

1.3. Definitions of Probability

Exercise:

1. What is the probability that a leap year selected at random will contain
(a) 53 Tuesdays and (b) 53 Sundays or 53 Mondays?
2. In a single throw of two dice, what is the probability of getting
(a) a total of 8 ; and (b) total different from 8 :
3. Prove that in a single throw with a pair of dice, the probability of getting the sum of 7 is equal to $\frac{1}{6}$ and the probability of getting the sum of 10 is equal to $\frac{1}{12}$
4. In the play of two dice, the thrower loses if his first throw is 2,4, or 12. He wins if his first throw is a 5 or 11. Find the ratio between his probability of losing and probability of winning in the first throw.
Hint: Number of favourable cases for getting
(a) 2,4 or 12 is $1 + 3 + 1 = 5$; (b) 5 or 11 is $4 + 2 = 6$
5. If a pair of dice is thrown, find the probability that the sum of the digits on them is neither 7 nor 11.
6. Tickets are numbered from 1 to 100. They are well shuffled and a ticket is drawn at random. What is the probability that the drawn ticket has :
(a) an even number? (b) a number 5 or a multiple of 5?
(c) a number which is greater than 75? (d) a number which is a square?
7. There are 17 balls, numbered from 1 to 17 in a bag. If a person selects one ball at random, what is the probability that the number printed on the ball will be an even number greater than 9?

8. An integer is chosen at random from the first 200 positive integers. What is the probability that integer chosen is divisible by 6 or 8?

9. One ticket is drawn at random from a bag containing 30 tickets numbered from 1 to 30. Find the probability that

(a) It is multiple of 5 or 7; (b) It is multiple of 3 or 5

10. A number is chosen from each of the two sets :

$$A = \{1, 2, 3, 4, 5, 6, 7, 8, 9\} ; \quad B = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$$

If P_1 is the probability that the sum of the two numbers be 10 and P_2 the probability that their sum be 8, find $P_1 + P_2$.

11. A bag contains 7 white and 9 black balls. Two balls are drawn in succession at random. What is the probability that one of them is white and the other is black?

12. A bag contains eight balls, five being red and three white. If a man selects two balls at random from the bag. What is the probability that he will get one ball of each colour?

13. A bag contains 5 white and 3 black balls. Two balls are drawn at random one after the other without replacement. Find the probability that balls drawn are black.

14. A bag contains 4 white, 5 red and 6 green balls. Three balls are drawn at random. What is the probability that a white, a red and a green ball are drawn?

15. A bag contains 8 black, 3 red and 9 white balls. If 3 balls are drawn at random, find the probability that
(a) all are black, (b) 2 are black and 1 is white, (c) 1 is of each colour,
(d) the balls are drawn in the order black, red and white, (e) None is red.
16. The Federal Match Company has forty female employees and sixty male employees. If two employees are selected at random, what is the probability that (i) both will be males, (ii) both will be females, (iii) there will be one of each sex?
17. If a single draw is made from a pack of 52 cards, what is the probability of securing either an ace of spades or a jack of clubs.
18. Four cards are drawn from a full pack of cards. Find the probability that two are spades and two are hearts?
19. What is the probability of getting 9 cards of the same suit in one hand at a game of bridge?
20. The letters of the word **Triangle** are arranged at random. Find the probability that the word so formed (a) starts with T, (b) ends with E, (c) starts with T and ends with E.
21. In a random arrangement of the letters of the word **VIOLENT**, find the chance that the vowels I, O, E occupy odd positions only.
22. In a random arrangement of the letters of the word **Allahabad**, find the chance that the vowels occupy the even places.

23. The letters of the word **ARRANGE** are arranged at random. Find the chance that : (a) The two R's come together (b) The two R's does not come together (c) The two R's and the two A's come together
24. (a) If the letters of the word REGUALTIONS be arrange at random, what is the chance that there will be exactly 4 letters between the R and the E?
(b) What is the probability that four S's come consecutively in the word
MISSISSIPPI?
25. A and B stand in a ring with 10 others persons. If the arrangement of the persons is at random, find the chance that (a) there are exactly three persons between A and B (b) A and B stand together
26. The first 12 letters of the English alphabet are written at random. What is the probability that (a) there are 4 letters between A and B (b) A and B are written down side by side.
27. Seven persons sit in a row at random. Find the chance that (a) three persons A, B, C sit together in a particular order (b) A, B, C sit together in any order (c) B and C occupy the end seats (iv) C always occupies the middle seat.
28. A six figure number is formed by the digits 4, 5, 6, 7, 8, 9 ; no digit being repeated. Find the probability that the number formed is (a) divisible by 5 (b) not divisible by 5.
29. Five digit numbers are formed from the digits 1, 2, 3, 4, 5. Find the chance that the number formed is greater than 2300.

Answers:

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

2. (a) $\frac{5}{36}$ (b) $\frac{31}{36}$

3.

4.

5. $\frac{7}{9} = 0.78$

6. (a) 0.5 (b) 0.2 (c) 0.25 (d) 0.10

7. $\frac{4}{17}$

8. $\frac{1}{4}$

9. (a) $\frac{1}{3}$ (b) $\frac{7}{15}$

10. $\frac{16}{81}$

11. $\frac{21}{40}$

12. $\frac{{}^5C_1 \times {}^3C_1}{{}^8C_2} = \frac{15}{28}$

13. $\frac{3}{28}$

14. $\frac{24}{91}$

$$15. (a) \frac{14}{285} \quad (b) \frac{21}{95} \quad (c) \frac{18}{95} \quad (d) \frac{3}{95} \quad (e) \frac{34}{57}$$

$$16. (a) 0.357, \quad (b) 0.157, \quad (c) 0.4848$$

$$17. \frac{1}{26}$$

$$18. \frac{{}^{13}C_2 \times {}^{13}C_2}{{}^{52}C_4} = \frac{468}{20825}$$

$$19. 4 \times {}^{13}C_9 \times {}^{39}C_4 / {}^{52}C_4$$

$$20. (a) \frac{1}{8} \quad (b) \frac{1}{8} \quad (c) \frac{1}{56}$$

$$21. \frac{{}^4C_3 \times 3!4!}{7!} = \frac{4}{35}$$

$$22. \frac{1 \times 5!}{2!} \div \frac{9!}{4!2!} = \frac{1}{126}$$

$$23. (a) \frac{6!}{2!} \div \frac{7!}{2!2!} = \frac{2}{7} \quad (b) (1260 - 360) \div 1260 = \frac{5}{7} \quad (c) \frac{5!}{1260} = \frac{2}{21}$$

$$24. (a) \frac{6}{55} \quad (b) \frac{4}{165}$$

$$25. (a) \frac{2}{11} \quad (b) \frac{2}{11}$$

$$26. (a) \frac{7}{66} \quad (b) \frac{1}{6}$$

$$27. (a) \frac{5!}{7!} = \frac{1}{42} \quad (b) \frac{5!3!}{7!} = \frac{1}{7} \quad (c) \frac{5 \times 2!}{7!} = \frac{1}{21} \quad (d) \frac{6!}{7!} = \frac{1}{7}$$

$$28. (a) \frac{1}{6} \quad (b) \frac{5}{6}$$

$$29. \frac{3!+3 \times 4!}{5!} = \frac{13}{20}$$