Chapter 29

PROBABILITY

KEY FACTS

1. **Probability** is the chance of occurring of a certain event when measured quantitatively.
2. **Trial** is the performance of an experiment, such as throwing a dice or tossing a coin.
3. An **event** is anything whose probability we want to measure, as getting an even number on throwing a dice.
4. An **outcome** is any way in which an event can happen.
5. **Sample space** is the set of all possible outcomes of an experiment, generally denoted by S.
   Ex. When a dice is thrown, $S = \{1, 2, 3, 4, 5, 6\}$
6. **Equally likely events:** When two or more events have an equal chance of happening, then they are called **equally likely.**
   Ex. In a throw of a dice, all the six faces (1, 2, 3, 4, 5, 6) are equally likely to occur.
7. The probability of a **certain event** is **1** and the probability of an **impossible event** is **0.** Probability is **never greater than 1 or less than 0.**
8. Generally probability examples involve coins, dice and pack of cards. Here is a remainder of their outcomes.
   (i) A toss of a coin has **two outcomes: head or tail.**
   (ii) A throw of a dice has **six outcomes: 1, 2, 3, 4, 5, 6.**
   (iii) A pack of cards consists of **52 cards**, divided into **4 suits**, **each suit** containing **13 cards**.
   Hearts (Red), Spades (Black), Diamonds (Red) and Clubs (Black). Each of the suits has 13 cards bearing the values 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack, Queen, King and Ace. The Jack, Queen and King are called 'picture cards'.
   Hence there are 12 picture cards in all.
   Total number of possible outcomes = 52
9. Probability of an event = $P(E) = \dfrac{\text{Number of ways the event can happen}}{\text{Total number of possible outcomes}}$
   Ex. P(drawing a picture card) $= \dfrac{12}{52} = \dfrac{3}{13}$ ($\therefore$ There are 12 picture cards)
10. **Mutually exclusive and exhaustive events:**
    Events such as tossing a head or a tail with a coin, drawing a Queen or a Jack from a pack of cards, throwing an even or a odd number with a dice are all **mutually exclusive events**. *Here, the occurrence of an event rules out the happening of all the other events in the same experiment, i.e.,*
    If we toss a coin, we can never get a head or a tail in the same toss.

Probability (head) $=\frac{1}{2}$, Probability (tail) $=\frac{1}{2}$

Also, Probability (head) + Probability (tail) $=\frac{1}{2}+\frac{1}{2}=1$

Such events are also called **exhaustive events,** because there are no other possibilities and their probabilities always add up to **1.**

An example of events that are **not mutually exclusive** would be throwing a prime number or an odd number with a dice. There are two prime number 3 and 5 which are also odd numbers.

11. Complementary event: The complementary event of A = Event A not happening.

Thus*, an event and its complementary event are both mutually exclusive and exhaustive.*

Hence, **Probability (event A not happening) = 1 – Probability (event A happening)**

Thus, $\boldsymbol{P(A) + P(\bar{A}) = 1}$, where $\bar{A}$ denotes the complementary event of A.

Ex. Probability of drawing a blue ball from a bag of 4 blue, 6 red and 2 yellow balls

$$= \frac{4}{4+6+2}=\frac{4}{12}=\frac{1}{3}.$$

$\therefore$ P (not drawing a blue ball) $= 1-\frac{1}{3}=\frac{2}{3}$

12. Addition rule for events:

When two events are mutually exclusive, we can find the probability of either of them occurring by adding together the separate probabilities.

Ex. The probability of throwing a 3 or a 5 with a dice is

$$P(3)+P(5)=\frac{1}{6}+\frac{1}{6}=\frac{2}{6}=\frac{1}{3}.$$

Note. *Addition rule in case of events which are not mutually exclusive.*

Ex. From a well shuffled pack of 52 cards, a card is drawn at random. Find the probability that it is either a spade or a queen.

Sol. Let A be the event of getting a spade and B be the event of getting a queen.

A and B are not mutually exclusive as there is a queen of spades also, so

P(either a spade or a queen) = P(spade) + P(queen) – P(queen of spade)

$$= \frac{13}{52}+\frac{4}{52}-\frac{1}{52}=\frac{16}{52}=\frac{4}{13}$$

13. Independent events: If the outcome of event A does not affect the outcome of event B, then the events A and B are called independent events.

$$P(A \text{ and } B) = P(A).\ P(B)$$

Ex. Two dice are thrown. Find the probability of getting a prime number on one dice and even number on the other dice.

Sol. Here both the events are independent, so

P (a prime number) $=\frac{3}{6}=\frac{1}{2}$ ($\therefore$ There are 3 prime numbers 2, 3, 5)

P (an even number) $=\frac{3}{6}=\frac{1}{2}$ ($\therefore$ There are 3 even numbers 2, 4, 6)

$\therefore$ Reqd. probability $=\frac{1}{2}\times\frac{1}{2}=\boldsymbol{\frac{1}{4}}$.

14. Combined events: There are many times when two or more events occur together. Some common examples are:

(i) **Tossing two coins together**

There are four equally likely outcomes: {*HH, HT, TH, TT*}

(ii) **Tossing three coins together**

There are eight equally likely outcomes: {*HHH, HTT, THH, TTH, HHT, HTH, THT, TTT*}

Ex. P (3 heads or 3 tails) = $\frac{1}{8}+\frac{1}{8}=\frac{2}{8}=\mathbf{\frac{1}{4}}$.

(iii) **Throwing two dice together**

There are 36 equally likely outcomes:

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

Ex. P (a sum of 5) = $\frac{4}{36}=\frac{1}{9}$ ($\therefore$ There are four combinations to get a sum of 5. (1,4), (2,3), (3,2) and (4,1)).

15. Odds of an event

If there are p outcomes favourable to a certain event and q outcomes unfavourable to the event in a sample space

then, odds in favour of the event = $\frac{\text{Number of favourable outcomes}}{\text{Number of unfavourable outcomes}}=\frac{p}{q}$

Odds against the event = $\frac{\text{Number of unfavourable outcomes}}{\text{Number of favourable outcomes}}=\frac{q}{p}$

If odds in favour of an event A are $m : n$, then

Probability of happening of event $A = P(A)=\frac{m}{m+n}$

Probability of not happening of event $A = P(\bar{A})=\frac{n}{m+n}$

Solved Examples

Ex. 1. ***A bag contains 27 balls. Ten are red, 2 are green and the rest are white. Annie takes out a ball from the bag at random. What is the probability that she takes***
(i) a white ball (ii) a ball that is red or green

Sol. (i) Number of white balls = 27 – (10 + 2) = 15

$$P(\text{white ball})=\frac{\text{Number of white balls}}{\text{Total number of balls}}=\frac{15}{27}=\mathbf{\frac{5}{9}}$$

(ii) P (red ball or green ball) = P (red) + P (green)

$$=\frac{10}{27}+\frac{2}{27}=\frac{12}{27}=\mathbf{\frac{4}{9}}.$$

Ex. 2. ***Each morning I walk to work or take a taxi to work. The probability that I walk to work is $\frac{3}{5}$. What is the probability that I take a taxi?***

Sol. The events " walk to work" and " take a taxi to work" are mutually exclusive events, therefore are complementary events.

Hence, P (take a taxi to work) = 1 – P (walk to work) = $1-\frac{3}{5}=\mathbf{\frac{2}{5}}$.

Ex. 3. ***When two coins are tossed together, what is the probability of getting at least one tail?***

Sol. When two coins are tossed together, there are four equally likely outcomes, *i.e.,* $S = \{ HH, HT, TH, TT \}$
The outcomes having at least one tail are *HT, TH* and *TT*, *i.e.,* 3.

$\therefore P$ (at least one tail) $= \mathbf{\frac{3}{4}}$.

Ex. 4. ***Sid draws a card from a pack of cards, replaces it, shuffles the pack and then draws another card. What is the probability that the cards are both aces?***

Sol. $P(\text{ace}) = \frac{4}{52} = \frac{1}{13}$ ($\because$ there are 4 aces in a pack of 52 cards)

$\therefore$ P (both aces) = P (first ace **and** second ace) $= \frac{1}{13} \times \frac{1}{13} = \mathbf{\frac{1}{169}}$.

Ex. 5. ***There are seven white and one brown eggs in an egg box. Ruchira decides to make a two-egg omelette. She takes out each egg from the box without looking at its colour. What is the probability that Ruchira gets an omelette made from***

(i) two white eggs (ii) one white and one brown egg (iii) two brown eggs

Sol. (i) P (first white egg) $= \frac{7}{8}$ (7 white eggs, 8 total eggs)

P (second white egg) $= \frac{6}{7}$ (6 white eggs, 7 total eggs as 1 egg has been taken out)

$\therefore$ P (omelette of two white eggs) $= \frac{7}{8} \times \frac{6}{7} = \frac{6}{8} = \mathbf{\frac{3}{4}}$

(ii) P (first white egg) $= \frac{7}{8}$ | P (first brown egg) $= \frac{1}{8}$

P (second brown egg) $= \frac{1}{7}$ | P (second white egg) $= \frac{7}{7} = 1$

$\therefore$ P (omelette of one white and one brown egg) $= \frac{7}{8} \times \frac{1}{7} + \frac{1}{8} \times \frac{7}{7}$

$= \frac{1}{8} + \frac{1}{8} = \mathbf{\frac{1}{4}}$.

Note. The eggs can be taken out in any order, so we consider both the cases, it is either first case or second case.

(iii) P (first brown egg) $= \frac{1}{8}$

P (second brown egg) $= \frac{0}{7}$

$\therefore$ P (omelette of two brown eggs) $= \frac{1}{8} \times 0 = \mathbf{0}$.

Question Bank–29

1. In a test, the marks obtained by 15 students are 34, 37, 44, 39, 45, 46, 35, 42, 48, 40, 39, 33, 43, 47, 44. The probability that a pupil chosen at random passed the test, if the passing marks are 40 is:

(a) $\frac{8}{15}$ (b) $\frac{3}{5}$

(c) $\frac{7}{15}$ (d) $\frac{11}{15}$

2. Which of the following pairs of events is not mutually exclusive?
(a) Throwing a number greater than 4 with a dice/ Throwing a number less than 4 with a dice.
(b) Drawing a red card from a pack of cards /Draw a club from a pack of cards.
(c) Drawing a diamond from a pack of cards/ Drawing an ace from a pack of cards.
(d) Drawing a vowel card from a set of alphabet cards/Drawing a consonant card from a set of alphabet cards.

3. An electronic machine choses random numbers from 1 to 30. What is the probability that the number chosen is a triangular number?
(a) $\frac{11}{30}$ (b) $\frac{1}{10}$
(c) $\frac{1}{6}$ (d) $\frac{7}{30}$

4. In a simultaneous toss of two coins, find the probability of getting two tails.
(a) $\frac{1}{2}$ (b) $\frac{1}{4}$
(c) $\frac{3}{4}$ (d) $\frac{1}{3}$

5. Three coins are tossed simultaneously. Find the probability of at least one head and one tail.
(a) $\frac{1}{2}$ (b) $\frac{1}{4}$
(c) $\frac{3}{4}$ (d) None of these

6. In a single throw of two dice, what is the probability of getting a total of 11.
(a) $\frac{1}{9}$ (b) $\frac{1}{18}$
(c) $\frac{1}{12}$ (d) $\frac{35}{36}$

7. A bag contains 4 blue, 5 red and 7 green balls. If 4 balls are drawn one by one with replacement, what is the probability that all are blue?
(a) $\frac{1}{16}$ (b) $\frac{1}{4}$
(c) $\frac{1}{256}$ (d) $\frac{1}{64}$

8. The set $S = \{n : n \text{ is an integer, } 1 \le n \le 50\}$. If an element of S is selected at random, find the probability that it does not contain the digit '2' at all.
(a) $\frac{7}{25}$ (b) $\frac{18}{25}$
(c) $\frac{17}{50}$ (d) $\frac{7}{10}$

9. In a single throw of two dice, find the probability of getting a doublet of odd numbers.
(a) $\frac{1}{9}$ (b) $\frac{1}{18}$
(c) $\frac{1}{36}$ (d) $\frac{1}{12}$

10. What is the probability that a card drawn at random from a pack of playing cards is either a king or a jack?
(a) $\frac{1}{13}$ (b) $\frac{2}{13}$
(c) $\frac{3}{13}$ (d) $\frac{4}{9}$

11. Two dice are thrown. Find the odds in favour of getting the sum 4.
(a) 1 : 11 (b) 11 : 1
(c) 4 : 11 (d) 11: 4

12. A machine generates a two-digit number randomly. Find the probability that the number generated is either less than 25 or greater than 85.
(a) $\frac{27}{89}$ (b) $\frac{28}{89}$
(c) $\frac{28}{90}$ (d) $\frac{29}{90}$

13. From a pack of cards, two are drawn, the first being replaced before the second is drawn. Find the probability that the first is a club and the second is a red card.
(a) $\frac{1}{52}$ (b) $\frac{1}{26}$
(c) $\frac{1}{8}$ (d) $\frac{4}{13}$

14. If A and B are two mutually exclusive and exhaustive events with $P(B) = 3\ P(A)$, then what is the value of $P(\bar{B})$?
(a) $\frac{3}{4}$ (b) $\frac{1}{4}$
(c) $\frac{1}{3}$ (d) $\frac{2}{3}$

15. The probability that a student passes in Mathematics is $\frac{4}{9}$ and he passes in Physics is $\frac{2}{5}$. Assuming that passing in Mathematics and Physics are independent of each other, what is

the probability that he passes in Mathematics and fails in Physics?

(a) $\frac{4}{15}$ (b) $\frac{8}{45}$

(c) $\frac{26}{45}$ (d) $\frac{19}{45}$

16. An aircraft has three engines *A, B* and *C*. The aircraft crashes if all the three engines fail. The probabilities of failure are 0.03, 0.02 and 0.05 for engines *A, B* and *C* respectively. What is the probability that the aircraft will not crash?

(a) 0.00003 (b) 0.90

(c) 0.99997 (d) 0.90307

17. A card is drawn from an ordinary pack of 52 cards and a gambler bets that it is a spade or an ace. What are the odds against his winning the bet?

(a) 9 : 4 (b) 4 : 9

(c) 5 : 9 (d) 9 : 5

18. A problem in statistics is given to four students *A, B, C* and *D*. Their chances of solving it are $\frac{1}{3}, \frac{1}{4}, \frac{1}{5}$ and $\frac{1}{6}$ respectively. What is the probability that the problem will be solved?

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

(c) $\frac{4}{5}$ (d) None of these

19. A man *A* speaks truth in 80% of the cases and another man *B* in 90% of the cases. While stating the same fact, what is the probability that they contradict?

(a) $\frac{37}{50}$ (b) $\frac{13}{50}$

(c) $\frac{16}{50}$ (d) None of these

20. From a bag containing 60 standard and 40 substandard articles, two articles are chosen at random. What is the probability that one of them is standard and the other substandard?

(a) $\frac{60}{100} \times \frac{40}{100}$ (b) $\frac{60}{100} \times \frac{39}{100}$

(c) $\frac{16}{33}$ (d) 24%

Answers

1. (b)	**2.** (c)	**3.** (d)	**4.** (b)	**5.** (c)	**6.** (b)	**7.** (c)	**8.** (b)	**9.** (d)	**10.** (b)
11. (a)	**12.** (d)	**13.** (b)	**14.** (b)	**15.** (a)	**16.** (c)	**17.** (a)	**18.** (b)	**19.** (b)	**20.** (c)

Hints and Solutions

1. (b) Number of students getting marks equal to or more than 40 = 9 (44, 45, 46, 42, 48, 40, 43, 47, 44)

$$\therefore P(\text{pass}) = \frac{\text{Number of students who passed}}{\text{Total number of students}} = \frac{9}{15} = \frac{3}{5}.$$

2. (c) As we have an ace of diamonds, so drawing a diamond from a pack of cards also includes the possibility of drawing an ace. Hence the events are not mutually exclusive.

3. (d) Triangular numbers between 1 and 30 are 1, 3, 6, 10, 15, 21, 27, *i.e.*, 7 in number.

$$\therefore \text{Reqd. probability} = \frac{7}{30}$$

4. (b) The sample space for a simultaneous toss of two coins is

$S = \{HH, HT, TH, TT\}$

Favourable cases = $\{TT\}$

$$\therefore P(\text{getting two tails}) = \frac{1}{4}.$$

5. (c) The sample space for a simultaneous toss of three coins

$S = \{HHH, HHT, HTT, THH, TTH, THT, HTH, HHH\}$

Favourable cases = $\{HHT, HTT, THH, TTH, THT, HTH\}$

$$\therefore P(\text{getting at least one head, one tail}) = \frac{6}{8} = \frac{3}{4}.$$

6. (b) Total number of exhaustive cases = 6 × 6 = 36

A total of 11 may be obtained in 2 ways as (5, 6), (6, 5).

$$\therefore P(\text{total of 11}) = \frac{2}{36} = \frac{1}{18}.$$

7. (c) Probability of drawing a blue ball

$$= \frac{4}{4+5+7} = \frac{4}{16} = \frac{1}{4}$$

$$\therefore \text{Required probability} = \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} = \frac{1}{256}.$$

8. (b) $S = \{1, 2, 3, 4, 5, ...49, 50\}$

Numbers containing digit 2 are 2, 12, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32, 42, *i.e.,* 14 in number.

Probability (Number contains 2) $= \frac{14}{50} = \frac{7}{25}$

$\therefore$ Probability (Number does not contain 2)

$= 1 - \frac{7}{25} = \frac{18}{25}$.

9. (d) Total number of exhaustive cases in a single throw of two dice $= 6 \times 6 = 36$

Doublets are obtained as (1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)

Number of doublets of odd numbers = 3

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

10. (b) P(a king or a jack) = P(King) + P(Jack)

$= \frac{4}{52} + \frac{4}{52} = \frac{2}{13}$.

11. (a) Total number of exhaustive cases $= 6 \times 6 = 36$

A sum of 4 can be obtained as (1, 3) (2, 2) (3, 1)

Therefore, there are 3 favourable outcomes and $(36 - 3) = 33$ unfavourable outcomes.

$\therefore$ Odds in favour of sum of $4 = \frac{3}{33} = \frac{1}{11}$.

12. (d) Two digit numbers are {10, 11, 12, ..., 98, 99} *i.e.,* 90 in number.

Numbers less than 25 = {10, 11, 12, 13, ..., 24}, *i.e.,* 15

Numbers greater than 85 = {86, 87, 88, …, 99}, *i.e.*, 14

$\therefore$ P (number less than 25 or greater than 85)

$= \frac{15}{90} + \frac{14}{90} = \frac{29}{90}$.

13. (c) Total number of cards = 52

Clubs = 13

$\therefore$ P (club) $= \frac{13}{52} = \frac{1}{4}$

Red cards = 26

$\therefore$ P(red) $= \frac{26}{52} = \frac{1}{2}$

$\therefore$ P(club and red card) $= \frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$.

14. (b) Since $P(A)$ and $P(B)$ are two mutually exclusive and exhaustive events , $P(A) + P(B) = 1$

$\Rightarrow P(A) + 3P(A) = 1 \quad \because P(B) = 3P(A)$

$\Rightarrow 4P(A) = 1 \Rightarrow P(A) = \frac{1}{4}$

$\Rightarrow P(B) = 1 - \frac{1}{4} = \frac{3}{4}$

$\Rightarrow P(\bar{B}) = 1 - \frac{3}{4} = \frac{1}{4}$.

15. (a) P (pass in Maths) $= \frac{4}{9}$

P (pass in Phy) $= \frac{2}{5}$

$\therefore$ P (fail in Phy) $= 1 - \frac{2}{5} = \frac{3}{5}$

$\therefore$ P (pass in Maths and fail in Phy) $= \frac{4}{\cancel{9}_3} \times \frac{\cancel{3}^1}{5} = \frac{4}{15}$.

16. (c) P (aircraft will crash) $= 0.03 \times 0.02 \times 0.05$

$= 0.00003$

P (aircraft will not crash) $= 1 - 0.00003$

$=$ **0.99997.**

17. (a) Let event A : a spade is drawn and event B : an ace is drawn.

Probability of winning the bet = P (A or B)

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

Note.	Here A and B are not mutually exclusive events, hence the common part has to be taken into consideration.

$= \frac{13}{52} + \frac{4}{52} - \frac{1}{52}$ (There is **one** ace of spades)

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

$\therefore$ Probability of losing the bet $= 1 - \frac{4}{13} = \frac{9}{13}$

$\therefore$ Odds against winning the bet $= \frac{9}{13} : \frac{4}{13} = \mathbf{9 : 4}$.

18. (b) $P(A \text{ solving}) = \frac{1}{3} \Rightarrow P(A \text{ not solving}) = 1 - \frac{1}{3} = \frac{2}{3}$

$P(B \text{ solving}) = \frac{1}{4} \Rightarrow P(B \text{ not solving}) = 1 - \frac{1}{4} = \frac{3}{4}$

$P(C \text{ solving}) = \frac{1}{5} \Rightarrow P(C \text{ not solving}) = 1 - \frac{1}{5} = \frac{4}{5}$

$P(D \text{ solving}) = \frac{1}{6} \Rightarrow P(D \text{ not solving}) = 1 - \frac{1}{6} = \frac{5}{6}$

$\therefore$ Probability (problem not solved)

$= \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} \times \frac{5}{6} = \frac{1}{3}$

$\Rightarrow$ Probability (problem solved) $= 1 - \frac{1}{3} = \frac{2}{3}$.

19. (b) Probability (contradiction)

$=$ $P(A$ speaks truth$) \times P(B$ does not speak truth$)$

$+ P(A$ does not speak truth$) \times P(B$ speaks truth$)$

$= \frac{80}{100} \times \frac{10}{100} + \frac{20}{100} \times \frac{90}{100}$

$= \frac{8}{100} + \frac{18}{100} = \frac{26}{100} = \frac{\mathbf{13}}{\mathbf{50}}$.

20. (c) Here two articles are chosen together without replacement

P(one of the articles is substandard)

$= P$ (first article is standard) × P(second article is substandard) + P (first article is substandard) × P (second article is standard)

$= \frac{60}{100} \times \frac{40}{99} + \frac{40}{100} \times \frac{60}{99} = \frac{4800}{9900} = \frac{48}{99} = \frac{\mathbf{16}}{\mathbf{33}}$.

Self Assessment Sheet–28

1. Each letter of the word "INDEPENDENT" is written on individual cards. The cards are placed in a box and mingled thoroughly. A card with letter '*N*' is removed from the box. Now find the probability of picking a card with a consonant?

(a) $\frac{7}{11}$ (b) $\frac{7}{10}$

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

2. In a simultaneous throw of two dice, what is the number of exhaustive events?

(a) 6 (b) 12

(c) 36 (d) 18

3. Three coins are tossed simultaneously. What is the probability that head and tail show alternately. (*i.e., HTH* or *THT*)?

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

(c) $\frac{1}{8}$ (d) $\frac{1}{2}$

4. Two cards are drawn from a well shuffled pack of 52 cards without replacement. The probability of drawing a queen and a jack is :

(a) $\frac{16}{663}$ (b) $\frac{2}{663}$

(c) $\frac{4}{663}$ (d) $\frac{8}{663}$

5. In a single throw of two dice, find the probability of getting a total of 3 or 5.

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

(c) $\frac{1}{9}$ (d) $\frac{1}{6}$

6. A husband and a wife appear in a interview for two vacancies in the same post. The probability of husband's selection is $\frac{1}{7}$ and that of wife's is $\frac{1}{6}$. What is the probability that none of them will be selected.

(a) $\frac{2}{13}$ (b) $\frac{5}{7}$

(c) $\frac{1}{42}$ (d) $\frac{41}{42}$

7. A bag contains x red balls, $(x + 5)$ blue balls and $(3x + 10)$ white balls. If the probability of drawing a blue ball is $\frac{2}{9}$, what is the number of white balls?

(a) 15 (b) 20

(c) 35 (d) 55

8. A letter is chosen at random from the letters in the word "PROBABILITY". What is the probability that the letter will be a *B* or a vowel?

(a) $\frac{5}{11}$ (b) $\frac{6}{11}$

(c) $\frac{2}{11}$ (d) $\frac{7}{11}$

9. There are three events one of which must and only happen. The odds are 8 : 3 against *A*, 5 to 2 against *B*. Find the odds against *C*?

(a) 43 : 34 (b) 34 : 43

(c) 43 : 77 (d) 77 : 43

10. *A* can solve 80% of the problems given in a book and *B* can solve 60%. What is the probability that at least one of them will solve a problem selected at random from the book?

(a) $\frac{12}{25}$ (b) $\frac{97}{100}$

(c) $\frac{23}{25}$ (d) $\frac{11}{25}$

Answers

1. (c) **2.** (c) **3.** (b) **4.** (c) **5.** (d) **6.** (d) **7.** (d) **8.** (b)

9. (a) [**Hint.** All three are exhaustive events, $P(A) + P(B) + P(C) = 1$]

10. (c) [**Hint.** P (solved) = 1 – P (not solved)]