



**SNS COLLEGE OF TECHNOLOGY**  
**An Autonomous Institution**  
**Coimbatore-35**



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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**19GET276 – VQAR II**

II YEAR/ IV SEMESTER

**UNIT 2 – QUANTITATIVE ABILITY IV**

TOPIC – PROBABILITY





# PROBABILITY



## 1. Experiment:

An operation which can produce some well-defined outcomes is called an experiment.

## 2. Random Experiment:

An experiment in which all possible outcomes are known and the exact output cannot be predicted in advance, is called a random experiment.

### Examples:

- i. Rolling an unbiased dice.
- ii. Tossing a fair coin.
- iii. Drawing a card from a pack of well-shuffled cards.
- iv. Picking up a ball of certain colour from a bag containing balls of different colours.





# PROBABILITY



## 3. Sample Space:

When we perform an experiment, then the set  $S$  of all possible outcomes is called the **sample space**.

### Examples:

1. In tossing a coin,  $S = \{H, T\}$
2. If two coins are tossed, the  $S = \{HH, HT, TH, TT\}$ .
3. In rolling a dice, we have,  $S = \{1, 2, 3, 4, 5, 6\}$ .

## 4. Event:

Any subset of a sample space is called an **event**.





# PROBABILITY



## 5. Probability of Occurrence of an Event:

Let  $S$  be the sample and let  $E$  be an event.

Then,  $E \subseteq S$ .

$$\therefore P(E) = \frac{n(E)}{n(S)}$$

## 6. Results on Probability:

- i.  $P(S) = 1$
- ii.  $0 \leq P(E) \leq 1$
- iii.  $P(\Phi) = 0$
- iv. For any events  $A$  and  $B$  we have :  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- v. If  $\bar{A}$  denotes (not- $A$ ), then  $P(\bar{A}) = 1 - P(A)$ .





## PROBABILITY



Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?

- A.  $\frac{1}{2}$
- B.  $\frac{2}{5}$
- C.  $\frac{8}{15}$
- D.  $\frac{9}{20}$

**Answer:** Option D

**Explanation:**

Here,  $S = \{1, 2, 3, 4, \dots, 19, 20\}$ .

Let  $E =$  event of getting a multiple of 3 or 5  $= \{3, 6, 9, 12, 15, 18, 5, 10, 20\}$ .

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{9}{20}$$





# PROBABILITY



A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

- A.  $\frac{10}{21}$
- B.  $\frac{11}{21}$
- C.  $\frac{2}{7}$
- D.  $\frac{5}{7}$

**Answer:** Option A

**Explanation:**

Total number of balls =  $(2 + 3 + 2) = 7$ .

Let S be the sample space.

Then,  $n(S)$  = Number of ways of drawing 2 balls out of 7

$$\begin{aligned} &= {}^7C_2 \\ &= \frac{(7 \times 6)}{(2 \times 1)} \\ &= 21. \end{aligned}$$

Let E = Event of drawing 2 balls, none of which is blue.

$\therefore n(E)$  = Number of ways of drawing 2 balls out of  $(2 + 3)$  balls.

$$\begin{aligned} &= {}^5C_2 \\ &= \frac{(5 \times 4)}{(2 \times 1)} \\ &= 10. \end{aligned}$$

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{10}{21}$$





# PROBABILITY



In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?

- A.  $\frac{1}{3}$
- B.  $\frac{3}{4}$
- C.  $\frac{7}{19}$
- D.  $\frac{8}{21}$
- E.  $\frac{9}{21}$

**Answer:** Option A

**Explanation:**

Total number of balls =  $(8 + 7 + 6) = 21$ .

Let E = event that the ball drawn is neither red nor green

= event that the ball drawn is blue.

$$\therefore n(E) = 7.$$

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{7}{21} = \frac{1}{3}.$$





## PROBABILITY



What is the probability of getting a sum 9 from two throws of a dice?

- A.  $\frac{1}{6}$
- B.  $\frac{1}{8}$
- C.  $\frac{1}{9}$
- D.  $\frac{1}{12}$

**Answer:** Option C

**Explanation:**

In two throws of a dice,  $n(S) = (6 \times 6) = 36$ .

Let E = event of getting a sum =  $\{(3, 6), (4, 5), (5, 4), (6, 3)\}$ .

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{4}{36} = \frac{1}{9}$$







## PROBABILITY



Three unbiased coins are tossed. What is the probability of getting at most two heads?

- A.  $\frac{3}{4}$
- B.  $\frac{1}{4}$
- C.  $\frac{3}{8}$
- D.  $\frac{7}{8}$

**Answer:** Option D

**Explanation:**

Here  $S = \{TTT, TTH, THT, HTT, THH, HTH, HHT, HHH\}$

Let  $E =$  event of getting at most two heads.

Then  $E = \{TTT, TTH, THT, HTT, THH, HTH, HHT\}$ .

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{7}{8}$$





## PROBABILITY



Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?

- A.  $\frac{1}{2}$
- B.  $\frac{3}{4}$
- C.  $\frac{3}{8}$
- D.  $\frac{5}{16}$

**Answer:** Option B

**Explanation:**

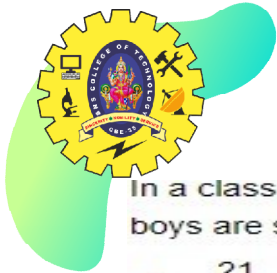
In a simultaneous throw of two dice, we have  $n(S) = (6 \times 6) = 36$ .

Then,  $E = \{(1, 2), (1, 4), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 2), (3, 4), (3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 2), (5, 4), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)\}$

$$\therefore n(E) = 27.$$

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{27}{36} = \frac{3}{4}$$





# PROBABILITY



In a class, there are 15 boys and 10 girls. Three students are selected at random. The probability that 1 girl and 2 boys are selected, is:

- A.  $\frac{21}{46}$
- B.  $\frac{25}{117}$
- C.  $\frac{1}{50}$
- D.  $\frac{3}{25}$

**Answer:** Option A

**Explanation:**

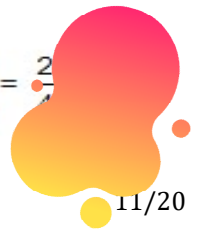
Let S be the sample space and E be the event of selecting 1 girl and 2 boys.

Then,  $n(S)$  = Number ways of selecting 3 students out of 25

$$\begin{aligned} &= {}^{25}C_3 \\ &= \frac{(25 \times 24 \times 23)}{(3 \times 2 \times 1)} \\ &= 2300. \end{aligned}$$

$$\begin{aligned} n(E) &= ({}^{10}C_1 \times {}^{15}C_2) \\ &= \left[ 10 \times \frac{(15 \times 14)}{(2 \times 1)} \right] \\ &= 1050. \end{aligned}$$

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{1050}{2300} = \frac{21}{46}$$





## PROBABILITY



In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize?

- A.  $\frac{1}{10}$
- B.  $\frac{2}{5}$
- C.  $\frac{2}{7}$
- D.  $\frac{5}{7}$

**Answer:** Option C

**Explanation:**

$$P(\text{getting a prize}) = \frac{10}{(10 + 25)} = \frac{10}{35} = \frac{2}{7}$$



# PROBABILITY



From a pack of 52 cards, two cards are drawn together at random. What is the probability of both the cards being kings?

- A.  $\frac{1}{15}$
- B.  $\frac{25}{57}$
- C.  $\frac{35}{256}$
- D.  $\frac{1}{221}$

**Answer:** Option D

**Explanation:**

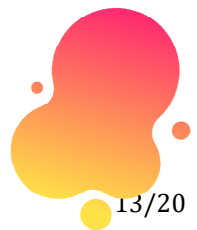
Let S be the sample space.

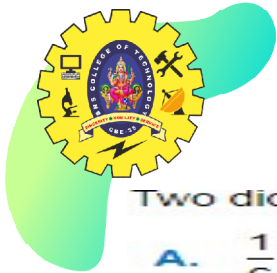
$$\text{Then, } n(S) = {}^{52}C_2 = \frac{(52 \times 51)}{(2 \times 1)} = 1326.$$

Let E = event of getting 2 kings out of 4.

$$\therefore n(E) = {}^4C_2 = \frac{(4 \times 3)}{(2 \times 1)} = 6.$$

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{6}{1326} = \frac{1}{221}.$$





## PROBABILITY



Two dice are tossed. The probability that the total score is a prime number is:

- A.  $\frac{1}{6}$
- B.  $\frac{5}{12}$
- C.  $\frac{1}{2}$
- D.  $\frac{7}{9}$

**Answer:** Option B

**Explanation:**

Clearly,  $n(S) = (6 \times 6) = 36$ .

Let E = Event that the sum is a prime number.

Then E = { (1, 1), (1, 2), (1, 4), (1, 6), (2, 1), (2, 3), (2, 5), (3, 2), (3, 4), (4, 1), (4, 3), (5, 2), (5, 6), (6, 1), (6, 5) }

$\therefore n(E) = 15$ .

$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{15}{36} = \frac{5}{12}$ .





## PROBABILITY



A card is drawn from a pack of 52 cards. The probability of getting a queen of club or a king of heart is:

- A.  $\frac{1}{13}$
- B.  $\frac{2}{13}$
- C.  $\frac{1}{26}$
- D.  $\frac{1}{52}$

**Answer:** Option C

**Explanation:**

Here,  $n(S) = 52$ .

Let E = event of getting a queen of club or a king of heart.

Then,  $n(E) = 2$ .

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{2}{52} = \frac{1}{26}$$





## PROBABILITY



A bag contains 4 white, 5 red and 6 blue balls. Three balls are drawn at random from the bag. The probability that all of them are red, is:

- A.  $\frac{1}{22}$
- B.  $\frac{3}{22}$
- C.  $\frac{2}{91}$
- D.  $\frac{2}{77}$

**Answer:** Option C

**Explanation:**

Let S be the sample space.

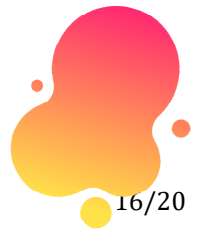
Then,  $n(S)$  = number of ways of drawing 3 balls out of 15

$$\begin{aligned} &= {}^{15}C_3 \\ &= \frac{(15 \times 14 \times 13)}{(3 \times 2 \times 1)} \\ &= 455. \end{aligned}$$

Let E = event of getting all the 3 red balls.

$$\therefore n(E) = {}^5C_3 = {}^5C_2 = \frac{(5 \times 4)}{(2 \times 1)} = 10.$$

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{10}{455} = \frac{2}{91}.$$







## PROBABILITY



Two cards are drawn together from a pack of 52 cards. The probability that one is a spade and one is a heart, is:

- A.  $\frac{3}{20}$
- B.  $\frac{29}{34}$
- C.  $\frac{47}{100}$
- D.  $\frac{13}{102}$

**Answer:** Option D

**Explanation:**

Let S be the sample space.

$$\text{Then, } n(S) = {}^{52}C_2 = \frac{(52 \times 51)}{(2 \times 1)} = 1326.$$

Let E = event of getting 1 spade and 1 heart.

$$\begin{aligned} \therefore n(E) &= \text{number of ways of choosing 1 spade out of 13 and 1 heart out of 13} \\ &= ({}^{13}C_1 \times {}^{13}C_1) \\ &= (13 \times 13) \\ &= 169. \end{aligned}$$

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{169}{1326} = \frac{13}{102}.$$





## PROBABILITY



One card is drawn at random from a pack of 52 cards. What is the probability that the card drawn is a face card (Jack, Queen and King only)?

- A.  $\frac{1}{13}$
- B.  $\frac{3}{13}$
- C.  $\frac{1}{4}$
- D.  $\frac{9}{52}$

**Answer:** Option **B**

**Explanation:**

Clearly, there are 52 cards, out of which there are 12 face cards.

$$\therefore P(\text{getting a face card}) = \frac{12}{52} = \frac{3}{13}$$





## PROBABILITY



A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

- A.  $\frac{3}{4}$
- B.  $\frac{4}{7}$
- C.  $\frac{1}{8}$
- D.  $\frac{3}{7}$

**Answer:** Option **B**

**Explanation:**

Let number of balls =  $(6 + 8) = 14$ .

Number of white balls = 8.

$$P(\text{drawing a white ball}) = \frac{8}{14} = \frac{4}{7}$$





**THANK YOU**

