

1. Give an example of 3 events A, B, C which are pairwise independent but not independent. Hint: find an example where whether C occurs is completely determined if we know whether A occurred and whether B occurred, but completely undetermined if we know only one of these things.

Solution:

If we consider the 300 Meter Relay race in which 3 participants took place A,B,C.

If we want to find the probability of winning a race based on past data and performance, we need both player data(A and B) After that we can find the probability that Player C will complete the race with winning state, because Player C will start his race after A and B will complete their race.

2. A bag contains one marble which is either green or blue, with equal probabilities. A green marble is put in the bag (so there are 2 marbles now), and then a random marble is taken out. The marble taken out is green. What is the probability that the remaining marble is also green?

Solution:

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Solution 2 :

A bag contain green or blue marble with equal probability

After green marble is put into bag and 1 marble taken out that is green.

define events :

$A \Rightarrow$ green ball is in bag.

$B \Rightarrow$ blue ball in bag.

$E \Rightarrow$ taken out green ball after adding it.

$$P(A) = 0.5$$

$$P(B) = 0.5$$

$$P(E) = 1$$

$$\text{Find} = P(A|E)$$

using Bayes Theorem

$$P(A|E) = \frac{P(E|A) \cdot P(A)}{P(E|A) \cdot P(A) + P(E|B) \cdot P(B)}$$

$$= \frac{(1) \cdot (\frac{1}{2})}{(1) \cdot (\frac{1}{2}) + (\frac{1}{2}) \cdot (\frac{1}{2})} = \frac{2}{3}$$

