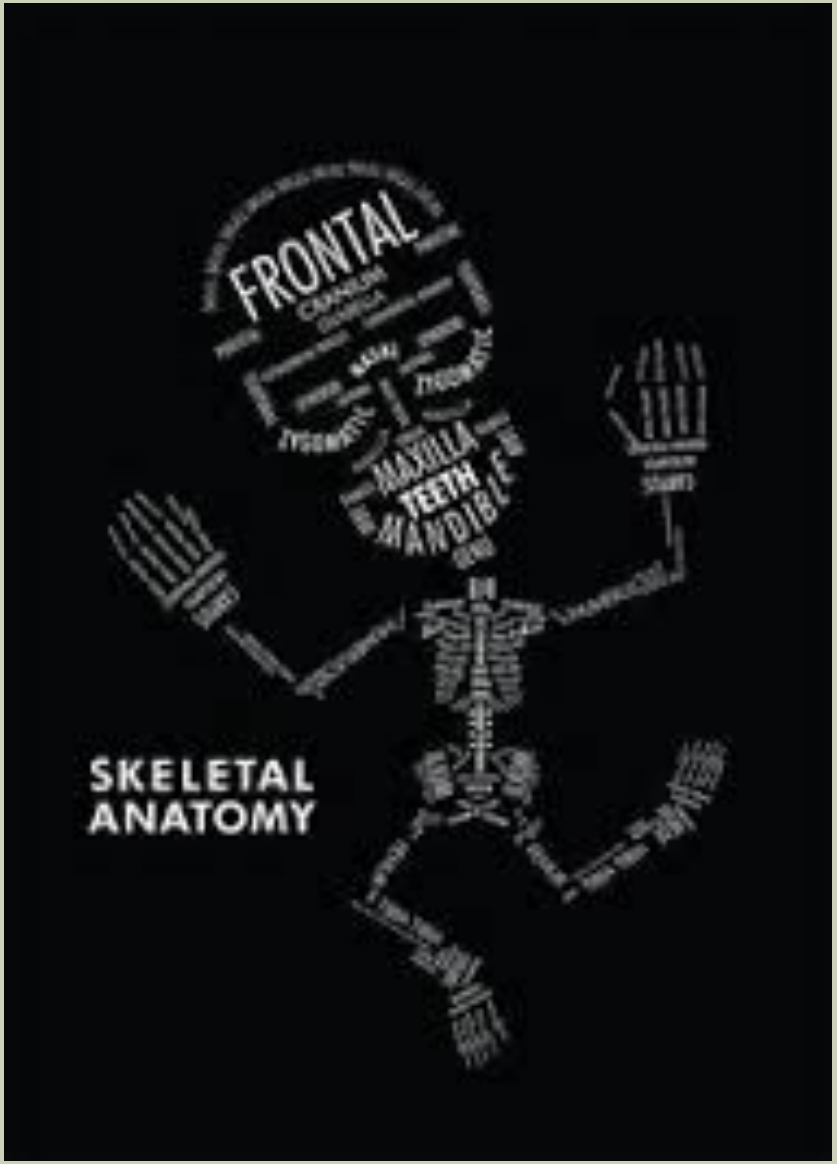


The Ribs

- 12 pairs of ribs
- articulate with 12 thoracic vertebra posteriorly
- Articulate with costal cartilage and sternum anteriorly

- True ribs = 1-7
- False ribs = 8-12
- Floating ribs = 11 & 12




FRONTAL
CRANIUM
MAXILLA
TEETH
MANDIBLE
SKELETAL
ANATOMY