Exercise 13.1: Probability

Q:1: The probability that it will rain tomorrow is 0.85. What is the probability that it will not rain tomorrow?

Soln:

Given: Probability that it will rain P(E) = 0.85

TO FIND: Probability that it will not rain P(E)

CALCULATION: We know that sum of the probability of occurrence of an event and probability of non occurrence of an event is 1.

P(E) + P(¯E)$P(\bar{E})$= 1

0.85 + P(¯E)$P(\bar{E})$ = 1

P(¯E)$P(\bar{E})$ = 1 – 0.85

P(¯E)$P(\bar{E})$ = 0.15

Hence the probability that it will not rain is = 0.15

Q: 2. A die is thrown. Find the probability of getting:

(i) a prime number

(ii) 2 or 4

(iii) a multiple of 2 or 3

(iv) an even prime number

(v) a number greater than 5

(vi) a number lying between 2 and 6

Soln:

GIVEN: A dice is thrown once

TO FIND

(i) Probability of getting a prime number

(ii) Probability of getting 2 or 4

(iii) Probability of getting a multiple of 2 or 3.

(iv) Probability of getting an even number

(v) Probability of getting a number greater than five.

(vi) Probability of lying between 2 and 6

Total number on a dice is 6.

(i) Prime number on a dice are 2,3,5 Total number of prime numbers on dice is 3

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting a prime number = 36=12 $\frac{3}{6} = \frac{1}{2}$

(ii) For getting 2 and 4 favorable outcome are 2

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting 2 or 4 = 26=13 $\frac{2}{6}=\frac{1}{3}$

(iii) Multiple of 2 are 3 are 2, 3, 4 and 6

Hence favorable outcome is 4

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting an multiple of 2 or 3 = 46=23 $\frac{4}{6}=\frac{2}{3}$

(iv) An even prime number is 2

Hence favorable outcome is 1

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting an even prime number 16 $\frac{1}{6}$

(v) A number greater than 5 is 6

Hence favorable outcome is 1

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting a number greater than 5 = 16 $\frac{1}{6}$

(vi) Total number on a dice is 6.

Number tying between 2 and 6 are 3, 4 and 5

Total number of number lying between 2 and 6 is 3

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting a number lying between 2 and 6 = 36=12 $\frac{3}{6} = \frac{1}{2}$

Q: 3. Three coins are tossed together. Find the probability of getting:

(i) exactly two heads

(ii) at most two heads

(iii) at least one head and one tail

(iv) no tails

Soln:

GIVEN: Three coins are tossed simultaneously.

TO FIND: We have to find the following probability

When three coins are tossed then the outcome will be

TTT, THT, TTH, THH. HTT, HHT, HTH, HHH.

Hence total number of outcome is 8.

(i) For exactly two head we get favorable outcome as THH, HHT ,HTH

Hence total number of favorable outcome i.e. exactly two head 3

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting exactly two head is 38 $\frac{3}{8}$

(ii) In case, at least two head we have favorable outcome as HHT, HTH, HHH ,THH

Hence total number of favorable outcome i.e. at least two head is 4

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting at least two head when three coins are tossed simultaneously is equal to 48=12 $\frac{4}{8} = \frac{1}{2}$

(iiii) At least one head and one tail we get in case THT, TTH, THH. HTT, HHT, HTH,

Hence total number of favorable outcome i.e. at least one tail and one head is 6

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting at least one head and one tail is equal to 68=34 $\frac{6}{8} = \frac{3}{4}$

(iv) No tail i.e HHH

Hence total number of favorable outcome is 1

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting no tails is 18 $\frac{1}{8}$

Q: 4. A and B throw a pair of dice. If A throws 9, find B's chance of throwing a higher number

Soln:

GIVEN: A pair of dice is thrown

TO FIND: Probability that the total of numbers on the dice is greater than 9

Let us first write the all possible events that can occur

(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),

Hence total number of events is $6^2 = 36$

Favorable events i.e. getting the total of numbers on the dice greater than 9 are

(5,5), (5,6), (6,4), (4,6), (6,5) and (6,6),

Hence total number of favorable events i.e. getting the total of numbers on the dice greater than 9 is 6

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting the total of numbers on the dice greater than 9 is 636=16

$$\frac{6}{36} = \frac{1}{6}$$

Q: 5. Two unbiased dice are thrown. Find the probability that the total of the numbers on the dice is greater than 10.

Soln:

GIVEN: A pair of dice is thrown

TO FIND: Probability that the total of numbers on the dice is greater than 10

Let us first write the all possible events that can occur

(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),

Hence total number of events is $6^2 = 36$

Favorable events i.e. getting the total of numbers on the dice greater than 10

Is (5, 6), (6, 5) and (6, 6)

Hence total number of favorable events i.e. getting the total of numbers on the dice greater than 10 is 3

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting the total of numbers on the dice greater than 10 is 336=112

$$\frac{3}{36} = \frac{1}{12}$$

Q: 6. A card is drawn at random from a pack of 52 cards. Find the probability that the card drawn is:

(i) a black king

(ii) either a black card or a king

(iii) black and a king

(iv) a jack, queen or a king

(v) neither a heart nor a king

(vi) spade or an ace

(vii) neither an ace nor a king

(viii) neither a red card nor a queen

(ix) the seven of clubs

(x) a ten

(xi) a spade

(xii) a black card

(xiii) a seven of clubs

(xiv) jack

(xv) the ace of spades

(xvi) a queen

(xvii) a heart

(xviii) a red card

Soln:

Given: A card is drawn at random from a pack of 52 cards

TO FIND: Probability of the following

Total number of cards = 52

(i) Cards which are black king is 2

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting a black king is equal to 252=126 $\frac{2}{52} = \frac{1}{26}$

(ii) Total number of black cards is 26

Total numbers of kings are 4 in which 2 black kings are also included

Hence total number of black card or king will be 26+2 = 28

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Numberoffavorableevent}{Totalnumberofevent}$$

Hence probability of getting a black cards or a king = 2852=713 $\frac{28}{52} = \frac{7}{13}$

(iii) Total number of black and a king cards is 2

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Numberoffavorableevent}{Totalnumberofevent}$$

Hence probability of getting a black cards and a king is 252=126 $\frac{2}{52} = \frac{1}{26}$

(iv) A jack, queen or a king are 3 from each 4 suits

Total number of a jack, queen and king are 12

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Numberoffavorableevent}{Totalnumberofevent}$$

Hence probability of getting a jack, queen or a king is 1252=313 $\frac{12}{52} = \frac{3}{13}$

(v) Total number of heart cards are 13 and king are 4 in which king of heart is also included.

Total number of cards that are a heart and a kingie equal to 13 + 3 = 16

Hence Total number of cards that are neither a heart nor a king = 52 – 16 = 36

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Numberoffavorableevent}{Totalnumberofevent}$$

Hence probability of getting cards neither a heart nor a king = 3652=913 $\frac{36}{52} = \frac{9}{13}$

(vi)Total number of spade cards is 13

Total number of aces are 4 in which ace of spade is included in the spade cards.

Hence total number of card which are spade or ace = 13 + 3 = 16

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Numberoffavorableevent}{Totalnumberofevent}$$

Hence probability of getting cards that is spade or an ace = 1652=413 $\frac{16}{52} = \frac{4}{13}$

(vii) Total number of ace card are 4 and king are 4

Total number of cards that are a ace and a king is equal to 4 + 4 = 8

Hence Total number of cards that are neither an ace nor a king is 52 – 8 = 44

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Numberoffavorableevent}{Totalnumberofevent}$$

Hence probability of getting cards neither an ace nor a king = 4452=1113 $\frac{44}{52} = \frac{11}{13}$

(viii) Total number of red cards is 26

Total numbers of queens are 4 in which 2 red queens are also included

Hence total number of red card or queen will be 26+2 = 28

Hence Total number of cards that are neither a red nor a queen= 52 -28 = 24

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Numberoffavorableevent}{Totalnumberofevent}$$

Hence probability of getting neither a red card nor a queen is equal to 2452=613 $\frac{24}{52} = \frac{6}{13}$

(ix) Total number of card other than ace is 52-4 = 48

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Numberoffavorableevent}{Totalnumberofevent}$$

Hence probability of getting other than ace is 4852=1213 $\frac{48}{52} = \frac{12}{13}$

(x) Total number of ten is 4

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Numberoffavorableevent}{Totalnumberofevent}$

Hence probability of getting a ten is 452=113 $\frac{4}{52} = \frac{1}{13}$

(xi) Total number of spade is 13

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Numberoffavorableevent}{Totalnumberofevent}$

Hence probability of getting a spade = 1352=14 $\frac{13}{52} = \frac{1}{4}$

(xii) Total number of black cards is 26

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Numberoffavorableevent}{Totalnumberofevent}$

Hence probability of getting black cards is 2652=12 $\frac{26}{52} = \frac{1}{2}$

(xiii) Total number of 7 of club is 1

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Numberoffavorableevent}{Totalnumberofevent}$

Hence probability of getting a 7 of club is equal to = 152 $\frac{1}{52}$

(xiv) Total number of jacks are 4

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Numberoffavorableevent}{Totalnumberofevent}$

Hence probability of getting jack 452=113 $\frac{4}{52}=\frac{1}{13}$

(xv) Total number of ace of spade is 1

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting a ace of spade = 152 $\frac{1}{52}$

(xvi) Total number of queen is 4

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting a queen is 452=113 $\frac{4}{52}=\frac{1}{13}$

(xvii) Total number of heart cards is 13

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting a heart cards = 1352=14 $\frac{13}{52}=\frac{1}{4}$

(xviii) Total number of red cards is 26

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting a red cards = 2652=12 $\frac{26}{52}=\frac{1}{2}$

Q: 7. In a lottery of 50 tickets numbered 1 to 50, one ticket is drawn. Find the probability that the drawn ticket bears a prime number.

Soln:

GIVEN: Tickets are marked with one of the numbers 1 to 50. One ticket is drawn at random.

TO FIND: Probability of getting a prime number on the drawn ticket

Total number of tickets is 5.

Tickets marked prime number are 1,3,5,7,11,13,17,19,23,29,31,37,43,47,49

Total number of tickets marked prime is 15

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Numberoffavorableevent}{Totalnumberofevent}$$

Hence probability of getting a prime number on the ticket is 1550=310 $\frac{15}{50} = \frac{3}{10}$

Q: 8. An urn contains 10 red and 8 white balls. One ball is drawn at random. Find the probability that the ball drawn is white.

Soln:

GIVEN: A bag contains 10 red, and 8 white balls

TO FIND: Probability that one ball is drawn at random and getting a white ball

Total number of balls 10 + 8 = 18

Total number of white balls is 8

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Numberoffavorableevent}{Totalnumberofevent}$$

Hence probability of getting a white ball is 818=49 $\frac{8}{18} = \frac{4}{9}$

Q: 9. A bag contains 3 red balls, 5 black balls and 4 white balls. A ball is drawn at random from the bag. What is the probability that the ball drawn is:

(i) white?

(ii) red?

(iii) black?

(iv) not black

Soln:

GIVEN: A bag contains 3 red, 5 black and 4 white balls

TO FIND: Probability of getting a

(i) White ball

(ii) Red ball

(iii) Black ball

(iv) Not red ball Total number of balls 3+5+4 =12

(i) Total number white balls is 4

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting white ball = 412=13 $\frac{4}{12} = \frac{1}{3}$

(ii) Total number red balls are 3

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting red ball is 312=14 $\frac{3}{12} = \frac{1}{4}$

(iii) Total number of black balls is 5

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting black ball = 512 $\frac{5}{12}$

(iv) Total number of non red balls are 4 white balls and 5 black balls i.e. 4+5 = 9

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting no red ball = 912=34 $\frac{9}{12} = \frac{3}{4}$

Q: 10. What is the probability that a number selected from the numbers 1, 2, 3, ..., 15 is a multiple of 4?

Soln:

Given:

Numbers are from 1 to 15. One number is selected

To find: Probability that the selected number is multiple of 4

Total number 15

Numbers that are multiple of 4 are 4, 8, 12,

Total number that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of selecting a multiple of 4 is 315=15 $\frac{3}{15} = \frac{1}{5}$

Q: 11. A bag contains 6 red, 8 black and 4 white balls. A ball is drawn at random. What is the probability that the ball drawn is white?

Soln:

GIVEN: A bag contains 6 red, 8 black and 4 white balls and a ball is drawn at random

TO FIND: Probability that the ball drawn is not black

Total number of balls 6+8+4 = 18

Total number of black balls is 8

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Probability of getting a black ball P(E) 818=49 $\frac{8}{18} = \frac{4}{9}$........... (1)

We know that sum of probability of occurrence of an event and probability of non occurrence of an event is 1.

Hence P(E) + P(¯E)$P(\bar{E})$ = 1

49+P(¯E)=1$\frac{4}{9} + P(\bar{E}) = 1$ P(¯E)=1−49$P(\bar{E}) = 1 - \frac{4}{9}$ P(¯E)=59$P(\bar{E}) = \frac{5}{9}$

Q: 12. A bag contains 5 white balls and 7 red balls. One ball is drawn at random. What is the probability that the ball drawn is white?

Soln:

GIVEN: A bag contains 7 red, and 5 white balls and a ball is drawn at random

TO FIND: Probability that the ball drawn is white

Total number of balls 7 + 5 = 12

Total number of white balls is 5

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Probability of getting a white ball P(‾E)=512 $P(\bar{E}) = \frac{5}{12}$

Q: 13. Tickets numbered from 1 to 20 are mixed up and a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 7?

Soln:

GIVEN: Tickets are marked from 1 to 20 are mixed up. One ticket is picked at random.

TO FIND: Probability that the ticket bears a multiple of 3 or 7

Total number of cards is 20 Cards marked multiple of 3 or 7 are 3, 6, 7, 9, 12, 14, 15 and18

Total number of cards marked multiple of 3 or 7 are 8

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting a, multiple of 3 or 7 is 820=25 $\frac{8}{20} = \frac{2}{5}$

Q: 14. In a lottery there are 10 prizes and 25 blanks. What is the probability of getting a prize?

Soln:

Given: In a lottery there are 10 prizes and 25 blanks.

TO FIND: Probability of winning a prize

Total number of tickets is 10 + 25 = 35

Total number of prize carrying tickets is 10

We know that PROBABILITY

Hence probability of winning a prize is 1030=27 $\frac{10}{30} = \frac{2}{7}$

Q: 15. If the probability of winning a game is 0.3, what is the probability of losing it?

Soln:

Given: probability of winning a game P(E) = 0.3

TO FIND: Probability of losing the game P(¯E)$P(\bar{E})$

CALCULATION: We know that the sum of probability of occurrence of an event and probability of non occurrence of an event is 1.

P(E) + P(¯E)$P(\bar{E})$ = 1

0.3 + P(¯E)$P(\bar{E})$ = 1

P(¯E)$P(\bar{E})$ = 1 – 0.3

P(¯E)$P(\bar{E})$ = 0.7

Hence the probability of losing the game is P(¯E)$P(\bar{E})$ = 0.7

Q: 16. A bag contains 5 black, 7 red and 3 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is:

(i) red

(ii) black or white

(iii) not black

Soln:

GIVEN: A bag contains 7 red, 5 black and 3 white balls and a ball is drawn at random

TO FIND: Probability of getting a

(i) Red ball

(ii) Black or white ball

(iii) Not black ball Total number of balls 7+5+3 =15

(i) Total number red balls are 7

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting a red ball is equal to = 715 $\frac{7}{15}$

(ii) Total number of black or white balls is 5+3 = 8

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting white or black ball = 815 $\frac{8}{15}$

(iii) Total number of black balls is 5

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting black ball P(E) = 515=13 $\frac{5}{15} = \frac{1}{3}$

We know that sum of probability of occurrence of an event and probability of non occurrence of an event is 1

P(E) + P(¯E)$P(\bar{E})$ = 1

13+P(¯E)$\frac{1}{3} + P(\bar{E})$ = 1

P(¯E)=1−13$P(\bar{E}) = 1 - \frac{1}{3}$ P(¯E)=23$P(\bar{E}) = \frac{2}{3}$

Hence the probability of getting non black ball P(¯E)=23$P(\bar{E}) = \frac{2}{3}$

Q: 17. A bag contains 4 red, 5 black and 6 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is:

(i) White

(ii) Red

(iii) Not black

(iv) Red or White

Soln:

GIVEN: A bag contains 4 red, 5 black and 6white balls and a ball is drawn at random

TO FIND: Probability of getting a

(i) white ball

(ii) red ball

(iii) not black ball

(iv) red or white

Total number of balls 4+5+6=15

(i) Total number white balls are 6

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting white a ball is 615=25 $\frac{6}{15} = \frac{2}{5}$

(ii) Total number of red are 4

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting red a ball is equal to = 415 $\frac{4}{15}$

(iii) Total number of black balls are 5

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Numberoffavorableevent}{Totalnumberofevent}$

Hence probability of getting black ball P(E) = 515=13 $\frac{5}{15} = \frac{1}{3}$

We know that sum of probability of occurrence of an event and probability of non occurrence of an event is 1.

P(E) + P(¯E)$P(\bar{E})$ = 1

13+P(¯E)$\frac{1}{3} + P(\bar{E})$ = 1

P(¯E)=1−13$P(\bar{E}) = 1 - \frac{1}{3}$ P(¯E)=23$P(\bar{E}) = \frac{2}{3}$

Hence the probability of getting non black ball is P(¯E)=23$P(\bar{E}) = \frac{2}{3}$

(iv) Total number of red or white balls 4 + 6 = 10

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Numberoffavorableevent}{Totalnumberofevent}$

Hence probability of getting white or red ball 1015=23 $\frac{10}{15} = \frac{2}{3}$

Q: 18. One card is drawn from a well shuffled deck of 52 cards. Find the probability of getting:

(i) A king of red suit

(ii) A face card

(iii) A red face card

(iv) A queen of black suit

(v) A jack of hearts

(vi) A spade

Soln:

GIVEN: One card is drawn from a well shuffled deck of 52 playing cards

TO FIND: Probability of following

Total number of cards is 52

(i) Cards which are king of red suit are 2

Total number of Cards which are king of red suit is 2

Number of favorable event i.e. Total number of Cards which are king of red suit is 2

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting cards which are king of red suit is 252=126 $\frac{2}{52} = \frac{1}{26}$

(ii) Total number of face cards are 12

Number of favorable event i.e. total number of face cards is 12

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting face cards is 1252=313 $\frac{12}{52} = \frac{3}{13}$

(iii) Total number of red face cards are 6

Number of favorable events i.e. total number of red face cards is 6

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting red face cards is 652=326 $\frac{6}{52} = \frac{3}{26}$

(iv) Total number of queen of black suit cards is 2

Total Number of favorable event i.e. total number of queen of black suit cards is 2

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting cards which are queen of black suit cards is 252=126 $\frac{2}{52} = \frac{1}{26}$

(v) Total number of jack of hearts is 1

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting cards which are jack of hearts is equal to = 152 $\frac{1}{52}$

(vi) Total number of spades cards are 13

Total numbers of favorable events i.e. total number of queen of black suit cards are 13

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting spade cards is equal to = 1352=14 $\frac{13}{52} = \frac{1}{4}$

Q: 19. Five cards – ten, jack, queen, king, and an ace of diamonds are shuffled face downwards. One card is picked at random.

(i) What is the probability that the card is a queen?

(ii) If a king is drawn first and put aside, what is the probability that the second card picked up is the (a) ace? (b) king?

Soln:

GIVEN: Five cards-ten, jack, queen, king and Ace of diamond are shuffled face downwards

TO FIND: Probability of following

Total number of cards is 5

(i) Cards which is a queen

Total number of Cards which are queen is 1

Number of favorable event i.e. Total number of Cards which are queen is 1

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting cards which are queen = 15 $\frac{1}{5}$

(ii) If a king is drawn first and put aside then

Total number of cards is 4

Number of favorable event i.e. Total number of ace card is 1

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting ace cards = 14 $\frac{1}{4}$

Q: 20. A bag contains 3 red balls and 5 black balls. A ball is drawn at random from the bag. What is the probability that the ball drawn is:

(i) Red

(ii) Back

Soln:

GIVEN: A bag contains 3 red, and 5 black balls. A ball is drawn at random

TO FIND: Probability of getting a

(i) red ball

(ii) white ball

Total number of balls 3+5 .8

(i) Total number red balls are 3

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting red ball is equal to = 38 $\frac{3}{8}$

(ii) Total number of black ball are 5

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting black ball = 58 $\frac{5}{8}$

Q: 21. A game of chance consists of spinning an arrow which is equally likely to come to rest pointing to one of the number, 1, 2, 3, …., 12 as shown in figure what is the probability that it will point to:

(i) 10?

(ii) an odd number?

(iii) a number which is multiple of 3?

(iv) an even number?

Soln:

GIVEN: A game of chance consists of spinning an arrow which is equally likely to come to rest pointing number 1,2,3 ….12

TO FIND: Probability of following

Total number on the spin is 12

(i) Favorable event i.e. to get 10 is 1

Total number of Favorable event i.e. to get 10 is 1

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting a 10 = 112 $\frac{1}{12}$

(ii) Favorable event i.e. to get an odd number are 1,3,5,7,9,11,

Total number of Favorable event i.e. to get a prime number is 6

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting a prime number is = 612=12 $\frac{6}{12} = \frac{1}{2}$

(iii) Favorable event i.e. to get an multiple of 3 are 3,6,9, 12

Total number of Favorable event i.e. to get a multiple of 3 is 4

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting multiple of 3 = 412=13 $\frac{4}{12} = \frac{1}{3}$

(iv) Favorable event i.e. to get an even number are 2, 4, 6, 8, 10, 12

Total number of Favorable events i.e. to get an even number is 6

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$$\frac{Number of favorable event}{Total number of event}$$

Hence probability of getting an even number is 612=12 $\frac{6}{12} = \frac{1}{2}$

Q: 22. In a class, there are 18 girls and 16 boys. The class teacher wants to choose one pupil for class monitor. What she does, she writes the name of each pupil on a card and puts them into a basket and mixes thoroughly. A child is asked to pick one card from the basket. What is the probability that the name written on the card is:

(i) The name of a girl

(ii) The name of a boy?

Soln: Given: in a class there are 18 girls and 16 boys, the class teacher wants to choose one name. The class teacher writes all pupils' name on a card and puts them in basket and mixes well thoroughly. A child picks one card

TO FIND: The probability that the name written on the card is

(i) The name of a girl

(ii) The name of a boy

Total number of students in the class 18 + 16 = 34

(i) The name of a girl are 18 hence favorable cases are 18

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting a name of girl on the card is equal to = 1834=917 $\frac{18}{34} = \frac{9}{17}$

(ii) The name of a boy are 16 hence favorable cases are 16

We know that PROBABILITY = NumberoffavorableeventTotalnumberofevent

$\frac{Number of favorable event}{Total number of event}$

Hence probability of getting a name of boy on the card is equal to = 1634=817 $\frac{16}{34} = \frac{8}{17}$

Q: 23. Why is tossing a coin considered to be a fair way of deciding which team should choose ends in a game of cricket?

Solution: No. of possible outcomes while tossing a coin = 2 {1 head & 1 tail}

Probabiiity= NumberoffavorableoutcomesNumberofpossibleoutcomes $\frac{Number of favorable outcomes}{Number of possible outcomes}$

P(getting head) = 12 $\frac{1}{2}$

P(getting tail) = 12 $\frac{1}{2}$

Since, probability of two events are equal, these are called equally like events. Hence, tossing a coin is considered to be a fair way of deciding which team should choose ends in a game of cricket.

Q: 24. What is the probability that a number selected at random from the number 1,2,2,3,3,3, 4, 4, 4, 4 will be their average?

Solution:

Given no's are 1, 2, 2, 3, 3, 3, 4, 4, 4, 4

Total no. of possible outcomes =10

Average of the no's = sumofnumberstotalnumbers $\frac{sumofnumbers}{totalnumbers}$

= 1+2+2+3+3+3+4+4+4+410 $\frac{1+2+2+3+3+3+4+4+4+4}{10}$

= 3010 $\frac{30}{10}$

= 3

E = event of getting 3

No. of favorable outcomes = 3 {3, 3, 3}

P(E) = NumberoffavorableoutcomesNumberofpossibleoutcomes $\frac{Numberoffavorableoutcomes}{Numberofpossibleoutcomes}$

P(E) = 310 $\frac{3}{10}$

Q: 25. There are 30 cards, of same size, in a bag on which numbers 1 to 30 are written. One card is taken out of the bag at random. Find the probability that the number on the selected card is not divisible by 3.

<u>Solution</u>:

Total no. of possible outcomes – 30 { 1, 2, 3, … 30)

E = event of getting number divisible by 3

Number of favorable outcomes = 10 {3, 6, 9, 12, 15, 18, 21, 24, 27, 30}

Probability, P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 1030 $\frac{10}{30}$

= 13 $\frac{1}{3}$

E$\overline{E}$ = event of getting number not divisible by 3

P(E$\overline{E}$) = 1 – P(E)

P(‾E$\overline{E}$) = 1 – 13 $\frac{1}{3}$

= 23 $\frac{2}{3}$

Q: 26. A bag contains 5 red, 8 white and 7 black balls. A ball is drawn at random from the bag. Find the probability that the drawn ball is

(i) red or white

(ii) not black

(ii) neither white nor black.

<u>Solution:</u>

Total number of possible outcomes = 20 (5 red, 8 white & 7 black}

(i) E = event of drawing red or white ball

No. of favorable outcomes = 13 {5 red, 8 white}

Probability, P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 1320 $\frac{13}{20}$

(ii) Let E = event of getting black ball

No. of favorable outcomes =7 {7 black balls}

P(E) = 720 $\frac{7}{20}$

‾E$\overline{E}$ = event of not getting black ball

P(‾E$\overline{E}$) = 1 – P(E)

P(‾E$\overline{E}$) = 1 – 720 $\frac{7}{20}$

P(‾E$\overline{E}$) = 1320 $\frac{13}{20}$

(iii) Let E = event of getting neither white nor black ball

No. of favorable outcomes = 20 – 8 – 7

= 5 {total balls – no. of white balls – no. of black balls}

P(E) = 520 $\frac{5}{20}$

P(E) = 14 $\frac{1}{4}$

Q: 27. Find the probability that a number selected from the number 1 to 25 is not a prime number when each of the given numbers is equally likely to be selected.

<u>Solution:</u>

Total no. of possible outcomes = 25 {1, 2, 3…. 25}

E = event of getting a prime no.

No. of favorable outcomes = 9 {2, 3, 5, 7, 11, 13, 17, 19, 23}

P(E) = NumberoffavorableoutcomesNumberofpossibleoutcomes $\frac{Number of favorable outcomes}{Number of possible outcomes}$

P(E) = 925 $\frac{9}{25}$

(E$\overline{E}$) = event of not getting a prime

P(E$\overline{E}$) = 1— P(E)

P(E$\overline{E}$) = 1 – 925 $\frac{9}{25}$

P(E$\overline{E}$) = 1625 $\frac{16}{25}$

Q: 28. A bag contains 8 red, 6 white and 4 black balls. A ball is drawn at random from the bag. Find the probability that the drawn ball is

(i) Red or white

(ii) Not black

(iii) Neither white nor black

Solution:

Total no. of possible outcomes = 8 + 6 + 4 =18 {8 red, 6 white, 4 black)

(i) E = event of getting red or white ball

No. of favorable outcomes = 14 {8 red balls, 6 white balls}

P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 1418 $\frac{14}{18}$

P(E) = 79 $\frac{7}{9}$

(ii) E = event of getting a black ball

Number of favorable outcomes = 4 {4 black balls}

P(E) = 418 $\frac{4}{18}$

P(E) = 29 $\frac{2}{9}$

(E$\overline{E}$) = event of not getting a black ball

P(E$\overline{E}$) = 1 – P(E)

P(E$\overline{E}$) = 1 – 29 $\frac{2}{9}$

P(E$\overline{E}$) = 79 $\frac{7}{9}$

(iii) E = event of getting neither white nor black

No. of favorable outcomes = 18 – 6 – 4

= 8(Total balls – no. of white balls – no. of black balls)

P(E) = 818 $\frac{8}{18}$

P(E) = 49 $\frac{4}{9}$

Q: 29. Find the probability that a number selected at random from the numbers 1, 2, 3…. 35 is a:

(i) Prime number

(ii) Multiple of 7

(iii) Multiple of 3 or 5

<u>Solution</u>:

Total no. of possible outcomes = 35 {1, 2, 3….. 35}

(i) E = event of getting a prime no.

No. of favorable outcomes =11 {2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31)

P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 1135 $\frac{11}{35}$

(ii) E = event of getting no. which is multiple of 7

No. of favorable outcomes = 5 {7, 14, 21, 28, 35}

P(E) = 535 $\frac{5}{35}$

P(E) = 17 $\frac{1}{7}$

(iii) E = event of getting no which is multiple of 3 or 5

No. of favorable outcomes = 16 {3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 5, 10, 20, 25, 35}

P(E) = 1635 $\frac{16}{35}$

Q: 30. From a pack of 52 playing cards Jacks, queens, kings and aces of red color 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 black jack

(iv) a picture card (Jacks. queens and kings are picture cards)

Solution:

Total no. of cards = 52

All jacks, queens & kings, aces of red color are removed.

Total no. of possible outcomes = 52 – 2 – 2 – 2 – 2 = 44 {remaining cards}

(i) E = event of getting a black queen

No. of favorable outcomes = 2 {queen of spade & club}

P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$ P(E) = 244 $\frac{2}{44}$

P(E) = 122 $\frac{1}{22}$

(ii) E = event of getting a red card

No. of favorable outcomes = 26-8

= 18 (total red cards jacks – queens, kings, aces of red color)

P(E)= 1844 $\frac{18}{44}$

P(E) = 922 $\frac{9}{22}$

(iii) E = event of getting a black jack

No. of favorable outcomes = 2 {jack of club & spade}

P(E) = 244 $\frac{2}{44}$

P(E) = 122 $\frac{1}{22}$

(iv) E = event of getting a picture card

No. of favorable outcomes = 6 {2 jacks, 2 kings & 2 queens of black color}

P(E) = 644 $\frac{6}{44}$

P(E) = 322 $\frac{3}{22}$

Q: 31. A bag contains lemon flavored candies only. Malini takes out one candy without looking into the bag. What is the probability that she takes out :

(i) an orange flavored candy

(ii) a lemon flavored candy

<u>Solution:</u>

(i) The bag contains lemon flavored candies only. So, the event that Malini will take out an orange flavored candy is an impossible event.

Since, probability of impossible event is 0, P(an orange flavored candy) = 0

(ii) The bag contains lemon flavored candies only. So, the event that Malini will take out a lemon flavored candy is sure event. Since probability of sure event is 1.

P(a lemon flavored candy) = 1

Q: 32. It is given that in a group of 3 students, the probability of 2 students not having the same birthday is 0.992. What is the probability that the 2 students have the same birthday?

Solution:

Let E = event of 2 students having same birthday

P(E) is given as 0.992

Let, (E$\overline{E}$)= event of 2 students not having same birthday.

We know that,

P(E$\overline{E}$) + P(E) = 1

P(E$\overline{E}$) = 1 — P(E)

P(E$\overline{E}$) = 1 – 0.992 = 0.008

Q: 33. A bag contains 3 red balls and 5 black balls. A ball is drawn at random from the bag. What is the probability that the ball drawn is

(i) red

(ii) not red

Solution:

Total no. of possible outcomes = 8 {3 red, 5 black}

(i) E = event of getting red ball.

No. of favorable outcomes = 3 {3 red}

Probability, P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 38 $\frac{3}{8}$

(ii) E = event of getting no red ball.

P(E) + P(E$\overline{E}$) = 1

P(E$\overline{E}$) = 1 – P(E)

P(E$\overline{E}$) = 1 – 38 $\frac{3}{8}$

P(E$\overline{E}$) = 58 $\frac{5}{8}$

Q: 34. A box contains 5 red marbles, 8 white marbles and 4 green marbles. One marble is taken out of the box at random. What is the probability that the marble taken out will be:

(i) red

(ii) not green

<u>Solution:</u>

Total no. of possible outcomes = 17 { 5 red, 8 white, 4 green}

(i) E = event of getting a red marble

Number of favorable outcomes = 5 {5 red marbles}

P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 517 $\frac{5}{17}$

(ii) E= event of getting a green marble

Number of favorable outcomes = 4 {4 green marbles}

P(E) = 417 $\frac{4}{17}$

(E$\overline{E}$) = event of getting not a green marble

P(E$\overline{E}$) = 1 – P(E)

P(E$\overline{E}$) = 1 – 417 $\frac{4}{17}$

P(E$\overline{E}$) = 1317 $\frac{13}{17}$

Q: 35. A lot consists of 144 ball pens of which 20 are defective and others good. Nuri will buy a pen if it is good, but will not buy if it is defective. The shopkeeper draws one pen at random and gives it to her. What is the probability that

(i)She will buy it

(ii) She will not buy it

Sol:

No. of good pens =144 —20 = 24

No. of detective pens = 20

Total no. of possible outcomes =144 (total no. of pens)

(i) E = event of buying pen which is good.

No. of favorable outcomes =124 (124 good pens)

P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 124144 $\frac{124}{144}$

P(E) = 3136 $\frac{31}{36}$

(ii) E = event of not buying a pen which is bad

P(E) + P(E$\overline{E}$) = 1

P(E$\overline{E}$) = 1 – P(E)

P(E$\overline{E}$) = 1 – 3136 $\frac{31}{36}$

P(E$\overline{E}$) = 536 $\frac{5}{36}$

Q: 36. 12 defective pens are accidently mixed with 132 good ones. It is not possible to just look at pen and tell whether or not it is defective. One pen is taken out at random from this lot. Determine the probability that the pen taken out is good one.

Solution:

No. of good pens =132

No. of defective pens = 12

Total no. of possible outcomes = 132 + 12 {total no of pens}=144

E = event of getting a good pen.

No. of favorable outcomes =132 {132 good pens}

P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 132144 $\frac{132}{144}$

P(E) = 1112 $\frac{11}{12}$

Q: 37. Five cards— the ten, jack, queen, king and ace of diamonds, are well shuffled with their face downwards. One card is then picked up at random.

(i) What is the probability that the card is the queen?

(ii) If the queen is drawn and put aside, what is the probability that the second card picked up is

1. **a) an ace?**

b)a queen?

Solution:

Total no. of possible outcomes = 5 {5 cards}

(i) E = event of getting a queen.

No. of favorable outcomes = 1 {1 queen}

Probability, P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 15 $\frac{1}{5}$

(ii) If queen is drawn & put aside.

Total no. of remaining cards = 4

(a) E = events of getting a queen.

No. of favorable outcomes = 3

Total no. of possible outcomes = 4 {4 remaining cards}

P(E) = 34 $\frac{3}{4}$

(b) E = event of getting a good pen.

No. of favorable outcomes = 0 {there is no queen}

P(E) = 0

Therefore, E is known as impossible event.

Q: 38. Harpreet tosses two different coins simultaneously (say, one is of Re 1 and other of Rs 2). What is the probability that he gets at least one head?

<u>Solution:</u>

Total no. of possible outcomes = 4 which are{HT, HH, TT, TH}

E = event of getting at least one head

No. of favorable outcomes = 3 {HT, HH, TH}

Probability, P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 34 $\frac{3}{4}$

Q: 39. Cards marked with numbers 13, 14, 15…. 60 are placed in a box and mixed thoroughly. One card is drawn at random from the box. Find the probability that number on the card drawn is:

(i) divisible by 5

(ii) a number is a perfect square

<u>Solution:</u>

Total no. of possible outcomes = 48{13, 14, 15, ….,60)

(i) E = event of getting no divisible by 5

No. of favorable outcomes =10{15, 20, 25, 30, 35, 40, 45, 50, 55, 60}

Probability, P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 1048 $\frac{10}{48}$

P(E) = 524 $\frac{5}{24}$

(ii) E = event of getting a perfect square.

No. of favorable outcomes = 4 {16, 25, 36, 49)

P(E) = 468 $\frac{4}{68}$

P(E) = 116 $\frac{1}{16}$

Q: 40. A bag contains tickets numbered 11, 12……. 30. A ticket is taken out from the bag at random. Find the probability that the number on the drawn ticket

(i) is a multiple of 7

(ii) is greater than 15 and a multiple of 5.

Solution:

Total no. of possible outcomes = 20 {11, 12, 13…… 30}

(i) E = event of getting no. which is multiple of 7

No. of favorable outcomes = 3 {14, 21, 28}

Probability, P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 320 $\frac{3}{20}$

(ii) E = event of getting no. greater than 15 & multiple of 5

No. of favorable outcomes = 3 {20, 25, 30}

P(E) = 320 $\frac{3}{20}$

Q: 41. Fill in the blanks:

(i) Probability of a sure event is …….

(ii)Probability of an impossible event is ……..

(iii)The probability of an event (other than sure and impossible event) lies between ……

(iv)Every elementary event associated to a random experiment has ………. probability.

(v) Probability of an event A + Probability of event 'not A' = ……………..

(vi) Sum of the probabilities of each outcome in an experiment is …………

Solution:

(i) 1, P(sure event) =1

(ii) 0, P (impossible event) = 0

(iii) 0 & 1, $0<P(E)<1$$0 < P(E) < 1$

(iv)Equal

(v) 1, P(E) + P(E$\overline{E}$) = 1

(vi)1

Q: 42. Examine each of the following statements and comment:

(i) If two coins are tossed at the same time. There are 3 possible outcomes—two heads, two tails, or one of each. Therefore, for each outcome, the probability of occurrence is 13 $\frac{1}{3}$.

(ii) If a die is thrown once, there are two possible outcomes – an odd number or an even number. Therefore, the probability of obtaining an odd number is 12 $\frac{1}{2}$ and the probability of obtaining an even number is 12 $\frac{1}{2}$.

-

Solution:

(i) Given statement is incorrect. If 2 coins are tossed at the same time.

Total no. of possible outcomes = 4 {HH, HT, TH, TT}

P(HH)= P(HT) = P(TH) = P(TT) = 14 $\frac{1}{4}$

{Since, Probability = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$}

i.e. for each outcome, probability of occurrence is 14 $\frac{1}{4}$

Outcomes can be classified as (2H, 2T, 1H & 1T)

P(2H) = 14 $\frac{1}{4}$, P(2T) = 14 $\frac{1}{4}$,

P(1H & 1T)= 12 $\frac{1}{2}$

Events are not equally likely because the event 'one head & one tail' is twice as likely to occur as remaining two.

(ii) This statement is true.

When a die is thrown; total no. of possible outcomes = 6 {1, 2, 3, 4, 5, 6}

These outcomes can be taken as even number & odd number.

P(even no.) = P(2, 4, 6) = 36 $\frac{3}{6}$ = 12 $\frac{1}{2}$

P(odd no.) = P(1, 3,5) = 36 $\frac{3}{6}$ = 12 $\frac{1}{2}$

Therefore, two outcomes are equally likely

Q: 43. A box contains 100 red cards, 200 yellow cards and 50 blue cards. If a card is drawn at random from the box, then find the probability that it will be

(i) a blue card

(ii) not a yellow card

(iii) Neither yellow nor a blue card.

Solution:

Total no. of possible outcomes = 100 + 200 + 50 = 350 {100 red, 200 yell= & SO blue}

(i) E = event of getting blue card.

No. of favorable outcomes = 50 (50 blue cards}

P(E) = 50350 $\frac{50}{350}$

P(E) = 17 $\frac{1}{7}$

(ii) E = event of getting yellow card

No. of favorable outcomes = 200 (200 yellow)

P(E) = 200350 $\frac{200}{350}$

P(E) = 47 $\frac{4}{7}$

(‾E$\overline{E}$) = event of not getting yellow card

P(‾E$\overline{E}$) = 1 – P(E)

P(‾E$\overline{E}$) = 1 – 47 $\frac{4}{7}$

= 37 $\frac{3}{7}$

(iii) E = getting neither yellow nor a blue card

No. of favorable outcomes = 350 – 200 – 50 = 100 {removing 200 yellow & 50 blue cards)
P(E) = 100350 $\frac{100}{350}$

P(E) = 27 $\frac{2}{7}$

Q: 55. The faces of a red cube and a yellow cube are numbered from 1 to 6. Both cubes are rolled. What is the probability that the top face of each cube will have the same number.

<u>Solution</u>: Total no. of outcomes when both cubes are rolled = 6 x 6 = 36 which are

{(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)}

E = event of getting same no. on each cube

No. of favorable outcomes = 6 which are

{ (1, 1) (2, 2) (3, 3) (4, 4) (5, 5) (6, 6)} probability, P(E) = NumberoffavorableoutcomesNumberofpossibleoutcomes

$$\frac{Number of favorable outcomes}{Number of possible outcomes}$$

P(E) = 636 $\frac{6}{36}$

= 16 $\frac{1}{6}$

Q: 56. The probability of selecting a green marble at random from a jar that contains only green, white and yellow marbles is 14 $\frac{1}{4}$. The probability of selecting a white marble at random from the same jar is 13 $\frac{1}{3}$.If this jar contains 10 yellow marbles. What is the total number of marbles in the jar?

Sol:

Let the no. of green marbles = x

The no. of white marbles = y

No. of yellow marbles =10

Total no. of possible outcomes = x+ y+ 10 (total no. of marbles)

P(E)= NumberoffavorableoutcomesNumberofpossibleoutcomes $\frac{Number of favorable outcomes}{Number of possible outcomes}$

Probability (green marble) = 14 $\frac{1}{4}$= xx+y+10 $\frac{x}{x+y+10}$

x + y+ 10 = 4×x4 $\times x$

3×x3 $\times x$ – y – 10 = 0 …….. (i)

Probability (White marble) = 13 $\frac{1}{3}$ = yx+y+10 $\frac{y}{x+y+10}$

x + y+ 10 = 3×y3 $\times y$

x – 2×y2 $\times y$ + 10 = 0 …………. (ii)

Multiplying (ii) by 3,

3×x3 $\times x$ – 6×y6 $\times y$ + 30 = 0 ……… (iii)

Sub (i) from (iii), we get

−6×y+y+30+10=0$-6 \times y + y + 30 + 10 = 0$

−5×y$-5 \times y$ + 40=0

5×y$5 \times y$ = 40

y= 8

Substitute y=8 in (i),

3×x$3 \times x$ – 8 -10=0

3×x$3 \times x$-18=0

x = 183 $\frac{18}{3}$ = 6

Total number of marbles in jar= x +y + 10 = 6+ 8 + 10=24

Q: 57. (i) A lot of 20 bulbs contain 4 defective ones. One bulb is drawn at random from the lot. What is the probability that this bulb is defective?

(ii) Suppose the bulb drawn in (a) is not defective and not replaced. Now bulb is drawn at random from the rest. What Is the probability that this bulb is not defective?

Solution:

Total no. of possible outcomes = 20 {20 bulbs}

(i) E = event of getting defective bulb.

No. of favorable outcomes = 4 (4 defective bulbs)

Probability, P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 420 $\frac{4}{20}$

P(E) = 15 $\frac{1}{5}$

(ii) Bulb drawn in is not detective & is not replaced

Remaining bulbs = 15 good + 4 bad bulbs = 19

Total no. of possible outcomes =19

E = event of getting defective

No. of favorable outcomes = 15 (15 good bulbs)

P(E)= 1519 $\frac{15}{19}$

Q: 58. A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears:

(i) a two digit number

(ii) a perfect square number

(iii) a number divisible by 5.

Solution:

Total no. of possible outcomes -90 {1, 2, 3 ……. 90}

(i) E = event of getting 2 digit no.

No. of favorable outcomes = 81 {10, 11, 12, …. 90}

Probability, P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 8190 $\frac{81}{90}$

P(E) = 910 $\frac{9}{10}$

(ii) E = event of getting a perfect square.

No. of favorable outcomes = 9 {1, 4, 9, 16, 25, 26, 49, 64, 81}

P(E) = 990 $\frac{9}{90}$

P(E) = 110 $\frac{1}{10}$

(iii) E = event of getting a no. divisible by 5.

No. of favorable outcomes = 18 {5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90}

P(E) = 1890 $\frac{18}{90}$

P(E) = 15 $\frac{1}{5}$

Q: 59. Two dice, one blue and one grey, are thrown at the same time. Complete the following table:

Event: 'Sum on two dice'	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Probability											

From the above table a student argues that there are 11 possible outcomes 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12. Therefore, each of them has a probability 111 $\frac{1}{11}$ **. Do you agree with this argument?**

Solution:

Total no. of possible outcomes when 2 dice are thrown = 6 x 6 = 36 which are

{(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)}

E = event of getting sum on 2 dice as 2

No. of favorable outcomes = 1{(1, 1)}

Probability, P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 136 $\frac{1}{36}$

E = event of getting sum as 3

No. of favorable outcomes = 2 ((1, 2) (2, 1))

P(E) = 236 $\frac{2}{36}$

P(E) = 118 $\frac{1}{18}$

E = event of getting sum as 4

No. of favorable outcomes = 3 {(3, 1) (2, 2) (1, 3)}

P(E) = 336 $\frac{3}{36}$

P(E) = 112 $\frac{1}{12}$

E = event of getting sum as 5

No. of favorable outcomes = 4 {(1, 4) (2, 3) (3, 2) (4, 1)}

P(E) = 436 $\frac{4}{36}$

P(E) = 19 $\frac{1}{9}$

E = event of getting sum as 6

No. of favorable outcomes = 5 {(1, 5) (2, 4) (3, 3) (4, 2) (5, 1)}

P(E) = 536 $\frac{5}{36}$

E = event of getting sum as 7

No. of favorable outcomes = 6 {(1, 6) (2, 5) (3, 4) (4, 3) (5, 2) (6, 1)}

P(E) = 636 $\frac{6}{36}$

P(E) = 16 $\frac{1}{6}$

E = event of getting sum as 8

No. of favorable outcomes = 5 {(2, 6) (3, 5) (4, 4) (5, 3) (6, 2)}

P(E) = 536 $\frac{5}{36}$

<u>E = event of getting sum as 9</u>

No. of favorable outcomes = 4 {(3, 6) (4, 5) (5, 4) (6, 3)}

P(E) = 436 $\frac{4}{36}$

P(E) = 19 $\frac{1}{9}$

<u>E = event of getting sum as 10</u>

No. of favorable outcomes = 3 {(4, 6) (5, 5) (6, 4)}

P(E) = 336 $\frac{3}{36}$

P(E) = 112 $\frac{1}{12}$

Q: 60. A bag contains 6 red balls and some blue balls. If the probability of drawing a blue ball from the bag is twice that of a red ball, find the number of blue balls in the bag.

<u>Solution:</u>

No of red balls = 6

Let, no. of blue balls = x

Total no. of possible outcomes = 6+ x (total no. of balls)

P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(Blue ball) = 2P(red ball)

xx+6 = 2×6x+6 $\frac{x}{x+6} = \frac{2\times6}{x+6}$ x=2×6 $x = 2 \times 6$

x = 12

Therefore, number of blue balls = 12

Q: 61. The king, queen and jack of clubs are removed from a deck of 52 playing cards and the remaining cards are shuffled. A card is drawn from the remaining cards. Find the probability of getting a card of

(i) heart

(ii) queen

(iii) clubs.

<u>Solution:</u>

Total no. of remaining cords = 52 – 3 = 49

(i) E = event of getting hearts

No. of favorable outcomes = 13 {13 hearts}

Probability, P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 1349 $\frac{13}{49}$

(ii) E= event of getting queen

No. of favorable outcomes = 3 {4 – 1} (Since queen of clubs is removed)

P(E) = 349 $\frac{3}{49}$

(iii) E = event of getting clubs

No. of favorable outcomes =10 (13 – 3) {Since 3 club cards are removed)

P(E) = 1049 $\frac{10}{49}$

<u>E = event of getting sum as 11</u>

No. of favorable outcomes = 2 {(5, 6) (6, 5)}

P(E) = 236 $\frac{2}{36}$

P(E) = 118 $\frac{1}{18}$

E = event of getting sum as 12

No. of favorable outcomes =1 {(6, 6)}

P(E) = 136 $\frac{1}{36}$

No, the outcomes are not equally likely. From the above results we see that, there is different probability for different outcome.

Q: 62. Two dice are thrown simultaneously. What is the probability that:

(i) 5 will not come up on either of them?

(ii) 5 will come up on at least one?

(iii) 5 will come up at both dice?

Solution:

Total no. of possible outcomes when 2 dice are thrown = 6 x 6 = 36 Which are

{(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)}

(i) E = event of 5 not coming up on either of them

No. of favorable outcomes = 25 Which are

{(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)}

Probability, P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 2536 $\frac{25}{36}$

(ii) E = event of 5 coming up at least once

Number of favorable outcomes = 11 Which are

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

P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 1136 $\frac{11}{36}$

(iii) E = event of getting 5 on both dice

No. of favorable outcomes =1 {(5, 5)}

P(E) = 136 $\frac{1}{36}$

Q: 63. A number is selected at random from first 50 natural numbers. Find the probability that it is a multiple of 3 and 4.

<u>Solution:</u>

Total no. of possible outcome = 50 {1, 2, 3 …. 50}

No. of favorable outcomes = 4 {12, 24, 36, 48}

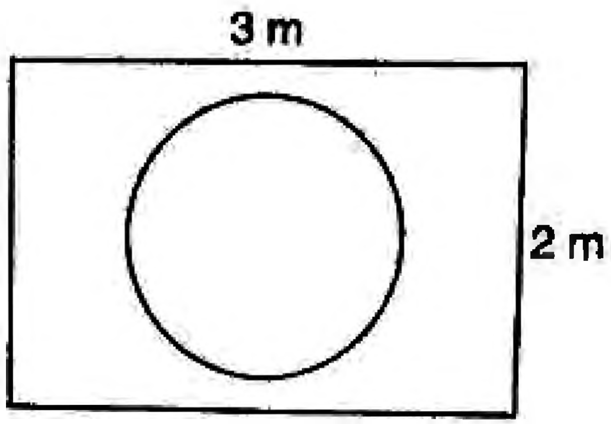
P(E) = FavorableoutcomesPossibleoutcomes $\frac{Favorableoutcomes}{Possibleoutcomes}$

P(E) = 450 $\frac{4}{50}$

P(E) = 225 $\frac{2}{25}$

Exercise 13.2: Probability

Q.1: Suppose you drop a tie at random on the rectangular region shown in fig. below. What is the probability that it will land inside the circle with diameter 1 m?



Solution:

Area of circle with radius 0.5 m

A circle = $(0.5)^2(0.5)^2$ = $0.25\pi m^2 0.25\pi m^2$

Area of rectangle = 3 x 2 = $6m^2 6m^2$

Probability (geometric) = measureofspecifiedregionpartmeasureofwholeregion

$\frac{measure of specified region part}{measure of whole region}$

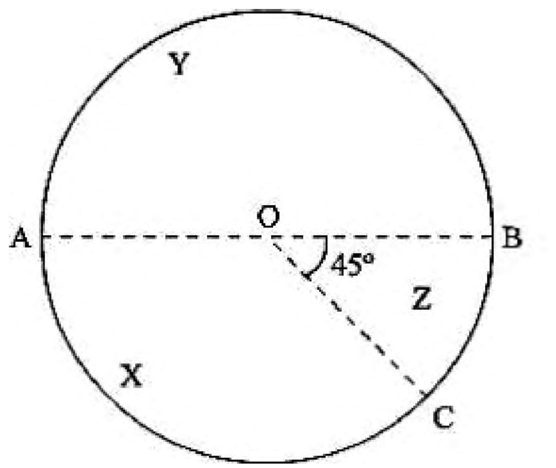
Probability that tie will land inside the circle with diameter 1m

= areaofcircleareaofrectangle $\frac{area of circle}{area of rectangle}$

= 0.25πm²6m² $\frac{0.25\pi m^2}{6m^2}$

= π24 $\frac{\pi}{24}$

Q.2: In the accompanying diagram, a fair spinner is placed at the center O of the circle. Diameter AOB and radius OC divide the circle into three regions labeled X, Y and Z. If ∠BOC$\angle BOC$ = 45°. What is the probability that the spinner will land in the region X?



Solution:

Given,

∠BOC$\angle BOC$ = 45°

∠AOC$\angle AOC$ = 180 – 45 = 135°

Area of circle = πr²πr^2

Area of region x = $\Theta 360 \times \pi r^2 \frac{\Theta}{360} \times \pi r^2$

= $135360 \times \pi r^2 \frac{135}{360} \times \pi r^2$

= $38 \times \pi r^2 \frac{3}{8} \times \pi r^2$

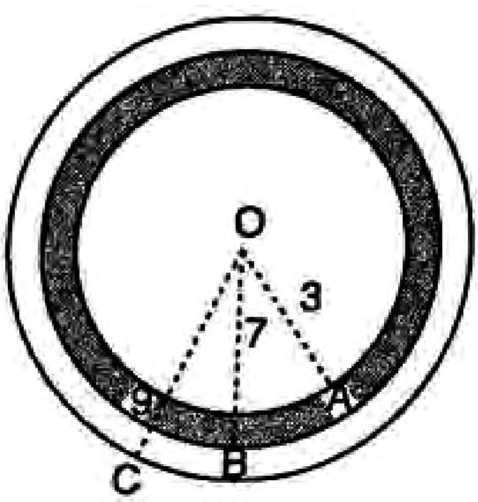
Probability that the spinner will land in the region

X = AreaofregionxTotalareaofcircle $\frac{Areaofregionx}{Totalareaofcircle}$

X= $38\pi r^2 \pi r^2 \frac{\frac{3}{8}\pi r^2}{\pi r^2}$

X= $38 \frac{3}{8}$

Q.3: A target shown in fig. below consists of three concentric circles of radii, 3, 7 and 9 cm respectively. A dart is thrown and lands on the target. What is the probability that the dart will land on the shaded region?



Solution:

1st circle – with radius 3

2nd circle – with radius 7

3rd circle – with radius 9

Area of 1st circle = $\pi(3)^2\pi(3)^2$ = $9\pi 9\pi$

Area of 2nd circle= $\pi(7)^2\pi(7)^2$ = $49\pi 49\pi$

Area of 3rd circle = $\pi(9)^2\pi(9)^2$ = $81\pi 81\pi$

Area of shaded region = Area of 2nd circle – area of 1st circle

= $49\pi – 9\pi 49\pi - 9\pi$

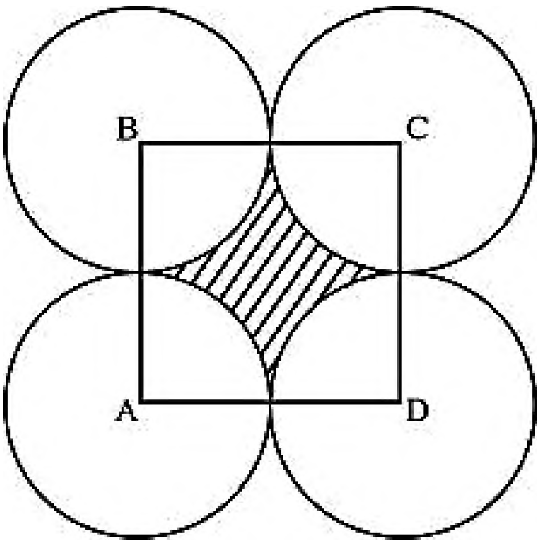
= $40\pi 40\pi$

Probability that it will land on the shaded region = areaofshadedregionareaofthirdcircle

$$\frac{areaofshadedregion}{areaofthirdcircle}$$

= $40\pi 81\pi \frac{40\pi}{81\pi}$ = $4081 \frac{40}{81}$

Q.4: In below fig. points A, B, C and D are the centers of four circles that each has a radius of length one unit. If a point is selected at random from the interior of square ABCD. What is the probability that the point will be chosen from the shaded region?



Solution:

Radius of circle = 1 cm

Length of side of square =1+ 1= 2 cm

Area of square = 2 x 2= $4cm^2$ $4cm^2$

Area of shaded region = area of square – 4 x area of quadrant

= $4-4\times(14)\times\pi(1)^2$ $4-4\times\left(\frac{1}{4}\right)\times\pi(1)^2$

= $(4-\pi)cm^2$ $(4-\pi)cm^2$

Probability that the point will be chosen from the shaded region =
AreaofshadedregionAreaofsquareABCD $\frac{Areaofshadedregion}{AreaofsquareABCD}$

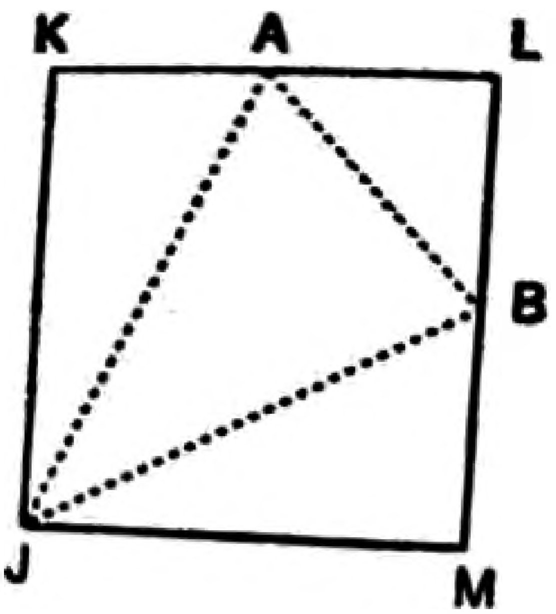
= $4-\pi 4$ $\frac{4-\pi}{4}$

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

Since geometrical probability,

P(E) = MeasureofspecifiedpartofregionMeasureofthewholeregion $\frac{Measureofspecifiedpartofregion}{Measureofthewholeregion}$

Q.5: In the fig. below, JKLM is a square with sides of length 6 units. Points A and B are the midpoints of sides KL and LM respectively. If a point is selected at random from the interior of the square. What is the probability that the point will be chosen from the interior of triangle JAB?



Solution:

JKLM is a square with sides of length 6 units. Points A and B are the midpoints of sides KL and ML, respectively. If a point is selected at random from the interior of the square.

We have to find the probability that the point will be chosen from the interior of ΔJAB ΔJAB.

Now,

Area of square JKLM is equal to $6^2$$6^2$ = 36 sq.units

Now, we have

ar(ΔKAJ)=12×AK×KJ$ar(\Delta KAJ)=\frac{1}{2}\times AK\times KJ$

= 12×3×6$\frac{1}{2}\times 3\times 6$

= 9 unit^2$unit^2$

ar(ΔJMB)=12×JM×BM$ar(\Delta JMB)=\frac{1}{2}\times JM\times BM$

= 12×6×3$\frac{1}{2}\times 6\times 3$

= 9 unit^2$unit^2$

ar(ΔAJB)=12×AL×BL$ar(\Delta AJB)=\frac{1}{2}\times AL\times BL$

= 12×3×3$\frac{1}{2}\times 3\times 3$

= 92unit^2 $\frac{9}{2}\ unit^2$

Now, area of the triangle AJB

ar(ΔAJB)=36–9–9–=92$ar(\Delta AJB)=36–9–9–=\frac{9}{2}$

= 272unit^2 $\frac{27}{2}\ unit^2$

We know that:

Probability = NumberoffavourableeventsTotalnumberofevents $\frac{Number\ of\ favourable\ events}{Totalnumber\ of\ events}$

= 27236 $\frac{\frac{27}{2}}{36}$

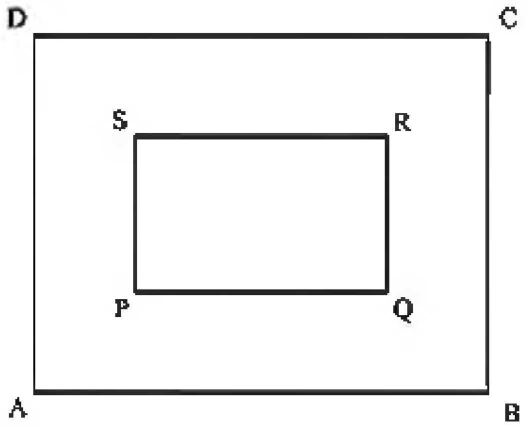
= $272\times36 \frac{27}{2\times36}$

= $38 \frac{3}{8}$

Hence, the probability that the point will be chosen from the interior of ΔAJB=38

$\Delta AJB = \frac{3}{8}$.

Q.6: In the fig. below, a square dartboard is shown. The length of a side of the larger square is 1.5 times the length of a side of the smaller square. If a dart is thrown and lands on the larger square. What is the probability that it will land in the interior of the smaller square?



Solution:

Let, length of side of smaller square = a

Then length of side of bigger square = 1.5a

Area of smaller square = a^2a^2

Area of bigger square = $(1.5)^2a^2(1.5)^2a^2$ = $2.25a^22.25a^2$

Probability that dart will land in the interior of the smaller square = AreaofsmallersquareAreaofbiggersquare $\frac{Area of smaller square}{Area of bigger square}$

= $a^22.25a^2 \frac{a^2}{2.25a^2}$

= 12.25 $\frac{1}{2.25}$

= 49 $\frac{4}{9}$

Geometrical probability,

P(E) = MeasureofspecifiedregionpartMeasureofwholeregion $\frac{Measure of specified region part}{Measure of whole region}$