

# Skeletal System

# Skeletal System Facts:

The skeletal system is made up of organs called bones.

An adult human has 206 bones, but babies are born with 270 bones. Why?

The male and female skeleton have 1 major difference -what is it?

The female pelvis is wider and deeper. Why?

The bones work as a system to perform 5 functions.

# Functions of the skeletal system:

- ▶ 1. **Framework**: bones form a framework to support the body's muscles, fat, and skin
- ▶ 2. **Protection**: bones surround vital organs to protect them. Can you think of an example?
- ▶ The skull surrounds the brain. The ribs surround the heart and lungs.

## Functions of the skeletal system:

- ▶ 3. **Levers**: muscles attach to bones to help provide movement
- ▶ 4. **Production of blood cells**: bones help produce RBCs, WBCs, and platelets, a process called hemopoiesis or hematopoiesis.
- ▶ 5. **Storage**: bones store most of the calcium supply of the body in addition to phosphorus and fats.

Bones vary in shape & size depending on their locations within the body

BONES OF THE EXTREMITIES ARE CALLED LONG BONES

## Parts of a long bone:

- ▶ 1. **Diaphysis** – long shaft
- ▶ 2. **Epiphysis** – the 2 ends
- ▶ 3. **Medullary Canal** – cavity in the diaphysis
- ▶ 4. **Yellow Marrow** – found in the medullary canal, it is a storage area for fat cells. It contains cells that form WBCs (leukocytes)
- ▶ 5. **Endosteum** – membrane that lines the medullary canal and keeps the yellow marrow intact. It produces some bone growth

## Parts of a long bone:

- ▶ 6. **Red Marrow** – found in certain bones (vertebrae, ribs, sternum, cranium, and in the proximal ends of humerus & femur). It produces RBCs, platelets, and some WBCs. Because this bone marrow is important in the making of blood cells & the body's immune response, the red marrow is used to diagnose blood diseases and can be transplanted in people with diseases of the immune system.

## Parts of a long bone:

- ▶ 7. **Periosteum** – tough membrane that covers the outside of the bone. It contains blood vessels, lymph vessels, and **osteoblasts** (special cells that form new bones).
- ▶ 8. **Articular cartilage** – covers the epiphysis and acts as a shock absorber when 2 bones meet to form a joint.

# Skeletal system is divided into 2 sections:

## Axial skeleton

- ▶ Forms the main trunk of the body and is composed of the skull, spinal column, ribs, and breastbone

## Appendicular skeleton

- ▶ Forms the extremities and is composed of the shoulder girdle, arm bones, pelvic girdle, and leg bones

# Axial Skeleton:



- ▶ The skull is composed of cranial and facial bones. **Cranium**= spherical structure that surrounds and protects the brain. It is made of 8 bones (1 **frontal**, 2 **parietal**, 2 **temporal**, 1 **occipital**, 1 **ethmoid**, 1 **sphenoid**).

# Axial Skeleton:



- ▶ Facial bones – 14 bones (1 **mandible**, 2 **maxilla**, 2 **zygomatic**, 2 lacrimal, 5 **nasal**, 2 palatine)

# Axial Skeleton:

- ▶ At birth the cranium isn't solid bone. There are spaces that allow for the enlargement of the skull as brain growth occurs.
- ▶ What are these spaces called?
- ▶ **Fontanels** or soft spots
- ▶ They are made of membrane and cartilage and turn to solid bone by about 18 months of age.

# Axial Skeleton:

**Sutures**: areas where cranial bones have joined together

**Sinuses**: air spaces in the bones of the skull that act as resonating chambers for the voice. They are lined with mucous membranes.

**Foramina**: openings in bones that allow nerves and blood vessels to enter or leave the bone

# Axial Skeleton:

- ▶ **Vertebrae**- 26 bones that make up the spinal column. They protect the spinal cord and provide support for the head and trunk.
- ▶ 7 **cervical** (neck)
- ▶ 12 **thoracic** (chest)
- ▶ 5 **lumbar** (waist)
- ▶ 1 **sacrum**
- ▶ 1 **coccyx** (tailbone)
- ▶ **Intervertebral disks**- pads of cartilage that separate the vertebrae. They act as shock absorbers and permit bending and twisting motions of the vertebral column

# Axial Skeleton:

- ▶ **Ribs**- 12 pairs. They attach to the thoracic vertebrae on the dorsal surface of the body.
- ▶ **True ribs**- 1<sup>st</sup> 7 pairs, they attach directly to the sternum
- ▶ **False ribs**- Next 5 pairs. The 1<sup>st</sup> 3 pairs of false ribs attach to the cartilage of the rib above.
- ▶ **Floating ribs**- Last 2 pairs of false ribs, they have no attachment on the front of the body.

# Axial Skeleton:

- ▶ **Sternum** = breastbone
- ▶ **Xiphoid process** – small piece of cartilage at the bottom of the sternum
- ▶ The ribs are attached to the sternum with **costal cartilages** to form a cage that protects the heart and lungs.

# Appendicular Skeleton:

- ▶ Shoulder girdle is made of 2 **clavicles** (collarbones) and 2 **scapulas** (shoulder bones).
- ▶ The scapula provide for the attachment of the upper arm bones.
- ▶ Bones of the upper arm: 1 **humerus** (upper arm), 1 **radius** (lower arm, thumb side), 1 **ulna** (larger bone of the lower arm with projection called the **olecranon process** at its upper end that forms the elbow), 8 **carpals** (wrist), 5 **metacarpals** (palm), 14 **phalanges** (3 on each finger, 2 on thumb)

# Appendicular Skeleton:

- ▶ Pelvic girdle is made of 2 **os coxae** (coxal, or hip, bones), which join the **sacrum** on the dorsal part of the body. On the ventral part of the body the os coxae join together at a joint called the **symphysis pubis**.
- ▶ Each os coxae is made of 3 fused sections: **ilium**, **ischium**, and **pubis**
- ▶ Pelvic girdle contains 2 recessed areas or sockets called **acetabula** which provide for the attachment of the smooth rounded head of the femur.
- ▶ **Obturator foramen**- opening between the ischium and pubis, it allows for the passage of nerves and blood vessels to and from the legs.

# Appendicular Skeleton:

- ▶ Bones of the leg: 1 **femur** (thigh), 1 **patella** (kneecap), 1 **tibia** (shin bone, it is the larger weight bearing bone of the lower leg), 1 **fibula** (slender, smaller bone of lower leg that attaches to the proximal end of the tibia), 7 **tarsals** (ankle), 5 **metatarsals** (instep of foot), and 14 **phalanges** (2 on great toe, 3 on other toes).
- ▶ Heel is formed by the large tarsal bone - **calcaneous**

# Joints

- ▶ **Joints**- areas where 2 or more bones join together. Connective tissue bands, called **ligaments**, help hold long bones together at joints.
- ▶ There are 3 main types of joints:
- ▶ 1. **Diarthrosis or synovial** – freely movable joint. Can you name an example?
- ▶ Ball-and-socket joints of the shoulder and hip or hinge joints of the elbow and knee

# Joints

- ▶ 2. **Amphiarthrosis** – slightly movable joint. Can you name an example?
  - ▶ Attachment of ribs to thoracic vertebrae or the joint between the 2 pelvic bones (symphysis pubis)
- ▶ 3. **Synarthrosis** – immovable joint. Can you name an example?
  - ▶ Suture joints of the cranium