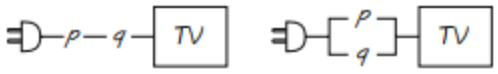
c. Which arrangement should be used for the better protection?



Series Configuration Parallel Configuration

32. Same Birthdays If 25 people are randomly selected, find the probability that no 2 of them have the same birthday. Ignore leap years.

4-5 Multiplication Rule: Complements and Conditional Probability

Key Concept Section 4-4 presented the basic concept of the multiplication rule, and in this section we extend the use of the multiplication rule to include the following two special applications:

1. **Probability of "at least one":** Find the probability that among several trials, we get *at least one* of some specified event.
2. **Conditional probability:** Find the probability of an event occurring when we have additional information that some other event has already occurred.

We begin with situations in which we want to find the probability that among several trials, *at least one* will result in some specified outcome.

Complements: The Probability of "At Least One"

When finding the probability of some event occurring at least once, it is usually best to solve the problem "backwards" by working directly with the complementary event. In this context, the meaning of language must be clearly understood. In particular, the following principle should be well known:

In multiple trials, if *at least one* of some event occurs, then the complement (opposite) is that the event does not occur at all. If you don't get at least one occurrence of event A, then event A does not happen at all.

- "At least one" has the same meaning as "one or more."
- The *complement* of getting at least one particular event is that you get *no* occurrences of that event.

For example, not getting at least 1 defective DVD in a lot of 50 DVDs is the same as getting no defective DVDs, which is also the same as getting 50 good DVDs. The following steps describe the details of this backward method of finding the probability of getting at least one of some event:

Finding the probability of getting *at least one* of some event:

1. **Let A = getting *at least one* of some event**
2. **Then $\overline{A}$ = getting *none* of the event being considered.**
3. **Find $P(\overline{A})$ = probability that event A does not occur.** (This should be relatively easy with the multiplication rule.)
4. **Subtract the result from 1. That is, evaluate this expression:**

$$P(\textit{at least one} \text{ occurrence of event } A) = 1 - P(\textit{no} \text{ occurrences of event } A)$$