Affiliated to CBSE, New Delhi (Affiliation No. 1030642)

GNPS

GOMTI NANDAN PUBLIC SCHOOL

Gandhi Ward, Bina (M.P.) 470113. | 9165 609 333. | info@mygnps.com | www.mygnps.com

CLASS X · MATHEMATICS BASIC (241) · CBSE BOARD EXAMINATION 2027

CHAPTER 14 BASIC

Probability

Answer Booklet · Full worked solutions with CBSE-style step marks

Every question of the Basic booklet | Step marks shown line by line | MCQ keys with working

INSIDE THIS BOOKLET

✓	**Marking Guide** How step marks are given	2
A	**Guided Practice – Solutions** 6 filled-in methods	2
B	**NCERT Practice – Solutions** 14 solutions	3
C	**Board Pattern Practice – Solutions** 29 solutions	6
D	**Case-Based Questions – Solutions** 3 case studies, all parts and ORs	10

HOW TO USE THE ANSWERS

1. Solve the question in your notebook **first**. Open this booklet only to check.
2. The orange number beside each line is the **step mark** an examiner gives for that line, as in the CBSE marking scheme.
3. Give yourself marks line by line. A right answer without the listed outcomes can lose step marks.
4. Write the fraction in lowest terms and check that it lies between 0 and 1.
5. Copy every wrong answer to the My Mistakes page of your booklet.

READ THIS FIRST

Marking Guide

Full worked solutions to every question in the chapter booklet, set out the way a CBSE examiner marks them.

HOW MARKS ARE GIVEN IN PROBABILITY ANSWERS

1. **1-mark MCQ / assertion–reason:** only the correct option scores. The working here is for your understanding.
2. **2 marks, one part:** total outcomes ½ · favourable outcomes listed ½ · probability 1.
3. **2 or 3 marks, several parts:** each part carries its own mark: favourable outcomes ½ + probability ½ for a 1-mark part.
4. **Case study (4 marks):** 1 + 1 + 2. In the 2-mark part, each answer is worth 1 mark.
5. An unreduced but correct fraction (e.g. $\frac{6}{36}$) usually keeps the mark, but always reduce it.
6. Lines with no number are working that earns no separate mark but must be shown.

PART A · SOLUTIONS

A Guided Practice – Solutions

Worked solutions with step marks for every question in Part A.

Sample spaces

A1. Complete the table. [2]

Two coins: HT, TH → 4 outcomes	½
Three coins: THH, TTH → 8 outcomes	½
One die: 1, 2, 3, 4, 5, 6 → 6 outcomes	½
Two dice: $6 \times 6 = 36$ outcomes	½

Finding a probability step by step

A2. Two dice are thrown together. Complete the steps to find the probability that the sum is 9. [2]

Total outcomes $= 36$	½
Favourable: (3, 6), (6, 3), (4, **5**), (**5**, 4) → **4** outcomes	½
$P(\text{sum } 9) = \frac{4}{36} = \frac{1}{9}$	1

A3. One card is drawn from a well-shuffled pack of 52 cards. Complete the steps to find the probability that it is a red king. [2]

Total outcomes $= 52$	½
Red suits: hearts and diamonds; red kings: king of hearts, king of diamonds → 2	½
$P(\text{red king}) = \frac{2}{52} = \frac{1}{26}$	1

A4. A bag has 5 red, 7 green and 8 blue balls. One ball is taken out at random. Complete the steps to find the probability that it is not green. [2]

Total balls $= 5 + 7 + 8 = 20$ ½

$P(\text{green}) = \dfrac{7}{20}$ ½

$P(\text{not green}) = 1 - \dfrac{7}{20} = \dfrac{13}{20}$ 1

A5. Complete the reasoning to find the probability that a leap year has 53 Sundays. [2]

A leap year has 366 days = 52 weeks + 2 days ½

The missing pair is (Sat, Sun); there are 7 pairs in all ½

Pairs with Sunday: (Sat, Sun) and (Sun, Mon) → 2 ½

$P(53 \text{ Sundays}) = \dfrac{2}{7}$ ½

Sure and impossible events

A6. Write whether each event is *sure*, *impossible* or *neither*, and write its probability. **(i)** Getting 7 when a die is thrown. **(ii)** Getting a number less than 7 when a die is thrown. **(iii)** Drawing a red ball from a bag that has only red balls. **(iv)** Getting a head when a coin is tossed. [2]

(i) Impossible; $P = 0$ ½

(ii) Sure; $P = 1$ ½

(iii) Sure; $P = 1$ ½

(iv) Neither; $P = \dfrac{1}{2}$ ½

B PART B · SOLUTIONS
NCERT Practice – Solutions

Worked solutions with step marks for every question in Part B.

Rules and simple events

Q	Answer	Working / reason
B1	**(c)** 1.3	1.3 is greater than 1. A probability lies between 0 and 1.

B2. If $P(E) = 0.25$, what is the probability of "not E"? [1]

$P(\text{not } E) = 1 - 0.25 = 0.75$ 1

B3. A bag contains 3 red balls and 5 white balls. One ball is drawn at random. Find the probability that it is: **(i)** red **(ii)** not red [2]

Total balls $= 3 + 5 = 8$

(i) Red balls → 3; $P = \dfrac{3}{8}$ ½ + ½

(ii) Not red = white → 5; $P = \dfrac{5}{8}$ ½ + ½

B4. A box contains 5 red, 8 white and 7 green marbles. One marble is taken out at random. Find the probability that it is: **(i)** red **(ii)** white **(iii)** not green **[3]**

Total marbles $= 5 + 8 + 7 = 20$

(i) Red $\rightarrow 5$; $P = \frac{5}{20} = \frac{1}{4}$ ½ + ½

(ii) White $\rightarrow 8$; $P = \frac{8}{20} = \frac{2}{5}$ ½ + ½

(iii) Not green: $5 + 8 \rightarrow 13$; $P = \frac{13}{20}$ ½ + ½

B5. A die is thrown once. Find the probability of getting: **(i)** a number greater than 4 **(ii)** a multiple of 3 **(iii)** a number less than 6 **[3]**

Total outcomes $= 6$

(i) Greater than 4: $5, 6 \rightarrow 2$; $P = \frac{2}{6} = \frac{1}{3}$ ½ + ½

(ii) Multiples of 3: $3, 6 \rightarrow 2$; $P = \frac{2}{6} = \frac{1}{3}$ ½ + ½

(iii) Less than 6: $1, 2, 3, 4, 5 \rightarrow 5$; $P = \frac{5}{6}$ ½ + ½

B6. One card is drawn from a well-shuffled pack of 52 cards. Find the probability of getting: **(i)** a red king **(ii)** a face card **(iii)** the ace of spades **[3]**

Total outcomes $= 52$

(i) Red kings: K♥, K♦ $\rightarrow 2$; $P = \frac{2}{52} = \frac{1}{26}$ ½ + ½

(ii) Face cards: 4 kings, 4 queens, 4 jacks $\rightarrow 12$; $P = \frac{12}{52} = \frac{3}{13}$ ½ + ½

(iii) The ace of spades $\rightarrow 1$; $P = \frac{1}{52}$ ½ + ½

B7. An arrow is spun and stops at one of the numbers 1 to 8 (see the figure). All the outcomes are equally likely. Find the probability that it stops at: **(i)** 6 **(ii)** a number greater than 2 **[2]**

Total outcomes $= 8$

(i) The number $6 \rightarrow 1$; $P = \frac{1}{8}$ ½ + ½

(ii) Greater than 2: $3, 4, 5, 6, 7, 8 \rightarrow 6$; $P = \frac{6}{8} = \frac{3}{4}$ ½ + ½

Everyday situations

B8. 8 defective pens are mixed by mistake with 112 good pens. One pen is taken out at random. Find the probability that it is good. **[1]**

Total pens $= 8 + 112 = 120$ ½

$P(\text{good}) = \frac{112}{120} = \frac{14}{15}$ ½

B9. A box contains 50 discs numbered 1 to 50. One disc is taken out at random. Find the probability that it bears: **(i)** a two-digit number **(ii)** a perfect square [2]

Total discs = 50

(i) Two-digit numbers 10 to 50: $50 - 10 + 1 \to 41$; $P = \frac{41}{50}$ ½ + ½

(ii) Perfect squares: 1, 4, 9, 16, 25, 36, 49 → 7; $P = \frac{7}{50}$ ½ + ½

B10. A die is thrown twice. Find the probability that: **(i)** 4 does not come up either time **(ii)** 4 comes up at least once [2]

Total outcomes = 36

(i) No 4 on either throw: $5 \times 5 = 25$; $P = \frac{25}{36}$ 1

(ii) $P(\text{at least one 4}) = 1 - \frac{25}{36} = \frac{11}{36}$ 1

B11. Two coins are tossed together. Find the probability of getting: **(i)** two heads **(ii)** at least one tail [2]

Outcomes: HH, HT, TH, TT → 4

(i) Two heads: HH → 1; $P = \frac{1}{4}$ ½ + ½

(ii) At least one tail: HT, TH, TT → 3; $P = \frac{3}{4}$ ½ + ½

B12. A jar has 30 marbles, some blue and the rest red. The probability of drawing a blue marble is $\frac{2}{5}$. Find the number of red marbles. [2]

Blue marbles $= \frac{2}{5} \times 30 = 12$ 1

Red marbles $= 30 - 12 = 18$ 1

B13. In a lucky draw there are 200 tickets. 10 tickets carry a watch as prize, 30 carry a pen and the rest are blank. One ticket is drawn at random. Find the probability of: **(i)** winning a watch **(ii)** getting a blank ticket [2]

Total tickets = 200

(i) Watch tickets → 10; $P = \frac{10}{200} = \frac{1}{20}$ ½ + ½

(ii) Blank tickets: $200 - 10 - 30 \to 160$; $P = \frac{160}{200} = \frac{4}{5}$ ½ + ½

B14. Two dice are thrown together. Write all the outcomes that give a sum of 7. Find the probability that the sum is 7, and that the sum is not 7. [2]

Sum 7: (1,6), (2,5), (3,4), (4,3), (5,2), (6,1) → 6 of 36 ½

$P(\text{sum } 7) = \frac{6}{36} = \frac{1}{6}$ ½

$P(\text{sum not } 7) = 1 - \frac{1}{6} = \frac{5}{6}$ 1

C

PART C · SOLUTIONS

Board Pattern Practice – Solutions

Worked solutions with step marks for every question in Part C.

Rules: complement, range, impossible event

Q	Answer	Working / reason
C1	(c) 1 – p	Winning and losing are complementary: $P(\text{lose}) = 1 - p$
C2	(a) $\frac{1}{0.85}$	$\frac{1}{0.85} \approx 1.18$, which is greater than 1.
C3	(b) $0 \le P(E) \le 1$	A probability can be 0 (impossible) or 1 (sure).
C4	(d) $\frac{5}{8}$	$1 - \frac{3}{8} = \frac{5}{8}$
C5	(a)	No face shows 9, so it is an impossible event; R explains A.
C6	(b) $\frac{2}{3}$	Losing faces 1, 2, 3, 4 $\rightarrow \frac{4}{6} = \frac{2}{3}$

Two dice

Q	Answer	Working / reason
C7	(c) $\frac{1}{6}$	6 doublets of 36 $= \frac{1}{6}$
C8	(a) $\frac{1}{18}$	(5,6), (6,5) $\rightarrow$ 2 of 36 $= \frac{1}{18}$
C9	(d) $\frac{11}{36}$	No 5 on either: 25; at least one 5: $36 - 25 = 11$

C10. Two dice are thrown at the same time. Find the probability that: **(i)** the sum of the numbers is 6 **(ii)** the sum is not 6 **[2]**

Total outcomes = 36

(i) Sum 6: (1,5), (2,4), (3,3), (4,2), (5,1) $\rightarrow$ 5; $P = \frac{5}{36}$ — ½ + ½

(ii) $P(\text{sum not } 6) = 1 - \frac{5}{36} = \frac{31}{36}$ — 1

C11. Two dice are thrown at the same time. Find the probability of getting: **(i)** an even number on both dice **(ii)** a sum more than 8 **(iii)** a doublet **[3]**

Total outcomes = 36

(i) Even number on both: $3 \times 3 \rightarrow 9$; $P = \frac{9}{36} = \frac{1}{4}$ — ½ + ½

(ii) Sum more than 8 (9, 10, 11, 12): $4 + 3 + 2 + 1 \rightarrow 10$; $P = \frac{10}{36} = \frac{5}{18}$ — ½ + ½

(iii) Doublets: (1,1), …, (6,6) $\rightarrow$ 6; $P = \frac{6}{36} = \frac{1}{6}$ — ½ + ½

C12. Two dice are thrown at the same time. Find the probability that: **(i)** the sum is 5 **(ii)** a prime number appears on each die **(iii)** the sum is at least 11 **[3]**

Total outcomes $= 36$

(i) Sum 5: (1,4), (2,3), (3,2), (4,1) → 4; $P = \frac{4}{36} = \frac{1}{9}$ ½ + ½

(ii) A prime (2, 3, 5) on each die: $3 \times 3 \to 9$; $P = \frac{9}{36} = \frac{1}{4}$ ½ + ½

(iii) Sum at least 11: (5,6), (6,5), (6,6) → 3; $P = \frac{3}{36} = \frac{1}{12}$ ½ + ½

Cards from a pack

Q	Answer	Working / reason
C13	**(b)** $\frac{1}{52}$	Only one jack of clubs: $\frac{1}{52}$
C14	**(c)** $\frac{1}{26}$	K♠, K♣ → $\frac{2}{52} = \frac{1}{26}$
C15	**(a)** $\frac{3}{13}$	12 face cards: $\frac{12}{52} = \frac{3}{13}$

C16. One card is drawn from a well-shuffled pack of 52 cards. Find the probability that it is: **(i)** a spade **(ii)** not a face card **[2]**

Total outcomes $= 52$

(i) Spades → 13; $P = \frac{13}{52} = \frac{1}{4}$ ½ + ½

(ii) Not a face card: $52 - 12 \to 40$; $P = \frac{40}{52} = \frac{10}{13}$ ½ + ½

C17. All the jacks and aces are removed from a pack of 52 cards. One card is drawn from the remaining cards. Find the probability that it is: **(i)** the king of hearts **(ii)** a red card **(iii)** a face card **[3]**

Cards removed $= 4 + 4 = 8$; **cards left** $= 44$

(i) King of hearts → 1; $P = \frac{1}{44}$ ½ + ½

(ii) Red cards left: $26 - 4 \to 22$; $P = \frac{22}{44} = \frac{1}{2}$ ½ + ½

(iii) Face cards left: 4 kings + 4 queens → 8; $P = \frac{8}{44} = \frac{2}{11}$ ½ + ½

C18. The two red queens and the two black jacks are removed from a pack of 52 cards. One card is drawn from the rest. Find the probability that it is: **(i)** a red card **(ii)** a king **(iii)** a face card **[3]**

Cards left $= 52 - 4 = 48$

(i) Red cards left: $26 - 2 \to 24$; $P = \frac{24}{48} = \frac{1}{2}$ ½ + ½

(ii) Kings → 4; $P = \frac{4}{48} = \frac{1}{12}$ ½ + ½

(iii) Face cards left: $12 - 4 \to 8$; $P = \frac{8}{48} = \frac{1}{6}$ ½ + ½

Defective items and data

C19. A lot of 180 bulbs contains 18 defective bulbs. One bulb is taken out at random. Find the probability that it is: **(i)** defective **(ii)** not defective [2]

Total bulbs $= 180$

(i) Defective $\rightarrow 18$; $P = \dfrac{18}{180} = \dfrac{1}{10}$ ½ + ½

(ii) Not defective: $180 - 18 \rightarrow 162$; $P = \dfrac{162}{180} = \dfrac{9}{10}$ ½ + ½

C20. 20 faulty pens are mixed with 140 good pens. One pen is taken out at random. Find the probability that it is: **(i)** good **(ii)** faulty [2]

Total pens $= 20 + 140 = 160$

(i) Good $\rightarrow 140$; $P = \dfrac{140}{160} = \dfrac{7}{8}$ ½ + ½

(ii) Faulty $\rightarrow 20$; $P = \dfrac{20}{160} = \dfrac{1}{8}$ ½ + ½

Q	Answer	Working / reason
C21	**(b)** 570	Defective $= 0.05 \times 600 = 30$; good $= 570$

Letters of a word

Q	Answer	Working / reason
C22	**(d)** $\dfrac{4}{11}$	11 letters; vowels A, E, A, I $\rightarrow 4$

C23. A letter is chosen at random from the letters of the word ASSESSMENT. Find the probability that it is: **(i)** the letter S **(ii)** a vowel [2]

Letters: A, S, S, E, S, S, M, E, N, T → 10

(i) The letter S $\rightarrow 4$; $P = \dfrac{4}{10} = \dfrac{2}{5}$ ½ + ½

(ii) Vowels: A, E, E $\rightarrow 3$; $P = \dfrac{3}{10}$ ½ + ½

Bag of balls with an unknown number

C24. A bag contains 6 red balls, 9 white balls and some yellow balls. The probability of drawing a red ball is $\dfrac{1}{5}$. Find the probability of drawing a yellow ball. [2]

$\dfrac{6}{\text{total}} = \dfrac{1}{5} \Rightarrow \text{total} = 30$ 1

Yellow balls $= 30 - 6 - 9 = 15$ ½

$P(\text{yellow}) = \dfrac{15}{30} = \dfrac{1}{2}$ ½

C25. A box contains 15 balls, of which x are white. If 5 more white balls are put in, the probability of drawing a white ball becomes double. Find x. [2]

Before: $P = \frac{x}{15}$ ½

After: white $= x + 5$, total $= 20$, $P = \frac{x+5}{20}$ ½

$\frac{x+5}{20} = 2 \times \frac{x}{15} \Rightarrow 15x + 75 = 40x \Rightarrow x = 3$ 1

Numbers from a range

C26. A number is chosen at random from the numbers 20, 21, 22, …, 50. Find the probability that it is: **(i)** a prime number **(ii)** a multiple of 4 [2]

Count $= 50 - 20 + 1 = 31$

(i) Primes: 23, 29, 31, 37, 41, 43, 47 → 7; $P = \frac{7}{31}$ ½ + ½

(ii) Multiples of 4: 20, 24, 28, 32, 36, 40, 44, 48 → 8; $P = \frac{8}{31}$ ½ + ½

Q	Answer	Working / reason
C27	**(a)** $\frac{1}{5}$	1, 4, 9, 16, 25 → $\frac{5}{25} = \frac{1}{5}$

Coins

Q	Answer	Working / reason
C28	**(d)** $\frac{3}{8}$	HTT, THT, TTH → 3 of 8
C29	**(a)** $\frac{1}{4}$	Only TT → 1 of 4

PART D · SOLUTIONS

D Case-Based Questions – Solutions

Worked solutions with step marks for every question in Part D.

D1. Case Study · Board Game [4]

(i) What is the probability of getting a doublet? **[1]**

Doublets $= 6$ of 36 ½

$P = \frac{6}{36} = \frac{1}{6}$ ½

(ii) What is the probability that the sum is 4? **[1]**

Sum 4: (1,3), (2,2), (3,1) $\rightarrow 3$ ½

$P = \frac{3}{36} = \frac{1}{12}$ ½

(iii) Find the probability that a player moves a token on a turn, and the probability that the player does not. **[2]**

Sum more than 8: $4+3+2+1=10$; $P(\text{moves}) = \frac{10}{36} = \frac{5}{18}$ 1

$P(\text{does not move}) = 1 - \frac{5}{18} = \frac{13}{18}$ 1

OR

(iii) Find the probability that both numbers are odd, and the probability that at least one number is even. **[2]**

Both odd: $3 \times 3 = 9$; $P = \frac{9}{36} = \frac{1}{4}$ 1

$P(\text{at least one even}) = 1 - \frac{1}{4} = \frac{3}{4}$ 1

D2. Case Study · Shoe Factory [4]

(i) What is the probability that Arun buys the pair? **[1]**

$P = \frac{440}{500} = \frac{22}{25}$ 1

(ii) What is the probability that Bina buys the pair? **[1]**

No major defect: $440 + 45 = 485$; $P = \frac{485}{500} = \frac{97}{100}$ 1

(iii) Find the probability that the pair is not good. **[2]**

Not good $= 45 + 15 = 60$ (major defect: $500 - 440 - 45 = 15$) 1

$P = \frac{60}{500} = \frac{3}{25}$ 1

OR

(iii) Find the probability that neither Arun nor Bina buys the pair. **[2]**

Neither buys only pairs with a major defect: $500 - 440 - 45 = 15$ 1

$P = \frac{15}{500} = \frac{3}{100}$ 1

D3. Case Study · Card Game [4]

(i) What is the probability that the card is a king? **[1]**

Cards left $= 48$; kings $= 4$; $P = \frac{4}{48} = \frac{1}{12}$ 1

(ii) What is the probability that the card is red? **[1]**

Red cards left $= 26 - 2 = 24$; $P = \frac{24}{48} = \frac{1}{2}$ 1

(iii) Find the probability that the card is a face card, and the probability that it is not a face card. **[2]**

Face cards $= 12$; $P = \frac{12}{48} = \frac{1}{4}$ 1

$P(\text{not a face card}) = 1 - \frac{1}{4} = \frac{3}{4}$ 1

OR

(iii) Find the probability that the card is a black number card (2 to 10). **[2]**

Black number cards: $9 \times 2 = 18$ 1

$P = \frac{18}{48} = \frac{3}{8}$ 1