Chapter 2

Probability

Independence

Two events A and B are called independent if $P(A|B)=P(A)$.

Otherwise they are called dependent.

Example

An urn contains 2 black balls, numbered 1 and 2, and 2 white balls, numbered 3 and 4. Consider the following events: 'A black ball is selected' (event A), 'an even numbered ball is selected' (event B), 'a ball with a number bigger than 2 is selected' (event C).

a) Are events A and B independent or dependent?
b) Are events A and C independent or dependent?

Independence

Two events A and B are independent if and only if

$$P(A\cap B)=P(A)\cdot P(B).$$

Example

It is known that 30% of a certain company's laser printers require service while under warranty, whereas only 10% of that company's inkjet printers need service while under warranty. If someone purchases both a laser printer and an inkjet printer of that company, what is the probability that both printers need warranty service (assuming that both machines function independently of one another)?

Independence

If two events A and B are independent, then also

1. **A' and B are independent,**
2. **A and B' are independent,**
3. **A' and B' are independent.**

Example

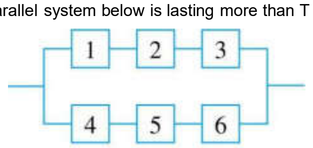
It is known that 30% or a certain company's laser printers require service while under warranty, whereas only 10% of that company's inkjet printers need service while under warranty. If someone purchases both a laser printer and an inkjet printer of that company, what is the probability that neither printer need warranty service (assuming that both machines function independently of one another)?

Independence of More than Two Events

n events are called mutually independent if the probability of the intersection of any subset of the n events is equal to the product of the individual probabilities.

Example

Assuming that each of the identical cells work independently and that the probability that a cell lasts more than T hours is 0.8, what is the probability that the series-parallel system below is lasting more than T hours?



Example

Assuming that each of the identical cells work independently and that the probability that a cell lasts more than T hours is 0.8, what is the probability that the total-cross-tied system below is lasting more than T hours?