PROBABILITY

(Ref: FM-QAH2022009)

I) Based on coins

1. (a) if a coin is tossed x times, then the total number of possible outcomes is
   a) 2^{x+1} b) 2^{x-1} c) 2^{x} d) 2^{2x}

   (b) if a coin is tossed three times, then the number of outcomes in which tails occurs exactly two times is
   a) 2 b) 3 c) 1 d) 6

2. A coin is tossed 10 times. Find the probability of obtaining tails at least once.
   a) $1/2^{10}$ b) $10/2^{10}$
   c) $9/2^{10}$ d) $(2^{10} - 1)/2^{10}$

3. (a) The probability of getting at least 3 tails when 5 coins are tossed is
   a) 15/32 b) 1/2 c) 3/4 d) 1/4

   (b) The probability of getting all head when 4 coins are tossed is
   a) 9/16 b) 1/16 c) 5/16 d) 1/4

4. The probability of getting no head when five fair coins are tossed, is
   a) 31/32 b) 1/32 c) 1/16 d) None

5. The probability of getting at least three heads when six coins are tossed, is
   a) 1/2 b) 1/4 c) 3/4 d) 21/32

6. When a fair coin is tossed eight times, find the probability of getting tails at least once.

7. An unbiased coin is tossed until it shows up the same face in two consecutive throws. What is the probability that the number of tosses is not more than 5?

8. An unbiased coin is tossed until it shows up the same face in two consecutive throws. What is the probability that the number of tosses is not more than 3?

9. If a coin is tossed 5 times, then what is the probability of exactly one pair of consecutive tosses turning up the same face?

10. A fair coin is tossed 8 times. What is the probability of a head occurring as many times in the first five tosses, as in the last four?
    a) 7/32 b) 9/32 c) 5/32 d) 1/32

II) Based on Dice

11. If a dice is rolled 4 times, then the total number of possible outcomes is

12. A dice is rolled twice. In how many outcomes is the sum of the numbers shown on the two dice a composite number?

13. A dice is rolled thrice. In how many outcomes is the sum of the numbers shown on them is at least 15?

14. When two dice are rolled together, what is the probability that the sum of the numbers on the two dice is 9?
    a) 1/18 b) 1/24 c) 1/3 d) 1/12

15. If three dice are rolled together, the probability of getting prime numbers on all the three dice is
    a) 2/27 b) 4/27 c) 1/8 d) 8/27

16. The probability of getting at least one 6 when three unbiased dice are thrown together is
    a) 13/216 b) 11/216 c) 7/216 d) 91/216

17. In rolling an unbiased dice, the probability of getting an even number or a number less than 4 is
    a) 2/3 b) 2/5 c) 1/3 d) 5/6

18. If two dice are thrown together, the probability of getting an even number on one dice and an odd number on the other dice is
    a) 1/4 b) ½ c) 3/4 d) None

19. A dice has two of its sides painted pink, two blue and two green. If the dice is rolled twice the probability that same colour appears both the times is
    a) 1/3 b) 2/3 c) 7/9 d) 8/9

20. On biased dice, any even number appears four times as frequently as any odd number. If the dice is rolled thrice what is the probability that the sum of the scores on them is more than 16?

21. Varun throws two unbiased dice together and gets a sum of 7. If his friend Tarun, now throws the same two dice, what is the probability that the sum is lesser than that?
    a) 1/6 b) 7/12 c) 1/2 d) 5/12

22. Four fair dice are thrown together if p and q respectively are the probabilities of the sum of the scores on the dice being 20 and 21, then p : q is
    a) 2 : 3 b) 5 : 7 c) 9 : 7 d) 7 : 4

23. Two biased dice are thrown together. On one of them, 6 appears twice as often as any other number while on the other, an odd number appears thrice as frequently as an even number. What is the probability that the sum of the scores on them is 11 or 12?
    a) 1/12 b) 9/28 c) 3/28 d) 5/12

24. If 5 dice are rolled together, then find the probability that the total score on the five dice is 27.
    a) $29/6^5$ b) $25/6^5$ c) $23/6^5$ d) $31/6^5$

III) Based on cards

a) If a card is drawn from a pack of cards, find the probability that the card drawn is a face card.

a) 3/13 b) 4/13 c) 5/13 d) 7/13

b) If a card is drawn from a pack of cards, then find the probability that the card drawn is a numbered card.
a) 8/13 b) 10/13 c) 9/13 d) 11/13

c) If a card is drawn from a pack of cards, then find the probability that the card drawn is a spade or a face card.
a) 27/52 b) 13/26 c) 11/26 d) 25/52

d) If three cards are drawn at random from a pack of cards, what is the probability that each card is a ACE?

e) If two cards are picked at random from a pack of cards, what is the probability that both the cards picked are Kings or Hearts?
a) 14/221 b) 15/221 c) 16/221 d) 17/221

f) If a card is picked at random from pack of cards, what is the probability that it is neither a queen nor a heart?
a) 4/13 b) 11/13 c) 2/13 d) 9/13

g) Two cards are drawn at random from a pack of cards. What is the probability that both are spades or both are diamonds?

25. If four cards are drawn at random, from a well shuffled pack of cards, then what is the probability that three of them are number cards of the same colour and the 4th card is a numbered card of different colour?

26. From a well shuffled pack of cards, if three cards are drawn in succession without replacement; what is the probability that the first one is an ace. the second a king and the third is a jack?
a) 1/5525 b) 7/16575
c) 16/5525 d) 8/16575

27. If two cards are selected at random from a well shuffled pack of cards, what is the probability that the cards are both honours or both hearts?

28. While shuffling a pack of cards, four cards are accidentally dropped. The probability that all of them are numbered cards of different suits is

29. Two cards are drawn from a pack of cards one after another, what is the probability that the first drawn card is black and the second is a king, when the card that is drawn first is
a) replaced?
a) 1/13 b) 5/26 c) 1/26 d) 3/26

(b) not replaced?
a) 7/221 b) 1/442 c) 8/221 d) 1/26

IV) Based on Balls/Marbles

30. A bag has 15 balls, of which 9 are black and 6 are white. Find the probability of each of the following events
(i) If 2 balls are selected simultaneously, they will be of different colours.
(ii) If 2 balls are selected successively (without replacement) they will be of different colours.

31. A bag contains 9 white and 5 yellow balls, and another bag contains 6 white and 8 yellow balls. If one of the bags is selected at random and two balls are drawn at random from the bag, then the probability that both the balls are white is

32. A bag contains five red balls, three black balls and a white ball. If three balls are drawn from the bag, the probability that the three balls are of different colours is
a) 23/28 b) 5/28
c) 3/28 d) None of these

33. Two balls are drawn, one after the other, from a bag containing 8 pink and 6 orange balls. The probability of drawing pink and orange balls in succession in that order. When the ball that is drawn first is
(i) not replaced is
(ii) replaced is

34. Three balls are drawn at random, from a bag containing 6 white, 5 green and 4 red balls. What is the probability that the three balls are of same colour?

35. A bag contains 5 black and 7 white balls. Find the probability of drawing two white balls in succession, when the bail that is drawn first is
(i) replaced.
(ii) not replaced.

36. A box contains ten cards. Seven of these cards have the letter 'I' printed on them, and the others have the letter 'M' printed on them. If three cards are picked up one after the other at random, and placed on a table in that order, then what is the probability that the word formed is 'IIM'?
a) 21/40 b) 17/40 c) 7/40 d) 9/40

37. Box A contains four red and six green balls, box B contains seven red and three green balls. A ball is drawn from box A and without seeing its color; it is put into box B. If a ball is now drawn from box B, then the probability that it is green is

38. From a hag containing two Pens, three Erasers and four Books, three Items are drawn at random. What is the probability that
(a) all the three Items are of the same variety?
a) 5/84 b) 77/84 c) 7/84 d) 79/84

(b) exactly two of them are of the same variety?
a) 10/84 b) 55/84 c) 56/84 d) 57/84

(c) the three fruits are of different varieties?
a) 3/7 b) 4/7 c) 2/7 d) 6/7

Directions for questions 39 to 41: These questions are based on the foliating information.
A bag contains 11 toys of which 3 are defective. If 4 toys are chosen at random, find the probability that.

39. All the toys are defective
a) 0 b) 1 c) 14/165 d) 40/165

40. exactly two of them are defective
a) 13/55 b) 16/55 c) 15/55 d) 14/55

41. one is good and three are defective.
a) 5/165 b) 4/165 c) 3/165 d) 6/165

42. There are 3 urns containing 4 white, and 5 green balls; 3 white and 6 green balls; 2 white and 3 green ball. One urn is chosen at random and a ball is drawn from it. What is the probability that it is a green ball?

43. In a box containing 1000 apples, 100 are defective. What is the probability that out of a sample of 8 apples, none are defective?
a) $(0.1)^8$ b) $(0.9)^8$ c) $(0.6)^8$ d) $8(0.1)^8$

V) Based on Numbers

44. The probability that a number selected at random from the first 45 natural numbers is a prime number is

45. If a number is chosen from the set {1, 2, 3...75}, then the probability that the chosen number is a multiple of 5 is
a) 2/5 b) 1/5 c) 3/5 d) 4/5

46. The probability that a number chosen at random from the set A = {1, 3. 5, 7, 9, 11, 13, 15…,29} being a multiple of 9 is
a) 7/15 b) 1/3 c) 4/15 d) 1/5

47. If two distinct numbers are picked at random from the set {1, 2, 3, 4, 5, 6} then what is the probability that the sum of the numbers picked is even?

48. A number is chosen at random from the set, A = {2, 4, 6, 8, 10, 12, 14, 16}, the probability that it is a multiple of 4 is
a) 1/2 b) 3/4 c) 1 d) 3/8

49. A number is selected at random from the first fifty natural numbers the probability that it is a composite number is
a) 21/25 b) 17/25 c) 4/25 d) 8/25

50. A natural number is chosen at random from 1 to 100. What is the probability that it is a prime number?
a) 1/4 b) 1/2 c) 2/3 d) ¾

51. If a number is chosen at random from the set {1, 2, 3,…… 100}, then the probability that the chosen number is a perfect cube is
a) 1/25 b) 1/2 c) 1/20 d) 1/10

52. If two distinct numbers are picked at random from the set A = {2, 3, 5, 7, 11, 13}, then what is the probability that the sum of the numbers picked is odd?

53. If a number is selected randomly from the natural numbers 1 to 30. The probability that the number is divisible by either 4 or 7 is

54. A five digit number is formed using the digits 0, 1, 2, 3, 4 and 5 at random but without repetition. The probability that the number so formed is divisible by 5 is

55. A number is selected at random from all possible four-digit numbers that are formed using the digits 0, 1, 2, 3, 4, 5. Given that the number is even, what is the probability that it is divisible by 5?

VI) Based on odds in favour & Against

56. The odds in favour of Ram completing a task are 3:4. The odds against Shyam completing the task are 2:5, and the odds against Geeta not completing the task are 1 : 5.
(i) What is the probability that all of them complete the task?
(ii) What is the probability that none of them complete the task?
(iii) What is the probability that at least one of them will complete the task?
(iv) What is the probability that exactly one of them will complete the task?

57. The odds against an event E are 2:3. The probability of occurrence of the event E is

58. P and Q are two mutually exclusive and exhaustive events associated with a random experiment. If odds in favour of P are 3 : 2, then find the probability of the event Q.

59. A bag contains 4 five rupee coins, 3 two rupee coins and 3 one rupee coins. If 6 coins are drawn from the bag at random, what are the odds in favour of the draw yielding maximum amount?
a) 1 : 70 b) 1 :69 c) 69 : 70 d) 70 : 1

60. The odds in favour of Ram getting a final selection in a Job are 5 : 7 and the odds against Raja getting it are 4 : 3. Find the probability that
(a) at least one of them gets a final selection in the Job.
a) 2/3 b) 7/12 c) 1/3 d) 4/7

(b) exactly one of them gets a final selection in the Job.
a) 5/21 b) 1/4 c) 41/84 d) 11/21

61. Find the odds against throwing six at least once with a single die in three trials.
a) 125 : 216 b) 91 : 216
c) 125 : 91 d) 91 : 125

62. The odds in favour of Ram, that he can pass in three different subjects are 4:3, 2:1 and 1:4 respectively. What is the probability that he passes in atleast two subjects?
a) 11/21 b) 10/21 c) 12/21 d) 13/21

VII) Mixed

63. A puzzle in logic was given to three students A, B and C whose chances of solving it are 1/2, 3/4 and 1/4 respectively. The probability that the problem being solved is
a) 29/32 b) 31/32 c) 1/8 d) 7/8

64. The probability that A can solve a question is 2/3. The probability that B can solve the same question

is 3/4. What is the probability that the question is solved?

65. There are 7 friends in a class. What is the probability that exactly 2 of them were born on the same day of the week?

66. The probability of solving a question correctly is 2/5. What is the probability that at least 1 out of 10 questions is solved correctly?

67. Akash walks only either one step forward or one step backward when he walks. The probability of the man taking a step forward is 1/5 and the probability of the man taking a step backward is 4/5.
    (i) What is the probability that after 9 steps, he is 1 step away from the starting point?
    (ii) What is the probability that after 8 steps, he is 1 step away from the starting point?

68. 100 coins are tossed. The probability of heads appearing on any of the coins is 'x'. It is known that the probability of heads appearing on 51 coins is the same as that on 50 coins. Find x.

69. Two small 1 x 1 squares are chosen at random on a chessboard. What is the probability that they share a common side?

70. The probability that a non-leap year chosen at random has 52 Mondays and 52 Tuesdays is
    a) 2/7 b) 4/7 c) 5/7 d) 1/7

71. A puzzle in logic was given to three students A, B and C whose chances of solving it are 1/2, 3/4 and 1/4 respectively. The probability that the problem being solved is
    a) 29/32 b) 31/32 c) 1/8 d) 7/8

72. What is the probability that a non-leap year selected at random has 53 Mondays?

73. The probability that a square selected at random from an 8 × 8 chessboard is of size 3 × 3 is

74. If three consecutive letters are selected at random from the English alphabet, then the probability that all the three are consonants is

75. A cube has four of its faces blank, one face is marked 5 and the other is marked 6. In a game involving throwing this cube, a person is said to have a success, if he throws a numbered face. Two persons A and B participate in this game. A throws the cube thrice while B throws it once. Find the ratio of A's chance of success to that of B.
    a) 19 : 9 b) 9 : 19 c) 8 : 9 d) 9 : 8

76. From a collection of ten books of which six are biographies and rest are autobiographies, two books are selected simultaneously at random. What is the probability that one is a biography and the other an autobiography?
    a) 8/15 b) 7/15 c) 2/15 d) 13/15

77. If a square is selected at random from an 8 x S chess board, what is the probability that it is a 3 x 3 square?

78. Three bulb holders are fitted in a room. From a box containing 20 bulbs of which 25% are fused, 3 bulbs are taken at random and fitted into these bulb holders. What is the probability that the room is lighted?
    a) 91/228 b) 113/114
    c) 1/114 d) 137/228

79. 400 tickets are numbered as 000, 001, 002, 003, . 399. if a ticket is drawn at random from them and M is the event that the sum of the digits of the number is 6, then P(M) =
    a) 200 b) 0 c) 20 d) 40

80. In a non-leap year, what is the probability that in a group of 10 people, (none of whom was born on 29 February) at least two have the same birthday?

81. Kids and Toys factory is transporting balls of 5 different colours - yellow, blue, red, green and white. Mr. Bholeram, a worker in the factory has to separate these balls as per their colours into different boxes and label them with the corresponding coloured labels. Mr. Bholeram, after separating the balls, sealed the boxes and then labelled the boxes at random. What is the probability that
    (i) all the boxes are labelled correctly?
    a) 1 b) 0
    c) 1/120 d) 119/120

    (ii) at least one box is labelled incorrectly?
    a) 1 b) 0
    c) 1/120 d) 119/120

    (iii) exactly one box is labelled incorrectly?
    a) 1 (B)
    c) 11/120 d) 44/120

    (iv) all the boxes are incorrectly labelled?
    a) 1 b) 0
    c) 11/120 d) 11/30

82. Arpit and Bipin pick up a ball at random from a bag containing 5 violet, 2 red and 3 orange balls one after the other, replacing it every time till one of them gets an orange ball and the one who first gets an orange bail is declared a winner. If Arpit begins the game, then the probability of Bipin winning the game is
    a) 10/17 b) 7/17 c) 7/10 d) 3/10

83. Kiran rotates a roulette wheel which has markings form 201 to 300. If the wheel stops at a multiple of 7, he wins Rs. 7,000. If the wheel stops at a multiple of 13, he wins Rs. 13,000 and if the wheel stops at a number which is a multiple of both 7 and 13, he wins Rs. 91,000. If Kiran has to pay an amount of Rs. 2,700 every time he rotates the wheel as a participation fee, then, in the long run what is the average profit he makes per game?