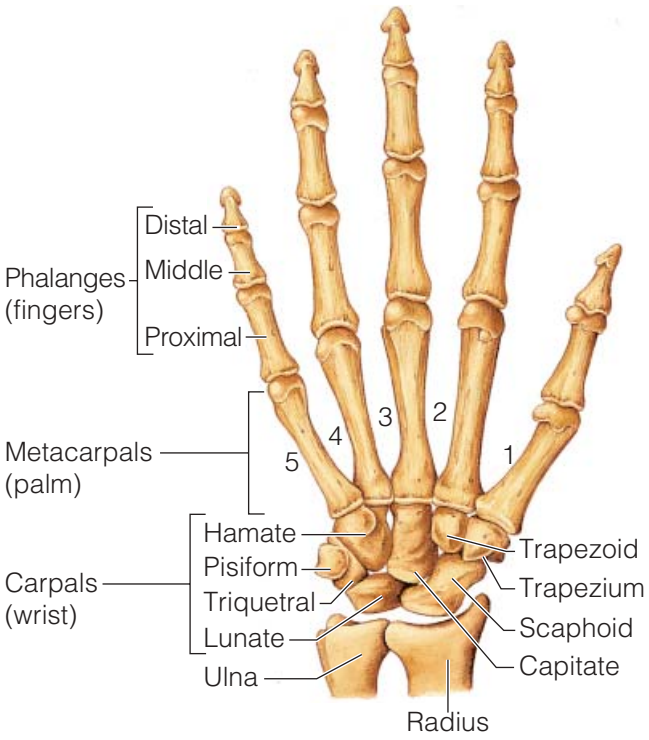

FIGURE 5.22 **Bones of the right hand, anterior view.**

Bones of the Pelvic Girdle

The **pelvic girdle** is formed by two **coxal** (kok′sal) **bones,** or **ossa coxae,** commonly called **hip bones.** Together with the sacrum and the coccyx, the hip bones form the *bony pelvis* (Figure 5.23). Note that the terms *pelvic girdle* and *pelvis* have slightly different meanings.

The bones of the pelvic girdle are large and heavy, and they are attached securely to the axial skeleton. The sockets, which receive the thigh bones, are deep and heavily reinforced by ligaments that attach the limbs firmly to the girdle. Bearing weight is the most important function of this girdle; the total weight of the upper body rests on the pelvis. The reproductive organs, urinary bladder, and part of the large intestine lie within and are protected by the bony pelvis.

Each hip bone is formed by the fusion of three bones: the *ilium, ischium,* and *pubis.* The **ilium** (il′e-um), which connects posteriorly with the sacrum at the **sacroiliac** (sak″ro-il′e-ac) **joint,** is a large, flaring bone that forms most of the hip bone. When you put your hands on your hips, they are resting over the *alae* or winglike portions of the ilia. The upper edge of the alae, the **iliac crest,** is an important anatomical landmark that is always kept in mind by those who give injections. The iliac crest ends anteriorly in the **anterior superior iliac spine** and posteriorly in the **posterior superior iliac spine.** Small inferior spines are located below these.

The **ischium** (is′ke-um) is the "sit-down bone," since it forms the most inferior part of the coxal bone. The **ischial tuberosity** is a roughened area that receives body weight when you are sitting. The **ischial spine,** superior to the tuberosity, is another important anatomical landmark, particularly in the pregnant woman, because it narrows the outlet of the pelvis through which the baby must pass during the birth process. Another important structural feature of the ischium is the **greater sciatic notch,** which allows blood vessels and the large sciatic nerve to pass from the pelvis posteriorly into the thigh. Injections in the buttock should always be given well away from this area.

The **pubis** (pu′bis), or **pubic bone,** is the most anterior part of a coxal bone. Fusion of the *rami* of the pubis anteriorly and the ischium posteriorly forms a bar of bone enclosing the **obturator** (ob′tu-ra″tor) **foramen,** an opening that allows blood vessels and nerves to pass into the anterior part of the thigh. The pubic bones of each hip bone fuse anteriorly to form a cartilaginous joint, the **pubic symphysis** (pu′bik sim′fĭ-sis).

The ilium, ischium, and pubis fuse at the deep socket called the **acetabulum** (as″ĕ-tab′u-lum), which means "vinegar cup." The acetabulum receives the head of the thigh bone.

The bony pelvis is divided into two regions. The **false pelvis** is superior to the true pelvis; it is the area medial to the flaring portions of the ilia. The **true pelvis** is surrounded by bone and lies inferior to the flaring parts of the ilia and the pelvic brim. The dimensions of the true pelvis of a woman are very important because they must be large enough to allow the infant's head (the largest part of the infant) to pass during childbirth. The dimensions of the cavity, particularly the **outlet** (the inferior opening of the pelvis), and the **inlet** (superior opening) are critical, and thus they are carefully measured by the obstetrician.

Of course, individual pelvic structures vary, but there are fairly consistent differences between a male and a female pelvis. Look at Figure 5.23c and

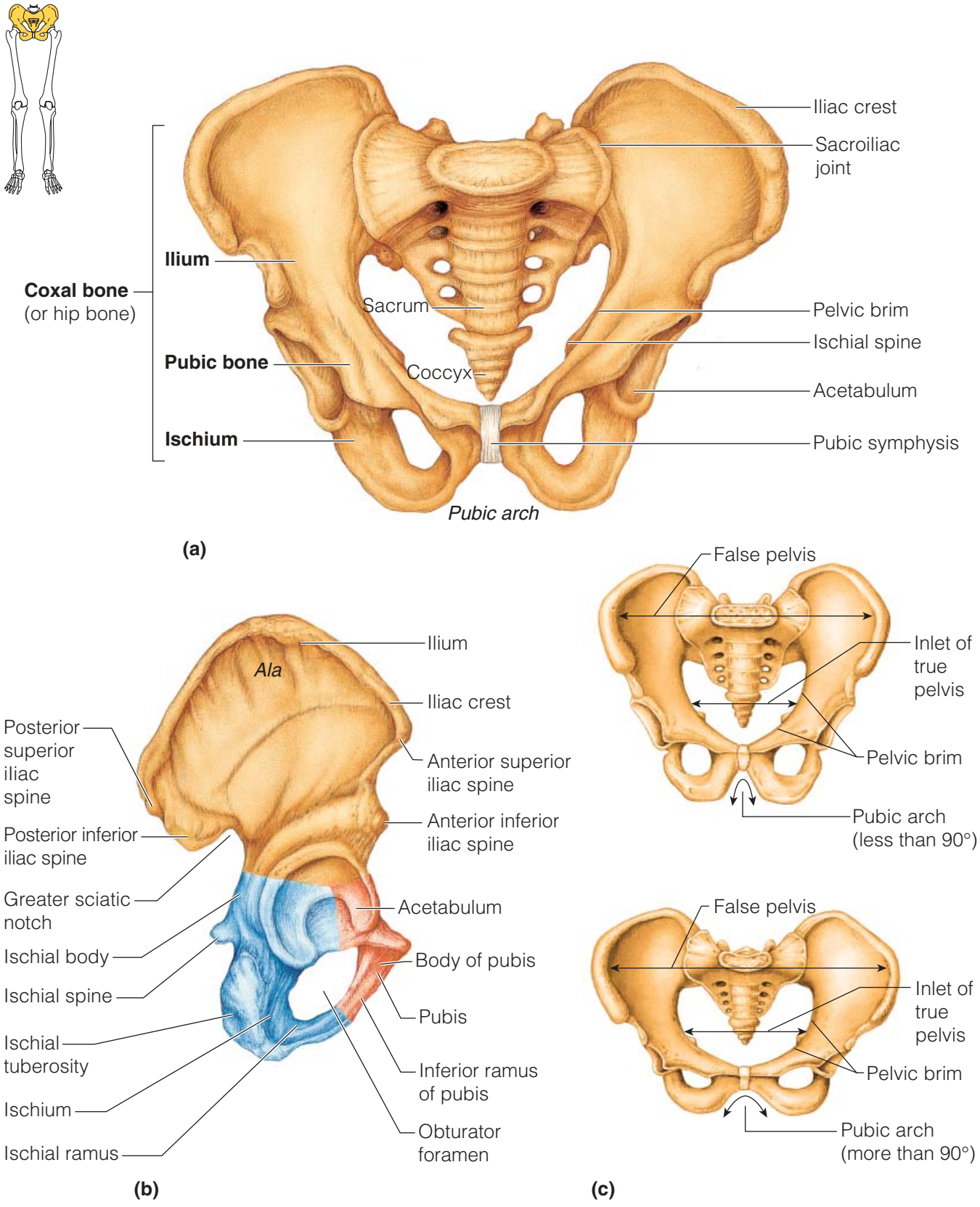

FIGURE 5.23 **The pelvis. (a)** Articulated male pelvis. **(b)** Right coxal bone, showing the point of fusion of the ilium, ischium, and pubic bones. **(c)** Comparison of the male (above) and female (below) pelves.

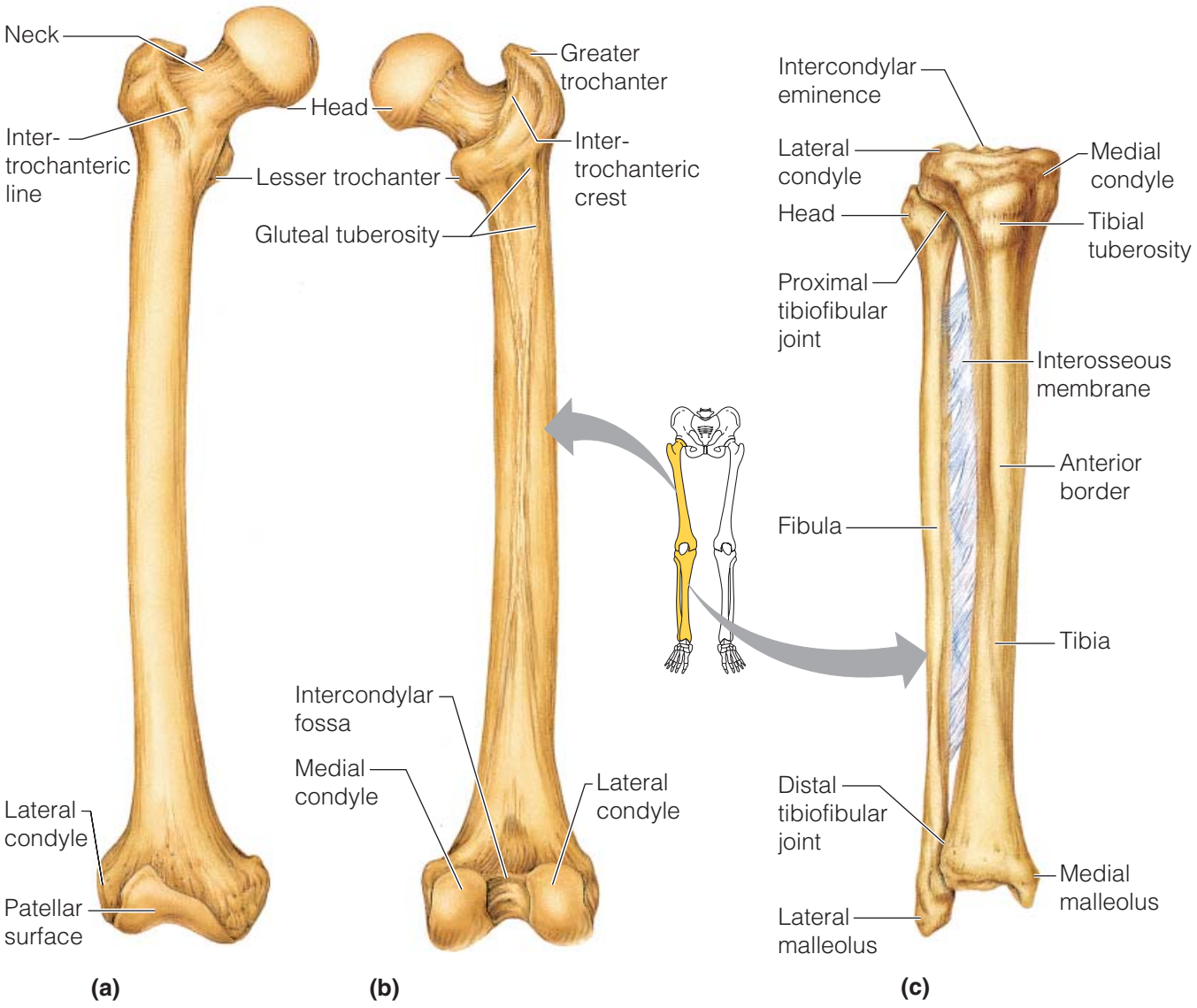

FIGURE 5.24 **Bones of the right thigh and leg. (a)** Femur (thigh bone), anterior view. **(b)** Femur, posterior view. **(c)** Tibia and fibula of the leg, anterior view.

notice the following characteristics that differ in the pelvis of the male and female.

- The female inlet is larger and more circular.
- The female pelvis as a whole is shallower, and the bones are lighter and thinner.
- The female ilia flare more laterally.
- The female sacrum is shorter and less curved.
- The female ischial spines are shorter and farther apart; thus the outlet is larger.
- The female pubic arch is more rounded because the angle of the pubic arch is greater.

Bones of the Lower Limbs

The lower limbs carry our total body weight when we are erect. Hence, it is not surprising that the bones forming the three segments of the lower limbs (thigh, leg, and foot) are much thicker and stronger than the comparable bones of the upper limb.

Thigh

The **femur** (fe′mur), or *thigh bone,* is the only bone in the thigh (Figure 5.24a and b). It is the

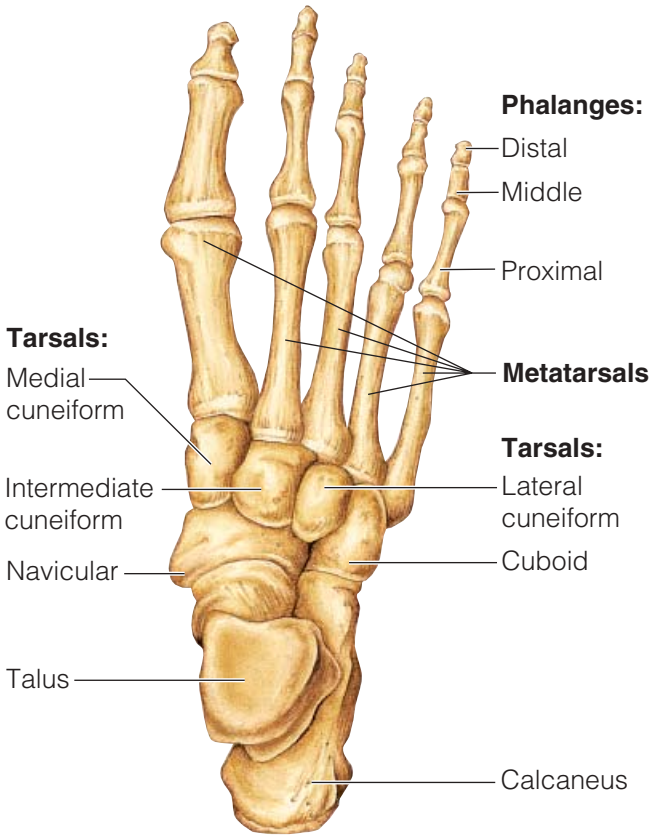

FIGURE 5.25 **Bones of the right foot, superior view.**

heaviest, strongest bone in the body. Its proximal end has a ball-like head, a neck, and **greater** and **lesser trochanters** (separated anteriorly by the **intertrochanteric line** and posteriorly by the **intertrochanteric crest**). The trochanters, intertrochanteric crest, and the **gluteal tuberosity,** located on the shaft, all serve as sites for muscle attachment. The head of the femur articulates with the acetabulum of the hip bone in a deep, secure socket. However, the neck of the femur is a common fracture site, especially in old age.

The femur slants medially as it runs downward to join with the leg bones; this brings the knees in line with the body's center of gravity. The medial course of the femur is more noticeable in females because of the wider female pelvis. Distally on the femur are the **lateral** and **medial condyles,** which articulate with the tibia below. Posteriorly these condyles are separated by the deep **intercondylar fossa.** Anteriorly on the distal femur is the smooth **patellar surface,** which forms a joint with the patella, or kneecap.

Leg

Connected along their length by an **interosseous membrane,** two bones, the tibia and fibula, form the skeleton of the leg (see Figure 5.24c). The **tibia,** or *shinbone,* is larger and more medial. At the proximal end, the **medial** and **lateral condyles** (separated by the **intercondylar eminence**) articulate with the distal end of the femur to form the knee joint. The patellar (kneecap) ligament attaches to the **tibial tuberosity,** a roughened area on the anterior tibial surface. Distally, a process called the **medial malleolus** (mal-le′o-lus) forms the inner bulge of the ankle. The anterior surface of the tibia is a sharp ridge, the **anterior border,** that is unprotected by muscles; thus, it is easily felt beneath the skin.

The **fibula,** which lies alongside the tibia and forms joints with it both proximally and distally, is thin and sticklike. The fibula has no part in forming the knee joint. Its distal end, the **lateral malleolus,** forms the outer part of the ankle.

Foot

The foot, composed of the tarsals, metatarsals, and phalanges, has two important functions. It supports our body weight and serves as a lever that allows us to propel our bodies forward when we walk and run.

The **tarsus,** forming the posterior half of the foot, is composed of seven **tarsal bones** (Figure 5.25). Body weight is mostly carried by the two largest tarsals, the **calcaneus** (kal-ka′ne-us), or heelbone, and the **talus** (ta′lus; "ankle"), which lies between the tibia and the calcaneus. Five **metatarsals** form the sole, and 14 **phalanges** form the toes. Like the fingers of the hand, each toe has three phalanges, except the great toe, which has two.

The bones in the foot are arranged to form three strong arches: two longitudinal (medial and lateral) and one transverse (Figure 5.26, p. 163). *Ligaments,* which bind the foot bones together, and *tendons* of the foot muscles help to hold the bones firmly in the arched position but still allow a certain amount of give or springiness. Weak arches are referred to as "fallen arches" or "flat feet."