



### Solution

- In the United States, Thanksgiving Day always falls on the fourth Thursday in November. It is therefore impossible for Thanksgiving to be on a Wednesday. When an event is impossible, we say that its probability is 0.
  - It is certain that Thanksgiving will be on a Thursday. When an event is certain to occur, we say that its probability is 1.
- Because any event imaginable is impossible, certain, or somewhere in between, it follows that the mathematical probability of any event  $A$  is 0, 1, or a number between 0 and 1 (see Figure 4-2). That is,  $0 \leq P(A) \leq 1$ .

Figure 4-2 shows the possible values of probabilities and the more familiar and common expressions of likelihood.

### Complementary Events

Sometimes we need to find the probability that an event  $A$  does *not* occur.

**DEFINITION** The **complement** of event  $A$ , denoted by  $\bar{A}$ , consists of all outcomes in which event  $A$  does *not* occur.

#### Example 9 Complement of Smoker

Results from Example 2 show that if we randomly select an adult in the United States, the probability of selecting a smoker is 0.200. Find the probability of randomly selecting an adult in the United States and getting someone who does *not* smoke.

### Solution

Because 202 of the 1010 surveyed adults in the United States are smokers, it follows that the other 808 are not smokers, so

$$P(\text{not a smoker}) = \frac{808}{1010} = 0.800$$

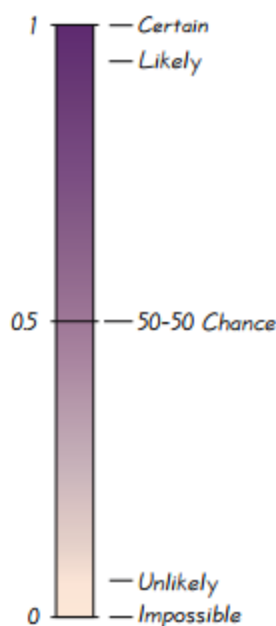
### Interpretation

The probability of randomly selecting an adult in the United States and getting someone who is *not* a smoker is 0.800.

Although it is difficult to develop a universal rule for rounding off probabilities, the following guide will apply to most problems in this text.

#### Rounding Off Probabilities

When expressing the value of a probability, either give the *exact* fraction or decimal or round off final decimal results to three significant digits. (*Suggestion:* When a probability is not a simple fraction such as  $2/3$  or  $5/9$ , express it as a decimal so that the number can be better understood.) All digits in a number are significant except for the zeros that are included for proper placement of the decimal point.



**Figure 4-2** Possible Values for Probabilities