



# Chapter 1

## Introductory Anatomical Terminology and Physiological Concepts

**M**ost of the terms used in anatomy and physiology are of either Greek or Latin origin. (In fact, the term *anatomy* is derived from a Greek word that means to “cut open.”) These terms are descriptive, and while they may appear to be rather difficult in the beginning, they soon will be second nature to you. You’ll find yourself speaking the language of anatomy and physiology in no time.

### Directional Terms

Have you ever been in a situation where someone is giving you directions and says something like this, “When you come to corner, turn right”? When you’re coming from one direction, turning right may be north. Coming from the opposite direction, turning right may be south. It would be far better to receive directions in this manner, “When you come to the corner, turn north.” This way, no matter which direction you’re traveling, north is always north.

The same issue applies when describing various aspects of the body. The following is a list of terms that are commonly used when discussing the body, and these are accurate terms regardless how the body is positioned or how you are looking at the body.

- ❑ **Superior** means moving from one point to another going toward the head. Do not use the word “up.” Here is an example: the patient’s nose is superior to their mouth. To get to the nose from the mouth, you have to move in a head-like manner—even if the patient happens to be standing on his or her head.
- ❑ **Inferior** means moving from one point to another going toward the feet. Do not use the word “down.” Here is an example: The patient’s chin is inferior to their mouth. To get to the chin from the mouth, you have to move toward the feet—even if the patient happens to be standing on his or her head.
- ❑ **Medial** means moving from one point to another going toward the midline of the body. Do not use the word “inside.” Here is an example: the patient’s big toe is medial to the little toe. The big toe is not on the “inside” of the foot. To get to the inside of the foot, one would have to make an incision and actually cut into the foot.

- ❑ **Lateral** means moving from one point to another going away from the midline of the body. Do not use the word “outside.” Here is an example: the patient’s little toe is lateral to the big toe.
- ❑ **Anterior** means the point of reference you are referring to is located on the front side of the body. For example: your chest is anterior to your upper back.
- ❑ **Posterior** means the point of reference you are referring to is located on the back side of the body. For example: your gluteus maximus is on the posterior side of the body.

### **Example Problems**

Fill in the following blanks using one of the previously discussed directional.

1. The knee is \_\_\_\_\_ to the hip bones.

**answer:** inferior

2. The ears are \_\_\_\_\_ to the nose.

**answer:** lateral

3. The shoulder is \_\_\_\_\_ to the elbow.

**answer:** superior

4. The lips are \_\_\_\_\_ to the nose.

**answer:** inferior

5. The elbow is on the \_\_\_\_\_ side of the arm.

**answer:** posterior

## **Anatomical Position**

The **anatomical position** for the human body is when the patient is standing with the palms of their hands facing anterior. This position is necessary for ease of study because it is in this position that the two bones that make up your lower arm are parallel to each other. In this manner, your thumbs will be lateral to your little finger. Regardless of the position the patient is in, always think in terms of anatomical position. Even if a patient is standing in front of you with his arms crossed, you still view his thumb as being lateral to his little finger.

**Example Problems**

Fill in the following blanks (using one of the previously discussed directional terms) while referring to Figure 1-1.

1. Point 1 is \_\_\_\_\_ to point 2.

**answer:** superior

2. Point 3 is \_\_\_\_\_ to point 4.

**answer:** lateral

3. Point 5 is \_\_\_\_\_ to point 6.

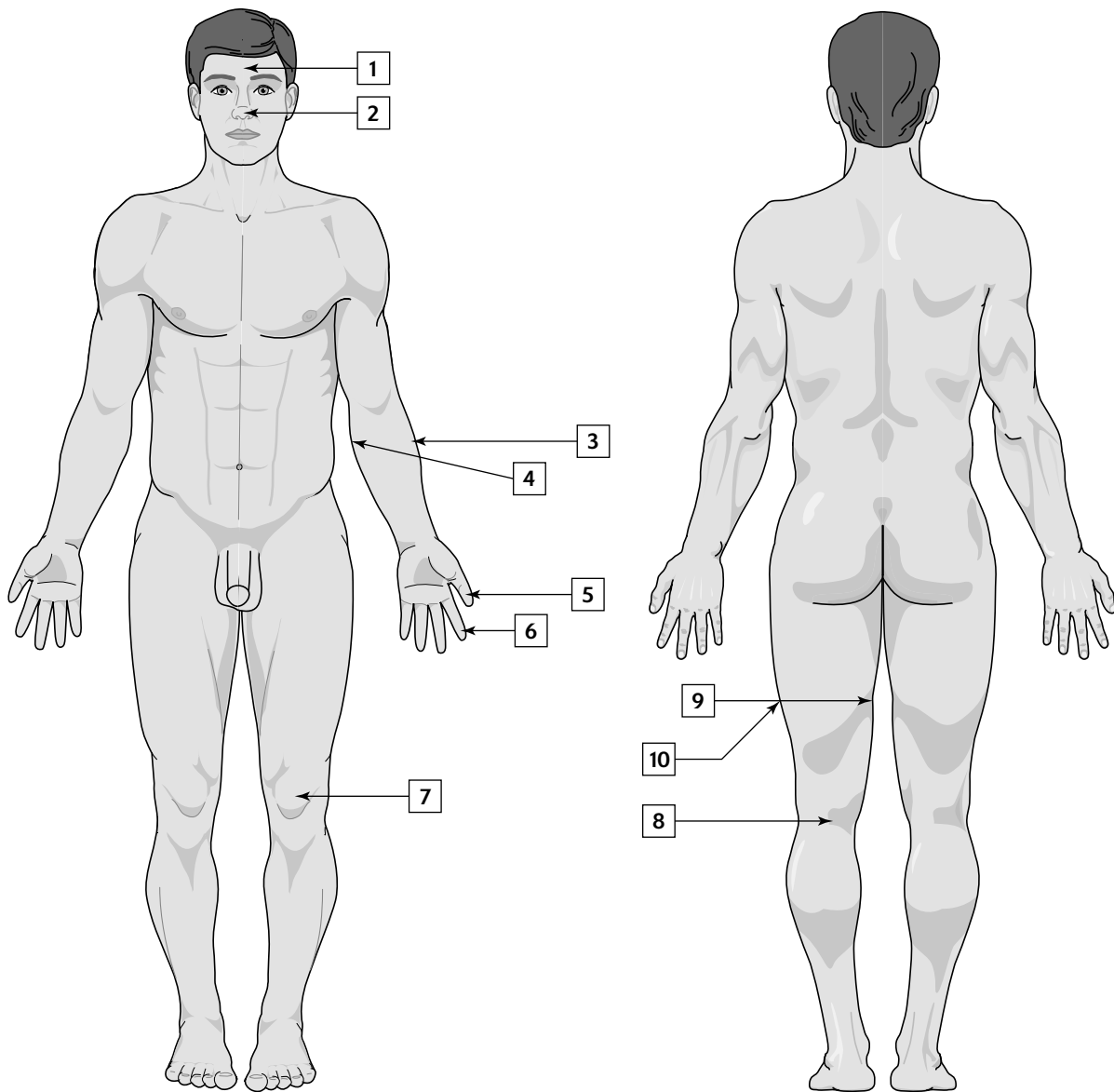
**answer:** lateral

4. Point 7 is \_\_\_\_\_ to point 8.

**answer:** anterior

5. Point 9 is \_\_\_\_\_ to point 10.

**answer:** medial



**Figure 1-1:** Directional terminology.

### ***Work Problems***

Fill in the blanks using one of the six directional terms previously discussed.

1. The bulgy part of your elbow is located on the \_\_\_\_\_ side of the arm.
2. Your fingernails are located on the \_\_\_\_\_ side of the finger.

3. Your kneecap is located on the \_\_\_\_\_ side of the body.
4. Your naval is located on the \_\_\_\_\_ side of the body.
5. Your gluteal region is located on the \_\_\_\_\_ side of the body.
6. Your heel bone is located on the \_\_\_\_\_ side of the foot.
7. Your eyes are located \_\_\_\_\_ and \_\_\_\_\_ to the tip of your nose.
8. Your naval is located \_\_\_\_\_ and \_\_\_\_\_ to the right nipple region.
9. Your ears are \_\_\_\_\_ to your nose.
10. Regardless of the position of the body, the thumbs (digit 1) are always \_\_\_\_\_ to digit 2.

### ***Worked Solutions***

1. **posterior**
2. **posterior**
3. **anterior**
4. **anterior**
5. **posterior**
6. **posterior**
7. **lateral and superior (superior and lateral)**
8. **inferior and medial (medial and inferior)**
9. **lateral**
10. **lateral**

## Superficial Landmarks

When two people are talking about cars, they typically use car terminology. Both people understand each other as long as both understand car terminology. When two people are talking about computers, they typically use computer terminology. Both people understand each other as long as both understand computer terminology.

The discussion of the human body isn't any different than the discussion of other topics. You just need to know and understand the language. The language used in science is of Latin or Greek origin.

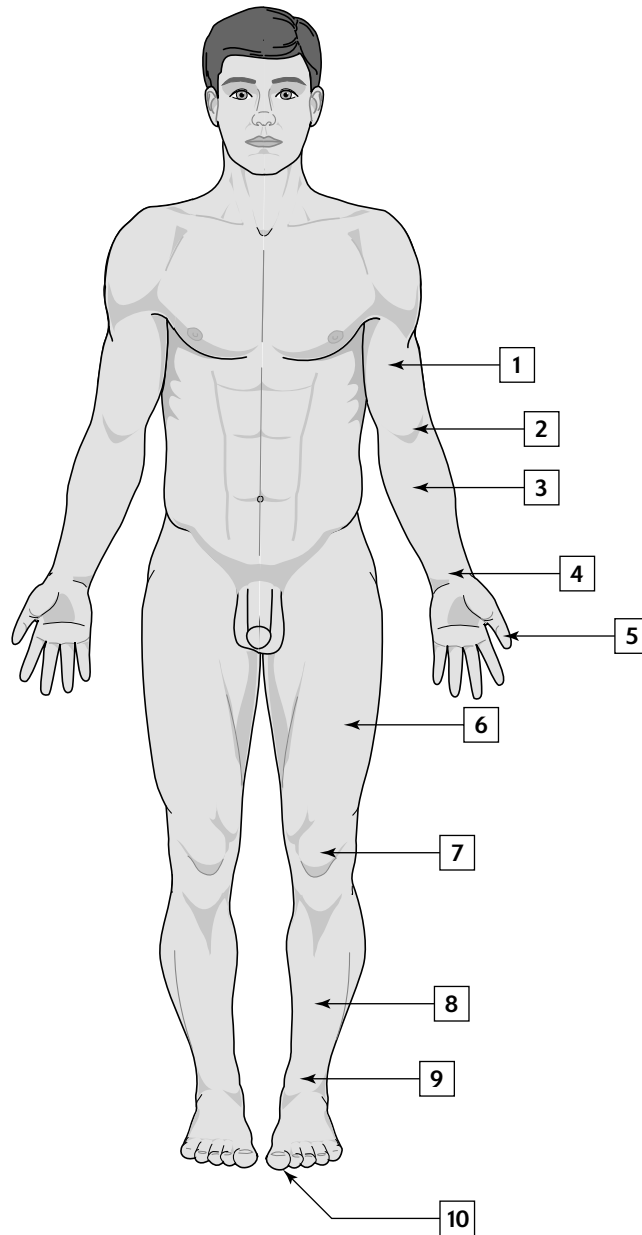
Table 1-1 lists many terms associated with the superficial regions of the body. The column labeled "term" is the scientific term and the "location" is described in laymen's terms.

**Table 1-1 Superficial Landmarks**

<i>Term</i>	<i>Location</i>	<i>Term</i>	<i>Location</i>
Frons	Forehead	Brachium	Upper arm
Otic	Ear	Antecubital	Anterior elbow
Oris	Mouth	Cubital (olecranon)	Posterior elbow
Oculus	Eye	Antebrachium	Lower arm
Mentis	Chin	Carpal	Wrist
Nasus	Nose	Pollex	Thumb
Bucca	Cheek	Femur	Thigh
Occipital	Back of head	Patella	Anterior knee
Cervical	Neck	Popliteal	Posterior knee
Axilla	Armpit	Crural (crus)	Anterior lower leg
Thoracic	Chest	Sural (sura)	Posterior lower leg
Abdomen	Abdomen	Calcaneus	Heel region
Umbilical	Naval	Tarsal	Ankle
Costal (dorsum)	Upper back	Hallux	Big toe
Lumbar	Lower back	Inguinal	Groin region
Gluteal cleft	Crease between the left and right buttocks	Gluteal fold	Fold between the buttocks and upper thigh

### Example Problems

Look at Table 1-1 and review the terms. Then use those terms to identify the numbered areas associated with Figures 1-2 through 1-5.



**Figure 1-2:** Superficial landmarks (anterior view; arm and leg superficial terms).

1. Body area number 1 is called \_\_\_\_\_.

**answer:** brachium

2. Body area number 3 is called \_\_\_\_\_.

**answer:** antebrachium

3. Body area number 5 is called \_\_\_\_\_.

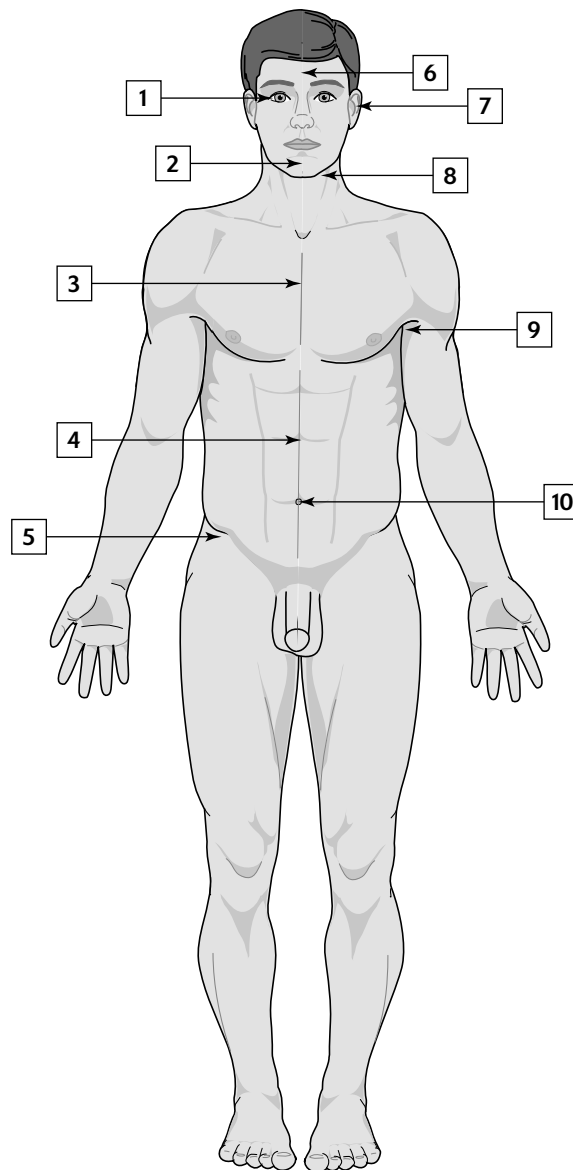
**answer:** pollex

4. Body area number 7 is called \_\_\_\_\_.

**answer:** patella

5. Body area number 9 is called \_\_\_\_\_.

**answer:** tarsal



**Figure 1-3:** Superficial landmarks (anterior view; head and torso superficial terms).



6. Body area number 2 is called \_\_\_\_\_.

**answer:** mentis

7. Body area number 4 is called \_\_\_\_\_.

**answer:** abdomen

8. Body area number 6 is called \_\_\_\_\_.

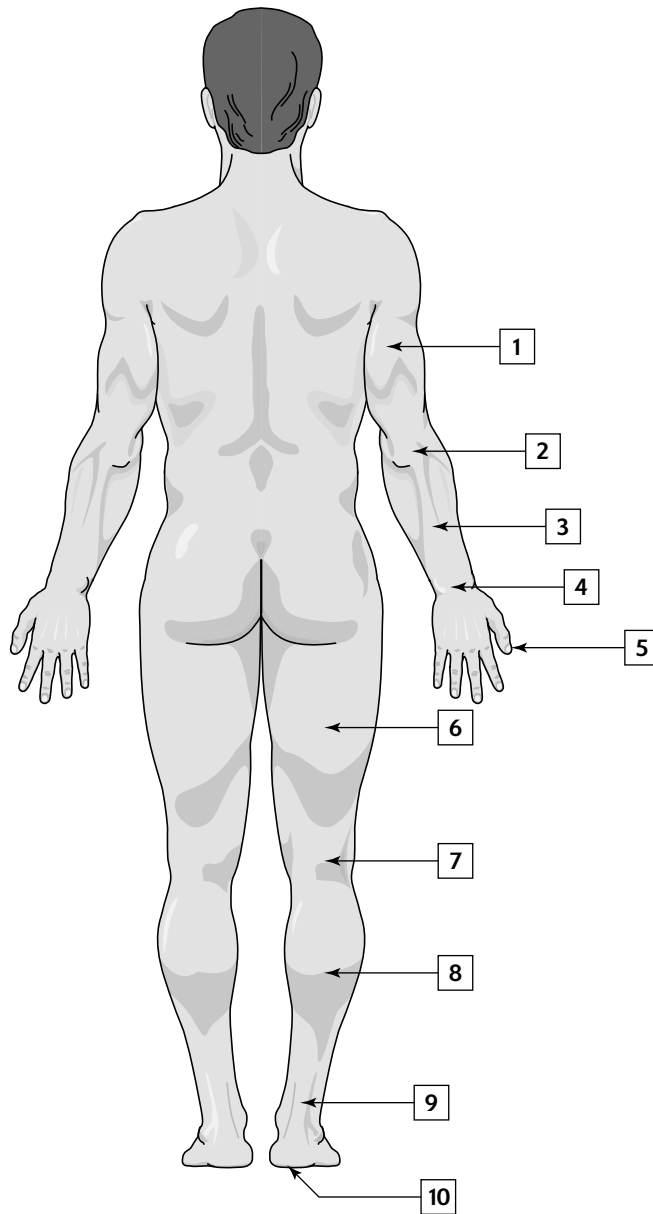
**answer:** frons (frontal)

9. Body area number 8 is called \_\_\_\_\_.

**answer:** cervical

10. Body area number 10 is called \_\_\_\_\_.

**answer:** umbilical



**Figure 1-4:** Superficial landmarks (posterior view; arm and leg superficial terms).

11. Body area number 1 is called \_\_\_\_\_.

**answer:** brachium

12. Body area number 3 is called \_\_\_\_\_.

**answer:** antebrachium

13. Body area number 7 is called \_\_\_\_\_.

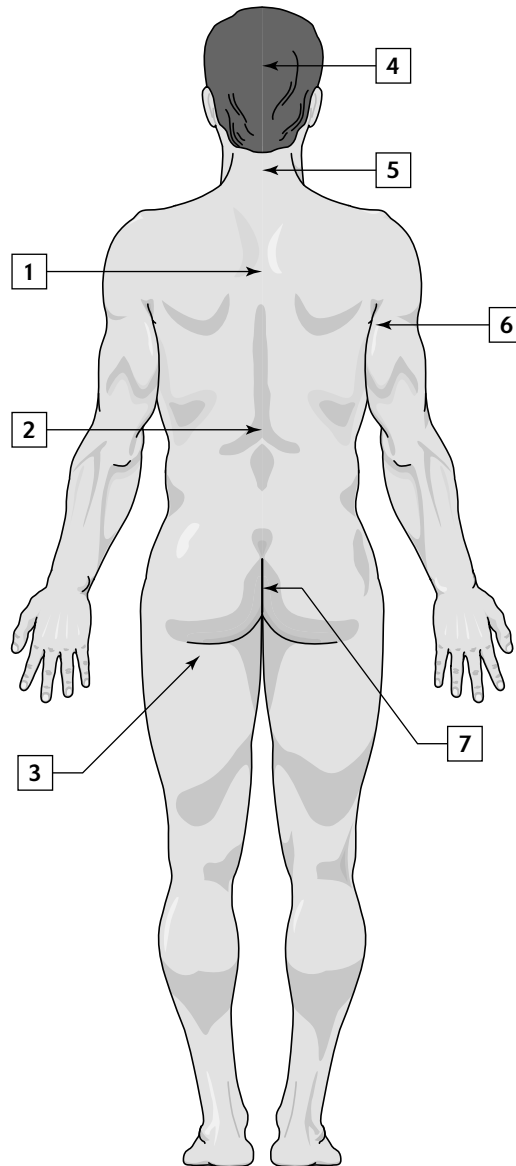
**answer:** popliteal

14. Body area number 8 is called \_\_\_\_\_.

**answer:** sura (sural)

15. Body area number 9 is called \_\_\_\_\_.

**answer:** tarsal



**Figure 1-5:** Superficial landmarks (posterior view; head and torso superficial terms).

16. Body area number 1 is called \_\_\_\_\_.

**answer:** costal

17. Body area number 2 is called \_\_\_\_\_.

**answer:** lumbar

18. Body area number 3 is called \_\_\_\_\_.

**answer:** gluteal fold

### **Work Problems**

Answer Questions 1 through 5 using a body term from Figure 1-2.

1. Body area number 2 is called \_\_\_\_\_.

2. Body area number 4 is called \_\_\_\_\_.

3. Body area number 6 is called \_\_\_\_\_.

4. Body area number 8 is called \_\_\_\_\_.

5. Body area number 10 is called \_\_\_\_\_.

Answer Questions 6 through 10 using a body term from Figure 1-3.

6. Body area number 1 is called \_\_\_\_\_.

7. Body area number 3 is called \_\_\_\_\_.

8. Body area number 5 is called \_\_\_\_\_.

9. Body area number 7 is called \_\_\_\_\_.

10. Body area number 9 is called \_\_\_\_\_.

Answer Questions 11 through 15 using a body term from Figure 1-4.

11. Body area number 2 is called \_\_\_\_\_.

12. Body area number 4 is called \_\_\_\_\_.

13. Body area number 5 is called \_\_\_\_\_.

14. Body area number 6 is called \_\_\_\_\_.

15. Body area number 10 is called \_\_\_\_\_.

Answer Questions 16 through 19 using a body term from Figure 1-5.

16. Body area number 4 is called \_\_\_\_\_.

17. Body area number 5 is called \_\_\_\_\_.

18. Body area number 6 is called \_\_\_\_\_.

19. Body area number 7 is called \_\_\_\_\_.

## Worked Solutions

1. **antecubital.** The antecubital is the area anterior to the elbow region.
2. **carpal.** The wrist area is called the carpal region.
3. **femoral.** The upper thigh is the femoral region.
4. **crus.** The anterior lower leg is the crus (cruel).
5. **hallux.** The big toe is the hallux. The thumb is the pollex.
6. **ocular.** The eye region is called the ocular or oculus.
7. **thoracic.** The chest region is the thoracic.
8. **inguinal.** The groin region is the inguinal.
9. **otic.** The ear region is the otic. The instrument to look inside the ear is called an otoscope.
10. **axilla.** The armpit region is the axilla.
11. **cubital.** The elbow region is the cubital. Some texts refer to this region as the olecranon.
12. **carpal.** This is the wrist area. The posterior view is the same as the anterior view.
13. **pollex.** The thumb is the pollex. The big toe is the hallux.
14. **femoral.** The posterior upper thigh is the femoral just at the anterior upper thigh.
15. **calcaneus.** The heel of the foot is the calcaneus.
16. **occipital.** The back of the head is the occipital.
17. **cervical.** The entire neck region is the cervical.
18. **axilla.** The armpit region is the axilla.
19. **gluteal cleft.** The sagittal crease between the gluteal regions is the gluteal cleft.

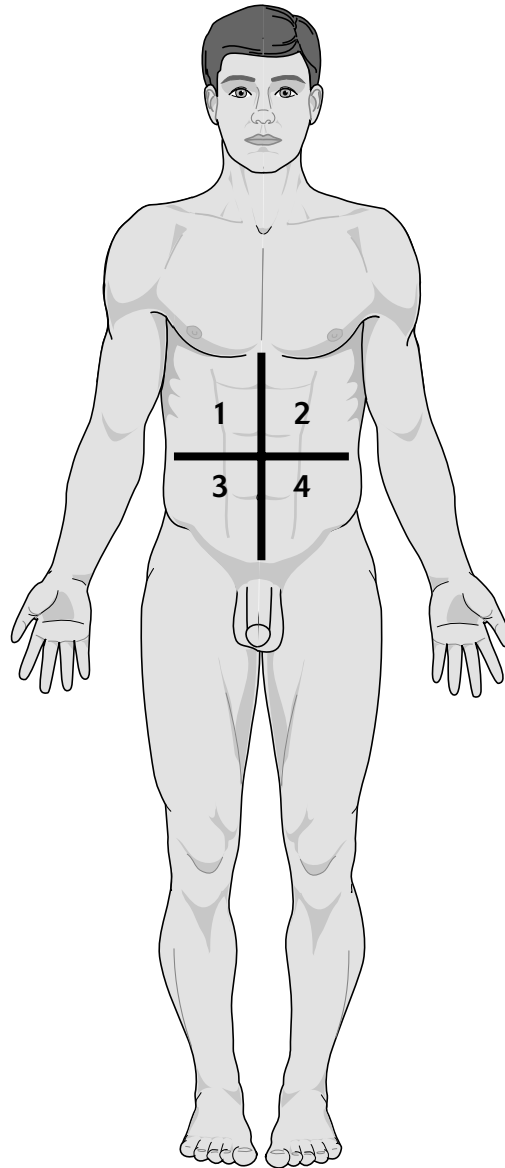
## Body Quadrants

The torso of the body consists of the thoracic region, the abdominal region, and the pelvic region. The thoracic region consists of the lungs and the heart. The thoracic region and abdominal region are separated by a muscle called the diaphragm muscle. This is our major breathing muscle. The abdominal region and pelvic region are not separated by any physical structure. Therefore, those two regions are combined together to form the abdominopelvic region.

The abdominopelvic region consists of numerous organs. Therefore, anatomists have subdivided the abdominopelvic region into four quadrants to make it easier for the physician to make a preliminary diagnosis.

Look at Figure 1-6 and match the body quadrant name with the appropriate number. The body quadrant names are: right upper quadrant (RUQ), right lower quadrant (RLQ), left upper quadrant (LUQ), and left lower quadrant (LLQ). Keep in mind, when we speak of the right side of the body, it is the patient's right side, not your right side.

After studying Figure 1-6, answer the four questions following the Figure.



**Figure 1-6:** Body quadrant.

### Example Problems

Answer the following questions using Figure 1-6.

1. Body quadrant 1 is called \_\_\_\_\_.

**answer:** right upper quadrant (RUQ). Remember, the right side of the body is the patient's right side, not yours.

2. Body quadrant 4 is called \_\_\_\_\_.

**answer:** left lower quadrant (LLQ)

3. Most of the liver is located in which body quadrant?

**answer:** RUQ. The liver is mostly on the right side of the abdomen region.

4. Most of the stomach is located in which body quadrant?

**answer:** LUQ. Most of the stomach is located to the left of the midline of the body.

5. All of the spleen is located in which body quadrant?

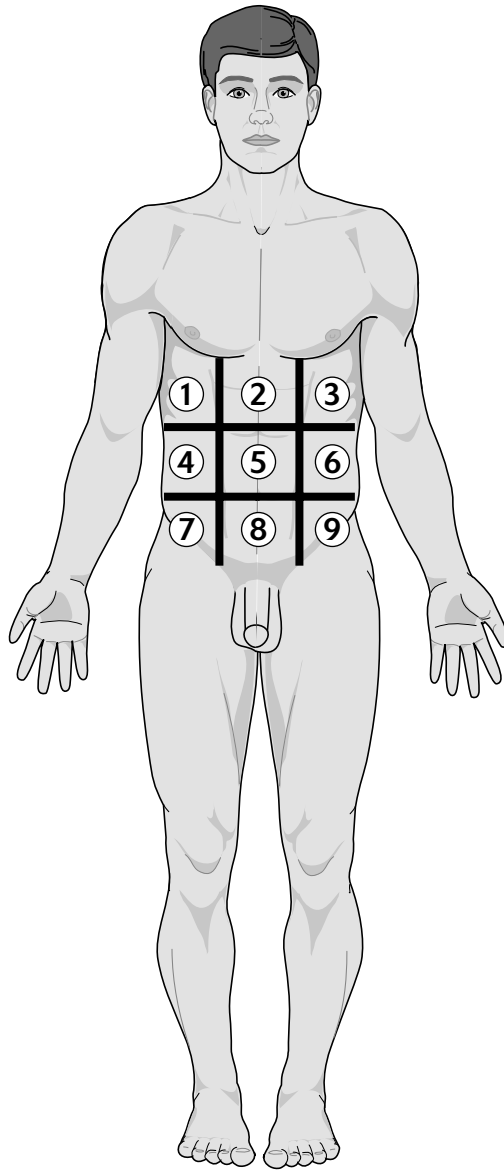
**answer:** LUQ. The spleen is located on the left side of the stomach.

## Abdominopelvic Regions

Because there are so many organs in the abdomen and pelvis (abdominopelvic), many physicians prefer the quadrants to be further subdivided into nine **abdominopelvic regions**. Look at Figure 1-7 to see how the imaginary lines are drawn to create the nine abdominopelvic regions. Table 1-2 lists the terminology associated with the nine abdominopelvic regions.

**Table 1-2 Abdominopelvic Regions**

<i>Abdominopelvic Term</i>	<i>Description of Location</i>
Umbilical	In the middle of the abdomen
Epigastric	Superior to the umbilical
Hypogastric	Inferior to the umbilical
Left hypochondriac	Left of the epigastric
Right hypochondriac	Right of the epigastric
Left lumbar	Left of the umbilical
Right lumbar	Right of the umbilical
Left inguinal (iliac)	Left of the hypogastric
Right inguinal (iliac)	Right of the hypogastric



**Figure 1-7:** Nine abdominopelvic regions.

### ***Example Problems***

Use Table 1-2 to match the name of the abdominopelvic region with its location on Figure 1-7.

1. What is the name for abdominopelvic region number 2?

**answer:** epigastric

2. What is the name for abdominopelvic region number 3?

**answer:** left hypochondriac

3. What is the name for abdominopelvic region number 4?

**answer:** right lumbar

4. What is the name for abdominopelvic region number 7?

**answer:** right inguinal (iliac)

5. What is the name for abdominopelvic region number 8?

**answer:** hypogastric

Physicians are able to use the nine abdominopelvic regions to help them determine what is wrong with a patient when the patient walks into the doctor's office and says, "It hurts right here." The patient then points to an area and based on that location, the doctor can determine which organ of the body may be involved in the pain that the patient feels.

Table 1-3 lists various organs located within the abdominopelvic region. The locations of those organs are briefly described. After examining Table 1-3 and referring to Figure 1-7, answer the example problems that follow.

**Table 1-3 Location of Organs in the Abdominopelvic Region**

<b><i>Abdominopelvic Organ</i></b>	<b><i>Description of Location</i></b>
Liver	The biggest part (the rounded part called the fundus) is located on the right side of the body, inferior to the diaphragm muscle. The smallest part of the liver is located left of the fundus.
Stomach	The biggest part (the rounded part called the fundus) is located on the left side of the body, inferior to the diaphragm muscle.
Spleen	Located lateral to the fundus of the stomach.
Ascending colon	Located on the middle right side of the body.
Descending colon	Located on the middle left side of the body.
Cecum	Located on the lower right side, attached to the ascending colon. It is the first part of the large intestine (colon).
Appendix	Connected to the cecum. Located right on the border of two lower abdominopelvic regions.
Urinary bladder	Located in the center lower abdominopelvic region.
Small intestine	Located primarily in the center of the abdomen.

### Example Problems

Study the names of the nine abdominopelvic regions. Answer the following questions by using one of the abdominopelvic terms.

1. The right portion of the liver is located primarily in which of the abdominopelvic regions?

**answer:** right hypochondriac

2. The major portion of the stomach is located primarily in which of the abdominopelvic regions?

**answer:** left hypochondriac

3. The spleen is located in which of the abdominopelvic regions?

**answer:** left hypochondriac

4. The urinary bladder is located in which of the abdominopelvic regions?

**answer:** hypogastric

5. The ascending colon is located in which of the abdominopelvic regions?

**answer:** right lumbar

### Work Problems

Answer numbers 1–5 after studying Figure 1-6.

1. According to Figure 1-6, body quadrant 2 is called \_\_\_\_\_.
2. According to Figure 1-6, body quadrant 3 is called \_\_\_\_\_.
3. The urinary bladder is located in which two body quadrants?
4. The appendix is located in which body quadrant?
5. The gallbladder is located in which body quadrant?

Answer numbers 6–10 after studying Figure 1-7.

6. What is the name for abdominopelvic region number 1?
7. What is the name for abdominopelvic region number 5?
8. What is the name for abdominopelvic region number 6?
9. The lumbar abdominopelvic region is (lateral or medial) to the umbilical region?
10. What is the name for abdominopelvic region number 9?
11. The liver is located primarily to the (left or right) side of the midline of the body.

12. The stomach is located primarily to the (left or right) of the midline of the body.
13. What is the name of the abdominopelvic region that is located in the center of the abdomen?
14. What is the name of the abdominopelvic region that is located in the midline area immediately inferior to the diaphragm muscle?
15. Which abdominal quadrant contains the majority of the stomach?
16. The naval is located in which abdominopelvic region?
17. The appendix is located in which abdominal quadrant?
18. What is the name for the abdominopelvic region that is located left lateral to the hypogastric region?
19. What is the name for the abdominopelvic region that is located medial to the left lumbar region?
20. Are the lungs located in an abdominopelvic region?

### ***Worked Solutions***

1. **left upper quadrant (LUQ).** Remember, the left side of the body is the patient's left side, not yours.
2. **right lower quadrant (RLQ)**
3. **RLQ and LLQ**
4. **RLQ**
5. **RUQ**
6. **right hypochondriac.** Remember that the right side of the body is the right side of the patient, not your right side.
7. **umbilical**
8. **left lumbar**
9. **lateral.** If you start out in the umbilical area and move left lateral or right lateral, you will find the left and right lumbar region.
10. **left inguinal (iliac)**
11. **The liver is located primarily to the right of the midline.**
12. **Most of the stomach is located to the left of the midline.**
13. **umbilical**

14. **epigastric**
15. **left upper quadrant**
16. **umbilical**
17. **left lower quadrant**
18. **left inguinal (left iliac)**
19. **umbilical**
20. **No, the lungs are in the thoracic cavity.**

## Body Planes

During surgeries or autopsies, the surgeon or examiner needs to cut into the body or cut into organs or tissues. In the following examples, you will find that it is no longer sufficient to say, “I am going to cut this piece of tissue in half.” There are three different ways to cut a piece of tissue. Keep in mind that the purpose of the language of anatomy is to develop precise and specific explanations or descriptions.

Table 1-4 lists the terms associated with the body planes (or planes of dissection) and a brief description of each.

**Table 1-4 Body Planes**

<i>Body Plane Term</i>	<i>Description</i>
Sagittal	This plane divides the body right and left. This term encompasses both mid-sagittal and parasagittal.
Midsagittal	This plane divides the body in equal halves, right and left.
Parasagittal	This plane divides the body right and left but not equally.
Transverse	This plane divides the body superior and inferior.
Frontal	This plane divides the body anterior and posterior.

### Example Problems

Use one of the body plane terms to answer the following questions.

1. If a surgeon were to make a cut that extends from the medial side of your patella region to the lateral side of the patella region, it would be a \_\_\_\_\_ cut.

**answer:** transverse. In this situation, the cut is separating superior from inferior.

2. If you were to make a cut that separates the face from the occipital region, it would be a \_\_\_\_\_ cut.

**answer:** frontal. In this situation, the cut is separating anterior from posterior.

3. If you were to make a cut that extends from the knuckle region of your hand to the carpal region, it would be a \_\_\_\_\_ cut.

**answer:** sagittal. If it were exactly in the middle, it would be midsagittal; if it were unequal, it would be parasagittal.

4. If you were to make a cut that extends from the center of the frons, goes between the eyes, and ends at the tip of your nose, it would be a \_\_\_\_\_ cut.

**answer:** sagittal (midsagittal). In this situation, the cut is separating the left from the right.

5. If a surgeon were to make a cut that extends from the left lumbar region to the right lumbar region, it would be a \_\_\_\_\_ cut.

**answer:** transverse. In this situation, the cut is separating superior from inferior.

### Work Problems

Fill in the following blanks with one of the three dissectional cuts previously discussed (sagittal, transverse, and frontal).

1. If a surgeon were to remove the lower leg from a patient's body, the cut that would be made would be a \_\_\_\_\_ cut.
2. If a surgeon were to make an incision that extends from the hip to the center of the knee, the incision would be a \_\_\_\_\_ cut.
3. If you were to cut your finger lengthwise through the fingernail, you would be making a \_\_\_\_\_ cut.
4. If you were to make a cut from the frons area that extended inferior through the right eye, it would be a \_\_\_\_\_ cut.
5. The gluteal cleft is a \_\_\_\_\_ crease in reference to the entire gluteal region.
6. If you were to make a cut that extends from the left hip region and goes across to the right hip region, it would be a \_\_\_\_\_ cut.
7. If a surgeon were to make a cut parallel to the diaphragm muscle, it would be a \_\_\_\_\_ cut.
8. If you had to have a finger amputated, the surgeon would typically make a \_\_\_\_\_ cut.
9. If you were to cut your hand and the cut extended from the medial side of the palm to the thumb, it would be a \_\_\_\_\_ cut.
10. The heart is located in which of the abdominopelvic regions?

## Worked Solutions

1. **This type of cut would be transverse.** By removing the lower leg, the surgeon is separating the inferior from the superior.
2. **This type of cut would be a sagittal cut.** If it were exactly in the middle, it would be midsagittal. If it were not in the exact middle, it would be parasagittal.
3. **This type of cut would be sagittal.** If it were exactly in the middle, it would be midsagittal; if it were not in the exact middle, it would be parasagittal.
4. **This type of cut would be sagittal.** Because this cut goes through the right eye, it is not in the center of the body. While it is separating the right from the left, it would be considered sagittal. However, because it is not in the center of the body, it would be more accurately described as parasagittal.
5. **The gluteal cleft is a sagittal structure.** Because it is the middle of the gluteal region, it can be considered midsagittal.
6. **This type of cut would be transverse.** By making an incision in this manner, the inferior is separated from the superior.
7. **This type of cut would be transverse.** The diaphragm muscle is located inferior to the lungs and superior to the liver and extends from one side of the body to the other side.
8. **This type of cut would be transverse.**
9. **This type of cut would be transverse.** In this situation, the cut is separating superior from inferior.
10. **The heart isn't located in an abdominopelvic region.** The heart is located in the thoracic area (superior to the diaphragm muscle).

## Homeostasis

A major physiological theme for physiology courses is understanding the concept of homeostasis. **Homeostasis** is the condition where the body is healthy. There are many mechanisms in the body that are at work all the time to help the body maintain homeostasis. If those mechanisms fail, the body will be out of homeostasis and the individual will need to seek medical attention from a doctor. The doctor then works to get the body back into homeostasis.

There are two major mechanisms. One mechanism is at work 24 hours a day, 7 days a week. The other mechanism is at work only under specific circumstances. Those mechanisms are called the **negative feedback mechanism** and **positive feedback mechanism**, respectively.

## Negative Feedback Mechanism

The negative feedback mechanism works every minute of the day to help us maintain homeostasis. The negative feedback mechanism works on a fluctuation principle. For example, when our body temperature begins to rise, there are mechanisms in place that begin to bring the temperature back down to a normal level. If our body temperature begins to fall, the mechanisms begin to bring the temperature back up to a normal level.

It is very important that the level of calcium ions in our blood is normal. Whenever the calcium ions begin to fall, there are mechanisms in place that begin to bring the calcium ions back up to their normal level.

## Positive Feedback Mechanism

The positive feedback mechanism works only under certain conditions. The positive feedback mechanism does not exhibit any kind of fluctuation. For example; if a person has a bacterial infection, their body temperature begins to climb. Many species of bacteria will die when exposed to high temperatures. If the body senses that not all the bacteria are dead, it will cause the temperature to rise some more. If it still senses that all the bacteria are not dead, it will cause the temperature to rise once again. Pretty soon, the temperature is up to 103°F. This of course is a fever. Notice in this example, the temperature did not fluctuate. It continued in one direction until it accomplished its goal: to kill bacteria.

### Example Problems

Identify the type of mechanism being described.

1. When the blood begins to clot, the chemical reactions involved in the process will continue until the clot is completed.

**answer:** positive feedback. The blood must continue the clotting process until the clot is completely formed.

2. The level of insulin will rise under certain conditions but will soon drop to normal levels in the presence of another hormone called glucagon. This process typically occurs throughout the day.

**answer:** negative feedback. Because the level of insulin rises and then falls (fluctuates) all day long, it is called a negative feedback mechanism.

3. Blood vessels will automatically dilate in an effort to release body heat and they will constrict in an effort to retain body heat. This is done to try to maintain the correct body temperature.

**answer:** negative feedback. Because the blood vessels dilate and constrict, they are changing size in a fluctuating manner. A fluctuating system is due to negative feedback mechanisms.

4. Once in awhile, there is a chemical reaction that produces a product that will enhance the chemical reaction even more and therefore producing even more of the product.

**answer:** positive feedback. Because one product causes the original substance to react even more, the system is not fluctuating. Because the system is not fluctuating, a positive feedback mechanism is at work.

5. The temperature of your house cools down, which triggers the heat mechanism to warm up the house. As soon as the house gets too warm, the heater shuts off to ultimately cool the house down. This process repeats.

**answer:** negative feedback. The temperature of the house fluctuates. It is regulated by a negative feedback mechanism.

# Chapter Problems and Solutions

## Problems

For problems 1–10, use superficial body terms.

1. Identify the superficial term that refers to the upper arm.
2. When most people speak about the elbow, they are typically referring to the posterior side. Identify the superficial term that refers to the elbow.
3. Identify the superficial term that refers to the area that is posterior to the patella.
4. The wrist area is called the \_\_\_\_\_ and the ankle area is called the \_\_\_\_\_.
5. The ears are called the \_\_\_\_\_.
6. The anterior lower leg is called the \_\_\_\_\_ and the posterior lower leg is called the \_\_\_\_\_.
7. The superficial area that is posterior to the frons is the \_\_\_\_\_.
8. The area immediately inferior to the oris is the \_\_\_\_\_.
9. The area superior to the diaphragm muscle (also superior to the abdominal area) is the \_\_\_\_\_.
10. The upper back is called the \_\_\_\_\_ and the lower back is called the \_\_\_\_\_.

For problems 11–20, use directional terminology.

11. The thumbs are \_\_\_\_\_ structures.
12. The palms of the hands face \_\_\_\_\_ according to the anatomical position.
13. The left side of the right leg is \_\_\_\_\_ to the right side of the right leg.
14. The popliteal is a (an) \_\_\_\_\_ structure.
15. The antecubital is a (an) \_\_\_\_\_ structure.
16. The ears are a (an) \_\_\_\_\_ structure.
17. The naval is located on the \_\_\_\_\_ side of the body.
18. The bulgy part of the elbow (cubital) is located on the \_\_\_\_\_ of the arm.
19. The first finger (digit number 2) is located \_\_\_\_\_ to the thumb.
20. The hallux is located \_\_\_\_\_ to the little toe.

For questions 21–25, use quadrant terms and/or abdominopelvic terms.

21. The majority of the liver is located in the \_\_\_\_\_ quadrant but more specifically in the \_\_\_\_\_ region.
22. The fundus of the stomach is located in the \_\_\_\_\_ quadrant but more specifically in the \_\_\_\_\_ region.
23. The urinary bladder is located on the border of the \_\_\_\_\_ and \_\_\_\_\_ quadrant but more specifically in the \_\_\_\_\_ region.
24. The naval is located right at the junction of all four quadrants but more specifically in the \_\_\_\_\_ region.
25. Parts of the small intestine can be found in all of the quadrants but most of it is found specifically in the \_\_\_\_\_ region.

For questions 26–30, use body plane terminology.

26. If you were to make a cut that extended from the cubital region to the posterior carpal region, you would be making a \_\_\_\_\_ cut.
27. If you were to make a cut that extended from the popliteal region to the patellar region, you would be making a \_\_\_\_\_ cut.
28. If you were to make a cut that extended the length of the finger but yet left the fingernail intact, you would be making a \_\_\_\_\_ cut.
29. If you were to make a cut that extended from the naval to the mentis, you would be making a \_\_\_\_\_ cut.
30. If you were to make a cut that extended from the popliteal to the calcaneus, you would be making a \_\_\_\_\_ cut.

## Answers and Solutions

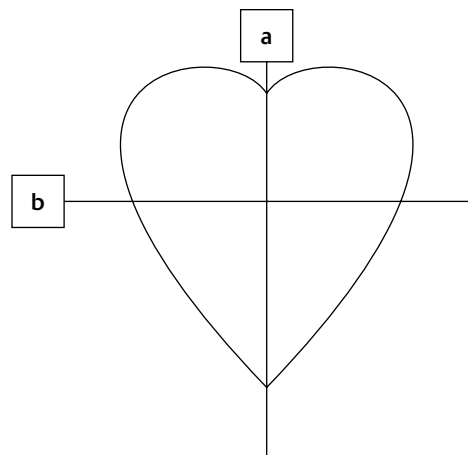
1. **brachium.** This term refers to the upper arm.
2. **cubital (olecranon).** This term refers to the elbow region.
3. **popliteal.** This term refers to the posterior side of the knee.
4. **carpal; tarsal**
5. **otic.** This term refers to the ear region.
6. **crus (crural); sura (sural).** The anterior lower leg is the crus while the posterior lower leg is the sura.
7. **occipital.** This term refers to the back of the head.
8. **mentis.** This term refers to the chin area.

9. **thoracic.** This term refers to the chest area.
10. **costal; lumbar.** The upper back is the costal region (sometimes called the dorsal region) and the lower back is the lumbar region.
11. **lateral.** In the anatomical position, the thumbs are farthest from the midline of the body.
12. **anterior.** In the anatomical position, the palms are facing forward.
13. **medial.** The left side of the right leg is medial. In layman's terms it is the inside of the right leg. Anatomists only use the term inside when they are literally looking "inside" the body.
14. **posterior.** The popliteal is on the "back side" of the knee.
15. **anterior.** The antecubital is on the "front side" of the arm.
16. **lateral.** The ears are on the "side" of the head, away from the midline.
17. **anterior.** The naval is the "belly button" and is on the "front side" of the body.
18. **posterior.** The cubital is the elbow region and is on the "back side" of the arm.
19. **medial.** In the anatomical position, if you move from the thumb to the first finger (digit 2) you have to move medial (closer to the midline of the body).
20. **medial.** The hallux is the big toe and the big toe is closer to the midline of the body than the little toe.
21. **RUQ; right hypochondriac.** Most of the liver is on the right side of the abdomen.
22. **LUQ; left hypochondriac.** The fundus is the rounded part of the stomach and is located mainly on the left side of the abdomen.
23. **LLQ and RLQ; hypogastric.** The urinary bladder is located between the inguinal regions.
24. **umbilical.** The naval is the "belly button" and is located in the center of the abdomen.
25. **umbilical.** If you put your hand on your naval, your hand would be resting on most of the small intestine.
26. **sagittal.** If it were exactly in the middle, it would be midsagittal; if it were unequal, it would be parasagittal.
27. **transverse.** You are separating the superior from the inferior.
28. **frontal.** You are separating the anterior from the posterior.
29. **midsagittal.** You are separating the right from the left.
30. **sagittal.** If it were exactly in the middle, it would be midsagittal; if it were unequal, it would be parasagittal.

## Supplemental Chapter Problems

### Problems

1. Which directional term is used when we are moving from the cubital region to the shoulder area?
2. Which directional term is used when we are moving from the left side of the right arm to the right side of the right arm?
3. Which two directional terms are used when we are moving from the umbilical region to the left inguinal region?
4. Which directional term is used when we are moving from the top of the ear to the ear lobe?
5. Which directional term is used when we are moving from the RUQ to the LLQ?
6. Identify an organ that is located in the right hypochondriac region.
7. Identify an organ that is located in the left hypochondriac region.
8. Identify an organ that is located in the hypogastric region.
9. Which quadrant is the appendix located in?
10. The thymus gland is located slightly superior to the heart. It is located in which abdominopelvic region?
11. If a surgeon were to make an incision that parallels the diaphragm muscle, he/she would be making a \_\_\_\_\_ cut.
12. If you were to make a cut that extended from the costal region to the lumbar region that equally divided the portions, you would be making a \_\_\_\_\_ cut.
13. The following is a picture of a heart. If you were to make an incision along line A, you would be making a \_\_\_\_\_ cut.



14. If you were to make an incision along line B in the heart picture in number 13, you would be making a \_\_\_\_\_ cut.
15. Examine the heart picture in number 13. Explain why we have to use the body plane terminology when describing various cuts on organs or tissues such as the heart. Why can't we simply say, "We are going to cut the heart in half?"

## Answers

1. superior
2. lateral
3. inferior and left lateral or left lateral and then inferior
4. inferior
5. inferior and left lateral or left lateral and then inferior
6. liver
7. stomach and/or spleen
8. urinary bladder
9. RLQ
10. The thymus gland is in the thoracic region, not in the abdominopelvic regions.
11. transverse
12. midsagittal
13. midsagittal
14. transverse
15. Based on the diagram of the heart, there are two ways to cut the heart in half. You can have it equally divided from left and right (midsagittal) and you can also have it equally divided superior from inferior (transverse). You can also have it equally divided anterior from posterior (frontal), but this view isn't shown.