



SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35



Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF CIVIL ENGINEERING

23GET276 – 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

$$= {}^7C_2$$

$$= \frac{(7 \times 6)}{(2 \times 1)}$$

$$= 21.$$

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.

$$= {}^5C_2$$

$$= \frac{(5 \times 4)}{(2 \times 1)}$$

$$= 10.$$

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



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

$$= {}^{25}C_3$$

$$= \frac{(25 \times 24 \times 23)}{(3 \times 2 \times 1)}$$

$$= 2300.$$

$$n(E) = ({}^{10}C_1 \times {}^{15}C_2)$$

$$= \left[10 \times \frac{(15 \times 14)}{(2 \times 1)} \right]$$

$$= 1050.$$

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



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

$$= {}^{15}C_3$$

$$= \frac{(15 \times 14 \times 13)}{(3 \times 2 \times 1)}$$

$$= 455.$$

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.

$\therefore n(E)$ = number of ways of choosing 1 spade out of 13 and 1 heart out of 13

$$= ({}^{13}C_1 \times {}^{13}C_1)$$

$$= (13 \times 13)$$

$$= 169.$$

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



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