

## Exercise 31.2

### 1. Solution:

Let A be the event of getting king in the first card and B be the event of getting king in as the second card too.

$$n(S) = 52$$

Now,

Probability of getting two kings (Without replacement) is given by

$$= P(A) \cdot P(B/A)$$

$$= (4/52) \times (3/51) \quad [\text{Since, there are 4 only kings out of 52 cards}]$$

$$= (1/13) \times (1/17)$$

$$= 1/221$$

Hence, the required probability is  $1/221$ .

### 2. Solution:

Let the various events be defined as,

A = first card is an ace

B = second card is an ace

C = third card is an ace

D = fourth card is an ace

Now,

$$P(\text{all four draw are ace, without replacement}) = P(A) \cdot P(B/A) \cdot P(C/A \cap B) \cdot P(D/A \cap B \cap C)$$

$$= 4/52 \times 3/51 \times 2/50 \times 1/49$$

$$= 1/270725$$

Hence, the required probability is  $1/270725$ .

### 3. Solution:

Here,

Bag contains 5 red and 7 white balls

Let the event A and B be defined as

A = first ball is white

B = second ball is white

Now,

$$P(\text{two white balls are drawn without replacement}) = P(A) \cdot P(B/A)$$

$$= 7/12 \times 6/11$$

$$= 7/22$$

Therefore, the required probability is  $7/22$ .

### 4. Solution:

It's given that,

Tickets are numbered from 1 to 25

So, the total number of tickets are 25

Now,

Number of tickets with even numbers on it is 12

i.e. {2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24}

Let,

A = event of getting an even number in the first ticket

B = event of getting an even number in the second ticket

So,

$$\begin{aligned} P(\text{both tickets will show even number, without replacement}) &= P(A) \cdot P(B/A) \\ &= 12/25 \times 11/24 \\ &= 11/50 \end{aligned}$$

Hence, the required probability is 11/50.

### 5. Solution:

We know that, a deck of has 52 cards

Let, various events be defined as

A = the first card is a spade

B = the second card is a spade

C = the third card is a spade

Now,

P(each of the three cards drawn without replacement is a spade) is given by

$$\begin{aligned} &= P(A) \cdot P(B/A) \cdot P(C/ A \cap B) \\ &= 13/52 \times 12/51 \times 11/50 \\ &= 11/850 \end{aligned}$$

Therefore, the required probability is 11/850.

### 6.

#### (i) Solution:

We know that, in a deck of cards there are 4 kings.

And, two cards are drawn without replacement

Let,

A be the event of getting a king as the first card

B be the event of getting another king as the second card

Now,

$$\begin{aligned} P(\text{both drawn cards are king}) &= P(A) \cdot P(B/A) \\ &= 4/52 \times 3/51 \\ &= 1/221 \end{aligned}$$

Hence, the required probability is 1/221.

#### (ii) Solution:

We know that, there are 4 kings and 4 aces in a pack of 52 cards.

Two cards are drawn without replacement

Let,

A = event of getting a king as the first card

B = event of getting an ace as the second card

Now,

$$\begin{aligned} P(\text{the first card is a king and second card is an ace}) &= P(A) \cdot P(B/A) \\ &= 4/52 \times 4/51 \\ &= 4/663 \end{aligned}$$

Therefore, the required probability is 4/663.

**(iii) Solution:**

We know that, in a pack of cards there are 13 hearts and 26 red cards

And, all heart cards are red

Let,

A = event of getting a heart as the first card

B = event of getting a red card as the second card

Now,

$$\begin{aligned} P(\text{first card is a heart and second card is a red card}) &\text{ is given by} \\ &= P(A) \cdot P(B/A) \\ &= 13/52 \times 25/51 \\ &= 25/204 \end{aligned}$$

Hence, the required probability is 25/204.

**7. Solution:**

Here,

Total number of tickets are 20 and are numbered from 1, 2, 3, ..., 20

So,

The number of tickets with even numbers are 10 i.e. {2, 4, 6, 8, ..., 20}

The number of tickets with odd numbers are 10 i.e. {1, 3, 5, 7, ..., 19}

Also, it is mentioned that two cards are drawn

Let,

A = event of getting an even numbered ticket

B = event of getting an odd numbered ticket

Now,

$$\begin{aligned} P(\text{First ticket has an even number and the second one has an odd number}) &\text{ is given by} \\ &= P(A) \cdot P(A/B) \\ &= 10/20 \times 10/19 \\ &= 5/19 \end{aligned}$$

Hence, the required probability is 5/19.

**8. Solution:**

Given, that an urn contains 3 white, 4 red and 5 black balls.

So, total number of balls = 12

Two balls are drawn without replacement

Let,

A = event of getting a black ball as the first

B = event of getting another black ball as the second

Now,

$$P(\text{At least one ball is black}) = P(A \cup B)$$

$$= P(A \cup B)$$

$$= 1 - P(\overline{A \cup B})$$

$$= 1 - P(\overline{A} \cap \overline{B})$$

$$= 1 - P(\overline{A})P(\overline{B/A})$$

$$= 1 - \left(\frac{7}{12} \times \frac{6}{12}\right)$$

$$= 1 - \frac{7}{22}$$

$$= \frac{15}{22}$$

Hence, the required probability is 15/22.

