are given in troy units. An avoirdupois pound is 453.59 g, which is greater than the 373.24 g in a troy pound. The second answer is Cervantes, and the quote is from his famous novel *Don Quixote*.)

One way to find the probability that if someone makes random guesses for both answers, the first answer will be correct *and* the second answer will be correct, is to list the sample space as follows:

Ta Tb Tc Td Te Fa Fb Fc Fd Fe

If the two answers are random guesses, then the above 10 possible outcomes are equally likely, so

$$P(\text{both correct}) = P(T \text{ and } c) = \frac{1}{10} = 0.1$$

With $P(T \text{ and } c) = 1/10$, $P(T) = 1/2$, and $P(c) = 1/5$, we see that

$$\frac{1}{10} = \frac{1}{2} \cdot \frac{1}{5}$$

A *tree diagram* is a picture of the possible outcomes of a procedure, shown as line segments emanating from one starting point. These diagrams are sometimes helpful in determining the number of possible outcomes in a sample space, if the number of possibilities is not too large. The tree diagram shown in Figure 4-7 summarizes the outcomes of the true/false and multiple-choice questions. From Figure 4-7 we see that if both answers are random guesses, all 10 branches are equally likely and the probability of getting the correct pair (T,c) is 1/10. For each response to the first question, there are 5 responses to the second. *The total number of outcomes is 5 taken 2 times, or 10.* The tree diagram in Figure 4-7 therefore provides a visual illustration for using multiplication.

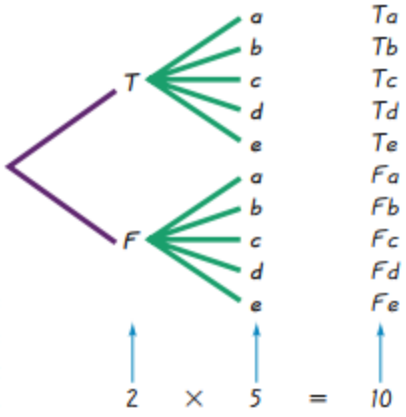

Figure 4-7 Tree Diagram of Test Answers

Probability Rules! We can summarize the addition rule from Section 4-3 and the multiplication rule from this section as follows:

Addition Rule for *P*(*A* or *B*): The word *or* suggests addition, and when adding $P(A)$ and $P(B)$, we must be careful to add in such a way that every outcome is counted only once.

Multiplication Rule for *P*(*A* and *B*): The word *and* suggests multiplication, and when multiplying $P(A)$ and $P(B)$, we must be careful to be sure that the probability of event B takes into account the previous occurrence of event A. Figure 4-8 summarizes the multiplication rule and shows the role of independence in applying it.

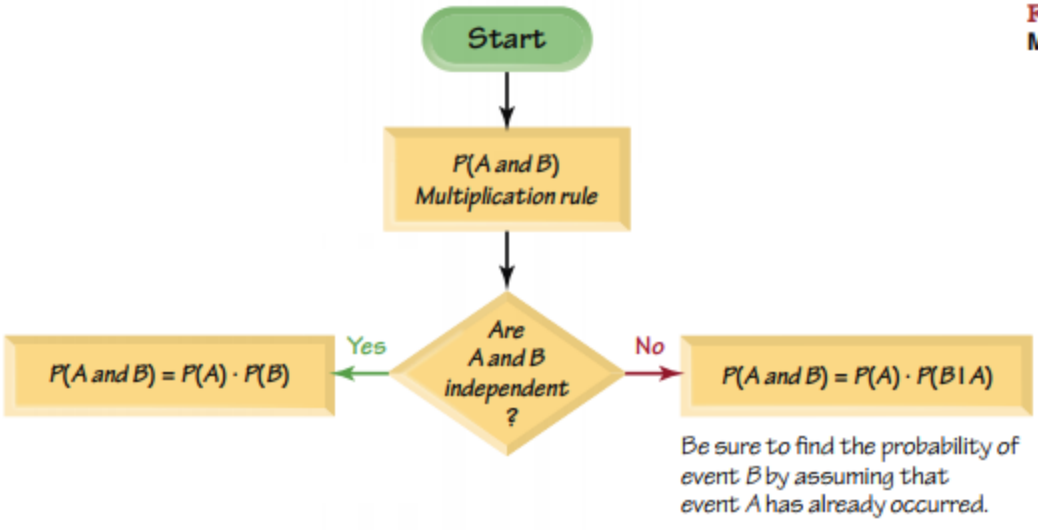

Figure 4-8 Applying the Multiplication Rule