The preceding formula is a formal expression of conditional probability, but blind use of formulas is not recommended. Instead, we recommend the following intuitive approach.

Intuitive Approach to Conditional Probability

Finding $P(B|A)$ The conditional probability of B occurring given that A has occurred can be found by assuming that event A has occurred and then calculating the probability that event B will occur.

Example 2 Pre-Employment Drug Screening

Refer to Table 4-1 to find the following:

a. If 1 of the 1000 test subjects is randomly selected, find the probability that the subject had a positive test result, given that the subject actually uses drugs. That is, find P(positive test result | subject uses drugs).

b. If 1 of the 1000 test subjects is randomly selected, find the probability that the subject actually uses drugs, given that he or she had a positive test result. That is, find P(subject uses drugs | positive test result).

Table 4-1 Pre-Employment Drug Screening Results

	Positive Test Result (Drug Use Is Indicated)	Negative Test Result (Drug Use Is Not Indicated)
Subject Uses Drugs	44 (True Positive)	6 (False Negative)
Subject Is Not a Drug User	90 (False Positive)	860 (True Negative)

Solution

a. *Intuitive Approach to Conditional Probability:* We want P(positive test result | subject uses drugs), the probability of getting someone with a positive test result, *given that the selected subject uses drugs*. Here is the key point: If we assume that the selected subject actually uses drugs, we are dealing only with the 50 subjects in the first row of Table 4-1. Among those 50 subjects, 44 had positive test results, so we get this result:

$$P(\text{positive test result} \mid \text{subject uses drugs}) = \frac{44}{50} = 0.88$$

Using the Formula for Conditional Probability: The same result can be found by using the formula for $P(B|A)$ given with the definition of conditional probability. We use the following notation.

$$P(B|A) = P(\text{positive test result} \mid \text{subject uses drugs})$$

where B = positive test result and A = subject uses drugs.

In the following calculation, we use P(subject uses drugs and had a positive test result) = $44/1000$ and P(subject uses drugs) = $50/1000$ to get the following results: