**Problem Statement 1:**

Two balls are drawn at random in succession without replacement from an urn

containing 4 red balls and 6 black balls.

Find the probabilities of all the possible outcomes.

**Solution:**

There are 10 balls in the urn, 4 – Red, 6 – Black

Total Balls: 10

Probability of picking the red ball out of the urn is 4/10 = 0.4

Probability of picking the black ball first is, 6/10 = 0.6

Scenario 1:

If the first ball is Red (4/10) = (2/5)

There are 9 balls left, 3 – Red, 6 – Black

Probability of picking the second ball as Red is, 3/9

Probability of picking the second bass as black would be 6/9

Probability of both balls being Red is = (2/5) \* (3/9) = 2/15

Probability of picking the Red ball first and Black ball second = (2/5) \* (6/9) = 2/5 \* 2/3 =4/15

Scenario 2:

If the first ball picked is Black, (6/10) = 3/5

There would be 9 balls left in the urn,

4 being Red, 5 Black

Probability of picking the second bass as Red is, 4/9

Probability of picking the second ball as Black is, 5/9

Probability of both balls being Black is, (3/5) \* (5/9) = 1/3

Probability of first pick to be Black and Second Pick to be Red is, (3/5) \* (4/9) = 4/15

P(R,R) = 2/15

P(R,B) = 4/15

P(B,R) = 4/15

P(B,B) = 1/3

By the basic rule of probability, the sum of all probabilities should be 1,

P(R,R) + P(R,B) + P(B,R) + P(B,B) = 2/15 + 4/15 + 4/15 + 1/3 = 2 + 4 + 4 + 5 / 15 = 15/15 = 1