1. **Experiment:** An experiment refers to an action or trial that leads to outcomes. For example, rolling a die.

2. **Outcome**: An outcome is a possible result of an experiment. For a die, the outcomes are 1, 2, 3, 4, 5, 6.

3. **Sample Space:** The sample space is the set of all possible outcomes of an experiment. For instance, in tossing a coin twice, the sample space is {HH, HT, TH, TT}.

4. **Event:** An **event** is a subset of the sample space. For example, getting an even number when rolling a die is an event {2, 4, 6}.

Types of Events:

- **Simple Event**: An event with a single outcome (e.g., rolling a 3 on a die).

- **Compound Event**: An event with more than one outcome (e.g., rolling an even number).

Definitions

- **Probability**: The probability of an event is the ratio of the number of favourable outcomes to the total number of outcomes in the sample space.

- **Complementary Events**: Events that are mutually exclusive and exhaustive. For example, if A is rolling a 6 on a die, the complement is not rolling a 6.

Formulas

Probability of an event $P(E).$:

$$P(E) = \text{ Number of favorable outcomes } / \text{ Total number of outcomes}$$

Probability of complementary events:

$$P(\text{Not } E) = 1 - P(E)$$

Probability in case of equally likely outcomes

$$P(E) = \text{ Number of outcomes in E } / \text{ Total number of outcomes in Sample Space}$$

Examples of Sample space :-

1. When one coin is tossed then S = H, T
2. When two coins are tossed then S = HH, TT, HT, TH .
3. When three coins are tossed than S = HHH, TTT, HTT, THT, TTH, THH, HTH, HHT
4. When four coins are tossed then S = HHHH, TTTT, HTTT, THTT, TTHT, TTTH, HHHT, HHTH, HTHH, THHH, HTHT, THTH, TTHH, HHTT, THHT, HTTH.

   1 coin :– 2 outcomes
   2coins :– 2 × 2 = 4 outcomes
   3 coins :– 2 × 2 × 2 = 8 outcomes
   4 coins :–2 × 2 × 2 × 2 = 16 outcomes

1. When a die is thrown once then S = 1, 2, 3, 4, 5, 6, n(S) = 6
2. When two dice are thrown together or A die is thrown twice then

   S = (1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6)
   (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6)
   (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6)
   (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6)
   (5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6)
   (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)

   n(S) = 6 × 6 = 36

3. When 3 dice are thrown or a die is thrown thrice then

   n(S) = 6 × 6 × 6 = 216
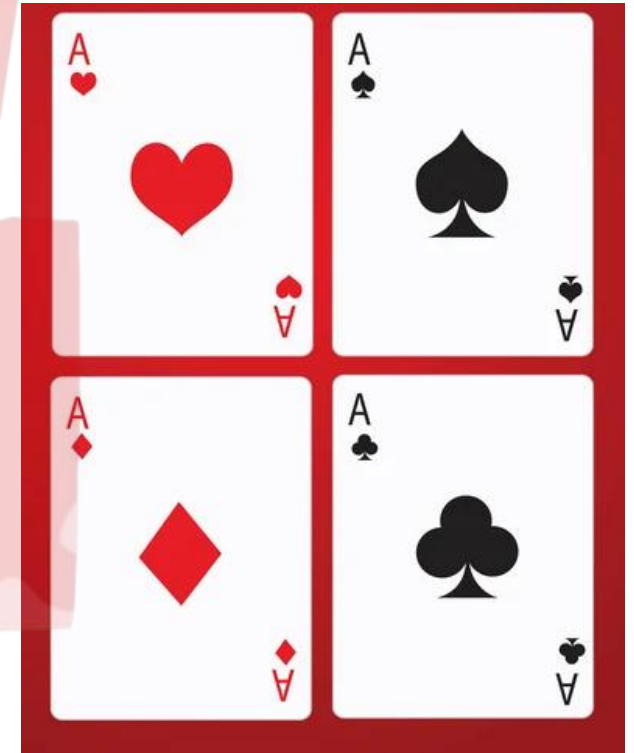
Total Playing Cards = 52

No. of Black Cards = 26

No. of Red Cards = 26

No of Spade Cards = 13

No of Club Cards = 13

No of Diamond Cards = 13

No of Heart Cards = 13

Playing cards n(s) = 52

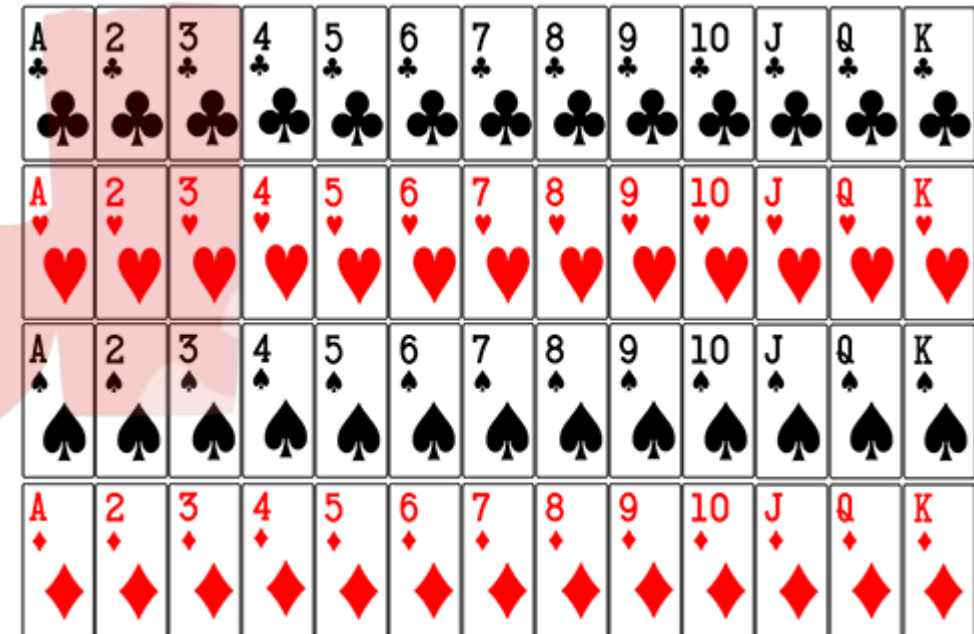Red Cards (26) Black Cards (26)

Heart 13 Diamond 13 Spade 13 Class 13

Each suit contains 1 ace, 1 king, 1 Queen, 1 jack and nine
number cards 2, 3, 4, 5, 6, 7, 8, 9, 10

Face card 12 Non face card 40

4 king, 4 Queen & 4 Jack 36 number cards + 4 aces

Multiple Choice Questions :-

1. A bag has 5 white marbles, 8 red marbles and 4 purple marbles. If we take a marble randomly, then what is the probability of not getting purple marble?
   (a) 0.5   (b) 0.66   (c) 0.08   (d) 0.77

2. Two dice are thrown simultaneously. What is the probability of getting doublet?
   (a) 1/36   (b) 1/6   (c) 5/6   (d) 11/36

3. A box contains cards numbered 9 to 53. A card is drawn at random from the box. The probability that the drawn card has a number which is a perfect square is :
   (a) 1/45   (b) 2/15   (c) 4/45   (d) 1/9

4. A card is selected from a deck of 52 cards. The probability of being a red face card is
   (a) 3/26   (b) 3/13   (c) 2/13   (d) 1/2

5. The probability of getting a bad egg in a lot of 400 is 0.035. The number of bad eggs in the lot is
   (a) 7   (b) 14   (c) 21   (d) 28

6. Two dice are thrown at the same time and the product of numbers appearing on them is noted. The probability that the product is a prime number is
   (a) 1/3   (b) 1/6   (c) 1/5   (d) 5/6

7. A ticket is drawn at random from a bag containing tickets numbered from 1 to 40. The probability that the selected ticket has a number which is a multiple of 5 is
   (a) 1/5   (b) 3/5   (c) 4/5   (d) 1

8. Two different dice are thrown together. The probability of getting the sum of the two numbers less than 7 is:
   (a) 5/12   (b) 7/12   (c) 12/5   (d) 3/11

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) (c) Assertion (A) is true but reason (R) is false.
(d) (d) Assertion (A) is false but reason (R) is true.

9. **Assertion (A):** The probability of getting exactly one head in tossing a pair of coins is 1/2.
   Reason (R): The sample space of two coin tossed is = {HH, TT, HT, TH} = 4.

10**. Assertion (A):** The probability of winning a game is 0.4, then the probability of losing it, is 0.6.
   Reason (R): P(E) + P (not E) = 1

11. Find the probability of getting 53 Fridays in a leap year.

   Ans: Leap year contains 366 days.
   52 weeks + 2 days
   52 weeks contain 52 Fridays. We will get 53 Fridays if one of the remaining two days is a Friday.
   Total possibilities for two days are: (Sunday, Monday), (Monday, Tuesday), (Tuesday, Wednesday), (Wednesday, Thursday), (Thursday, Friday), (Friday, Saturday), (Saturday, Sunday)
   There are 7 possibilities and out of these there are 2 favourable cases.
   ∴ P (53 Fridays) = 2 / 7

12. One card is drawn at random from a well-shuffled deck of 52 playing cards. Find the probability that the card drawn is
   (i) either a red card or a king,
   (ii) neither a red card nor a queen.

13. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball from the bag is thrice that of a red ball, find the number of blue balls in the bag.

14. Cards numbered 1 to 30 are put in a bag. A card is drawn at random from this bag. Find the probability that the number on the drawn card is

 (i) not divisible by 3.

 (ii) a prime number greater than 7.

15. Two coins are tossed simultaneously. What is the probability of getting

(i)   At least one head?

(ii) At most one tail?

(iii) A head and a tail?

16. All the black face cards are removed from a pack of 52 playing cards. The reaming cards are well shuffled and then a card is drawn at random. Find the probability of getting

(i) face card

(ii) red card

(iii) black card.

17. Two dice are thrown at the same time. What is the probability that the sum of the two numbers appearing on the top of the dice is

(i)   at least 9?

(ii) 7?

(iii) less than or equal to 6?
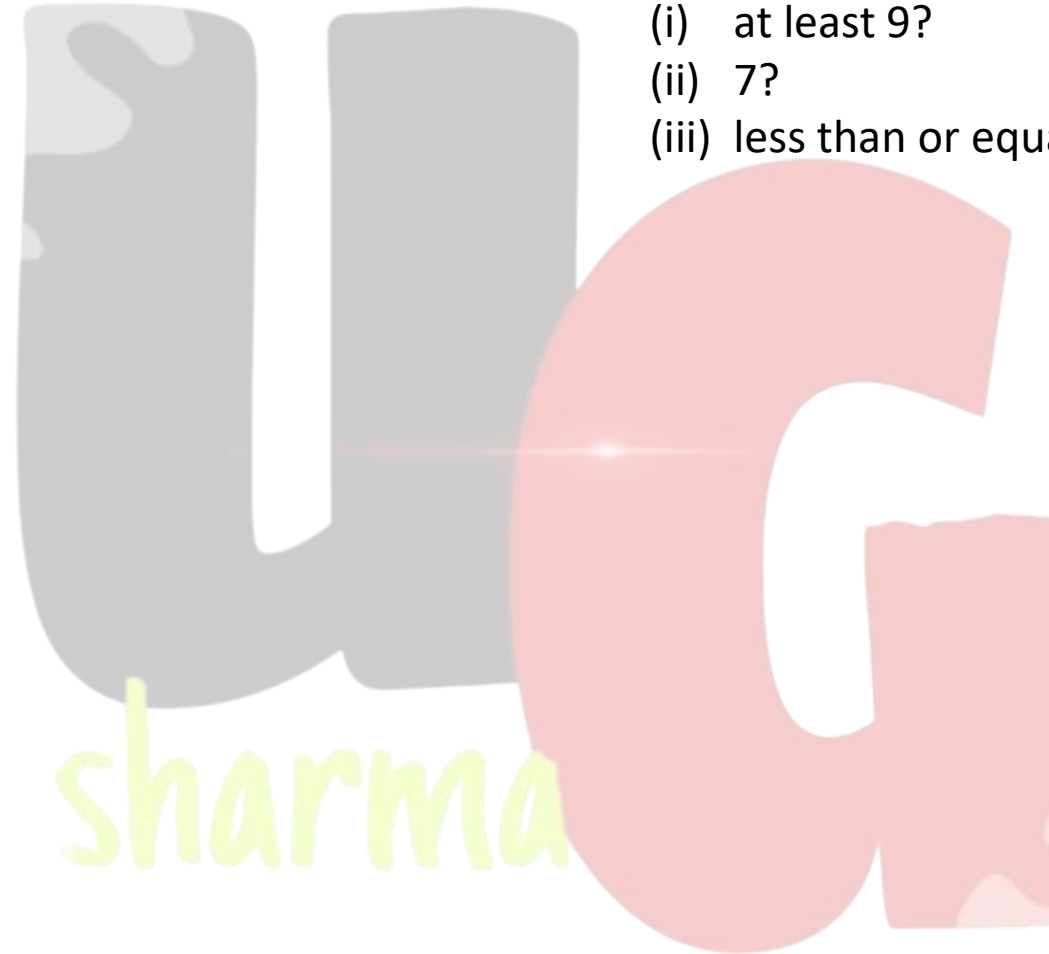
18. From a pack of 52 playing cards, jacks, queens, kings and aces of red colour are removed. From the remaining a card is drawn at random. Find the probability that the card drawn is
 (i) a black queen
 (ii) a red card
 (iii) a face card
 (iv) a spade card

19. A box contains cards bearing numbers from 6 to 70. If one card is drawn at random from the box, find the probability that it bears
 (i) one digit number.
 (ii) a number divisible by 5.
 (iii) an odd number less than 30.
 (iv) a composite number between 50 and 70.
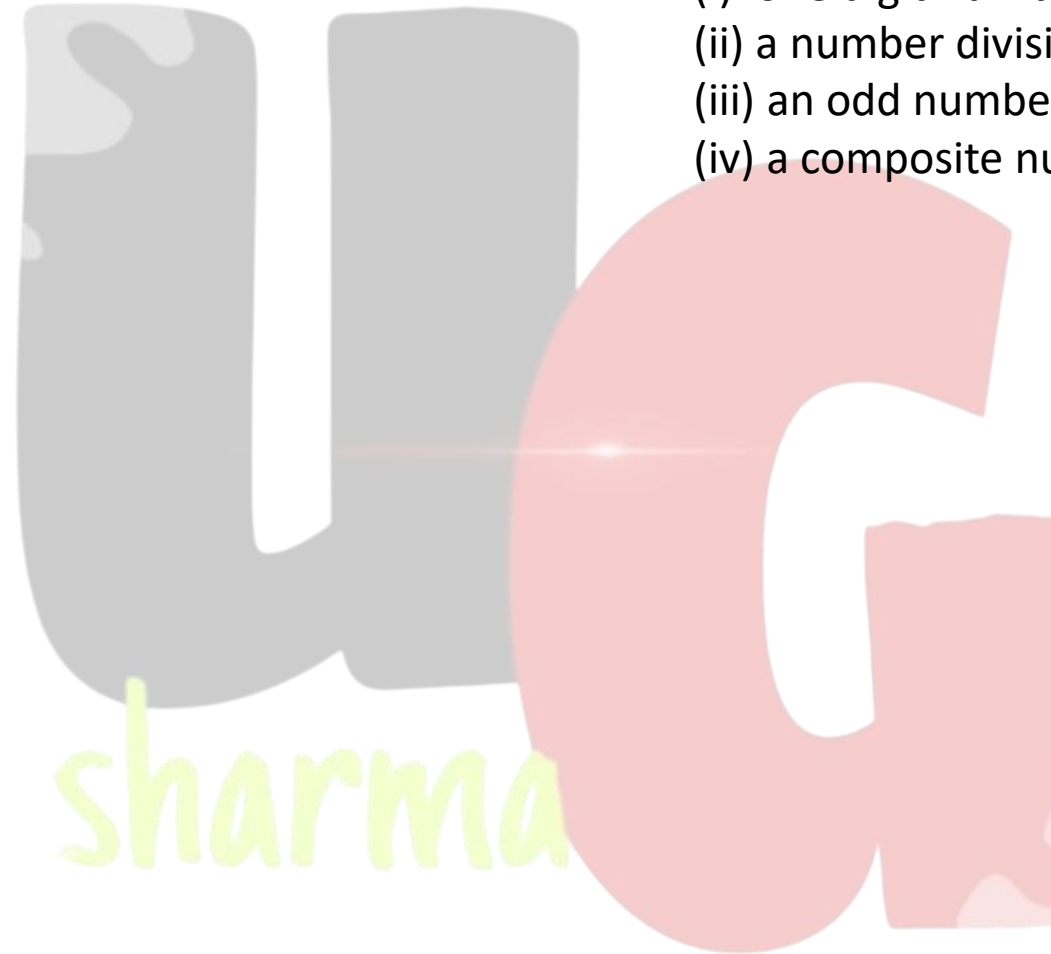
20. Tushara took a pack of 52 cards. She kept aside all the black face cards and shuffled the remaining cards well.

Based on the above information answer the following questions.
(i) Write the number of total possible outcomes.
(ii) She draws a card from the well-shuffled pack of remaining cards. What is the probability that the card is a face card?
(iii) Write the probability of drawing a black card.
                OR
(iii) What is the probability of getting neither a black card nor an ace card?

21. A, B, C, D and E are five friends. They prepared some numbered cards with labelled from 11 to 60 and then they put all the number cards in the empty box. In this game, every friend was asked to pick the card randomly and after each draw, card was replaced back in the box.

(a) Find the probability that the number on the drawn card is an odd number
(b) Find the probability that the number on the drawn card is a perfect square number
(c) Find the probability that the number on the drawn card is divisible by 5
(d) Find the probability that the number on the drawn card is a prime number less than 20