**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 total 10 balls in the urn, 4 – Red, 6 – Black

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

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

In succession drawing - Assuming

Case - 1

if the first ball is drawn is **black** then - 6/10 = 3/5

There will be 9 balls left in the urn, 4 - Red, 5 - Black

Probability of picking the second ball 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

Case - 2

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 ball 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

All possible combination outcomes

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

Thus, sum of all probabilities is 2/15+4/15+4/15+1/3 = 15/15 = 1