CHAPTER - 15
PROBABILITY

PROBABILITY	The terms 'Probably' 'in all likelihood', 'chance', 'odds in favor', 'odds against' are too familiar nowadays and they have their origin in a branch of Mathematics.
RANDOM EXPERIMENT	An experiment is defined to be random if the results of the experiment depend on chance only.
Experiment	An experiment may be described as a performance that produces certain results.
Events	Theresultsoroutcomesofarandomexperimentareknownasevents.Sometimes events may be combination of outcomes. The events are of two types: **(i) Simple or Elementary,** **(ii) Composite or Compound**
Mutually Exclusive Events or Incompatible Events	A set of events $A_1, A_2, A_3, \ldots\ldots$ is known to be mutually exclusive if not more than one of them can occur simultaneously
Exhaustive Events	The events A_1, A_2, A_3, are known to form an exhaustive set if one of these events must necessarily occur.
Equally Likely Events or Mutually Symmetric Events or Equi-Probable Events	The events of a random experiment are known to be equally likely when all necessary evidence are taken into account, no event is expected to occur more frequently as compared to the other events of the set of events.

CLASSICAL DEFINITION OF PROBABILITY OR A PRIORDEFINITION	The probability of occurrence of the event A is defined as the ratio of the number of events Favorable to A to the total number of events. Denoting this by P (A), we have. **P(A)= *No.* of equally likely events Favorable to A** **Total no. of equally likely events**
REMEBERANCE POINT & FORMULA	(a) Theprobabilityofaneventliesbetween0and1, both inclusive. When P (A) = 0, A is known to be an impossible event and when P (A) = 1, A is known to be a sure event. (b) Non-occurrence of event A is denoted by A' or A^C The event A along with its complimentary A' forms a set of mutually exclusive and exhaustive events i.e., **P(A) + P (A') =1** **P(A') = 1 -P(A)** (c) The ratio of no. of favorable events to the no. of unfavorable events is known as odds in favor of the event A and its inverse ratio is known as odds against the event A i.e., **odds in favor of A = $m_A : (m - m_A)$** **and odds against A = $(m - m_A) : m_A$** (d) For any two mutually exclusive events A and B, the probability that either A or B occurs is given by the sum of individual probabilities of A and B i.e., **P (A +B)** **P(A + B) = P(A) + P(B)** (e) For any K(+ 2) mutually exclusive events A_1, A_2, A_3 ..., A_K the probability that at least one of them occurs is given by the sum of the individual probabilities of the events i.e., **$P(A_1 + A_2 + ... + A_K) = P(A_1) + P(A_2) +$ .... $P(A_K)$** **(f)** For any two events A and B, the probability that either A or B occurs is given by the sum of individual probabilities of A and B less the

probability of simultaneous occurrence of the events A and B i.e.,

$$P\ (A + B) = P(A) + P(B) - P\ (A + B)$$

(g) For any three events A, B and C, the probability that at least one of the events occurs is given by

$$P\ (A + B + C) = P(A) + P(B) + P(C) - P(A + B) - P(A + C) - P(B + C) + P(A + B + C)$$

(h) For any two events A and B, the probability that A and B occur simultaneously is given by the product of the unconditional probability of A and the conditional probability of B given that A has already occurred i.e.,

$$P\ (A * B) = P(A) \times P(B/A) \quad \textbf{Provided } P(A) > 0$$

(i) Compound Probability or Joint Probability

$$P(B/A) = \frac{P(B + A)}{P(A)} = \frac{P(A + B)}{P(A)}$$

GRAPHICAL FORMULA OF PROBABILITY

$$P(A) = \frac{\text{number of favourable events}}{\text{number of total events}}$$

$$P(A) = \frac{n(A)}{n}$$

$$P(B) = \frac{n(B)}{n}$$

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

for Mutually Exclusive Events

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

for non-Mutual Events

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

for Conditional probability

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)}$$

Question 1

What is the chance of picking a spade or an ace not of spade from a pack of 52 cards?

(a) $\frac{4}{13}$ (b) $\frac{4}{14}$

(c) $\frac{15}{13}$ (d) $\frac{6}{13}$

Answer: a

Explanation:

A pack of 52 cards contain 13 spades, 13 Hearts, 13 Clubs and 13 Diamonds. Each of these groups of 13 cards has an ace. Hence the total number of elementary events is 52 out of which 13 + 3 or 16 are favorable to the event. A representing picking a space or an ace not of spade. This we have

P (A) = $\frac{16}{52} = \frac{4}{13}$

Question 2

A committee of 7 members is to be formed form a group comprising 8 gentlemen and 5 ladies. What is the probability that the committee would comprise: 2 ladies.

(a) $\frac{140}{429}$ (b) $\frac{14}{429}$

(c) $\frac{10}{49}$ (d) None

Answer: a

Explanation:

Since there is altogether 8 + 5 or 13 persons, committee 7 members can be formed in

13_{C_7}Or $\frac{13!}{7!6!}$ or $\frac{13\times12\times11\times10\times9\times8!}{7!\times6\times5\times4\times3\times2\times1}$ or 11 × 12 × 13 ways.

When the committee is formed taking 2 ladies out of 5 ladies, the remaining (7-2) or 5 committee members are to be selected from 8 gentlemen. Now 2 out of 5 ladies can be selected in 5_{C_2}ways and 5 out of 8 gentlemen can be selected in 8_{C_5}ways. Thus if A denotes the event of having the committee with 2 ladies, then A can occur in $5_{C_2} \times 8_{C_5}$OR 10 × 56 Ways thus,

P (A) $\frac{10\times56}{11\times12\times13} = \frac{140}{429}$

Question 3

What if in above questions 2. 2 ladies be replacing by at least 2 ladies?

(a) $\frac{92}{429}$ (b) $\frac{32}{29}$
(c) $\frac{392}{429}$ (d) None

Answer: c

Explanation:

Since the minimum number of ladies is 2, we can have the following combinations:

Population:	8G + 5L
Sample	2L + 5G
or	3L + 4G
or	4L + 3G
or	5L + 2G

Thus if B denotes the event of having at least two ladies in the committee, then B can occur in $5_{C_2} \times 8_{C_5} + 5_{C_3} \times 8_{C_4} + 5_{C_4} \times 8_{C_3} + 5_{C_5} + 8_{C_2}$ i.e. 1568 ways.

Hence P (A) = $\frac{1568}{11 \times 12 \times 13} = \frac{392}{429}$

Question 4

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: 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

$= 7_{C_2}$

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

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

Question 5

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) $\frac{8}{21}$

Answer: a

Explanation:

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

$\frac{\textit{event that the ball drawn is neither red or nor greeen}}{\textit{event that the ball drawn is blue.}}$

$\therefore$n (E) = 7.

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

Question 6

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: c

Explanation:

In two throws a dice n(S) = (6 × 6) = 36.

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

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

Question 7

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: d

Explanation:

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

Let E = event of getting at most heads.
Then E = {TTT, TTH, THT, HTT, THH, HTH, HHT}.
∴ P (E) = $\frac{n(E)}{n(S)} = \frac{7}{8}$

Question 8

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: b

Explanation:

In a simultaneously throw of two dice. We have n(S) = (6 × 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)}
∴ n (E) = 27.
∴ p (E) = $\frac{n(E)}{n(S)} = \frac{27}{36} = \frac{3}{4}$

Question 9

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: a

Explanation:

Let S be the sample space and E be the event selecting 1 girl and 2 boys.
Then, n (S) = Number Ways of selecting 3 student out of 25
$= 25_{C_3}$
$= \frac{(25\times24\times23)}{(3\times2\times1)}$
$= 2300$
n∊ = $\left(10_{C_1} \times 15_{C_2}\right)$
$= \left[10 \times \frac{(15\times14)}{2\times1}\right]$
= 1050.

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

Question 10

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: c

Explanation:

P (getting a prize) = $\frac{10}{(10+26)} = \frac{10}{35} = \frac{2}{7}$

Question 11

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) $\frac{1}{221}$ (d) $\frac{35}{256}$

Answer: c

Explanation:

Let S be the sample space.

Then, n(S) = $^{52}c_2 = \frac{(52\times51)}{(2\times1)}$ = 1326.

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

$\therefore$ n (E) = $^4C_2 = \frac{(4\times3)}{(2\times1)}$ = 6.

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

Question 12

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: b

Explanation:

Clearly, n(S) = (6×6) = 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) = $\frac{n(E)}{n(S)} = \frac{15}{36} = \frac{5}{12}$

Question 13

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

Question 14

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: d

Explanation:

Let S be the sample space.

Then, n(S) = $^{52}C_2 = \frac{(52\times51)}{(2\times1)}$ = 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 × 13)

= 169.

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

Question 15

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: b

Explanation:

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

$\therefore$ P (getting a face card) = $\frac{15}{52} = \frac{3}{13}$

Question 16

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: b

Explanation:

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

Number of white balls = 8.

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

Question 17

A bag contains 6 white and 4 black balls, 2 balls are drawn at random. Find the probability that they are of same colour.

(a) $\frac{1}{2}$ (b) $\frac{7}{15}$

(c) $\frac{8}{15}$ (d) $\frac{1}{9}$

Answer: b

Explanation:

Let S be the Sample space

Then n(S) = no of ways drawing 2 balls out of (6+4)

= ${}^{10}C_2$= 45

Let E = event of getting both balls of same colour

Then, n (E) = no of ways (2 balls out of six) or (2 balls out of 4)

= ${}^{6}C_2+{}^{4}C_2$

= 15+6 = 21

Therefore, P (E) = $\frac{n(E)}{n(S)} = \frac{21}{45} = \frac{7}{15}$

Question 18

A problem is given to three students whose chance of solving is are $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$ respectively what is the probability that the problem will be solved?

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$

(c) $\frac{3}{4}$ (d) $\frac{7}{12}$

Answer: c

Explanation:

Let A, B, C be the respective events solving the problem and $\bar{A}, \bar{B}, \bar{C}$be the respective events of not solving the problem. Then A, B, C are independent event

$\therefore \bar{A}, \bar{B}, \bar{C}$are independents events

Now P (A) =$\frac{1}{2}$, P (B) = $\frac{1}{3}$ and P(C) = $\frac{1}{4}$

P ($\bar{A}$) = $\frac{1}{2}$, P ($\bar{B}$) = $\frac{2}{3}$, P ($\bar{C}$) $\frac{3}{4}$

$\therefore$ P (none solves the problem) = P (not A) and (not B) and (not C)

= P ($\bar{A} \cap \bar{B} \cap \bar{C}$)

= P ($\bar{A}$) P ($\bar{B}$) P ($\bar{C}$) [$\because$ $\bar{A}, \bar{B}, \bar{C}$ are Independent]

$= \frac{1}{2} \times \frac{2}{3} \times \frac{3}{4}$

$= \frac{1}{4}$

Hence, P (the problem will be solved) = 1 – P (none solves the problem)

= $1 - \frac{1}{4} = \frac{3}{4}$

Question 19

Two cards are drawn at random from a pack of 52 cards what is the probability that either both are black or both are queen?

(a) $\frac{52}{221}$ (b) $\frac{55}{190}$

(c) $\frac{55}{221}$ (d) $\frac{19}{221}$

Answer: c

Explanation:

We have n(s) = ${}^{52}C_2 = \frac{52 \times 51}{2 \times 1}$ = 1326.

Let A = event of getting both black cards

B = event of getting both queens
A∩B = event of getting queen of black cards
n (A) = $\frac{52 \times 51}{2 \times 1}$= $^{26}C_2$ = 325.
n (B) = $\frac{26 \times 25}{2 \times 1}$= $\frac{4 \times 3}{2 \times 1}$ = 6 and
n (A∩B) = $^{4}C_2$ = 1
P (A) = $\frac{n(A)}{n(S)}$ =$\frac{325}{1326}$;
P (B) = $\frac{n(B)}{n(s)}$ = $\frac{6}{1326}$ and
P (A∩B) =$\frac{n(A∩B)}{n(S)}$ = $\frac{1}{1326}$
P (A∪B) = P (A) + P (B) – P (A∩B) = $\frac{(325+6-1)}{1326}$ = $\frac{330}{1326}$ = $\frac{55}{221}$

Question 20

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) $\frac{3}{5}$
(c) $\frac{9}{20}$ (d) $\frac{8}{15}$

Answer: c

Explanation:

Here, S = {1, 2, 3, 4... 19, 20}
Let E = event of getting multiple of 3 or 5 = {3, 6, 9, 12, 15, 18, 5, 10, 20}.
P (E) =$\frac{n(E)}{n(s)}$=$\frac{9}{20}$.

Question 21

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

(a) $\frac{5}{12}$ (b) $\frac{1}{6}$
(c) $\frac{1}{2}$ (d) $\frac{7}{9}$

Answer: a

Explanation:

Clearly, n(S) = (6×6) = 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)}

n (E) = 15.

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

Question 22

A man and his wife appear in an interview for two vacancies in the same post. The probability of husband's selection is $\left(\frac{1}{7}\right)$ and the probability of wife's selection is $\left(\frac{1}{5}\right)$. What is the probability that only one of them is selected?

(a) $\frac{2}{7}$ (b) $\frac{1}{7}$

(c) $\frac{3}{4}$ (d) $\frac{4}{5}$

Answer: a

Explanation:

Let A = Event that the husband the selected

And B = Event that the wife is selected

Then, P (A) = $\frac{1}{7}$ and P (B) = $\frac{1}{5}$

$\therefore$ P ($\bar{A}$) = $\left(1 - \frac{1}{7}\right) = \frac{6}{7}$ and P ($\bar{B}$) = $\left(1 - \frac{4}{5}\right) = \frac{4}{5}$

$\therefore$ Required probability = P [(A and not B) or (B and not A)]

= p [(A and$\bar{B}$) or (B and $\overline{A)]}$

= p [(A and$\bar{B}$) + P (B and $\overline{A)]}$

= P (A)-P($\bar{B}$)+P (B)-P($\bar{A}$) = $\left(\frac{1}{7} \times \frac{4}{5}\right)+\left(\frac{1}{5} \times \frac{6}{7}\right) = \frac{10}{35} = \frac{2}{7}$

Question 23

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) $\frac{2}{91}$ (b) $\frac{1}{22}$

(c) $\frac{3}{22}$ (d) $\frac{2}{77}$

Answer: a

Explanation:

Let S be the sample space.

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

= $15C_3 = \frac{15\times14\times13}{3\times2\times1}$= 455.

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

n (E) = $5C_3 = \frac{5\times4}{2\times1}$ = 10.

=> P (E) = $\frac{n(E)}{n(s)} = \frac{10}{455} = \frac{2}{91}$

Question 24

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) $\frac{2}{7}$ (b) $\frac{1}{5}$

(c) $\frac{1}{5}$ (d) $\frac{1}{2}$

Answer: a

Explanation:

Total number of outcomes possible, n(S) = 10 + 25 = 35

P (E) = n (E)/n(S) = 10/35 = 2/7

Question 25

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) $\frac{1}{5}$

(c) $\frac{3}{25}$ (d) $\frac{1}{50}$

Answer: a

Explanation:

Let, S – sample space E – event of selecting 1 girl and 2 boys.

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

= ${}^{25}C_3$ = 2300.

n (E) = 10C1×15C2= 1050.

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

Question 26

What is the probability of getting 53 Mondays in a leap year?

(a) $\frac{1}{7}$ (b) $\frac{3}{7}$

(c) $\frac{2}{7}$ (d) $\frac{2}{7}$

Answer: c

Explanation:

1 year = 365 days. A leap year has 366 days

A year has 52 weeks. Hence there will be 52 Sundays for sure.

52 weeks = 52×7 = 364days
366 – 364 = 2 days
In a leap year there will be 52 Sundays and 2 days will be left.
These 2 days can be:
1. Sunday, Monday
2. Monday, Tuesday
3. Tuesday, Wednesday
4. Wednesday, Thursday
5. Thursday, Friday
6. Friday, Saturday
7. Saturday, Sunday
Of these total 7 outcomes, the favorable outcomes are 2.
Hence the probability of getting 53 days = $\frac{2}{7}$

Question 27

Two dice are thrown together. What is the probability that the sum of the number on the two faces is divided by 4 or 6?

(a) $\frac{7}{18}$ (b) $\frac{14}{35}$
(c) $\frac{8}{18}$ (d) $\frac{7}{35}$

Answer: a

Explanation:

Clearly, n(S) = 6×6 = 36
Let E be the event that the sum of the b=numbers on the two faces is divided by 4 or 6, Then, E = {(1, 3), (1, 5), (2, 2), (2, 4), (2, 6), (3, 1), (3, 3), (3, 5), (4, 2), (4, 4), (5,, 1), (5, 3), (6,, 2), (6, 6)}
n (E) = 14.
Hence, P (E) = $\frac{n(E)}{n(S)} = \frac{14}{36} = \frac{7}{18}$

Question 28

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

(a) $\frac{3}{13}$ (b) $\frac{1}{13}$
(c) $\frac{3}{52}$ (d) $\frac{9}{52}$

Answer: a

Explanation:

Clearly, there are 52 cards, out of which there are 12 face cards.
P (getting a face card) = $\frac{12}{52}$ =$\frac{3}{13}$.

Question 29

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: d

Explanation:

Let S be the sample space.
Then, n(S) = $^{52}C_2$ = $\frac{(52\times51)}{(2\times1)}$ = 1326
Let E = event of getting 1 spade and 1 heart.
n (E) = number of ways of choosing 1 spade out of 13 and 1 heart out of 13
= $^{13}C_1\times{}^{13}C_1$= 169.
P (E) = $\frac{n(E)}{n(S)}$ = $\frac{169}{1326}$ = $\frac{13}{102}$

Question 30

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) $\frac{3}{7}$
(b) $\frac{4}{7}$
(c) $\frac{1}{8}$
(d) $\frac{3}{4}$

Answer: b

Explanation:

Let number of balls = (6+8) = 14.
Number of white balls = 8
P (drawing a white ball) = $\frac{8}{14}$= $\frac{4}{7}$.

Question 31

In a class 30% of the students offered English, 20% offered Hindi and 10% offered both. If a student is selected at random. What is the probability that he, has offered English or Hindi?

(a) $\frac{1}{2}$
(b) $\frac{3}{4}$
(c) $\frac{4}{5}$
(d) $\frac{2}{5}$

Answer: d

Explanation:

P (E) = $\frac{30}{100}$ = $\frac{3}{10}$, P (H) = $\frac{20}{100}$ = $\frac{1}{5}$ and P (E ∩ H) = $\frac{10}{100}$ = $\frac{1}{10}$

P (E OR H) = P (E ∪ H)

= P (E) + P (H) – P (E ∩ H)

= $\left(\frac{3}{10} + \frac{1}{5} - \frac{1}{10}\right) = \frac{4}{10} = \frac{2}{5}$

Question 32

If two letters are taken at random from the word HOME.What is the probability that none of the letters would be vowels?

(a) $\frac{1}{6}$ (b) $\frac{1}{2}$

(c) $\frac{1}{3}$ (d) $\frac{1}{4}$

Answer: a

Explanation:

P (first letter is not vowel) = 2/4

P (second letter is not vowel) = 1/3

So, probability that none of the letters would be vowels is = 2/4*1/3 = 1/6

Question 33

Two cards are drawn at random from a pack of 52 cards. The probability that both are the cards of space is

(a) $\frac{1}{26}$ (b) $\frac{1}{4}$

(c) $\frac{1}{17}$ (d) None of these

Answer: c

Explanation:

Required probability = $\frac{13_{C_2}}{52_{C_2}} = \frac{13.12}{52.51} = \frac{1}{17}$

Question 33

5 boys and 5 girls are sitting in a row randomly. The probability that boys and girls sit alternatively is:

(a) $\frac{5}{126}$ (b) $\frac{1}{126}$

(c) $\frac{4}{126}$ (d) $\frac{6}{125}$

Answer: b

Explanation:

Let n = total no. of ways = 10!
m = favorable no. of ways = 2 × 5! .5!
Since the boys and girls can sit alternately in 5!.5! Ways if began with a boy and similarly they can sit alternately in 5!.5! Ways if we begin with a girl
Hence, required probability = $\frac{m}{n} = \frac{2\times5!5!}{10!} = \frac{2\times5!}{10\times9\times8\times7\times6} = \frac{1}{126}$

Question 34

Fifteen persons among whom are A and B, sit down at random at a round table. The probability that there are 4 persons between A and B, is

(a) $\frac{1}{3}$ (b) $\frac{2}{3}$
(c) $\frac{2}{7}$ (d) $\frac{1}{7}$

Answer: d

Explanation:

Let A occupy any seat at the round table. Then there are 14 seats available for B. If there are to be four persons between A and B Then B has only two ways to sit, as show in the fig. hence required probability $\frac{2}{14} = \frac{1}{7}$

Question 35

From eighty cards numbered 1 to 80, two cards are selected randomly. The probability that both the cards have the numbers divisible by 4 is given by

(a) $\frac{21}{316}$ (b) $\frac{19}{316}$
(c) $\frac{1}{4}$ (d) None

Answer: b

Explanation:

Total numbers of ways = 80_{c_2} and favorable ways = 20_{c_2}
Required probability P = $\frac{80_{c_2}}{20_{c_2}} = \frac{19}{316}$

Question 36

A bag contains 8 red and 7 black balls. Two balls are drawn at random. The probability that both the balls are of the same colour is

(a) $\frac{14}{15}$ (b) $\frac{11}{15}$
(c) $\frac{7}{15}$ (d) $\frac{4}{15}$

Answer: c

Explanation:

Required probability = either thee balls are red or the balls are black

$\frac{8_{c_2}}{15_{c_2}} + \frac{7_{c_2}}{15_{c_2}} = \frac{28+21}{105}$

$\frac{49}{105} = \frac{7}{15}$

Question 37

5 persons A, B, C, D and E are in queue of a shop. The probability that A and E always together, is:

(a) $\frac{1}{4}$ (b) $\frac{2}{3}$
(c) $\frac{2}{5}$ (d) $\frac{3}{5}$

Answer: c

Explanation:

Total number of ways = 5!

Favorable number of ways 2.4!

Hence required probability

$\frac{2.4!}{5!} = \frac{2}{5}$

Question 38

A drawer contains 5 brown socks and 4 blue socks well mixed. A man reaches the drawer pulls out 2 socks at random. What is the probability that they match?

(a) $\frac{4}{9}$ (b) $\frac{5}{8}$
(c) $\frac{5}{9}$ (d) $\frac{7}{12}$

Answer: a

Explanation:

Out of 9 socks, 2 can be drawn in 9_{c_2} ways.

Two socks drawn from the drawer will match if either both are brown of both are blue.

$5_{c_2} + 4_{c_2}$

Hence the required probability = $\frac{5_{c_2}+4_{c_2}}{9_{c_2}} = \frac{4}{9}$

Question 39

Ten students are seated at random is a row. The probability that two particular students are not seated side by side is

(a) $\frac{4}{5}$ (b) $\frac{3}{5}$

(c) $\frac{2}{5}$ (d) $\frac{1}{5}$

Answer: a

Explanation:

Total ways = 10!

Two boys can sit by side in 2 × 9! Ways.

So probability = $\frac{2\times 9!}{10!} = \frac{1}{5}$

Thus the probability that they are not seated together is $1 - \frac{1}{5} = \frac{4}{5}$

Question 40

A fair coin is tossed 100 times. The probability of getting tails and odd number of times is

(a) $\frac{1}{2}$ (b) $\frac{1}{8}$

(c) $\frac{3}{8}$ (d) None

Answer: a

Explanation:

The total number of cases are 2^{100}

The number of favorable ways $100c_1 + 100\ c_3 + \ldots + 100\ c_{99} = 2^{100} - 1 = 2^{99}$

$= \frac{2^{99}}{2^{100}} = \frac{1}{2}$

Question 41

Three cards are drawn at random from a pack of 52 cards. What is the chance of drawing three aces?

(a) $\frac{3}{5525}$ (b) $\frac{2}{5525}$

(c) $\frac{1}{5525}$ (d) None

Answer: c

Explanation:

Required probability is $\frac{^4c_3}{^{52}c_3} = \frac{1}{5525}$

Question 42

A bag contains 4 white, 5 red and 6 green balls. Three balls are picked up randomly. The probability that a white, a red and a green ball is drawn is

(a) $\frac{15}{91}$ (b) $\frac{30}{31}$

(c) $\frac{20}{91}$ (d) $\frac{24}{91}$

Answer: d

Explanation:

Required probability = $\frac{4.5.6}{15_{c_3}} = \frac{24}{91}$

Question 43

Two numbers are selected randomly from the set S = {1, 2, 3, 4, 5, 6} without replacement one by one. The probability that minimum of the two numbers is less than 4 is

(a) $\frac{1}{15}$ (b) $\frac{14}{15}$

(c) $\frac{1}{5}$ (d) $\frac{4}{5}$

Answer: d

Explanation:

Total ways = 2! 6_{c_3} = 30

Favorable cases = 30-6 = 24

Required probability = $\frac{24}{30} = \frac{4}{5}$

Question 44

A bag contains 5 black balls, 4 white balls and 3 red balls. If a ball is selected random wise, the probability that it is a black or red ball is

(a) $\frac{1}{3}$ (b) $\frac{1}{4}$

(c) $\frac{5}{12}$ (d) $\frac{2}{3}$

Answer: d

Explanation:

P (Black or Red) = $\frac{5_{c_1} + 3_{c_1}}{12_{c_1}} = \frac{2}{3}$

Question 45

In a lottery there were 90 tickets numbered 1 to 90. Five tickets were drawn at random. The probability that two of the tickets drawn numbers 15 and 89 is

(a) $\frac{2}{801}$ (b) $\frac{2}{623}$

(c) $\frac{1}{267}$ (d) $\frac{1}{623}$

Answer: a

Explanation:

Required probability = $\frac{88_{C_3}}{90_{C_5}} = \frac{2}{801}$

Question 46

A bag contains 3 red, 4 white, and 5 black balls. Three balls are drawn at random. The probability of being their different colors is

(a) $\frac{3}{11}$ (b) $\frac{2}{11}$

(c) $\frac{8}{11}$ (d) None

Answer: a

Explanation:

Probability = $\frac{3_{C_1} \times 4_{C_1} \times 5_{C_1}}{12_{C_3}} = \frac{3}{11}$

Question 47

Dialing a telephone number an old man forgets the last two digits remembering only that these are different dialed at random. The probability that the number is dialed correctly, is

(a) $\frac{1}{45}$ (b) $\frac{1}{90}$

(c) $\frac{1}{100}$ (d) $\frac{1}{80}$

Answer: b

Explanation:

There are 10 digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

The last two digits can be dialed in 10_{P_2} = 90 ways.

Out of which only one way is favorable. Thus the required probability $= \frac{1}{90}$

Question 48

Two friends A and B have equal number of daughters. There are three cinema tickets which are to be distributed among the daughters of A and B. The probability that all tickets go to daughters to A and B. The probability that all the tickets go to daughters of A is, $\frac{1}{20}$. The numbers of daughters each of them have is

(a) 4 (b) 5

(c) 6 (d)3

Answer: d

Explanation:

Let each of the friend have x daughters. Then the probability that all the tickets go to the daughters of A is $\frac{x_{C_3}}{2X_{C_3}}$

Therefore = $\frac{x_{C_3}}{2x_{C_3}} = \frac{1}{20}$

Question 49

From a class of 12 girls and 18 boys, two students are chosen randomly. What is the probability that both of them are girls?

(a) $\frac{22}{145}$ (b) $\frac{13}{15}$

(c) $\frac{1}{8}$ (d) none

Answer: a

Explanation:

Required probability = $\frac{12_{C_2}}{30_{C_2}} = \frac{12\times11}{30\times29} = \frac{22}{145}$

Question 50

Twenty tickets are marked the numbers 1, 2, ... 20. If their tickets be drawn at random, then what is the probability that those marked 7 and 11 are among them.

(a) $\frac{3}{190}$ (b) $\frac{1}{19}$

(c) $\frac{1}{190}$ (d) None

Answer: a

Explanation:

7 and 11 have always 10 be in that group of three, therefore 3rd ticket may be chosen in 18 ways.

Hence required probability is $\frac{18}{20_{C_3}} = \frac{18.3.2}{20.19.18} = \frac{3}{190}$

Question 51

The letter of the word 'ASSASSIN' are written down at random in arrow. The probability that no two S occur together is

(a) $\frac{1}{35}$ (b) $\frac{1}{14}$
(c) $\frac{1}{15}$ (d) None

Answer: b

Explanation:

Total ways of arrangements = $\frac{8!}{2!.4!}$ w·x·y·z

Now S can have places at dot's and in places of w, x, y, z

We have to put 2A's, one I and one N.

Therefore favorable ways = $5\left(\frac{4!}{2!}\right)$

Hence required probability = $\frac{5.4!2!4!}{21.8!}$

$= \frac{1}{14}$

Question 52

A and B are two independent events such that P (A) = $\frac{1}{2}$ and P (B) = $\frac{1}{3}$. Then P (neither A nor B) is equal to

(a) $\frac{2}{3}$ (b) $\frac{1}{6}$
(c) $\frac{5}{6}$ (d) $\frac{1}{3}$

Answer: d

Explanation:

P (neither A nor B) = P $(\bar{A}\cap\bar{B})$ = P $(\overline{A})$.P $(\bar{B})$

= P$(\bar{A})$ = 1-P (A) = 1-$\frac{1}{2}$ = $\frac{1}{2}$

= P $(\bar{B})$ = 1-P$(\bar{B})$ = 1-$\frac{1}{3}$ = $\frac{2}{3}$

$\therefore$ P$(\bar{A})$.P$(\bar{B})$ = $\frac{1}{2} \times \frac{2}{3} = \frac{1}{3}$

Question 53

In a throw of a dice the probability of getting one in even number of throw is

(a) $\frac{5}{36}$ (b) $\frac{5}{11}$
(c) $\frac{6}{11}$ (d) $\frac{1}{6}$

Answer: b

Explanation:

Probability of getting 1 on 2nd throw,

$P(2)\left(\frac{5}{6}\right)\left(\frac{1}{6}\right)$

Probability of getting 1 on 4th throw,

$P(4)\left(\frac{5}{6}\right)^3\left(\frac{1}{6}\right)$

Probability of getting 1 on 6th throw,

$P(6)\left(\frac{5}{6}\right)^5\left(\frac{1}{6}\right)$

Therefore total probability

$P = P(2) + P(4) + P(6) + \ldots$

$P = \left(\frac{5}{6}\right)\left(\frac{1}{6}\right) + \left(\frac{5}{6}\right)^3\left(\frac{1}{6}\right) + \left(\frac{5}{6}\right)^5\left(\frac{1}{6}\right) + \ldots$

$P = \frac{1}{6}\left[\left(\frac{5}{6}\right) + \left(\frac{5}{6}\right)^3 + \left(\frac{5}{6}\right)^5 + \cdots.\right]$

By sum of an infinite geometric series,

$P = \frac{1}{6}\left[\frac{\frac{1}{6}}{1-\left(\frac{5}{2}\right)^2}\right]$

$P = \frac{5}{11}$

Question 54

For any two events A and B:

(a) $P(A - B) = P(A) - P(B)$

(b) $P(A - B) = P(A) - P(A \cap B)$

(c) $P(A - B) = P(B) - P(A \cap B)$

(d) $P(B - A) = P(B) + P(A \cap B)$

Answer: b

Explanation:

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$, and specialize this formula for the case (a) when A, B are mutually exclusive events and for the case (b) where A, Bare statistically independent

Question 55

Five Persons A, B, C, D and E are in queue of a shop. The probability that A and E are always together, is

(a) $\frac{1}{4}$

(b) $\frac{2}{3}$

(c) $\frac{2}{5}$

(d) $\frac{3}{5}$

Answer: c

Explanation:

Total number of person = 5

Total outcome = 5!
A & E come together. $\underline{AE}\overline{2}\overline{3}\overline{4}$
Favorable outcome = 4!× 2!
probability $\frac{4!\times 2!}{5!}\left[P = \frac{favorable}{Total}\right]$
= $\frac{2}{5}$ option (c) is correct.

Question 56

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

(a) $\frac{3}{13}$ (b) $\frac{1}{13}$
(c) $\frac{3}{52}$ (d) $\frac{9}{52}$

Answer: a

Explanation:

Clearly, there are 52 cards, out of which there are 12 face cards.
P (getting a face card) = $\frac{12}{52}$=$\frac{3}{13}$.

Question 57

If two Unbiased Coins are tossed what is Probability of getting at least one tail?

(a) 1/4 (b) 3/4
(c) 1/2 (d) 2/3

Answer: b

Explanation:

At least one tail

LET A=event of getting at least one tail (HT,TH,TT) P(A)= (N(A))/(N(S))=3/4

Past Examination Question

MAY - 2018

Question 1

Two broad divisions of probability are:

(a) Subjective probability and Objective probability
(b) Deductive probability and mathematical probability
(c) Statistical probability and mathematical probability
(d) None

Answer: a

Explanation:

Two broad and divisions of probability are
A. Subjective probability
B. Objective probability

Question 2

The term ''chance'' and probability is synonyms:

(a) True
(b) False
(c) Both
(d) None

Answer: a

Explanation:

The terms ''chance'' and probability are synonyms is True.

Question 3

The theorem of compound probability states that for any two A and B

(a) P $(A \cap B)$ = P (A) X P $\left(\frac{B}{A}\right)$
(b) P $(A \cup B)$ = P (A) X P $\left(\frac{B}{A}\right)$
(c) P $(A \cap B)$ = P (A) x P (B)
(d) P $(A \cup B)$ = P (A) + P (B) – P $(A \cap B)$

Answer: a

Explanation:

The theorem of compound probability states that for only events A and B given by

P $(A \cap B)$ = P (A) x P $\left(\frac{B}{A}\right)$

Question 4

Variance of a random variable x is given by

(a) $E(X-\mu)^2$
(b) $E[X-E(X)]^2$
(c) $E(X^2-\mu)$
(d) (a) or (b)

Answer: d

Explanation:

Variance of a random variable x is given by V(x) = E$(x-\mu)^2$

Or

V(x) = $[E(X-E(x)]^2$

Question 5

What is the probability of having at least one' six' year's throws of a project die?

(a) $\frac{5}{6}$

(b) $\left(\frac{5}{6}\right)^3$

(c) 1-$\left(\frac{1}{6}\right)^3$

(d) 1-$\left(\frac{5}{6}\right)^3$

Answer: d

Explanation:

For a die probability of getting six

P (A) = $\frac{1}{6} \rightarrow$ p

P ($\bar{A}$) = 1 - $\frac{1}{6}$ = $\frac{5}{6} \rightarrow$ q

Here n = 3

P(getting at least '1' six) = P (X≥1)

= 1 – P (X<1)

= 1-P (X=0)

$= 1 - 3_{C_0} . \left[\frac{1}{6}\right]^0 . \left(\frac{1}{6}\right)^{3-0}$

$= 1 - 1 \times 1 \times \left[\frac{5}{6}\right]^3$

$= 1 - \left[\frac{5}{6}\right]^3$

Question 6

Sum of all probabilities mutually exclusive and exhaustive events is equal to

(a) 0

(b) $\frac{1}{2}$

(c) $\frac{1}{4}$

(d) 1

Answer: d

Explanation:

Sum of all probabilities mutually exclusive and exhaustive events is equal to 1

Question 7

If two random variables x and y are related by = 2 – 3x then the SD of y is given by

(a) – 3 × SD of ×
(b) 3 × SD of ×
(c) 9 × SD of ×
(d) 2 × SD of ×

Answer: b

Explanation:

Given Equation

y = 2 – 3 ×

3x + y – 2 = 0

$B = \frac{-\text{ coedfficent of } x}{\text{coefficient of } y} = \frac{-3}{1} = -3$

S.D of y = |b| S.D of x

= |−3|. S.D of x

= 3x S.D of x

NOV - 2018

Question 1

If P (A) = $\frac{1}{2}$, P (B) = $\frac{1}{3}$, and P (A ∩ B) = $\frac{1}{4}$, then P (A ∪ B) is equal to

(a) $\frac{11}{12}$
(b) $\frac{10}{12}$
(c) $\frac{7}{12}$
(d) $\frac{1}{6}$

Answer: c

Explanation:

P (A) = $\frac{1}{2}$, P (B) = $\frac{1}{3}$, and P (A ∩ B) = $\frac{1}{4}$

We know that

P (A ∪ B) = P (A) + P (B) – P (A ∩ B)

$\frac{1}{2} + \frac{1}{3} - \frac{1}{4}$

$\frac{6+4-3}{12} = \frac{7}{12}$

Question 2

The probability that a leap year has 53Wednesday is

(a) $\frac{2}{7}$
(b) $\frac{3}{5}$
(c) $\frac{2}{3}$
(d) $\frac{1}{7}$

Answer: a

Explanation:

In a leap year, there are 366 days.

366 days = 52 weeks and 2 days.

2 odd days may be:

(a) Sunday and Monday
(b) Monday and Tuesday
(c) Tuesday and Wednesday
(d) Wednesday and Thursday
(e) Thursday and Friday
(f) Friday and Saturday
(g) Saturday and Sunday

No. of sample space
n(S) = 7
Event (A) = 'getting Wednesday'
n (A) = 2
P (A) = $\frac{2}{7}$

Question 3

A coin is tossed six times, then the probability of obtaining heads and tails alternatively is

(a) $\frac{1}{2}$ (b) $\frac{1}{64}$
(c) $\frac{1}{32}$ (d) $\frac{1}{16}$

Answer: c

Explanation:

If one coin is tossed '6' times

P (H) = $\frac{1}{2}$, P (T) = $\frac{1}{2}$

P (Alternate getting 'H' & ''T') = P (HT HT HT) + P (TH TH TH)

$$\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$$

$$\frac{1}{64}+\frac{1}{64}=\frac{2}{64}=\frac{1}{32}$$

Question 4

Ram is known to hit a target in 2 out of 3 shots whereas Shyam is known to hit the same target in 5 out of 11 shots. What is the probability that the target would be hit if they both try?

(a) $\frac{9}{11}$ (b) $\frac{3}{11}$
(c) $\frac{10}{11}$ (d) $\frac{6}{11}$

Answer: a

Explanation:

Probability of hitting the target by Ram P (A) = $\frac{2}{3}$

Probability of hitting the target by Shyam P (B) $\frac{5}{11}$

$P(\bar{A}) = 1 - \frac{2}{3} = \frac{1}{3}$

$P(\bar{B}) = 1 - \frac{5}{11} = \frac{6}{11}$

P (Target WOULT be HIT) = 1-P $(\bar{A} \cap \bar{B})$

1- $P(\bar{A}).\, P(\bar{B})$

$1 - \frac{1}{3} \times \frac{6}{11}$

$= 1 - \frac{2}{11} = \frac{9}{11}$

Question 5

Two different dice are thrown simultaneously, then the probability, that the sum of two numbers appearing on the top of dice is 9 is

(a) $\frac{8}{9}$
(b) $\frac{1}{9}$
(c) $\frac{7}{9}$
(d) None

Answer: b

Explanation:

If two dice are rolled then

Sample space n(s) = $6^2 = 36$

Event (A) = Getting the sum is ‘9’

= {(6, 3) (3, 6)(4, 5) (5, 4)}

n (A) = 4

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

Question 6

If P (A ∪ B) = 0.8 and P (A ∩ B) = 0.3, then P$(\bar{A})$ + P $(\bar{B})$ is equal to

(a) 0.3
(b) 0.5
(c) 0.7
(d) 0.9

Answer: d

Explanation:

Given

P (A ∪ B) = 0.8 and P (A ∩ B) = 0.3

We know that

P (A ∪ B) = P (A) + P (B) – P (A∩ B)

0.8 = [1 - P$(\bar{A})$| + [1 – P $(\bar{B})$ - 0.3

$P(\bar{A}) + P(\bar{B}) = 2 - 0.3 - 0.8$

$P(\bar{A}) + P(\bar{B}) = 0.9$

MAY - 2019

Question 1

If a coin is tossed 5 times, then the probability of getting Tail and Head occurs alternatively is:

(a) $\frac{1}{18}$ (b) $\frac{1}{16}$

(c) $\frac{1}{32}$ (d) $\frac{1}{64}$

Answer: c

Explanation:

$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{32}$

Question 2

According to bayee's theorem,

$P(E_K IA) = \frac{P(E_K)P\left(\frac{A}{E_K}\right)}{\sum_{i=1}^{n} P(E_i)P\left(\frac{A}{E_i}\right)}$ here

(a) E_1, E_2 .....are mutually exclusive (b) $P\left(\frac{E}{A}\right), P\left(\frac{E}{A_2}\right)$ .....are equal to 1

(c) $P\left(\frac{A_t}{E}\right), P\left(\frac{A_2}{E}\right)$ .... Are equal to 1 (d) A & E's are disjoint sets

Answer: a

Explanation:

Mutually Exclusive

Question 3

If y ≥ then mathematical expectation is

(a) E (x) > E (Y) (b) E (x) ≤ E (Y)

(c) E (x) = E (Y) (d) E (x) . E (Y)

Answer: a

Explanation:

If y ≥ x

Then E (y) ≥ E (X)

E (x) ≤ E (y)

Question 4

Two event A and B are such that they do not occurs simultaneously then they are called__________ event

(a) Mutually exhaustive (b) Mutually exclusive

(c) Mutually independent (d) Equally likely

Answer: b

Explanation:

Two events A and B such that they do not occurs simultaneously then they are called Mutually Exclusive events.

Question 5

When 2 – dice are thrown simultaneously then the probability of getting at least one 5 is

(a) $\frac{11}{35}$ (b) $\frac{5}{36}$

(c) $\frac{8}{15}$ (d) $\frac{1}{7}$

Answer: a

Explanation:

$`A' = \begin{bmatrix} (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (1,5) & (2,5) & (3,5) & (4,5) & & (6,5) \end{bmatrix}$

n (A) = 11

$p\ (A) = \frac{n\ (A)}{n\ (s)}$

$= \frac{11}{36}$

NOV - 2019

Question 1

Two letters are chosen from the word HOME. What is the probability that the letters chosen are not vowels?

(a) V2 (b) $\frac{1}{6}$

(c) $\frac{2}{3}$ (d) 0

Answer: b

Explanation:

(b) HOME

Total letters = 4

Total vowels = 2 {O, E}

Total consonants = 2 {H, M}

P (that 2 letters choosen are not vowels)$\frac{2}{4}$

P (that 2 letters choosen are consonants)$\frac{1}{3}$

$\frac{2\times4}{1\times3} = \frac{1}{6}$ (Required probability)

Question 2

If A, B. C are three mutually exclusive and exhaustive events such that: P (A) = 2 P (B) = 3P(C) what is P (B)?

(a) $\frac{6}{11}$ (b) $\frac{3}{11}$

(c) $\frac{1}{6}$ (d) $\frac{1}{3}$

Answer: b

Explanation:

(b) Since A, B, C are mutually exclusive events

P (A∩B) = 0, P (B∩C) = 0, P (C∩A) = 0 and P(A∩B∩C) = 0

Since A, B C are mutually exhaustive P (A∪B) = 1

We know,

P (A∪B) = P(A) + P(B) + P(C) – P(A∩B) – P(B∩C) – P(C∩A) + P(A∩B∩C)

1 = P(A) + P(B) + P(C) – 0 – 0 + 0

P (A) + P (B) + P (C) = 1

In given question; P (A) = 2P (B) = 3P (C)

P (A) = 2P (B)

And P (C) = $\frac{2}{3}$P (B)

Put Eq 2 and 3 in Eq 1

2P (B) + P (B) + = $\frac{2}{3}$P (B) = 1

$\frac{11}{3}$ P (B) = 1

P (B) =$\frac{3}{11}$

Question 3

What is the probability of getting 7 or 11 when two dices are thrown?

(a) $\frac{2}{9}$ (b) $\frac{6}{36}$

(c) $\frac{10}{36}$ (d) $\frac{2}{36}$

Answer: a

Explanation:

(a) When two dices are thrown

n (S) = 36

A event of getting sum 7

B event of getting sum 11

A {(1, 6), (2, 5), (3, 4), (4, 3), (5, 2), (6, 1)}

n (A) = 6

B {(5, 6), (6, 5)}

n (B) = 2

P (of getting sum 7 or 11) = $\frac{6+2}{36}$

$= \frac{8}{36} = \frac{2}{9}$

Question 4

A log contains 15 one rupee coins, 25 two rupee coins if a coin is selected at random than probability for not selecting a one-rupee coin is:

(a) 0.30 (b) 0.20

(c) 0.25 (d) 0.70

Answer: d

Explanation:

Given: Bag containing 15 one rupee coin +25 two rupee coin+10 five rupee coin =50 coins in total.

To find: the probability of not selecting a one rupee coin

Sol: The probability of not picking a one-rupee coin is 1 minus the probability of picking a one-rupee coin.

Hence the required probability = $1 - \frac{15}{50} = \frac{35}{50} =$ 0.7

Question 5

What is the probability of occurring 4 or more than 4 accidents?

No. of acc.	1	2	3	4	5	6	7
Frequency	8	17	15	24	27	18	9

(a) 24 (b) 69

(c) 78 (d) 80

Answer: c

Explanation:

(No. of 4 or more accidents) = 24 + 27 + 18 +9

= 78

Total accidents = 8 + 17 + 15 + 24 + 27 + 18 + 9

= 118

DEC - 2020

Question 1

When 2 fair dice are thrown. What is the probability of getting the sum which is a multiple of 3?

(a) $\frac{4}{36}$ (b) $\frac{8}{36}$

(c) $\frac{2}{36}$ (d) $\frac{12}{36}$

Answer: d

Explanation:

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

Favourable outcome is = 12

Hence, $\frac{12}{36}$ is the answer

Question 2

When 3 dice are rolled simultaneously the probability of a number on the third die is greater than the sum of the numbers on two dice.

(a) $\frac{12}{216}$ (b) $\frac{36}{216}$

(c) $\frac{48}{216}$ (d) $\frac{16}{216}$

Answer: d

Explanation:

Believing all three dice are 'fair' ones.

When three dice are thrown simultaneously; there are (6 * 6 * 6) = 216 possible outcomes.

Now, 2 ≤ Sum of those appeared on the first two dice ≤ 12.

But, 1 ≤ Number appearing on third die ≤ 6.

Thus, only the following outcomes on the three dice give the desired result : (1, 1, 3), (1, 1, 4), (1, 2, 4), (2, 1, 4), (1, 1, 5), (1, 2, 5), (1, 3, 5), (2, 1, 5), (3, 1, 5), (1, 1, 6), (1, 2, 6), (1, 3, 6), (1, 4, 6), (2, 1, 6), (3, 1, 6) and (4, 1, 6). Total 16 outcomes.

Thus, the required probability = (16 / 216) = (2 / 27) = 0.074074.

Question 3

If A speaks 75% of truth and B speaks 80% of truth. In what percentage both of them likely to contradict with each other in narrating the same questions

(a) 0.60 (b) 0.45

(c) 0.65 (d) 0.35

Answer: d

Explanation:

A Speak truth 75% i.e., P (A) =$\frac{3}{4}$, $P(\bar{A}) = \frac{1}{4}$

Similarly, B speak truth 80%i.e.,75% i.e., P(B)=$\frac{4}{5}$, $P(\bar{B}) = \frac{1}{5}$

While contradicting the narration Probability = P(A) $P(\bar{B})$+ $P(\bar{A})$P(B)

$$\frac{3}{4} \times \frac{1}{5} + \frac{1}{4} \times \frac{4}{5}$$

$$\frac{7}{20} = \frac{7}{20} \times 100\% = 35\%$$

Question 4

When two coins are tossed simultaneously the probability of getting at least one tail?

(a) 1 (b) 0.75

(c) 0.5 (d) 0.25

Answer: b

Explanation:

If two coins are tossed

Then sample space S = {HH, HT, TH, TT}

n (S) = 4

Event (A) = getting at least one tails

(A) = { HT, TH, TT}

n (A) = 3

p (A) = $\frac{n\,(A)}{n\,(S)} = \frac{3}{4} = 0.75$

JAN - 2021

Question 1

Two dice are thrown simultaneously. The probability of a total score of 5 from the outcomes of dice is '

(a) 1/18 (b)1/12

(c) 1/9 (d) 2/5

Answer: c

Explanation:

If two dice are thrown simultaneously, the total number of sample space is 36

Favourable outcomes = (1, 4), (4, 1), (2, 3) and (3, 2)

Therefore, the required probability = 4/ 36 = 1/9.

Question 2

If an unbiased coin is tossed twice, then the probability of obtaining at least one tail is '

(a) 1 (b) 0.5

(c) 0.75 (d) 0.25

Answer: c

Explanation:

we know that P(HHH)+P(HT)+ P(TH)+ P(TT) = 1

P(HT)+ P(TH)+ P(TT) = 1-P(HH)

$= 1 - \frac{1}{4} = \frac{3}{4}$

= 0.75

Question 3

If an unbiased coin is tossed three times. What is the probability of getting more than one head?

(a) $\frac{1}{2}$ (b) $\frac{3}{8}$

(c) $\frac{7}{8}$ (d) $\frac{1}{3}$

Answer: a

Explanation:

Given: coin tossed three times

To find: the probability of getting more than one head Sol: The sample space is {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT}, n(S)=8

The favourable outcomes for getting more than one head is {HHH, HHT, HTH, THH}, n(E)=4

Hence, the probability of getting more than one head is $\frac{n(E)}{n(S)} = \frac{4}{8} = \frac{1}{2}$

Question 4

An event that can be subdivided into further events is called as

(a) A composite event (b) A complex event

(c) A mixed event (d) A simple

Answer: Options (a)

Explanation:

An event that can be sub – divided into further events is called as a composite event.

Question 5

Three identical and balanced dice are rolled. The probability that the same number will appear on each of them is.

(a) $\frac{1}{6}$ (b) $\frac{1}{18}$

(c) $\frac{1}{36}$ (d) $\frac{1}{24}$

Answer: Options (c)

Explanation:

If three identical dice are rolled then no. of sample space

n (s) = 6^3

= 216

Event (A) = `getting some number will appear in each

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

n (A) = 6

P (A) = $\frac{n\ (A)}{n\ (s)} = \frac{6}{216} = \frac{1}{36}$

Question 6

A basket contains 15 white balls, 25 red balls and 10 blue balls if a ball is selected at random, the probability of selecting not a white ball

(a) 0.20
(b) 0.25
(c) 0.60
(d) 0.70

Answer: Options (d)

Explanation:

Total Balls = 15 w + 25R + 10B

= 50

If one ball is selected then

Sample space n (s) = ${}^{50}C_1$ = 50

Event (A) = `GETTING NOT A WHITE BALL'

n (A) = ${}^{35}C_1$ = 35

P (A)= $\frac{n\ (A)}{n\ (s)} = \frac{35}{50}$ = 0.70

JULY – 2021

Question 1

A biased coin is such that the probability of getting a head is thrice the probability of getting a tail. If the coin is tossed 4 times, what is the probability of getting a head all the times?

(a) 2/5
(b) 81/128
(c) 81/256
(d) 81/64

Answer: Options (c)

Explanation:

Here Probability of success = p

Probability of failure = q

Given p =3q

We know that

P + q = 1

3q + q = 1

4 q = 1

Q = ¼

Q = ¼ in eq (1) we get

$P = 3 \times \frac{1}{4}$

P = ¾

Here n = 4

P (all head) = p (x=4)

$= n_{C_{x.}}\ p^x . q^x$

$= 4_{C_{4.}} \left(\frac{3}{4}\right)^4 \left(\frac{1}{4}\right)^{4-4}$

$= 1 \times \frac{81}{256} \times 1 = \frac{81}{256}$

Question 2

If there are 16 phones, 10 of them are Android and 6 of them are of Apple, then the probability of 4 randomly selected phones to include 2 Android and 2 Apple phone is

(a) 0.47 (b) 0.51

(c) 0.37 (d) 0.27

Answer: Options (c)

Explanation:

∴ Probability of 4 randomly selected phones to include 2 Android and 2 Apple phone

$= \frac{\textbf{Total favourable outcome}}{\textbf{Sample Space}} = \frac{\mathbf{6}}{\mathbf{16}}$

Question 3

If there are 48 marbles marked with numbers 1 to 48, then the probability of selecting a marble having the number divisible by 4 is

(a) 1/2 (b) 2/3

(c) 1/3 (d) 1/4

Answer: Options (b)

Explanation:

Given: Marbles with numbers marked on each of them are 1, 2, 3, 4 … 48

∴ Probability of selecting a marble having the number divisible by

$4 = \frac{\textbf{Total favourableoutcome}}{\textbf{Sample Space}}$

$\frac{32}{48} = \frac{2}{3}$

Question 4

In a class, 40% of the students study math and science. 60% of the students study math. What is the probability of a student studying science given he/she is already studying math?

(a) 0.25 (b) 0.40

(c) 0.67 (d) 0.60

Answer: Options (c)

Explanation:

P (Mands) = 0.60

P (M) = 0.60

P (S|M) = $\frac{P(M \text{ and } S)}{P(S)} = \frac{0.40}{0.60} = \frac{2}{3}$ = 0.67

Question 5

A begs contains 7 blue and 5 green balls. One ball is drawn at random. The probability of getting a Blue ball is

(a) 5/12 (b) 12/35

(c) 7/12 (d) 0

Answer: Options (c)

Explanation:

Number of green balls=5

Number of blue balls=7

Total number of balls=12

Probability of not green balls =number of not green balls/ total number of balls =7/12.

Question 6

The probability that a football team losing a match at Kolkata is 3/5 and wining a match at Bengaluru is 6/7, the probability of the team winning at least one match is

(a) 3/35 (b) 18/35

(c) 32/35 (d) 17/35

Answer: Options (c)

Explanation:

P (winning) + P (losing) + P (drawing) = 1

3/5 +6/7+P (drawing) =1

P (drawing) = 32/35.

Question7

The value of K for the probability density function of a variate X is equal to

X	0	1	2	3	4	5	6
P (X)	5K	3K	4K	6K	7K	9K	11K

(a) 39 (b) 1/40
(c) 1/49 (d) 1/45

Answer: Options (c)

Explanation

Note: - Sum of all probabilities = 1

Therefore, 5k + 3k + 4k + 6k + 7k + 9k + 11k = 1

∴k=149

Question8

If in a class 60% of the student study mathematics and science and 90% of the student study science then the probability of a student studying mathematics given that he/ she is already studying science is:

(a) 1/4 (b) 2/3
(c) 1 (d) 1/2

Answer: Options (b)

Explanation

Mathematics → A

Science → B

Here P (A ∩ B) = $\frac{60}{100} = 0.6$

P (B) = $\frac{90}{100} = 0.9$

P (A/B) = p $\frac{(A \cap B)}{P\ (B)} = \frac{0.6}{0.9} = \frac{2}{3}$