Probability

Previous Years' CBSE Board Questions

14.1 Probability-A Theoretical Approach

MCQ

1. In a group of 20 people, 5 can't swim. If one person is selected at random, then the probability that he/she can swim, is

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

(2023)

2. Probability of happening of an event is denoted by p and probability of non-happening of the event is denoted by q. Relation between p and q is
(a) p+q=1
(b) p=1,q=1
(c) p=q-1
(d) p+q+1=0 (2023)

3. A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6000 tickets are sold, how many tickets has she bought?
(a) 40
(b) 240
(c) 480
(d) 750 (2023)

4. Two dice are thrown together. The probability of getting the difference of numbers on their upper faces equals to 3 is

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

(2023)

5. A card is drawn at random from a well-shuffled pack of 52 cards. The probability that the card drawn is not an ace is

(a) $\frac{1}{13}$ (b) $\frac{9}{13}$ (c) $\frac{4}{13}$ (d) $\frac{12}{13}$

(2023)

DIRECTIONS: In the question number 6, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option out of the following:

6. Assertion (A): The probability that a leap year has 53 Sundays is 2/7
Reason (R): The probability that a non-leap year has 53 Sundays is 5/7
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true. (2023)

7. A bag contains 5 red balls and n green balls. If the probability of drawing a green ball is three times that of a red ball, then the value of n is
(a) 18
(b) 15
(c) 10
(d) 20 (2023)

8. The probability of getting two heads when two fair coins are tossed together, is

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

(Term I, 2021-22)

9. In a single throw of a die, the probability of getting a composite number is

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

(Term I, 2021-22)

10. The probability that a non-leap year has 53 Wednesdays, is

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

(Term I, 2021-22)

11. From the letters of the word 'MANGO', a letter is selected at random. The probability that the letter is a vowel, is

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

(Term I, 2021-22)

12. Case study based question is compulsory. Attempt any 4 sub-parts from question. Each sub-partcarries 1 mark.
During summer break, Harish wanted to play with his friends but it was too hot outside, so he decided to play some indoor game with his friends. He collects 20 identical cards and writes the numbers 1 to 20 on them (one number on one card). He puts them in a box. He and his friends make a bet for the chances of drawing various cards out of the box. Each was given
a chance to tell the probability of picking one card out of the box. Based on the above, answer the following questions:
(i) The probability that the number on the card drawn is an odd prime number, is

(iii) The probability that the number on the card drawn is a multiple of 3, 6 and 9 is

(a) $\frac{1}{20}$ (b) $\frac{1}{10}$ (c) $\frac{3}{20}$ (d) 0

(iv) The probability that the number on the card drawn is a multiple of 3 and 7 is

(a) $\frac{3}{10}$ (b) $\frac{1}{10}$ (c) 0 (d) $\frac{2}{5}$

(v) If all cards having odd numbers written on them are removed from the box and then one card is drawn from the remaining cards, the probability of getting a card having a prime number is

(a) $\frac{1}{20}$ (b) $\frac{1}{10}$ (c) 0 (d) $\frac{1}{5}$

(2021C)

13. If two different dice are rolled together, the probability of getting an even number on both dice, is
(a) 1/36
(b) 1/2
(c) 1/6
(d) 1/4 (Delhi 2014)

14. A number is selected at random from the numbers 1 to 30. The probability that it is a prime number is
(a) 2/3
(b) 1/6
(c) 1/3
(d) 11/30 (Delhi 2014)

15. In a family of 3 children, the probability of having at least one boy is
(a) 7/8
(b) 1/8
(c) 5/8
(d) 3/4 (Al 2014)

16. The probability that a number selected at random from the numbers 1, 2, 3, ..., 15 is a multiple of 4, is
(a) 4/15
(b) 2/15
(c) 1/5
(d) 1/3 (Al 2014)

17. A bag contains cards numbered from 1 to 25. A card is drawn at random from the bag. The probability that the number on this card is divisible by both 2 and 3 is
(a) 1/5
(b) 3/25
(c) 4/25
(d) 2/25 (Foreign 2014)

18. Two different coins are tossed simultaneously. The probability of getting at least one head is
(a) 1/4
(b) 1/8

(c) 3/4
(d) 7/8 (Foreign 2014)

VSA (1 mark)

19. The probability of an event that is sure to happen, is (NCERT, 2020)

20. If the probability of an event E happening is 0.023,
then P(E) = _____ (2020)

21. A letter of English alphabet is chosen at random. What is the probability that the chosen letter is a consonant? (2020, Delhi 2015)

22. A die is thrown once. What is the probability of getting a number less than 3? (2020) (U

23. If the probability of winning a game is 0.07, what is the probability of losing it? (2020) (U

24. A number is chosen at random from the numbers -3, -2, -1, 0, 1, 2, 3. What will be the probability that square of this number is less than or equal to 1? (Delhi 2017)

25. The probability of selecting a rotten apple randomly from a heap of 900 apples is 0.18. What is the number of rotten apples in the heap? (Al 2017)

26. Cards marked with number 3, 4, 5, ..., 50 are placed in a box and mixed thoroughly. A card is drawn at random from the box. Find the probability that the selected card bears a perfect square number. (Delhi 2016)

27. A card is drawn at random from a well shuffled pack of 52 playing cards. Find the probability of getting neither a red card nor a queen. (Al 2016)

28. 20 tickets, on which numbers 1 to 20 are written, are mixed thoroughly and then a ticket is drawn at random out of them. Find the probability that the number on the drawn ticket is a multiple of 3 or 7. (Foreign 2016)

29. Two different dice are tossed together. Find the probability that the product of the two numbers on the top of the dice is 6. (Al 2015)

30. A game of chance consists of spinning an arrow which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8 and these are equally likely

outcomes. Find the probability that the arrow will point at any factor of 8. (Foreign 2015)

SAI (2 marks)

31. A bag contains 4 red, 3 blue and 2 yellow balls. One ball is drawn at random from the bag. Find the probability that drawn ball is (i) red (ii) yellow. (2023)

32. If a fair coin is tossed twice, find the probability of getting 'atmost one head. (2023)

33. A jar contains 18 marbles. Some are red and others are yellow. If a marble is drawn at random from the jar, the probability that it is red is $\frac{2}{3}$. Find the number of yellow marbles in the jar. *(2020C)*

34. A die is thrown twice. What is the probability that
(i) 5 will come up at least once, and
(ii) 5 will not come up either time? (2020C)

35. If a number x is chosen at random from the numbers -3, -2, -1, 0, 1, 2, 3. What is the probability that $x^2 \leq 4$? (2020)

36. Cards numbered 7 to 40 were put in a box. Poonam selects a card at random. What is the probability that Poonam selects a card which is a multiple of 7? (2019)

37. A card is drawn at random from a pack of 52 playing cards. Find the probability of drawing a card which is neither a spade nor a king. (2019)

38. A pair of dice is thrown once. Find the probability of getting (i) even number on each dice (ii) a total of 9. (2019C)

39. A bag contains some balls of which x are white, 2x are black and 3x are red. A ball is selected at random. What is the probability that it is (i) not red (ii) white? (2019C)

40. A die is thrown once. Find the probability of getting a number which (i) is a prime number (ii) lies between 2 and 6. (Delhi 2019)

41. A game consists of tossing a coin 3 times and noting the outcome each time. If getting the same result in all the tosses is a success, find the probability of losing the game. (Delhi 2019)

42. Cards marked with numbers 5 to 50 (one number on one card) are placed in a box and mixed thoroughly. One card is drawn at random from the box. Find the probability that the number on the card taken out is
(i) a prime number less than 10, (ii) a number which is a perfect square. (A/ 2019)

43. A child has a die whose 6 faces show the letters given below:

A	B	C	A	A	B

The die is thrown once. What is the probability of getting (i) A (ii) B? (AI 2019)

44. An integer is chosen at random between 1 and 100. Find the probability that it is:
(i) divisible by 8
(ii) not divisible by 8. (2018)

45. Two different dice are tossed together. Find the probability:
(i) of getting a doublet
(ii) of getting a sum 10 of the numbers on the two dice. (2018)

46. Two different dice are rolled together. Find the probability of getting:
(i) the sum of numbers on two dice to be 5.
(ii) even numbers on both dice. (Delhi 2015, Al 2014)

47. Rahim tosses two different coins simultaneously. Find the probability of getting at least one tail. (Delhi 2014)

48. Two different dice are rolled simultaneously. Find the probability that the sum of numbers appearing on the two dice is 10. (Foreign 2014)

SA II (3 mark

49. Two different dice are thrown together. Find the probability that the numbers obtained
(i) have a sum less than 7

(ii) have a product less than 16
(iii) is a doublet of odd numbers (Delhi 2017)

50. A bag contains 15 white and some black balls. If the probability of drawing a black ball from the bag is thrice that of drawing a white ball, find the number of black balls in the bag. (Al 2017)

51. In a single throw of a pair of different dice, what is the probability of getting (i) a prime number on each
dice? (ii) a total of 9 or 11? (Delhi 2016)

52. Two different dice are thrown together. Find the probability of:
(i) getting a number greater than 3 on each die
(ii) getting a total of 6 or 7 of the numbers on two dice (Delhi 2016)

53. A box consists of 100 shirts of which 88 are good, 8 have minor defects and 4 have major defects. Ramesh, a shopkeeper will buy only those shirts which are good but 'Kewal' another shopkeeper will not buy shirts with major defects. A shirt is taken out of the box at random. What is the probability that
(i) Ramesh will buy the selected shirt?
(ii) 'Kewal' will buy the selected shirt? (Delhi 2016)

54. Three different coins are tossed together. Find the probability of getting (i) exactly two heads (ii) at least two heads (iii) at least two tails. (AI 2016)

55. From a pack of 52 playing cards, Jacks, Queens and Kings of red colour are removed. From the remaining, a card is drawn at random. Find the probability that drawn card is (i) a black King (ii) a card of red colour
(iii) a card of black colour (AI 2016)

56. There are 100 cards in a bag on which numbers from 1 to 100 are written. A card is taken out from the bag at random. Find the probability that the number on the selected card (i) is divisible by 9 and is a perfect square (ii) is a prime number greater than 80. (Al 2016)

57. A game consist of tossing a one-rupee coin 3 times and noting the outcome each time. Ramesh will win the game if all the tosses show the same result, (i.e.

either all three heads or all three tails) and loses the game otherwise. Find the probability that Ramesh will lose the game. (Foreign 2016)

58. Three distinct coins are tossed together. Find the probability of getting
(i) at least 2 heads
(ii) at most 2 heads
(Delhi 2015)

59. All red face cards are removed from a pack of playing cards. The remaining cards were well shuffled and then a card is drawn at random from them. Find the probability that the drawn card is
(i) a red card
(iii) a card of club
(ii) a face card
(Delhi 2015)

60. The probability of selecting a red ball at random from a jar that contains only red, blue and orange balls is $\frac{1}{4}$. The probability of selecting a blue ball at random from the same jar is $\frac{1}{3}$. If the jar contains 10 orange balls, find the total number of balls in the jar.
(AI 2015) Cr

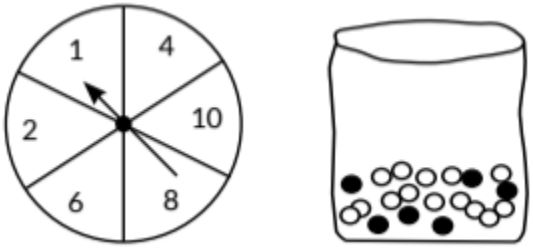
61. A bag contains, white, black and red balls only. A ball is drawn at random from the bag. If the probability of getting a white ball is $\frac{3}{10}$ and that of a black ball is $\frac{2}{5}$, then find the probability of getting a red ball.
If the bag contains 20 black balls, then find the total number of balls in the bag.
(Al 2015)
62. A bag contains 18 balls out of which x balls are red.
(i) If one ball is drawn at random from the bag, what is the probability that it is not red?
(ii) If 2 more red balls are put in the bag, the probability of drawing a red ball will be $\frac{9}{8}$ times the probability of drawing a red ball in the first case. Find the value of x.
(Foreign 2015) Cr

63. A game consists of tossing a one-rupee coin three times and noting its outcome each time. Find the probability of getting
(i) three heads,
(ii) at least two tails. (Foreign 2015)

64. A bag contains 20 balls out of which x balls are red.
(i) If one ball is drawn at random from the bag, find the probability that it is not red.
(ii) If 4 more red balls are put into the bag, the probability of drawing a red ball will be $\frac{5}{4}$ times the probability of drawing a red ball in the first case. Find the value of x. (Foreign 2015)

LA (4/5/6 marks)

65. Read the following passage and answer the questions given at the end: Diwali Fair A game in a booth at a Diwali Fair involves using a spinner first. Then, if the spinner stops on an even number, the player is allowed to pick a marble from a bag. The spinner and the marbles in the bag are represented in figure. Prizes are given, when a black marble is picked. Shweta plays the game once.

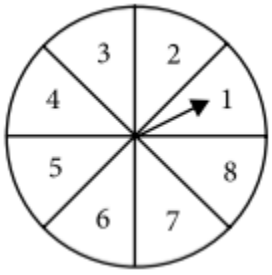


(i) What is the probability that she will be allowed to pick a marble from the bag?
(ii) Suppose she is allowed to pick a marble from the bag, what is the probability of getting a prize, when it is given that the bag contains 20 balls out of which 6 are black? (2020)

66. Peter throws two different dice together and finds the product of the two numbers obtained. Rina throws a die and squares the number obtained. Who has the better chance to get the number 25. (Delhi 2017)

67. Two different dice are thrown together. Find the probability that the numbers obtained have
(i) even sum and
(ii) even product (AI 2017)

68. A game of chance consists of spinning an arrow on a circular board, divided into 8 equal parts, which comes to rest pointing at one of the numbers 1, 2, 3, ..., 8 as shown in the given figure which are equally likely outcomes. What is the probability that the arrow will point at (i) an odd number (ii) a number greater than 3 (iii) a number less than 9.

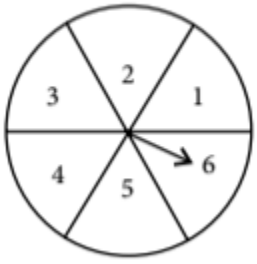


(Delhi 2016)

69. A number x is selected at random from the numbers 1, 2, 3 and 4. Another number y is selected at random from the numbers 1, 4, 9 and 16. Find the probability that product of x and y is less than 16. (AI 2016)
70. A number x is selected at random from the numbers 1,4,9, 16 and another number y is selected at random from the numbers 1, 2, 3, 4. Find the probability that the value of xy is more than 16. (AI 2016)

71. The given figure shows a disc on which a player spins an arrow twice. The fraction $\frac{a}{b}$ is formed, where 'a' is the number of sector on which arrow stops on the first spin and 'b' is the number of the sector in which the arrow stops on second spin. On each spin, each sector has equal chance of selection by the arrow.

Find the probability that the fraction $\frac{a}{b} > 1$.



(Foreign 2016)

72. A box contains 20 cards numbered from 1 to 20. A card is drawn at random from the box. Find the probability that the number on the drawn card is
(i) divisible by 2 or 3
(ii) a prime number (Delhi 2015)

73. A bag contains 25 cards numbered from 1 to 25. A card is drawn at random from the bag. Find the probability that the number on the drawn card is
(i)divisible by 3 or 5
(ii) a perfect square number (Delhi 2015)

74. A card is drawn at random from a well-shuffled deck of playing cards. Find the probability that the card drawn is
(i) a card of spade or an ace.
(ii) a black king.
(iii) neither a jack nor a king.
(iv) either a king or a queen. (AI 2015)

75. A box contains cards bearing number from 6 to 70. If one card is drawn at random from the box, find the probability that it bears
(i) a one digit number.
(ii) a number divisible by 5.
(iii) an odd number less than 30.
(iv) a composite number between 50 and 70. (Foreign 2015)

76. A bag contains cards numbered from 1 to 49. A card is drawn from the bag at random, after mixing the cards thoroughly. Find the probability that the number on the drawn card is
(i) an odd number
(ii) a multiple of 5
(iii) a perfect square
(iv) an even prime number (Delhi 2014)

77. All the black face cards are removed from a pack of 52 playing cards. The remaining cards are well shuffled and then a card is drawn at random. Find the probability of getting a
(i) face card
(iii) black card
(ii) red card
(iv) king (Delhi 2014)

78. Cards numbered from 11 to 60 are kept in a box. If a card is drawn at random from the box, find the probability that the number on the drawn card is
(i) an odd number
(ii) a perfect square number
(iii) divisible by 5
(iv) a prime number less than 20 (Delhi 2014)

79. Red queens and black jacks are removed from a pack of 52 playing cards. A card is drawn at random from the remaining cards, after reshuffling them. Find the probability that the drawn card is
(i) a king
(ii) of red colour
(iii) a face card
(iv) a queen (Al 2014)

80. All the red face cards are removed from a pack of 52 playing cards. A card is drawn at random from the remaining cards, after reshuffling them. Find the probability that the drawn card is
(i) of red colour
(ii) a queen
(iii) an ace
(iv) a face card (Al 2014)

81. Five cards the ten, jack, queen, king and ace of diamonds, are well shuffled with their faces downwards. One card is then picked up at random.
(a) What is the probability that the drawn card is the queen?
(b) If the queen is drawn and put aside, and a second card is drawn, find the probability that the second card is (i) an ace (ii) a queen. (NCERT, AI 2014)

82. Cards numbered 1 to 30 are put in a bag. A card is drawn at random from this bag. Find the probability that the number on the drawn card is
(i) not divisible by 3.
(ii) a prime number greater than 7.
(iii) not a perfect square number. (Foreign 2014)

83. A dice is rolled twice. Find the probability that
(i) 5 will not come up either time.
(ii) 5 will come up exactly one time. (Foreign 2014)

84. A piggy bank contains hundred 50 p coins, fifty Rs1 coins, twenty *2 coins and ten Rs5 coins. If it is equally likely that one of the coins will fall out when the bank is turned upside down, find the probability that the coin which fell
(i) will be a 50p coin.
(ii) will be of value more than Rs1.
(iii) will be of value less than Rs5.
(iv) will be a Rs1 or 2 coin. (Foreign 2014)

CBSE Sample Questions

14.1 Probability - A Theoretical Approach

MCQ

1. Two dice are rolled simultaneously. What is the probability that 6 will come up at least once?
(a) 1/6
(b) 7/36
(c) 11/36
(d) 13/36 (2022-23)

2. Two fair coins are tossed. What is the probability of getting at the most one head?

(a) $\frac{3}{4}$ (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) $\frac{3}{8}$

(Term I, 2021-22)

3. A letter of English alphabets is chosen at random. What is the probability that it is a letter of the word MATHEMATICS?

(a) $\frac{4}{13}$ (b) $\frac{9}{26}$ (c) $\frac{5}{13}$ (d) $\frac{11}{26}$

(Term I, 2021-22)

4. A card is drawn from a well shuffled deck of cards. What is the probability that the card drawn is neither a king nor a queen?

(a) $\frac{11}{13}$ (b) $\frac{12}{13}$ (c) $\frac{11}{26}$ (d) $\frac{11}{52}$

(Term I, 2021-22)

5. Two fair dice are rolled simultaneously. The probability that 5 will come up at least once is

(a) $\frac{5}{36}$ (b) $\frac{11}{36}$ (c) $\frac{12}{36}$ (d) $\frac{23}{36}$

(Term I, 2021-22)

VSA (1 mark)

6. Find the probability of getting a doublet in a throw of a pair of dice. (2020-21)

7. Find the probability of getting a black queen when a card is drawn at random from a well-shuffled pack of 52 cards. (2020-21)

SA II (3 marks)

8. Two coins are tossed simultaneously. What is the probability of getting
(i) At least one head?
(ii) At most one tail?
(iii) A head and a tail? (2022-23)

SOLUTIONS

Previous Years' CBSE Board Questions

1. (a): Total number of people = 20
Number of people who can't swim = 5
Number of people who can swim = 20-5 = 15

$$\therefore \quad \text{Required probability} = \frac{15}{20} = \frac{3}{4}$$

2. (a): Probability of happening of an event +
Probability of non-happening of an event = 1
:- p+q=1

3 (c): Probability of winning first prize

$$= \frac{\text{Ticket bought by girl}}{\text{Total ticket sold}}$$

$$\Rightarrow \quad 0.08 = \frac{\text{Ticket bought by girl}}{6000}$$

$$\Rightarrow \quad \text{Ticket bought by girl} = 0.08 \times 6000 = 480$$

4. (c): Total number of outcomes = 6x6 = 36
Favourable outcomes are (1, 4), (2, 5), (3, 6), (4, 1), (5, 2), (6, 3) i.e., 6 in number

$$\therefore \quad \text{Required probability} = \frac{6}{36} = \frac{1}{6}$$

5. (d): Total number of cards = 52
Number of ace card =4
:- Number of non ace card = 52-4 = 48

$$\therefore \quad \text{Required probability} = \frac{48}{52} = \frac{12}{13}$$

6. (c): The leap year has 366 days, i.e., 52 weeks and 2 days.

$$\therefore \quad \text{Required Probability} = \frac{2}{7}$$

The non-leap year has 365 days, i.e., 52 weeks and 1 day.

$$\therefore \quad \text{Required probability} = \frac{1}{7}$$

Therefore, assertion is true but reason is false.

7. (b): Probability of drawing a green ball
$= 3 \times$ Probability of drawing a red ball

$$\Rightarrow \quad \frac{n}{n+5} = \frac{3 \times 5}{n+5}$$

$$\Rightarrow \quad \frac{n}{n+5} = \frac{15}{n+5}$$

$$\therefore \quad n = 15$$

(b): Sample space = {(H,H), (H, T), (T, H), (T, T)}
:- Number of total outcomes = 4
Favourable outcomes = {(H,H)}
:- Number of favourable outcomes = 1

$$\therefore \quad \text{Required probability} = \frac{1}{4}$$

(a): Sample space = {1, 2, 3, 4, 5, 6}
:- Number of total outcomes = 6
Favourable outcomes = {4,6}
:- Number of favourable outcomes = 2

$$\therefore \quad \text{Required probability} = \frac{2}{6} = \frac{1}{3}$$

10. (a): We know that, there are 52 complete weeks in 364 days.
Since, it is non leap year.
So, there will be 52 Wednesdays and remaining 365th day may be any of the days of week.
So, total number of ways = 7
:- Number of favourable outcomes = 1

$$\therefore \quad \text{Required probability} = \frac{1}{7}$$

11. (c) Total number of letters in the word 'MANGO' are 5.
So, number of total outcomes = 5
Vowels in the word 'MANGO' are A, O

So, number of favourable outcomes = 2

$\therefore$ Required probability $= \frac{2}{5}$

12. Card numbered from {1, 2, 3, ..., 20}
Total number of possible outcomes = 20
(i) (d): Odd prime numbers from 1 to 20 = {3, 5, 7, 11,13, 17, 19}
Total number of favourable outcomes = 7
Hence, the probability that the number on the card

drawn is an odd prime number $= \frac{7}{20}$

(ii) (d): Total number of composite numbers between 1 to 20 = {4, 6, 8, 9, 10, 12, 14, 15, 16, 18}
:- Total number of favourable outcomes = 10
So, the probability that the number on the drawn card is

a composite number $= \frac{10}{20}$

$\therefore$ Required Probability $= \frac{1}{2}$

(iii) (c) : Multiple of 3 = {3, 6, 9, 12, 15, 18}
Multiple of 6 = {6, 12, 18}
Multiple of 9 = {9, 18}
$\therefore$ Total number of favourable outcomes = 1

Hence the probability that the card is a multiple of 3, 6

and 9 $= \frac{1}{20}$

$\therefore$ Required Probability $= \frac{1}{20}$

(iv) (c) Multiple of 3 between 1 to 20 = {3, 6, 9, 12, 15, 18}
Multiple of 7 between 1 to 20 = {7, 14}
.. Multiple of 3 and 7 = 0
:- Total number of favourable outcomes = 0
:- Required Probability = 0
(v) (b) If all odd number cards are removed then remaining cards which are

left = {2, 4, 6, 8, 10, 12, 14, 16, 18, 20}
Now, prime number cards in remaining cards = 1
So, the probability of getting a prime number from the remaining cards = 10

13. (d): Total number of outcomes = 6×6=36
Favourable outcomes are {(2, 2), (2, 4), (2, 6), (4, 2), (4, 4),
(4, 6), (6, 2), (6, 4), (6, 6)}
Total number of favourable outcomes = 9

$\therefore \quad P(\text{Even number on both dice}) = \frac{9}{36} = \frac{1}{4}$.

14. (c): Total number of possible outcomes = 30
Prime numbers from 1 to 30 are 2, 3, 5, 7, 11, 13, 17, 19, 23 and 29.
Total number of favourable outcomes = 10

$\therefore \quad \text{Required probability} = \frac{10}{30} = \frac{1}{3}$

15. (a): Total possible outcomes are
{GGG, GGB, GBG, BGG, BBB, BBG, BGB, GBB) i.e., 8 in number.
Favourable outcomes are
{GGB, GBG, BGG, BBB, BBG, BGB, GBB} i.e., 7 in number

$\therefore \quad P(\text{having at least one boy}) = \frac{7}{8}$

16. (c): Total number of outcomes = 15
Favourable outcomes are 4, 8, 12, i.e., 3 in number.

$\therefore \quad P(\text{getting a multiple of 4}) = \frac{3}{15} = \frac{1}{5}$

17. (c): Total number of cards = 25
Numbers divisible by both 2 and 3 are 6, 12, 18, 24.
:- Total number of favourable outcomes = 4

$\text{Hence, required probability} = \frac{4}{25}$

18. (c): Sample space = {HH, HT, TH, TT}
:- Total number of possible outcomes = 4
Total outcomes having at least one head = {HT, TH, HH}
:- Number of favourable outcomes = 3

$\therefore \quad P(\text{getting at least one head}) = \frac{3}{4}$

19. The probability of an event that is sure to happen, is 1.

20. Given, P(E) = 0.023
:- P(E)=1-P(E)=1 -0.023 = 0.977

21. Total number of English alphabets = 26
Number of consonants = 26-5=21
:- Number of favourable outcomes = 21

$P(\text{chosen letter is a consonant}) = \frac{21}{26}.$

22. Total number of outcomes = 6
Favourable outcomes are {1, 2} i.e., 2 in number

$P(\text{chosen letter is a consonant}) = \frac{21}{26}.$

22. Total number of outcomes = 6
Favourable outcomes are {1, 2} i.e., 2 in number

$\therefore \quad \text{Required probability} = \frac{2}{6} = \frac{1}{3}$

23. Given, probability of winning a game is 0.07.
:- Probability of losing it = 1 -0.07 = 0.93

24. Sample space = {-3, -2, -1, 0, 1, 2, 3}
Total number of outcomes = 7.
Favourable outcomes = {-1, 0, 1} i.e., 3 in number.

$\therefore \text{Required probability} = \frac{3}{7}$

25.

$$P(\text{selecting rotten apple}) = \frac{\text{Number of rotten apples}}{\text{Total number of apples}}$$

$$\Rightarrow 0.18 = \frac{\text{Number of rotten apples}}{900}$$

$$\Rightarrow \quad \text{Number of rotten apples} = 0.18 \times 900 = 162$$

26. Total number of outcomes = 48
Favourable outcomes are {4, 9, 16, 25, 36, 49}
i.e., 6 in number.

$$\therefore P(\text{card bears a perfect square number}) = \frac{6}{48} = \frac{1}{8}$$

27. Total number of outcomes = 52
No. of red card and queen = 26+2=28

$$\text{Probability of getting either a red card or a queen} = \frac{28}{52}$$

$$\therefore \quad \text{Probability of getting neither a red card nor a queen}$$

$$= 1 - \frac{28}{52} = \frac{6}{13}$$

28. Total number of possible outcomes = 20
Multiples of 3 from 1 to 20 are {3, 6, 9, 12, 15, 18} i.e., 6 in number.
Multiples of 7 from 1 to 20 are {7, 14} i.e. 2 in number.
So, number of favourable outcomes = 6+2 = 8

$$\therefore \quad \text{Required probability} = \frac{8}{20} = \frac{2}{5}$$

29. Total number of possible outcomes = 6 x 6 = 36
Favourable outcomes are {(1, 6), (2, 3), (3, 2), (6, 1)}
i.e., 4 in number.

$$\therefore P(\text{getting the product } 6) = \frac{4}{36} = \frac{1}{9}$$

30. Factors of 8 are 1, 2, 4, 8
.. Number of favourable outcomes = 4
Total number of possible outcomes = 8

$$\therefore P(\text{arrow pointing at any factor of } 8) = \frac{4}{8} = \frac{1}{2}$$

31. Number of red balls = 4
Number of blue balls = 3
Number of yellow balls = 2

Total number of balls = 4+3+2=9

(i) $P(\text{drawing a red ball}) = \frac{4}{9}$

(ii) $P(\text{drawing a yellow ball}) = \frac{2}{9}$

32. Let A be the event of getting atmost one head.
and S be the sample space.
S = {HH, HT, TH, TT} and A = {HT, TH, TT}
= n(s) = 4
Also, n(A) = 3

$\therefore$ Required probability $= \frac{n(A)}{n(S)} = \frac{3}{4}$

33. There are 18 marbles in the jar.
:- Number of possible outcomes = 18
Let there are x yellow marbles in the jar.
:- Number of red marbles = 18-x
⇒ Number of favourable outcomes = (18 - x)

$\therefore$ Probability of drawing a red marble $= \frac{(18-x)}{18}$

Now, according to the question, $\frac{18-x}{18} = \frac{2}{3}$

$\Rightarrow 3(18 - x) = 2 \times 18$

$\Rightarrow 54 - 3x = 36 \Rightarrow 3x = 18 \Rightarrow x = 6$

So, number of yellow marbles in jar = 6

34. Since, throwing a die twice or throwing two dice simultaneously are same.
Possible outcomes 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) Let N be the event that 5 will come up at least once, then number of favourable outcomes = 5 + 6 = 11

$\therefore P(N) = \frac{11}{36}$

(ii) Let E be the event that 5 does not come up either time, then number of favourable outcomes = [36 - (5+6)]
= 25.

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

35. Total number of outcomes = {-3, -2, -1, 0, 1, 2, 3}
i.e., 7.
:- Number of favourable outcomes = {4, 1, 0, 1, 4}
i.e., 5.

$$\therefore \quad \text{Required probability } =\frac{5}{7}$$

36. Cards are numbered from 7 to 40. i.e. {7, 8, 9,...., 40}
So, total number of outcomes = 34
Multiple of 7 lies between 7 to 40 are {7, 14, 21, 28, 35}
:- Total number of favourable outcomes = 5

$$\therefore \quad \text{Required probability } =\frac{5}{34}$$

37. Total number of cards = 52
Total number of spade cards = 13
Total number of king cards = 4
:- Total number of spade cards and king cards
= 13+ 4-1 = 16
[One card is subtracted as it is already included as a king of spade]

$$\therefore \quad \text{Probability of drawing a spade or king card } =\frac{16}{52}$$

So, probability of drawing a card which is neither a spade nor a king

$$=1-\frac{16}{52}=\frac{9}{13}$$

38. If a pair of dice is thrown once, then possible outcomes 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)}
:- Number of possible outcomes are 36.
(i) Total possible outcomes of getting even number on each die
= {(2, 2), (2, 4), (2, 6), (4, 4), (4, 6), (6, 6), (6, 2), (6, 4), (4, 2)}
Number of favourable outcomes = 9
:- Required probability of getting an even number on each die $= \frac{9}{36} = \frac{1}{4}$

(ii) Total possible outcomes of getting a total of 9
= {(3, 6), (4, 5), (5, 4), (6, 3)} which are 4 in number.

$\therefore$ Probability of getting a total of 9 $= \frac{4}{36} = \frac{1}{9}$

39. We have, total number of balls = x + 2x + 3x=6x
:- Total number of outcomes = 6x
(i) Number of favourable outcomes = 3x

$\therefore$ Probability of getting red ball $= \frac{3x}{6x} = \frac{1}{2}$

Now, probability of not getting red ball $= 1 - \frac{1}{2} = \frac{1}{2}$

$\therefore$ Required probability $= \frac{1}{2}$

(ii) Total number of favourable outcomes = x

$\therefore$ Probability of getting white ball $= \frac{x}{6x}$

$\therefore$ Required probability $= \frac{1}{6}$

40. Total possible outcomes are {1, 2, 3, 4, 5, 6} i.e., 6 in number.
(i) Favourable outcomes are {2, 3, 5} i.e., 3 in number.

$\therefore$ P (getting a prime number) $= \frac{3}{6} = \frac{1}{2}$

(ii) Favourable outcomes are {3, 4, 5} *i.e.*, 3 in number.

$\therefore$ P(getting a number lying between 2 and 6) $= \frac{3}{6} = \frac{1}{2}$

41. When a coin is tossed 3 times, then total possible outcomes are {HHH, HHT, HTH, THH, HTT, THT, TTH, TTT}
:- Total number of possible outcomes = 8

Possible outcomes to lose the game
are {HHT, HTH, THH, HTT, THT, TTH}
:- Number of favourable outcomes = 6

$\therefore$ Required probability $= \frac{6}{8} = \frac{3}{4}$

42. Total number of cards = 50-5+1=46
:- Total number of possible outcomes = 46
(i) Prime numbers less than 10 are 5, 7.
So, number of favourable outcomes = 2

$\therefore$ P(getting a prime number less than 10) $= \frac{2}{46} = \frac{1}{23}$

(ii) Perfect squares from 5 to 50 are 9, 16, 25, 36, 49 i.e., 5 in number.
:- P(getting a number which is a perfect square) = 5/46

43. Total number of faces in a die = 6
(i) Number of favourable outcomes = 3

$\therefore$ P (getting A) $= \frac{3}{6} = \frac{1}{2}$

(ii) Number of favourable outcomes = 2

$\therefore$ P(getting B) $= \frac{2}{6} = \frac{1}{3}$

44. Total number of possible outcomes = 98

$$\text{Probability} = \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}}$$

(i) When numbers are divisible by 8, then possible outcomes are 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96.
Number of favourable outcomes = 12

$\therefore$ P(divisible by 8) $= \frac{12}{98} = \frac{6}{49}$

(ii) P(not divisible by 8) $= 1 - \frac{12}{98} = \frac{86}{98} = \frac{43}{49}$

45. Total number of possible outcomes = 36
(i) For getting a doublet the possible outcomes are
(1,1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6).

:- Number of favourable outcomes = 6

$\therefore$ $P(\text{getting a doublet}) = \frac{6}{36} = \frac{1}{6}$

(ii) For getting a sum 10 on two dice the possible outcomes are (4, 6), (5, 5), (6, 4).

$\therefore$ Number of favourable outcomes = 3

$\therefore$ $P(\text{getting a sum 10}) = \frac{3}{36} = \frac{1}{12}$

46. Total number of possible outcomes = 6 x 6 = 36

(i) Possible outcomes for the sum of numbers on two dice to be 5 are (1, 4), (2, 3), (3, 2), (4, 1).

So, number of favourable outcomes = 4

$\therefore$ $P(\text{getting the sum of numbers to be 5}) = \frac{4}{36} = \frac{1}{9}$

(ii) Total number of outcomes = $6 \times 6 = 36$

Favourable outcomes are {(2, 2), (2, 4), (2, 6), (4, 2), (4, 4), (4, 6), (6, 2), (6, 4), (6, 6)}

Total number of favourable outcomes = 9

$\therefore$ $P(\text{Even number on both dice}) = \frac{9}{36} = \frac{1}{4}$.

47. Total possible outcomes are {HH, HT, TH, TT} i.e., 4 in number.

Favourable outcomes of getting at least one tail are {HT, TH, TT} i.e., 3 in number.

$\therefore$ $\text{Required probability} = \frac{3}{4}$

48. Total number of outcomes = $6 \times 6 = 36$

Favourable outcomes are {(4, 6), (5, 5), (6, 4)} i.e., 3 in number.

$\therefore$ $\text{Required probability} = \frac{3}{36} = \frac{1}{12}$

49. Total number of outcomes = $6 \times 6 = 36$

(i) Favourable outcomes are {(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (2, 1), (2, 2), (2, 3), (2, 4), (3, 1), (3, 2), (3, 3), (4, 1), (4, 2), (5, 1)} i.e., 15 in number.

:- Required probability

$$= \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}} = \frac{15}{36} = \frac{5}{12}$$

(ii) Favourable outcomes 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), (4, 1), (4, 2), (4, 3), (5, 1), (5, 2), (5, 3), (6, 1), (6, 2)} i.e., 25 in number.
:- Required probability

$$= \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}} = \frac{25}{36}$$

(iii) Favourable outcomes are {(1, 1), (3, 3), (5, 5)} i.e., 3 in number.
:- Required probability

$$= \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}} = \frac{3}{36} = \frac{1}{12}$$

50. Number of white balls in the bag = 15
Let the number of black balls be x.
Then, total number of balls in the bag = 15+x

$$P(\text{drawing a black ball}) = \frac{x}{15+x}$$

$$P(\text{drawing a white ball}) = \frac{15}{15+x}$$

$$\text{According to question, } \frac{x}{15+x} = 3\left(\frac{15}{15+x}\right) \Rightarrow x = 45$$

51. Total number of possible outcomes = 6 x 6 = 36
(i) Favourable outcomes are
{(2, 2), (2, 3), (2, 5), (3, 2), (3, 3), (3, 5), (5, 2), (5, 3), (5, 5)}

i.e., 9 in number.

$\therefore$ P(getting a prime number on each dice) $= \frac{9}{36} = \frac{1}{4}$

(ii) Favourable outcomes are

{(3, 6), (4, 5), (5, 4), (6, 3), (6, 5), (5, 6)} *i.e.*, 6 in number.

$\therefore$ P(getting a total of 9 or 11) = $\frac{6}{36} = \frac{1}{6}$

52. Total number of possible outcomes = 6 x 6 = 36

(i) Favourable outcomes are {(4, 4), (4, 5), (4, 6), (5, 4), (5, 5), (5, 6), (6, 4), (6, 5), (6, 6)} i.e., 9 in number.

$\therefore$ Required probability = $\frac{9}{36} = \frac{1}{4}$

(ii) Favourable outcomes are {(1, 5), (1, 6), (2, 4), (2,5), (3, 3), (3, 4), (4, 3), (4, 2), (5, 1), (5, 2), (6, 1)} i.e., 11 in number.

$\therefore$ P(getting a total of 6 or 7) = $\frac{11}{36}$

53. Total number of shirts = 100

(i) Number of good shirts = 88

$\therefore$ P(Ramesh buys a good shirt) = $\frac{88}{100} = \frac{22}{25}$

(ii) Number of shirts which don't have major defects
= 88 + 8 = 96

$\therefore$ P(Kewal buys the selected shirt) $= \frac{96}{100} = \frac{24}{25}$

54. Total possible outcomes are {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT}

Total number of possible outcomes = 8

(i) Favourable outcomes = {HHT, HTH, THH} i.e., 3 in number.

:- P(getting exactly 2 heads)

$$= \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}} = \frac{3}{8}$$

(ii) Favourable outcomes = {HHH, HHT, HTH, THH} *i.e.*, 4 in number.

$\therefore \quad P(\text{at least 2 heads}) = \frac{4}{8} = \frac{1}{2}$

(iii) Favourable outcomes = {HTT, THT, TTH, TTT} *i.e.*, 4 in number.

$\therefore \quad P(\text{getting at least 2 tails}) = \frac{4}{8} = \frac{1}{2}$

55. Total number of outcomes=52-(2+2+2)=46

(i) Number of black kings = 2

$\therefore \quad P(\text{drawing a card of black king}) = \frac{2}{46} = \frac{1}{23}$

(ii) Since 6 red colour cards are removed from the deck.

$\therefore$ Number of red cards left = 26 – 6 = 20

$\therefore \quad P(\text{drawing a card of red colour}) = \frac{20}{46} = \frac{10}{23}$

(iii) Total number of black cards = 26

$\therefore \quad P(\text{drawing a card of black colour}) = \frac{26}{46} = \frac{13}{23}$

56. Total number of possible outcomes = 100

(i) Numbers on cards, divisible by 9 and a perfect square are {9, 36, 81} i.e., 3 in number.

:- Total number of favourable outcomes = 3

$\therefore \quad \text{Required probability} = \frac{3}{100}$

(ii) Prime numbers greater than 80 are {83, 89, 97}.

$\therefore$ Total number of favourable outcomes = 3

$\therefore \quad \text{Required probability} = \frac{3}{100}$

57. When a coin is tossed 3 times, then total possible outcomes are {HHH, HHT, HTH, THH, HTT, THT, TTH, TTT}

:- Number of possible outcomes = 8

Possible outcomes to lose the game are {HHT, HTH, THH, HTT, THT, TTH}

:- Number of favourable outcomes = 6

$\therefore$ Required probability $= \frac{6}{8} = \frac{3}{4}$

58. Possible outcomes when three distinct coins tossed together are {HHA, HHT, HTH, THH, HTT, THT, TTH, TTT}.

;- Total number of possible outcomes = 8

(i) Favourable outcomes for at least two heads are {HHH, HHT, HTH, THH}.

:- Number of favourable outcomes = 4

$P(\text{getting at least 2 heads}) = \frac{4}{8} = \frac{1}{2}$

(ii) Favourable outcomes for atmost two heads are {HHT, HTH, THH, HTT, THT, TTH, TTT}.

$\therefore$ Number of favourable outcomes = 7

$\therefore P(\text{getting atmost 2 heads}) = \frac{7}{8}$

59. Total number of cards in a pack = 52

Number of red face cards removed = 6

:- Remaining cards = 52-6=46

(i) Number of favourable outcomes = 26-6=20

$P(\text{drawing a red card}) = \frac{20}{46} = \frac{10}{23}$

(ii) There are 12 face cards in a pack.

:- Number of favourable outcomes = 12-6=6

(As red face cards have been removed)

$P(\text{drawing a face card}) = \frac{6}{46} = \frac{3}{23}$

(iii) There are 13 cards of club.

$\therefore$ Number of favourable outcomes = 13

P (drawing a card of club) = $\frac{13}{46}$

60.

Given, probability of selecting a red ball, $P(R)=\frac{1}{4}$

Probability of selecting a blue ball, $P(B)=\frac{1}{3}$

Since, $P(R) + P(B) + P(O) = 1$

(where $P(O)$ is probability of selecting an orange ball)

$\Rightarrow \frac{1}{4}+\frac{1}{3}+P(O)=1$

$\Rightarrow P(O)=1-\frac{1}{4}-\frac{1}{3}=\frac{12-3-4}{12}=\frac{12-7}{12}=\frac{5}{12}$

Also, $P(O)=\frac{\text{Number of orange balls}}{\text{Total number of balls}}$

$\Rightarrow \frac{5}{12}=\frac{10}{\text{Total number of balls}}$

$\Rightarrow \text{Total number of balls}=\frac{12\times10}{5}=24$

61.

$P(\text{getting a white ball})=\frac{3}{10}$

$P(\text{getting a black ball})=\frac{2}{5}$

$P(\text{getting a red ball})=1-\left(\frac{3}{10}+\frac{2}{5}\right)$

$=1-\left(\frac{3+4}{10}\right)=1-\frac{7}{10}=\frac{3}{10}$

$P(\text{getting a black ball})=\frac{\text{Number of black balls}}{\text{Total number of balls}}$

$\Rightarrow \frac{2}{5}=\frac{20}{\text{Total number of balls}}$

$\therefore \text{Total number of balls}=\frac{20\times5}{2}=50$

62.

(i) Total number of balls = 18

Number of red balls = x

$P(\text{drawing a red ball}) = \frac{x}{18}$

$\therefore$ Number of balls other than red = $18 - x$

$\therefore\ P(\text{not drawing a red ball}) = \frac{18-x}{18}$

(ii) When 2 red balls are added,

Total number of balls = 20

Number of red balls = $x + 2$

$\therefore\ P(\text{drawing a red ball}) = \frac{x+2}{20}$

According to given condition, $\frac{x+2}{20} = \frac{9}{8}\left(\frac{x}{18}\right)$

$\Rightarrow \frac{x+2}{20} = \frac{x}{16} \Rightarrow 16(x+2) = 20x \Rightarrow 4x + 8 = 5x \Rightarrow x = 8$

63. When a one-rupee coin is tossed three times, then possible outcomes will be {HHH, HHT, THH, HTH, TTT, TTH, THT, HTT}.

Total number of possible outcomes = 8

(i) Favourable outcomes is {HHH}.

Number of favourable outcome = 1

$\therefore\ P(\text{getting three heads}) = \frac{1}{8}$

(ii) Outcomes with at least two tails are {TTT, TTH, THT, HTT}.

Number of favourable outcomes = 4

$P(\text{getting at least two tails}) = \frac{4}{8} = \frac{1}{2}$

64. (i) Total number of balls = 20

Number of red balls = x

$P(\text{drawing a red ball}) = \frac{x}{20}$

$\therefore$ Number of balls other than red = $20 - x$

$\therefore\ P(\text{not drawing a red ball}) = \frac{20-x}{20}$

(ii) When 4 red balls are added,

Total number of balls = 24

Number of red balls = $x + 4$

$\therefore\ P(\text{drawing a red ball}) = \frac{x+4}{24}$

According to given condition, $\frac{x+4}{24} = \frac{5}{4}\left(\frac{x}{20}\right)$

$\Rightarrow \frac{x+4}{24} = \frac{x}{16} \Rightarrow 16(x+4) = 24x$

$\Rightarrow 4x + 16 = 6x \Rightarrow 2x = 16 \Rightarrow x = 8$

65. (i) Numbers on the spinner are 1, 4, 10, 8, 6, 2
i.e., 6 in number.
:- n(S) = 6
Even numbers on the spinner are 4, 10, 8, 6, 2
i.e., 5 in number.
:- n(E)=5
So, the probability that Shweta will be allowed to pick a marble $= \frac{5}{6}$

(ii) Probability of getting a prize

$= \frac{\text{Number of black balls}}{\text{Total number of balls}} = \frac{6}{20} = \frac{3}{10}$

66. Case 1: Peter throws two dice
:- Total number of possible outcomes = 6 x 6 = 36
Favourable outcomes for getting the product of two

numbers as 25 is {(5, 5)} i.e., 1 in number.

$\therefore$ Required probability $= \frac{1}{36}$

Case II : Rina throws a die

$\therefore$ Total number of possible outcomes = 6

Favourable outcomes for getting square of the number as 25 is {5} *i.e.*, 1.

$\therefore$ Required probability $= \frac{1}{6}$

Now, $\frac{1}{36} < \frac{1}{6}$

So, Rina has the better chance to get the number 25.

67. Total number of possible outcomes = 6 x 6 = 36

(i) Favourable outcomes when sum is even are

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

i.e., 18 in number.

:- P(getting even sum)

$$= \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}} = \frac{18}{36} = \frac{1}{2}$$

(ii) Favourable outcomes when product is even are

{(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)}

i.e., 27 in number.

:- P(getting even product)

$$= \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}} = \frac{27}{36} = \frac{3}{4}$$

68. Total number of possible outcomes = 8

(i) Favourable outcomes are {1, 3, 5, 7} i.e., 4 in number.

$\therefore$ *P*(getting an odd number) = $\frac{4}{8} = \frac{1}{2}$

(ii) Favourable outcomes are {4, 5, 6, 7, 8}
i.e., 5 in number.

$\therefore$ *P*(getting a number greater than 3) = $\frac{5}{8}$

(iii) Favourable outcomes are {1, 2, 3, 4, 5, 6, 7, 8}
i.e., 8 in number.

$\therefore$ *P*(getting a number less than 9) = $\frac{8}{8} = 1$

69. Total number of possible outcomes are
{(1, 1), (1, 4), (1, 9), (1, 16), (2, 1), (2, 4), (2, 9), (2, 16), (3, 1),
(3, 4), (3, 9), (3, 16), (4, 1), (4, 4), (4, 9), (4, 16)} i.e., 16 Favourable outcomes are
{(1, 1), (1, 4), (1, 9), (2, 1), (2, 4), (3, 1), (3, 4), (4, 1)} i.e., 8 in number.
;- Probability that product of x and y is less than 16

$$=\frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}}=\frac{8}{16}=\frac{1}{2}$$

70. Total number of outcomes are
{(1, 1), (1, 2), (1, 3), (1, 4), (4, 1), (4, 2), (4, 3), (4, 4), (9, 1).
(9, 2), (9, 3), (9, 4), (16, 1), (16, 2), (16, 3), (16, 4)} i.e., 16 in number.
Favourable outcomes when xy is more than 16 are
{(9,2), (9,3), (9,4), (16, 2), (16, 3), (16, 4)} i.e., 6 in number.
;- Probability that xy is more than 16

$$=\frac{\text{Number of favourable outcomes when } xy \text{ is more than } 16}{\text{Total number of possible outcomes}}$$

$$=\frac{6}{16}=\frac{3}{8}$$

71. Total number of possible outcomes in spinning of an arrow twice = $6\times6=36$

So, favourable outcomes (a, b) for which $\frac{a}{b}>1$ are {(2, 1),
(3, 1), (3, 2), (4, 1), (4, 2), (4, 3), (5, 1), (5, 2), (5, 3), (5, 4),
(6, 1), (6, 2), (6, 3), (6, 4), (6, 5)}

$\therefore$ Number of favourable outcomes = 15

$\therefore$ Required probability $=\frac{15}{36}=\frac{5}{12}$

72. Total number of possible outcomes = 20
(i) Numbers on the card divisible by 2 or 3 are 2, 3, 4, 6, 8, 9, 10, 12, 14, 15, 16, 18 and 20.
:- Number of favourable outcomes = 13

:- P(getting a card bearing a number divisible by 2 or 3)

$$=\frac{13}{20}$$

(ii) Prime numbers on the card are 2, 3, 5, 7, 11, 13, 17 and 19.

$\therefore$ Number of favourable outcomes = 8

$\therefore$ P(getting a card bearing a prime number) $=\frac{8}{20}=\frac{2}{5}$

73. Total number of possible outcomes = 25

(i) Numbers on the cards divisible by 3 or 5 are 3, 5, 6, 9, 10, 12, 15, 18, 20, 21, 24 and 25.

:- Number of favourable outcomes = 12

P(drawing a card bearing a number divisible by 3 or 5)

$$=\frac{12}{25}$$

(ii) Perfect square numbers on cards are 1, 4, 9, 16 and 25.

$\therefore$ Number of favourable outcomes = 5

P(drawing a card bearing a perfect square number)

$$=\frac{5}{25}=\frac{1}{5}$$

74. Total number of possible outcomes = 52

(i) P(a card of spade or an ace)

$$=\frac{13}{52}+\frac{3}{52}=\frac{13+3}{52}=\frac{16}{52}=\frac{4}{13}$$

(ii) Number of favourable outcomes = 2

$\therefore$ P(a black king) $=\frac{2}{52}=\frac{1}{26}$

(iii) P(neither a jack nor a king)

= 1 – [P(a jack) + P(a king)]

$$=1-\left(\frac{4}{52}+\frac{4}{52}\right)=1-\frac{8}{52}=\frac{52-8}{52}=\frac{44}{52}=\frac{11}{13}$$

(iv) P(either a king or a queen) $=\frac{4}{52}+\frac{4}{52}=\frac{8}{52}=\frac{2}{13}$

75. Total number of possible outcomes = 65
(i) Cards having one digit number are 6, 7, 8 and 9.
:- Number of favourable outcomes = 4

$$P(\text{a one digit number}) = \frac{4}{65}$$

(ii) Numbers divisible by 5 are 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65 and 70.
:- Number of favourable outcomes = 13

$$P(\text{a number divisible by } 5) = \frac{13}{65} = \frac{1}{5}$$

(iii) Odd numbers less than 30 are 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27 and 29.
:- Number of favourable outcomes = 12

$$P(\text{an odd number less than } 30) = \frac{12}{65}$$

(iv) Composite numbers between 50 and 70 are 51, 52, 54, 55, 56, 57, 58, 60, 62, 63, 64, 65, 66, 68 and 69.
:- Number of favourable outcomes = 15

$$P(\text{a composite number between 50 and 70}) = \frac{15}{65} = \frac{3}{13}$$

76. Total number of outcomes = 49
(i) The odd numbers from 1 to 49 are 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47 and 49.
Total number of favourable outcomes = 25

$$\therefore \quad \text{Required probability} = \frac{25}{49}$$

(ii) The numbers 5, 10, 15, 20, 25, 30, 35, 40 and 45 are multiples of 5.
Total number of favourable outcomes = 9

$$\therefore \quad \text{Required probability} = \frac{9}{49}$$

(iii) The numbers 1, 4, 9, 16, 25, 36 and 49 are perfect squares.
:- Total number of favourable outcomes = 7

$$\therefore \quad \text{Required probability} = \frac{7}{49} = \frac{1}{7}$$

(iv) We know that there is only one even prime number, which is 2.
Number of favourable outcome = 1

$\therefore$ Required probability $= \frac{1}{49}$

77. Since black face cards are removed.
:- Total number of cards left = 52-6=46
(i) There are 12 face cards out of which 6 black face cards are removed.
So, total number of face cards left = 6

$\therefore$ P(getting a face card) $= \frac{6}{46} = \frac{3}{23}$

(ii) Total number of red cards = 26

$\therefore$ P(getting a red card) $= \frac{26}{46} = \frac{13}{23}$

(iii) Total number of black cards left = 26 – 6 = 20
($\because$ 6 black face cards are removed)

$\therefore$ P(getting a black card) $= \frac{20}{46} = \frac{10}{23}$

(iv) There are 4 kings out of which 2 have been removed

$\therefore$ Total number of kings left = 2

$\therefore$ P(getting a king) $= \frac{2}{46} = \frac{1}{23}$

78. Total number of cards from 11 to 60 = 50
(i) Cards bearing odd numbers are 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57 and 59.
:- Total number of favourable outcomes = 25

$\therefore$ P(getting an odd number) $= \frac{25}{50} = \frac{1}{2}$

(ii) Cards bearing perfect squares are 16, 25, 36 and 49.
:- Number of favourable outcomes = 4

$\therefore$ P(getting a perfect square number) $= \frac{4}{50} = \frac{2}{25}$

(iii) Cards bearing numbers which are divisible by 5 are 15, 20, 25, 30, 35, 40, 45, 50, 55 and 60.
:- Total number of favourable outcomes = 10

$\therefore$ P(getting a number divisible by 5) $= \frac{10}{50} = \frac{1}{5}$

(iv) Prime numbers less than 20 are 11, 13, 17 and 19. Total noumber of favourable outcomes = 4

$\therefore \quad P(\text{getting a number less than 20}) = \frac{4}{50} = \frac{2}{25}$

79. Number of red queens removed = 2
Number of black jacks removed = 2
:- Total number of possible outcomes = 52 - 4 = 48
(i) Favourable number of outcomes = 4

$\therefore \quad P(\text{getting a king}) = \frac{4}{48} = \frac{1}{12}$

(ii) Favourable number of outcomes = 26 – 2 = 24

$\therefore \quad P(\text{getting a card of red colour}) = \frac{24}{48} = \frac{1}{2}$

(iii) Favourable number of outcomes = 12 – 4 = 8

$\therefore \quad P(\text{getting a face card}) = \frac{8}{48} = \frac{1}{6}$

(iv) Favourable number of outcomes = 4 – 2 = 2

$\therefore \quad P(\text{getting a queen}) = \frac{2}{48} = \frac{1}{24}$

80. After removing all red face cards, total number of cards left = 52-6=46
(i) Total number of red cards = 26
:- Favourable number of outcomes = 26-6=20

Hence, $P(\text{getting a card of red colour}) = \frac{20}{46} = \frac{10}{23}$

(ii) Favourable number of outcomes = 4 – 2 = 2

$\therefore \quad P(\text{getting a queen}) = \frac{2}{46} = \frac{1}{23}$

(iii) Favourable number of outcomes = 4

$\therefore \quad P(\text{getting an ace}) = \frac{4}{46} = \frac{2}{23}$

(iv) Favourable number of outcomes = 12 – 6 = 6

$\therefore \quad P(\text{getting a face card}) = \frac{6}{46} = \frac{3}{23}$

81. Total number of cards i.e., 1 ten, 1 jack, 1 queen, 1 king and 1 ace are 5.
(a) Number of favourable outcome = 1

$\therefore$ P(getting a queen) $= \frac{1}{5}$

(b) If queen is drawn, then

Total number of possible outcomes = 4

(i) P(getting an ace) $= \frac{1}{4}$

(ii) P(getting a queen) = 0

82. Total number of possible outcomes = 30
(i) Numbers divisible by 3 are {3, 6, 9, 12, 15, 18, 21, 24, 27, 30) i.e., 10.
So, number of cards not divisible by 3 = 30-10=20

$\therefore$ Required probability $= \frac{20}{30} = \frac{2}{3}$

(ii) Prime numbers greater than 7 are {11, 13, 17, 19, 23, 29).
:- Total number of favourable outcomes = 6

$\therefore$ Required probability $= \frac{6}{30} = \frac{1}{5}$

(iii) Perfect square numbers from 1 to 30 are {1, 4, 9, 16, 25).
So, no. of cards which have not a perfect square no.
= 30-5=25

$\therefore$ Required probability $= \frac{25}{30} = \frac{5}{6}$

83. Total number of possible outcomes = 6 x 6 = 36
(i) Possible outcomes when 5 come up either time are
{(1, 5), (5, 1) (2, 5), (5, 2), (3, 5), (5, 3), (4, 5), (5, 4), (5,5), (5, 6), (6,5)).
:- Number of favourable outcomes = 11

$\therefore$ P(5 will come up either time) $= \frac{11}{36}$

So, P(5 will not come up either time) $= 1 - \frac{11}{36} = \frac{25}{36}$

(ii) Favourable outcomes when 5 will come up exactly one time are (1, 5), (5, 1), (2, 5), (5, 2), (3, 5), (5, 3), (4, 5), (5, 4), (5, 6), (6, 5) *i.e.*, 10 in number.

$\therefore$ P(5 will come up exactly one time) $= \frac{10}{36} = \frac{5}{18}$

84. Total coins in piggy bank = (100+ 50+20+10) = 180

(i) Total number of 50 p coins = 100

$\therefore$ $P(\text{getting a 50 } p \text{ coin}) = \frac{100}{180} = \frac{5}{9}$

(ii) Number of coins of value more than ₹1 = 20 + 10 = 30

$\therefore$ $P(\text{getting a coin of value more than ₹1}) = \frac{30}{180} = \frac{1}{6}$

(iii) Number of coins of value less than ₹5 = 100 + 50 + 20
= 170

$\therefore$ $P(\text{getting a coin of value less than ₹5}) = \frac{170}{180} = \frac{17}{18}$

(iv) Total number of coins which are either of ₹1 or ₹2
= 50 + 20 = 70

$\therefore$ $P(\text{getting a coin of ₹1 or ₹2}) = \frac{70}{180} = \frac{7}{18}$

CBSE Sample Questions

1. (c): When two dice are rolled simultaneously then sample space n(S) = 36
Number of event in which 6 will come up at least once is;
E = {(1, 6), (6, 1), (2, 6), (6, 2), (3, 6), (6, 3), (4, 6), (6, 4), (5, 6), (6, 5), (6, 6)}
.. n(E) = 11

So, required probability, $P(E) = \frac{n(E)}{n(S)} = \frac{11}{36}$ **(1)**

2. (a): Possible outcomes are
HH, HT, TH, TT
Favourable outcomes (at the most one head) are
HT, TH, TT

So, probability of getting at the most one head = $\frac{3}{4}$ **(1)**

3. (a): Total number of possible outcomes = 26
Favourable outcomes are M, A, T, H, E, I, C, S
Therefore, number of favourable outcomes = 8

$\therefore$ Required probability = $\frac{8}{26} = \frac{4}{13}$ **(1)**

4. (a): Total number of cards = 52
Total number of kings and queens in the deck of cards
= 4+4=8
:- Probability that the card drawn is neither a king nor a queen = $\frac{52-8}{52}=\frac{44}{52}=\frac{11}{13}$ **(1)**

5. (b): Total number of possible outcomes
=6×6=36
Now, outcomes when 5 will come up at least once are
(1, 5), (2, 5), (3, 5), (4, 5), (5, 5), (6, 5), (5, 1), (5, 2), (5, 3), (5, 4) and (5, 6)
$\therefore$ Probability that 5 will come up at least once = $\frac{11}{36}$ **(1)**

6. Total number of possible outcomes = 36.
For getting a doublet possible outcomes are (1, 1), (2, 2),
(3, 3), (4, 4), (5, 5), (6,6).
$\therefore$ Probability of getting a doublet = $\frac{6}{36}=\frac{1}{6}$ **(1)**

7. Total number of possible outcomes = 52
Favourable number of outcomes = 2
$\therefore$ Probability of getting a black queen = $\frac{2}{52}=\frac{1}{26}$ **(1)**

8. Total number of possible outcomes = 4
(i) Let E be the event for at least one head. Then
E = {(H, T), (T, H), (H,H)}, n(E) = 3, n(S) = 4,
$\therefore$ $P(E) = \frac{3}{4}$ **(1)**

(ii) Let E be the event for at most one tail. Then
E = {(H, T), (T, H), (H, H)}, n(E) = 3, n(S) = 4,
$\therefore$ $P(E) = \frac{3}{4}$ **(1)**

(iii) Let E be the event for a head and a tail. Then
E = {(H, T), (T, H)}
n(E) = 2, n(S) = 4
$\therefore$ $P(E) = \frac{2}{4}=\frac{1}{2}$ **(1)**