Appendicular Skeleton
• Bones of the limbs and their girdles
  • Pectoral girdle attaches the upper limbs to the body trunk
  • Pelvic girdle secures the lower limbs

Pectoral Girdle (Shoulder Girdle)
• Clavicles and the scapulae
  • Attach the upper limbs to the axial skeleton
  • Provide attachment sites for muscles that move the upper limbs

Clavicles (Collarbones)
• Flattened acromial (lateral) end articulates with the scapula
• Cone-shaped sternal (medial) end articulates with the sternum
• Act as braces to hold the scapulae and arms out laterally

Scapulae (Shoulder Blades)
• Situated on the dorsal surface of rib cage, between ribs 2 and 7
• Flat and triangular, with three borders and three angles
• Seven large fossae, named according to location

The Upper Limb
• 30 bones form the skeletal framework of each upper limb
  • Arm
    • Humerus
  • Forearm
    • Radius and ulna
  • Hand
    • 8 carpal bones in the wrist
    • 5 metacarpal bones in the palm
    • 14 phalanges in the fingers

Humerus
• Largest, longest bone of upper limb
• Articulates superiorly with glenoid cavity of scapula
• Articulates inferiorly with radius and ulna
Bones of the Forearm
- Ulna
  - Medial bone in forearm
  - Forms the major portion of the elbow joint with the humerus
- Radius
  - Lateral bone in forearm
  - Head articulates with capitulum of humerus and with radial notch of ulna
  - Interosseous membrane connects the radius and ulna along their entire length

Hand: Carpus
- Eight bones in two rows
  - Proximal row
    - Scaphoid, lunate, triquetrum, and pisiform proximally
  - Distal row
    - Trapezium, trapezoid, capitate, and hamate distally
- Only scaphoid and lunate articulate with radius to form wrist joint

Hand: Metacarpus and Phalanges
- Metacarpus
  - Five metacarpal bones (#1 to #5) form the palm
- Phalanges
  - Each finger (digit), except the thumb, has three phalanges—distal, middle, and proximal
  - Fingers are numbered 1–5, beginning with the thumb (pollex)
  - Thumb has no middle phalanx

Pelvic (Hip) Girdle
- Two hip bones (each also called coxal bone or os coxae)
  - Attach the lower limbs to the axial skeleton with strong ligaments
  - Transmit weight of upper body to lower limbs
  - Support pelvic organs
- Each hip bone consists of three fused bones: ilium, ischium, and pubis
- Together with the sacrum and the coccyx, these bones form the bony pelvis

Hip Bone
- Three regions
  1. Ilium
    - Superior region of the coxal bone
    - Auricular surface articulates with the sacrum (sacroiliac joint)
2. Ischium
   • Posteroinferior part of hip bone

3. Pubis
   • Anterior portion of hip bone
   • Midline pubic symphysis joint

Comparison of Male and Female Pelves
• Female pelvis
  • Adapted for childbearing
  • True pelvis (inferior to pelvic brim) defines birth canal
  • Cavity of the true pelvis is broad, shallow, and has greater capacity

Comparison of Male and Female Pelves
• Male pelvis
  • Tilted less forward
  • Adapted for support of male’s heavier build and stronger muscles
  • Cavity of true pelvis is narrow and deep

Comparison of Male and Female Pelves

The Lower Limb
• Carries the weight of the body
• Subjected to exceptional forces
• Three segments of the lower limb
  • Thigh: femur
  • Leg: tibia and fibula
  • Foot: 7 tarsal bones in the ankle, 5 metatarsal bones in the metatarsus, and 14 phalanges in the toes

Femur
• Largest and strongest bone in the body
• Articulates proximally with the acetabulum of the hip and distally with the tibia and patella

Bones of the Leg
• Tibia
  • Medial leg bone
  • Receives the weight of the body from the femur and transmits it to the foot
• Fibula
  • Not weight bearing; no articulation with femur
  • Site of muscle attachment
• Connected to tibia by interosseous membrane
• Articulates with tibia via proximal and distal tibiofibular joints

**Foot: Tarsals**
• Seven tarsal bones form the posterior half of the foot
• Talus transfers most of the weight from the tibia to the calcaneus
• Other tarsal bones: cuboid, navicular, and the medial, intermediate, and lateral cuneiforms

**Foot: Metatarsals and Phalanges**
• Metatarsals:
  • Five metatarsal bones (#1 to #5)
  • Enlarged head of metatarsal 1 forms the “ball of the foot”
• Phalanges
  • The 14 bones of the toes
  • Each digit (except the hallux) has three phalanges
  • Hallux has no middle phalanx

**Arches of the Foot**
• Arches are maintained by interlocking foot bones, ligaments, and tendons
• Arches allow the foot to bear weight
• Three arches
  • Lateral longitudinal
  • Medial longitudinal
  • Transverse

**Developmental Aspects: Fetal Skull**
• Infant skull has more bones than the adult skull
• Skull bones such as the mandible and frontal bones are unfused
• At birth, skull bones are connected by fontanelles
  • Fontanelles
    • Unossified remnants of fibrous membranes between fetal skull bones
    • Four fontanelles
      • Anterior, posterior, mastoid, and sphenoid

**Developmental Aspects: Growth Rates**
• At birth, the cranium is huge relative to the face
• At 9 months of age, cranium is _ adult size
• Mandible and maxilla are foreshortened but lengthen with age
• The arms and legs grow at a faster rate than the head and
trunk, leading to adult proportions

**Developmental Aspects: Spinal Curvature**
- Thoracic and sacral curvatures are obvious at birth
  - These primary curvatures give the spine a C shape
  - Convex posteriorly

**Developmental Aspects: Spinal Curvature**
- Secondary curvatures
  - Cervical and lumbar—convex anteriorly
  - Appear as child develops (e.g., lifts head, learns to walk)

**Developmental Aspects: Old Age**
- Intervertebral discs become thin, less hydrated, and less elastic
- Risk of disc herniation increases
- Loss of stature by several centimeters is common by age 55
- Costal cartilages ossify, causing the thorax to become rigid
- All bones lose mass