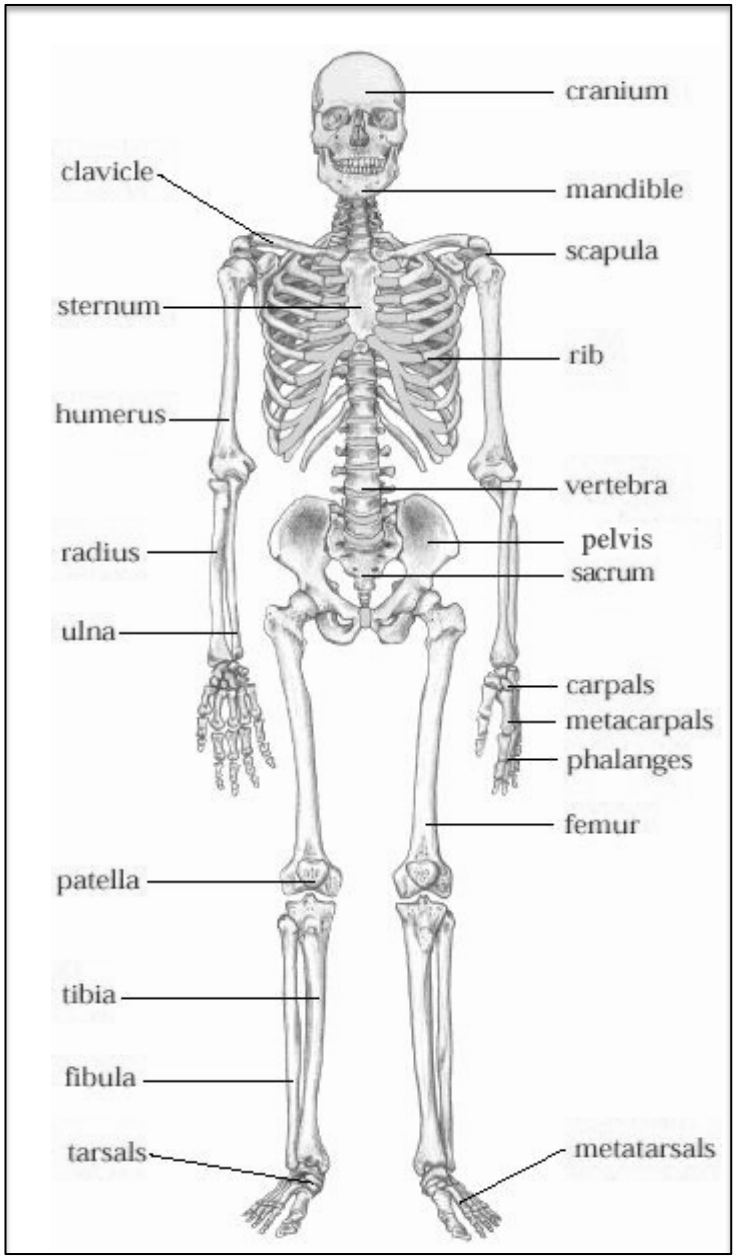
The Body Human:
Form & Function

# Skeletal System




Neutral position is known as the correct position.

The

# SKELETAL SYSTEM

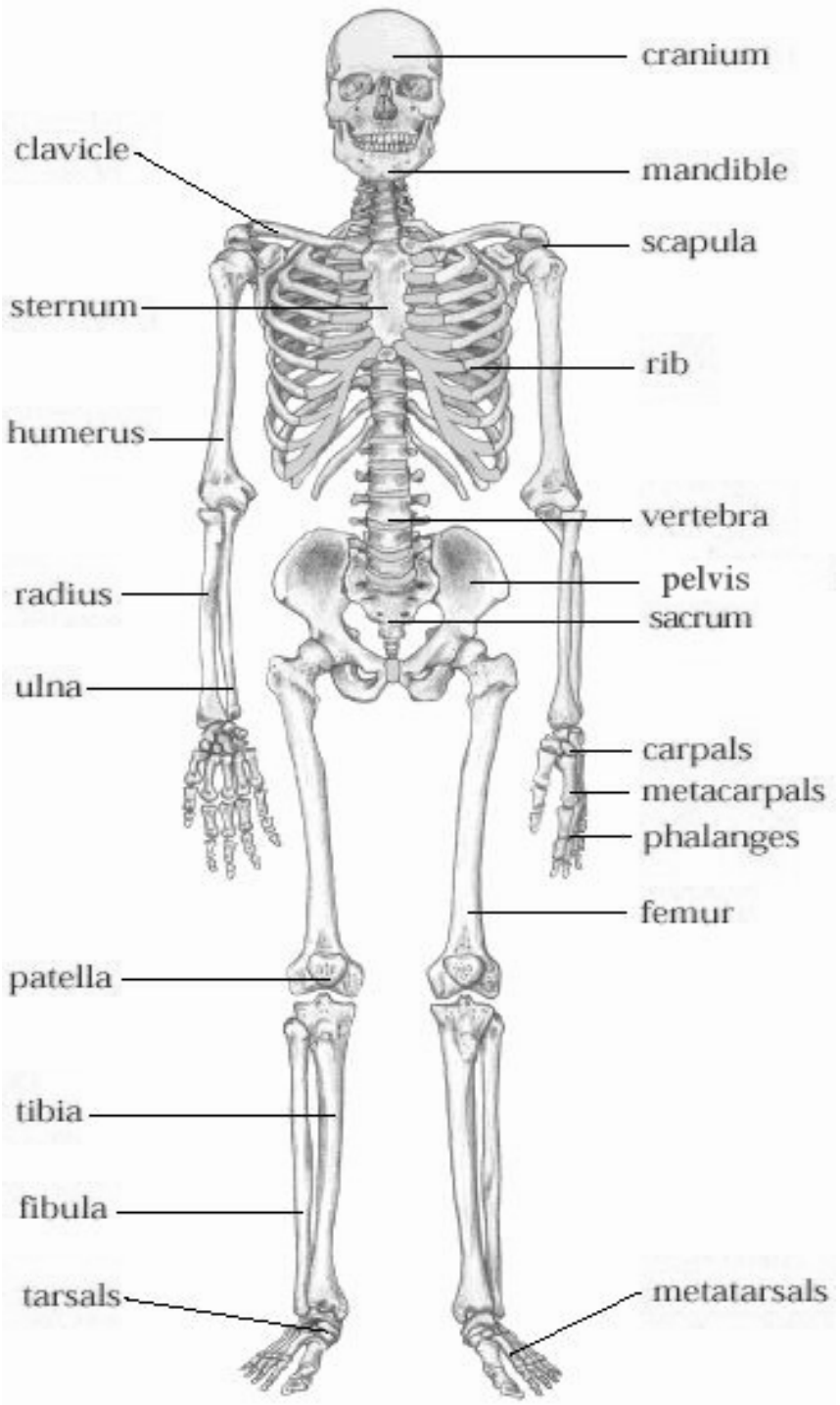
# Bones

How many bones does the human skeleton have?

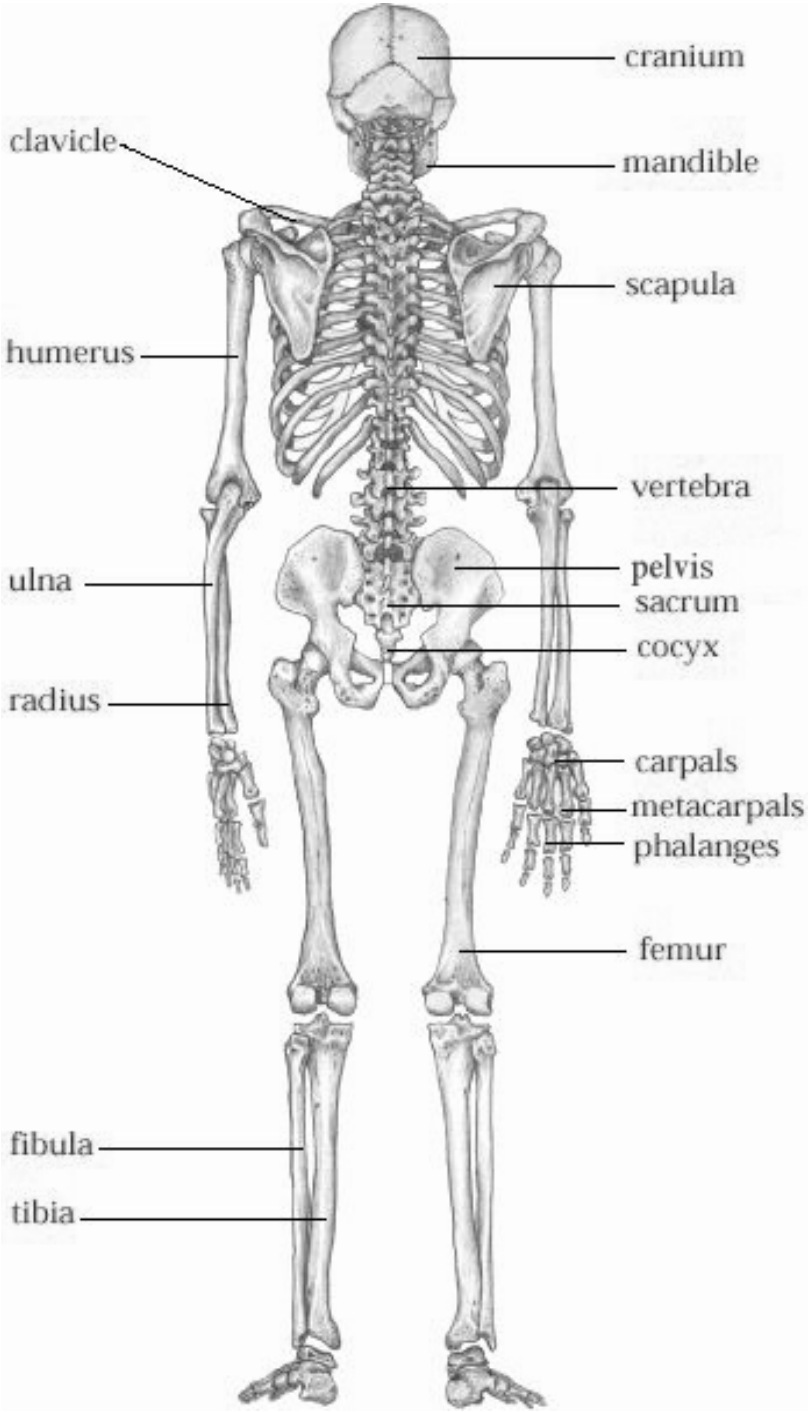
- 206

What do bones do?

- Structural support
- Protect organs : some bones are positioned in a particular way in order to protect organs
- Produce cells : in a living bone (hollow), there are occurrence of (chemical) processes.
  (Ex: blood flowing through, receiving nutrients (calcium))




**Front View (Anterior)**




**Back View (Posterior)**

# Bone Formation

- bones begin to develop before birth
- Initially flexible **cartilage**
- within a few weeks **ossification** begins
- Ossification is when…

cartilage is replaced by hard deposits of
calcium phosphate
and
stretchy collagen, (stretchy collagen is mature collagen forming a matrix, which allows slight movement that gives stability.)
(the two main components of bone)

(The 300 soft bones go through ossification, so if 2 soft bones are next to each other, they grow together. In other words the two bones fuse into one bigger bone.)

(The bone formation (bone growth) takes about 25 years.)

- A baby's body has about 300 "soft" bones at birth.

The back of the head of some newly born babies tend be flat because they are always sleeping on their back. This causes the back of the to become flat since they are composed of "soft" bones. However, the baby's body is able to repair that on its own.
Children have softer bones than adults, which allows them to be more flexible than adults.
High compact intensity activities are discouraged in kids due to their soft bones, since it can a negative effect of their bones.
(Ex: Gymnastics is an activity that an individual is constantly jump and thrown in the air. Hence, gravity wants the body back to its original "normal" position as soon as possible, which causes gymnasts to be shorter.
Its is sort of the same scenario with weight lifters, they tend to be shorter due to the gravity that acts upon the huge amounts of weights they lift.)

# Bone Formation

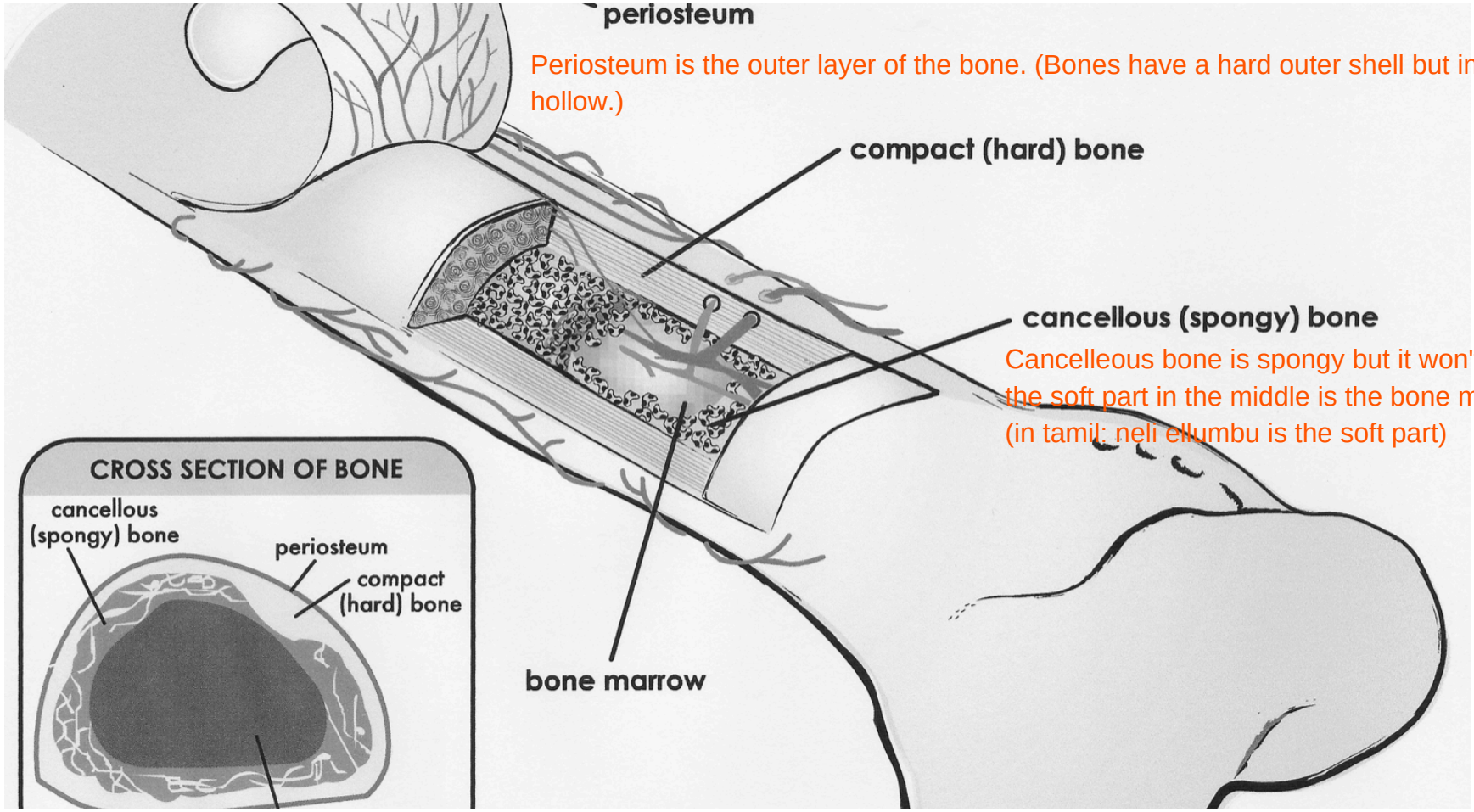
**Growth Plates**

- columns of multiplying cartilage cells that grow in length, and then change into hard, mineralized bone

Bone contains three types of cells:

- **osteoblasts** which make new bone and help repair damage;
- **osteocytes** which carry nutrients and waste products to and from blood vessels in the bone;
- **osteoclasts** which break down bone and help to sculpt and shape it.

# Parts of a Bone




Periosteum is the outer layer of the bone. (Bones have a hard outer shell but inside its hollow.)

Cancelleous bone is spongy but it won't tear. But the soft part in the middle is the bone marrow.)
(in tamil: neli ellumbu is the soft part)

What happens or are produced in the bone?

1) white blood cells (WBC)
2) red blood cells (RBC)
3) infections and bacterias are fought off

# Joints

- **Joint -** the place where two bones meet

  Joints allow potential movements.
- *Ligaments*

  what are they?

  what do they do?

Ligaments attach bone to bone. They prevent unwanted movements, which avoids injuries when you stretch a ligament. After a stretch, a ligament does not return back to its original length. Stretched ligaments will not be able to support the joint, which can cause injuries. If you tear or break a ligament, it can never repair on its own. If you have a torn ligament, normally a surgery is required which involves cutting the ligament to the correct size, which will now be able to support the joint properly and avoid injuries.

Sternum is the anchor of the the rib.

The light gray "bones" of the sternum connecting the ribs are the cartilage that allow very slight movements of the ribs cage, which prevents the ribs from breaking.


Hip is where the pelvis and the femur meet.

Proximal vs Distal
*reference point: shoulder joints and hip joints.
*Distal: farther away from the reference points.
*Proximal: closer to the reference points.
(The elbow is more proximal than thumb.)

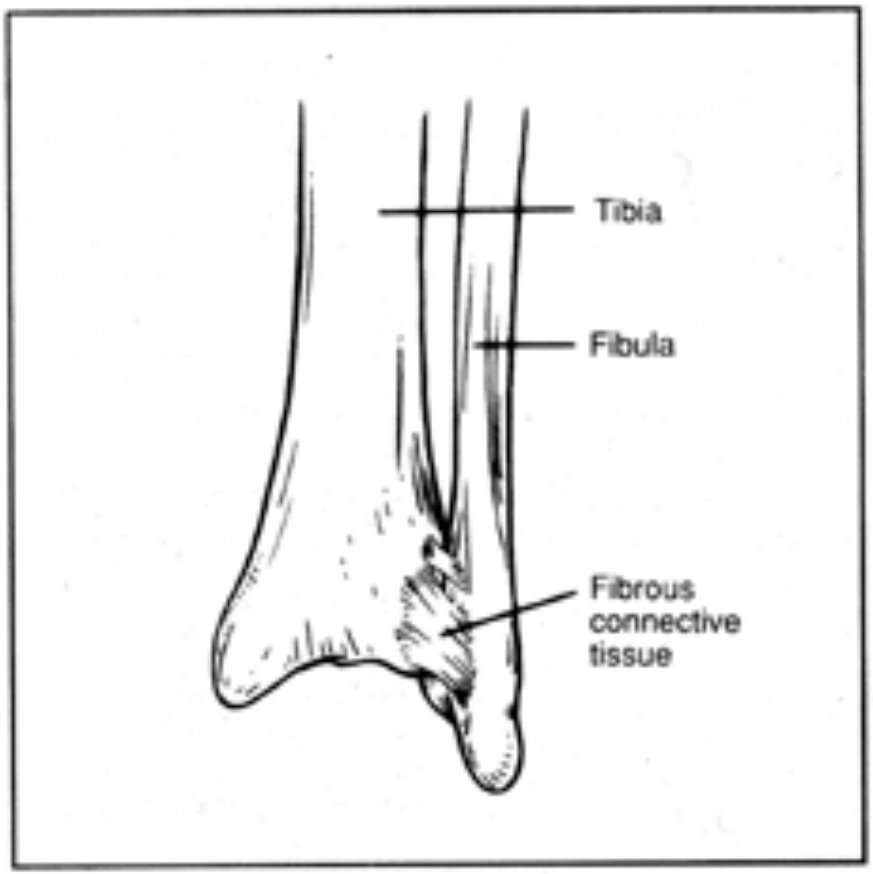
Even if you place your hand on your shoulder joint, your middle finger is still the most distal from your shoulder joint, since the length of the arm has not change.

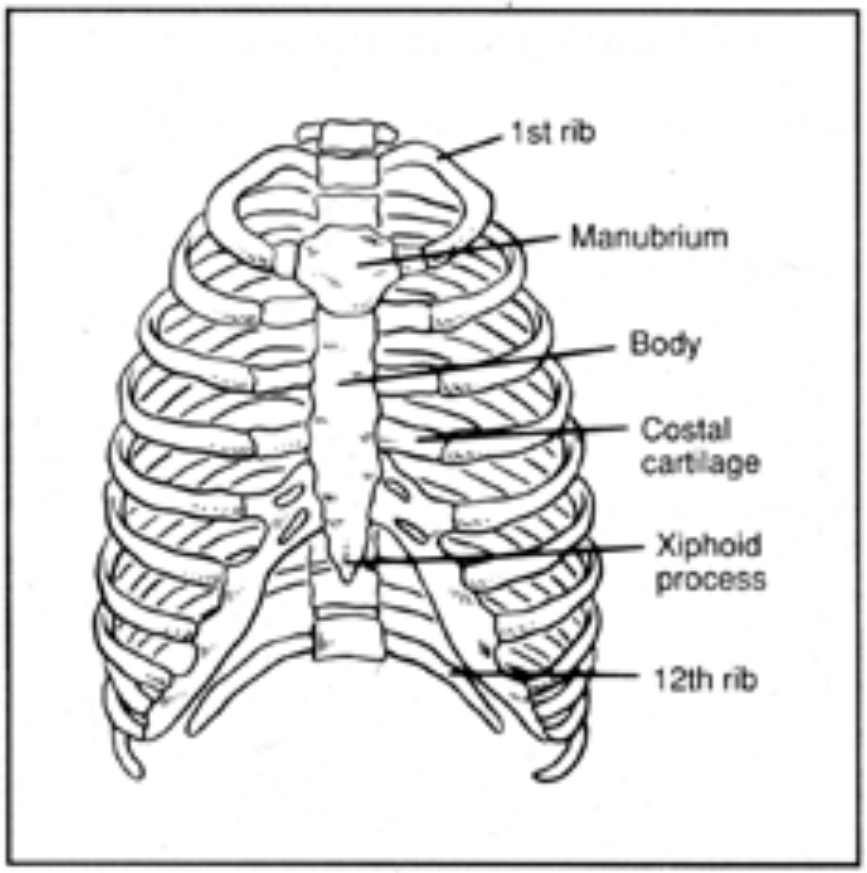
A fixed joint is required at the distal end of the fibula and the tibia because there is a lot of weight above it.

# Joints

## Types of Joints

**2. Fixed** joints are fixed in place and don't move at all.



# Joints

Types of Joints

2. **Moving** joints are the ones that allow you to twist, bend, and move different parts of your body.

- most of the joints in your body are moving joints
- Joint cavity between bones forming joint
- Movement limited by:
  - Shapes of bones forming joint
  - Soft tissues surrounding joint

Joint cavity (space) is necessary because if not two bones will be rubbing against each other (arthritis) and will start to decay, which is painful due to the nerves in the bones that rub against each other.

Synovial joint: The happening of the moving joint's joint cavity.

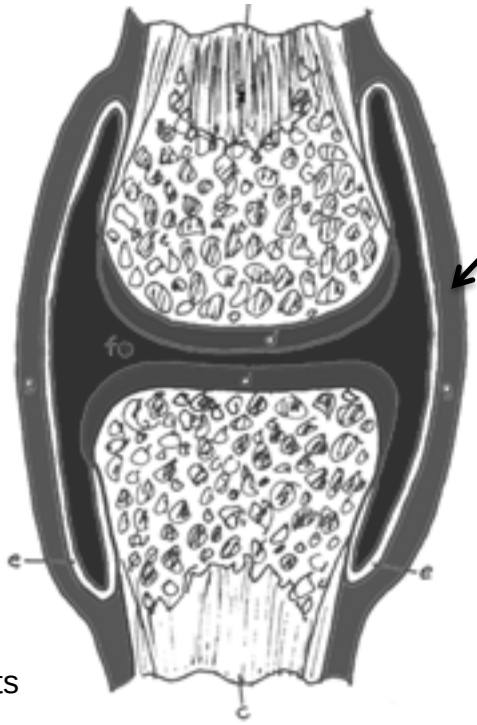
# Synovial Joint

Articular Cartilage: not part of the bones but part of the synovial joint. It is considered as the bones' second line of defense. When we get old, we produce less or stop producing synovial fluid. Hence, the articular cartilages start rubbing against each other and eventually wear off and the rubbing of the bones starts occurring.

Articular Cartilage (purple)

Synovial Cavity (blue)

Synovial Cavity: The place where the synovial fluid is kept.



Synovial Membrane (white)

Synovial membrane: very thin membrane around where the synovial fluid is made

Joint Capsule (green)

Joint Capsule: Encloses the synovial fluid, prevents it from entering the rest of the body.

Biomechanics: It is the study of movements that involves understanding how to put the body into a position that allows one to produce most (appropriate) amount of force with maximal effort with having the lowest amount of injury.
(Effective movement, efficient movement, with the minimal injury)

Back pain is due to slightly moving biomechanically incorrect.
(Ex: High heels lead to the shortening of the achilles tedon.)

# Joints

## Synovial Joints – 4 distinguishing features

Articular cartilage

Capsule

Synovial membrane

Synovial fluid

*A lot of tendons go from the top of the knee to the bottom of the knee at various angles to give that joint more stability.

# Joints

## Types of moving joints

1. Hinge: (like refrigerator door)
   Hinge joints only bend and straighten, if continues beyond the straighten or bent positions, it'll break.

2. Ball and socket: (Range of motion: How much at a joint can move. *The range of motion at a joint is specific to that joint.)
   A lot more movement, the amount of movement that can occur at a ball and socket depends on how well the ball fits in the socket. Also, depends on the ligaments that are present at that joint.

Dislocation: Occurs when ball separates from socket.

- **synovial fluid** helps them move freely.
- **ligaments** hold bones together.

Full range of motion: The full capacity of movement of a joint.
(To maintain this range of motion must move biomechanically as much as possible.)
Restricted range of motion: Not the full capacity of movement of a joint. This may occur due to injury, recovery of an injury was not proper, muscle tightness, arthritis, medical conditions and biomechanical incorrect movement.

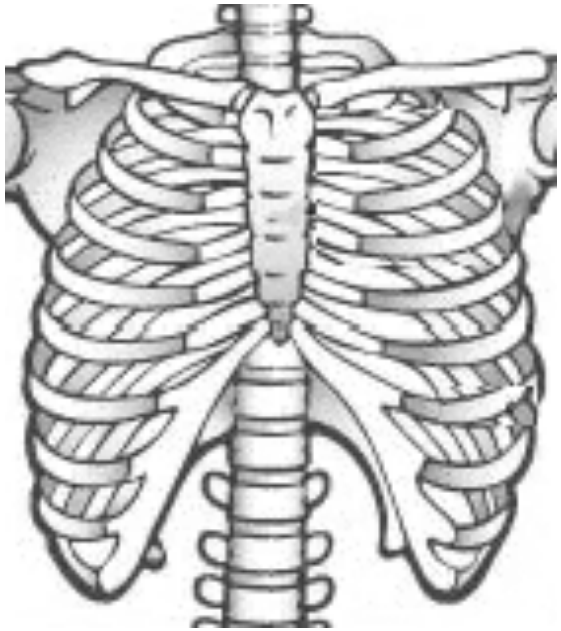
# Human Anatomy

- Spine - later in course
- Skull
- Ribs
- Arms & Hands
- Legs & Feet

Note: Normally if you break your ribs, its the bottom ones that break.
Floating ribs, not every one that has it and they are easily breakable.

# Ribs

- Ribs act like a cage of bones around your chest
- Protect heart, lungs and liver
- All 12 pairs of ribs attach in the back to the spine
- First seven pairs of ribs attach in the front to the sternum
- **Sternum** - a strong bone in the center of your chest that holds those ribs in place.
- The remaining sets of ribs don't attach to the sternum directly
- The next two or three pairs are held on with cartilage to the ribs above them.
- The very last two sets of ribs are called floating ribs because they aren't connected to the sternum or the ribs above them.
- Like the rest of the ribs, they are securely attached to the spine in the back.



# Skull

- Protects brain
- Make up the structure of your face
- Smallest bone in body? The smallest bone is called STAPES and it is found in the ear.

- Which is only bone in your head that you can move?

The only bone that can move in the head is the lower jaw bone called MANDIBLE.

# Arms and Hands

- Each arm is attached to a shoulder blade or **scapula**
- The arm is made up of three bones:
  1. **humerus**
  2. **radius**
  3. **ulna**

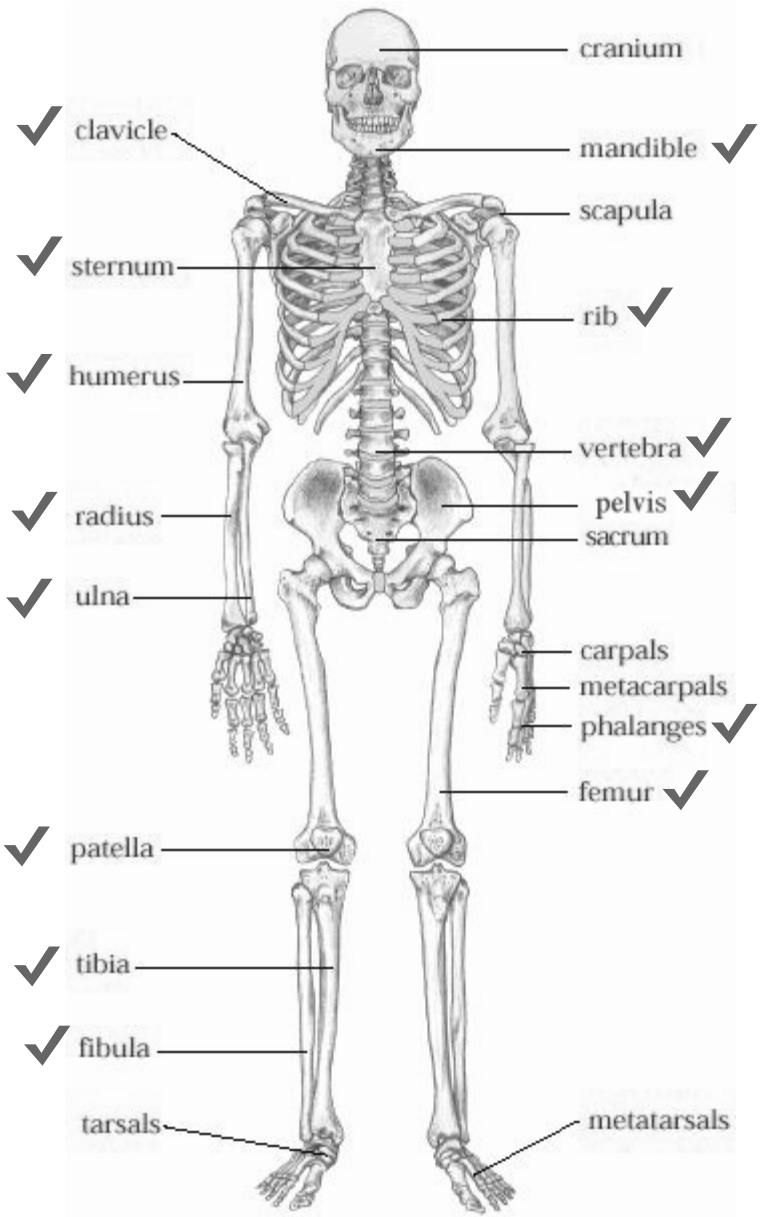
  Ulna and radius connect to the wrist joint.
  The wrist joint needs to withstand a lot of force in order to avoid injuries or breaking.
- Each of these bones is wider at the ends and skinnier in the middle, to help give it strength where it meets another bone.
- At the end of the radius and ulna are eight smaller bones that make up your wrist.
- The center part of your hand is made up of five separate bones. Each finger on your hand has three bones, except for your thumb, which has two.

*****All the check-marks need to know the locations of them.

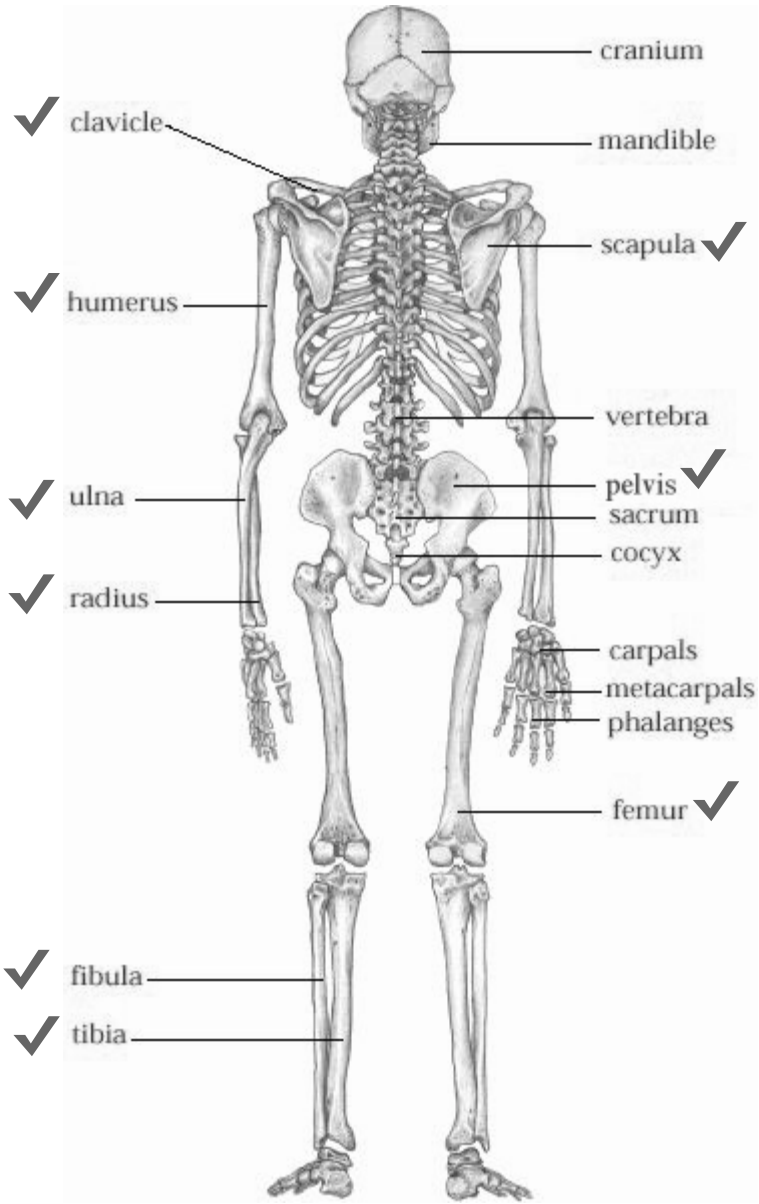
When looking at the appendicular skeleton and considering proximal and distal => remove appendages from pelvis and scapula.

*Shoulder girdle is made up of the clavicle and the scapula.

**Front View (Anterior)**




**Back View (Posterior)**




The tips of the pinky is more distal than the thumb.
The thumb sits directly under the radius.
The pinky sits directly under the ulna.

The mid-line cuts the appendicular skeleton in two, symmetrically.
Medial: moving a particular body part closer to the mid-line than another.
Lateral:moving a particular body part farther from the mid-line than another.
(Ex: you can move your arms either medially or laterally to/from the mid-line.)

# Pelvis

If some of the muscles are the pelvis are tighter or stronger than others (around the pelvis), it can lead to some sort of pull in a particular position which is not meant to be.

- Your legs are attached to a circular group of bones called your **pelvis**
- a bowl-shaped structure that supports the spinal column
- It is made up of the two large hip bones
- In front and behind are the sacrum and the coccyx.
- The pelvis acts as a tough ring of protection around parts of the digestive system, the urinary system, and parts of the reproductive system.

# Legs and Feet

- **Femur** the bone that goes from your pelvis to your knee
  it's the longest bone in your body.
- **Patella** a triangular-shaped bone at the knee
  kneecap, that protects the knee joint
- Below the knee are two other leg bones: the **tibia** and the **fibula**
- Standing
- Walking

Patella is only (visible) in the anterior position and its in a "triangular/ heart" shaped.

# Skeletal System Summary

- Structural support
- Protect organs
- Produce cells that
  - contribute to formation of RBCs and WBCs
  - store fat
  - release and absorb calcium
- 206 in total