Multiplication Law 24

The multiplication law for independent events is:

$$P(A \text{ and } B) = P(A) \bullet P(B)$$

or:

$$P(A \text{ and } B \text{ and } C) = P(A) \bullet P(B) \bullet P(C)$$

In an experiment involving independent events, one event does not affect the other. This means that P(A), P(B) and P(C) do not depend on each other.

Example 1: A coin is tossed and a die rolled. These events are independent. Find the probability of tossing a head and rolling a number < 5.

P(head and <5) = P(head)xP(<5) = 1/2 x 4/6 = 1/3.

Questions:

1) Find the probability of rolling a three with a die and drawing a face card from a standard deck of cards.

2) The probability of winning a game is 0.65. Results of a game do not depend on the previous game. Find:

a) The probability of winning two games in a row.

b) The probability of losing two games in a row.

3) Find the probability of getting four heads if a coin is tossed four times.

4) A bag contains five black and eight white marbles. One marble is picked, then replaced. Another marble is picked. Use the multiplication law to find the probabilities.

a) P(two black)

b) P(two white)

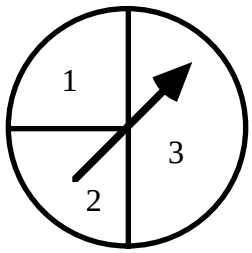
c) P(B and W) order not important

5) At a school, 95% of students have good hearing, while 82% of students have good eyesight. Find the probabilities. (assume eyesight and hearing are independent)

a) A student has good hearing and good eyesight.

b) A student has bad hearing and bad eyesight.

6) A spinner is spun twice. The choices on the dial are 1, 2, or 3. Find the probabilities.



a) P(3 and 3) b) P(3 and 1) c) P(1 and 2)

7) A computer consists of seven major components. The probability of success, in a certain time, for each component is 0.985.

a) Find the probability of success of the computer during this time. (no components fail)

b) Find the probability of failure of the computer.

Answers: 1) 1/6x12/52 = 1/26, 2)a) 0.42, b) 0.12, 3) 1/2x1/2x1/2x1/2 = 1/16, visit www.mrowen.com, 4)a) 5/13x5/13 = 25/169, b) 8/13x8/13 = 64/169, c) (5/13x8/13)x2 = 80/169 (black then white or white then black), 5)a) 0.78, b) 0.009, 6)a) 1/2x1/2 = 1/4, b) 1/2x1/4 = 1/8, c) 1/4x1/4 = 1/16, 7)a) $(0.985)^7$ = 0.900, b) 1 - 0.900 = 0.100.