The Skeletal System
Skeleton from a macroscopic perspective
Divisions of the Skeletal System

Axial vs. Appendicular
Take 20 seconds:
What prediction do you have about axial and appendicular? (what comes to mind)
Axial

- Bones along the **longitudinal axis** of the body. (Middle of the body)
• **80** of the body’s **206** bones
• Includes the **skull**, **hyoid bone**, **vertebrae**, **sternum**, **ribs** and **ossicles**.
Appendicular Skeleton

- Bones of the upper and lower limbs (extremities)
- Pelvic and pectoral girdle bones (connect the limbs to the axial skeleton)
- 126 of the 206 bones
• Color your diagram; one color for axial and a second for appendicular
• Pg 127 diagram
• Then identify the 13 listed bones as either axial or appendicular.
Bone surface Markings
Why do you suppose the bones of the body are not just smooth surfaces?
• Bones have numerous features on the surface to allow for:
  – Articulation (making joints)
  – Muscle attachment
  – Passage of nerves and blood vessels
Depressions and Openings

1. Foramen
   -A **hole or opening** for blood vessels, nerves or ligaments to pass through
   -Ex: foramen magnum (skull) – the large opening at the bottom of the skull
2. Meatus

- A **tunnel or tube like passage through bone.**
- Ex: external auditory meatus – the ear canal
Lateral View of The Skull

zygomatic bone
nasal bone
maxilla bone
mandible
frontal bone
parietal bone
temporal bone
external auditory meatus
occipital bone
lambdoidal suture
external occipital protuberance
mental foramen
mastoid process

See http://www.gwc.maricopa.edu/class/bio201/skull/latskul.htm for more bone labels.
3. Paranasal sinus
   - **air filled spaces** in the bone surrounding the nasal cavity
   - Ex: frontal sinus – just above the eyes
4. Fossa
   - a depression (trench) in a bone
   - Ex: mandibular fossa – indentation in the skull where the mandible attaches.
Processes that Form Joints

1. Condyle
   - rounded bump that form a joint
   - Ex: medial femoral condyle
2. Head
- a rounded bump at the end of a neck (thinner region)
- Ex: head of the femur
3. Facet
- a smooth flat surface that forms a joint
- Ex: vertebral facet
Process of attachment

• Sites of tendon and ligament attachment

1. Tuberosity
   - roughened boney process
   - Ex: tibial tuberosity
2. Spinous process or Spine
   - a sharp slender projection
   - Ex: spinous process of vertebra
3. Trochanter
   - large blunt projection in the femur
   - Ex: greater trochanter
4. Crest
   - A prominent border or ridge
   - Ex: iliac crest
Review

1. What is a hole through a bone?
2. What is a flat surface making a joint?
3. What is a large bump for muscle attachment, only on the femur?
4. What is an indentation in bone?
5. What is a rounded bump forming a joint?
The Skull
Parts of the skull

- Made up of **two** sets of bones

1. Cranial bones (8)
   - enclose and protects brain

2. Facial bones (14)
   - forms the face
What holds the bones together?
Sutures

• Are immovable joints that hold the skull bones together.

• Only found in the skull
1. Coronal suture

- Joins the **frontal** and 2 **parietal** bones together.
2. Sagittal suture

• Joins the 2 parietal bones (Remember the sagittal plane?)
3. Lambdoid suture

- Joins the *parietal* bones and the *occipital* bone.
4. Squamous suture

• Joins the *parietal* and *temporal* bones.
Cranial Bones
1. Frontal Bone

• Your forehead
• Makes the anterior part of the cranial cavity and the roof of the eye sockets (Orbits)
2. Parietal Bones

• 2 (left and right)
• Forms the roof and sides of the cranial cavity.
3. Temporal Bones

- Form the lower sides and part of the floor of the cranial cavity.
- Mandibular fossa and the external auditory meatus are 2 key structures in these bones.
4. Occipital Bone

• Forms the **posterior** portion and part of the floor of the cranial cavity.

• A key feature of this bone is the **foramen magnum**
5. Sphenoid Bone

• Forms the middle floor of the cranial cavity.
• It attaches to every other cranial bone.
6. Ethmoid Bone

- Bone between the orbits of the eyes on the floor of the cranial cavity.
- The olfactory nerve (smell) passes through this bone.
• On a ½ sheet of paper number 1-10. Please write your name at the top.
Facial Bones
1. Nasal Bones

• Form the **bridge** of the **nose**.
• Most of the nose is **cartilage**.
Temporal Bone

Mastoid Process
2. Maxillae

• The **upper jawbone**.
• Articulates with every bone of the face except the **mandible**.
• Contains the **maxillary sinus**.
• Forms the anterior portion of the **hard palate**.
3. Zygomatic Bones

• The cheek bones
4. Lacrimal Bones

- The **smallest** bones of the face. (about the size of a fingernail)
- The **tear ducts** sit in these bones.
Temporal Bone

Mastoid Process
5. Palatine Bones

• Makes the posterior portion of the hard palate.
6. Inferior nasal conchae

- Small bones projecting into the nasal cavity.
7. Vomer

- **Triangle** shaped bone in the middle, posterior nasal cavity.
- Along with the **ethmoid bone**, divides the nasal cavity into a right and left chamber.
8. Mandible

- Lower jawbone.
- **Largest** of the facial bones
Review

• On a ½ sheet of paper number 1-10. Please write your name at the top
III. SKELETAL SYSTEM
BONES OF THE SKULL

CRANIAL (8):
1. OCCIPITAL
2. PARIETAL
3. FRONTAL
4. TEMPORAL
5. ETIMOIDS
6. SPHENOID

FACIAL (14):
1. NASAL
2. VOMER
3. LACRIMAL
4. ZYGOMATIC
5. PALATINE
6. MAXILLA
7. MANDIBLE
8. INFERIOR NASAL CONCHA

ON: Work with this plate and the next one at the same time. Save the brightest colors for the smallest bones; use light colors on bones with surface detail. Work one bone at a time, coloring it where it appears in any of the 7 views shown on this and the next plate.

1) The anterior view, do not color the darkened areas in the orbits and nasal cavity.

The skull is composed of cranial bones (forming a vault for the brain) and facial bones (giving origin to the muscles of facial expression and providing sutures protecting the brain). Except for the temporomandibular joint (a synovial joint), all bones are connected by generally immovable fibrous sutures.

The orbit is composed of 7 bones, has 3 significant fissures/canal, and is home to the eye and related muscles, nerves, and vessels. The most delicate of the skull bones is at the medial orbital wall (i). The external nose is largely cartilaginous and is, therefore, not part of the bony skull.
What is the most common injury at work?
Nature of injury or illness of nonfatal occupational injuries and illnesses involving days away from work, 2003

- Sprains, strains
- Other
- Cuts, lacerations
- Fractures
- Heat burns
- Carpal tunnel syndrome
- Tendonitis
- Chemical burns
- Amputations
- Multiple traumatic injuries
- Bruises, contusions

Other categories (not shown in the pie chart)
Low back pain affects 60% to 85% of all people in their lifetime, and between 15% to 30% on any given day.
Vertebral column
The Vertebral Column

• What, if anything, do you know about the vertebra and the vertebral column?
  – functions, parts/divisions
  – how do bones differ
  – things that can go wrong
Vertebral column

- A series of bones called **vertebrae**.
- Also called **the spine** or **backbone**.
- **26** bones in an adult (**33** in a child)
Function of the V.C.

1. Protects the spinal cord
2. Allows for movement
3. Supports the head
4. Point of attachment for muscles and ribs
Divisions of the V.C.
1. Cervical

• Bones of the neck
• 7 bones
2. Thoracic

- Bones of the **chest** region
- **12** bones
- **Ribs** attach to each vertebra
7 Cervical vertebrae
12 Thoracic vertebrae
5 Lumbar vertebrae
Sacrum
Coccyx

7th rib
3. Lumbar

- Lower back bones
- 5 bones
4. Sacrum

- 5 fused sacral vertebrae
5. Coccyx

- 4 fused coccygeal vertebrae
Normal Curves of the Vertebral Column

- When looking at the spine from the side (lateral view) there are 4 curves in a normal spine.
  - In the **cervical** and **lumbar** spine the curve is toward the **front / anterior** of the body.
  - In the **thoracic** and **sacral** spine the curve is toward the **back / posterior** of the body.
What might be the advantage of these normal spinal curves
In a fetus and newborn there is a single spinal curve toward the back / posterior of the body (concave).

- At 3 months of age the **cervical** curve starts to develop as the child begins to hold their **head up**.
- The **lumbar** curve begins to develop when the infant begins to **sit up** and **walk**.
Exit Slip

• What are the divisions of the spine (from superior to inferior)?
• How many bones are in each division?
Warm-Up

• What are the divisions of the vertebral column and how many bones are in each?
Divisions of the VC

- 7 **cervical** vertebrae (neck)
- 12 **thoracic** vertebrae (chest region)
- 5 **lumbar** vertebrae (low back)
- 1 **sacrum** (5 fused bones)
- 1 **coccyx** (tailbone)
Structures associated with vertebrae and vertebral column
Intervertebral foramen

• Openings between 2 adjacent vertebrae.
• Allows for the passage of **nerves** from the spinal cord to the body.
Intervertebral disc

• Elastic fibrocartilage cushion between the bones of the spine from C2 down
Parts of a TypicalVertebra
1. **Body**

- **Large**, **anterior** portion of the bone.
- **Weight-bearing** portion
- Site of **IVD** attachment
-forms the **anterior or floor** surface of the spinal (vertebral) canal.
2. **Vertebral arch**

a. **Pedicles (2)**
- short thick bony processes
- forms the **sides or walls** of the spinal canal
b. Lamina (2)
   - flat bony processes extending from the posterior of the pedicles
   - forms the **posterior or roof** of the spinal canal
3. **Vertebral foramen**

- The opening formed by the **vertebral arch**.
- It serves as a passageway for the **spinal cord**.
Spinal Canal
4. **Transverse process (2)**

- Bony processes that projects **laterally**.
- Originate from where the **pedicle** and **lamina** join together.
5. **Spinous process**

- Bony process that projects **posteriorly**.
- Arises where the **lamina** join together
6. **Articular processes (4)**

a. **Superior articular processes (2)** - articulate with the vertebra above.
b. Inferior articular processes (2)
   - articulates with the vertebra below
7. facet

- The surface of the 4 articular processes
On a $\frac{1}{2}$ sheet of paper write your name at the top and number 1-7.
Warm up

• How can you tell a vertebra is from the cervical spine?
• How is C1 different than a typical cervical vertebra?
Cervical vertebra
C2

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C7
Thoracic vertebra
Lumbar vertebra
The Thorax
The Thorax

- Aka. the chest
- This is the part of the body bordered by the **Sternum, ribs** and **thoracic vertebrae**.
- These bones make up the **thoracic cage**.
Function of the Thoracic Cage

• It *encloses* and *protects* the organs of the thoracic cavity.
• Serves as a point of attachment for the shoulder girdle and upper limbs.
The Sternum

• Aka the breastbone
• A flat narrow bone located in the anterior center of the thoracic cavity.
1. Manubrium

- The upper portion of the sternum.
- Articulates with the clavicles and the upper 2 ribs.
2. Body

- The middle large portion of the sternum
- Articulates with the second through tenth ribs.
3. Xiphoid Process

- Lower portion of the sternum.
- No bone articulations
- Attachment site for abdominal muscle.
Warm up

• What is a girdle bone?
The ribs

• 12 pairs of ribs
• Increase in length from 1-7 and then decrease in length.
True ribs

- The first 7 ribs have a direct attachment to the sternum by costal cartilage.
False Ribs

- Cartilage does not attach directly to the sternum or does not attach at all.
- 8th, 9th and 10th ribs - cartilage attaches to each other then to the cartilage of the 7th
11th and 12th ribs - Anterior ends do not attach at all, these are called "floating ribs".
Intercostal spaces

• Space between the ribs that are occupied by muscles, blood vessels and nerves