(9) We call 2 an "irrational number" because it cannot be expressed as a quotient of two whole numbers.

(10) The ancient Greeks were the first to insist on proofs for mathematical statements to make sure they were correct.

EXERCISES

In Exercises 1–4 you are asked to define some familiar geometric terms. The exercises provide a review of these terms as well as practice in formulating definitions with precision. In making a definition, you may use the five undefined geometric terms and all other geometric terms that have been defined in the text so far or in any preceding exercises.

Making a definition sometimes requires a bit of thought. For example, how would you define perpendicularity for two lines / and m? A first attempt might be to say that "/ and m intersect and at their point of intersection these lines form right angles." It would be legitimate to use the terms "intersect" and "right angle" because they have been previously defined. But what is meant by the statement that lines form right angles? Surely, we can all draw a picture to show what we mean, but the problem is to express the idea verbally, using only terms introduced previously. According to the definition on p. 17, an angle is formed by two nonopposite rays emanating from the same vertex. We may therefore define / and m as perpendicular if they intersect at a point A and if there is a ray $\overrightarrow{AB}$ that is part of / and a ray $\overrightarrow{AC}$ that is part of m such that $\angle BAC$ is a right angle (Figure 1.16). We denote this by $/ \perp m$.

![Figure 1.16 Perpendicular lines.](image-url)
1. Define the following terms:
   (a) *Midpoint* $M$ of a segment $AB$.
   (b) *Perpendicular bisector* of a segment $AB$ (you may use the term “mid-point” since you have just defined it).
   (c) Ray $BD$ *bisects* angle $\angle ABC$ (given that point $D$ is between $A$ and $C$).
   (d) Points $A$, $B$, and $C$ are *collinear*.
   (e) Lines $l$, $m$, and $n$ are *concurrent* (see Figure 1.17).

![Figure 1.17](image)

**FIGURE 1.17** Concurrent lines.

2. Define the following terms:
   (a) The *triangle* $\triangle ABC$ formed by three noncollinear points $A$, $B$, and $C$.
   (b) The *vertices*, *sides*, and *angles* of $\triangle ABC$. (The “sides” are segments, not lines.)
   (c) The sides *opposite to* and *adjacent to* a given vertex $A$ of $\triangle ABC$.
   (d) *Medians* of a triangle (see Figure 1.18).
   (e) *Altitudes* of a triangle (see Figure 1.19).
   (f) *Isosceles* triangle, its *base*, and its *base angles*.
   (g) *Equilateral* triangle.
   (h) *Right* triangle.

![Figure 1.18](image)

**FIGURE 1.18** Median.