



MASTER LEARNING FLOW: CONCEPT DEKHO → FORMULA SAMJHO → TINKU SIR TRICK → ONEPATH HACK → PYQs PHOD VIL → FULL MARKS!

1. CHAPTER MAP & CBSE WEIGHTAGE ANALYSIS

Chapter Importance: Probability in Class 10 carries a direct weightage of **4 to 6 Marks** in CBSE Board Examinations. It is one of the highest ROI (Return on Investment) chapters because questions are predictable, formula-driven, and logical!

Question Type	Marks	Expected Areas / Contexts
MCQ / Assertion-Reason	1 Mark	Range of probability, Impossible/Sure events, $P(E) + P(\text{not } E) = 1$, Single coin/dice toss.
Short Answer (SA-I / SA-II)	2 - 3 Marks	Playing Cards (52 deck), Two Dice rolled simultaneously, Bag with colored/numbered balls.
Case Study / HOTS	4 Marks	Real-life situations (Spinning wheels, Quality checks, Game of chance, Leap year problem).

2. CORE CONCEPT 1: THEORETICAL PROBABILITY

① WHAT IS PROBABILITY?

Probability is the quantitative measure of the likelihood or chance that a particular event will occur. In Class 10, we study **Classical / Theoretical Probability** (based on equal likelihood), distinct from Experimental Probability (based on actual repeated trials).

② WHY DOES IT WORK?

When all outcomes of a random experiment are **Equally Likely** (have the same identical chance of happening), the probability of an outcome is directly proportional to the fraction of favorable outcomes over total possibilities.



③ THE GOLDEN FORMULA

● THEORETICAL PROBABILITY OF AN EVENT E

$$P(E) = \frac{\text{Number of outcomes favorable to } E}{\text{Number of all possible outcomes of the experiment}} = \frac{n(E)}{n(S)}$$

Where $n(E)$ = favorable outcomes, $n(S)$ = total outcomes in sample space S .

④ KEY PROPERTIES & BOUNDARIES

- **Probability Range:** For any event E , $0 \leq P(E) \leq 1$. It can NEVER be negative or greater than 1!
- **Impossible Event:** An event that can NEVER occur has $P(E) = 0$. (e.g., Getting 7 on a standard 6-sided die).
- **Sure / Certain Event:** An event that is guaranteed to occur has $P(E) = 1$. (e.g., Getting a number less than 7 on a standard die).
- **Complementary Events:** If E is an event and $\bar{E}$ (or E' or NOT E) is its complement:

$$P(E) + P(\bar{E}) = 1 \implies P(\bar{E}) = 1 - P(E)$$

- **Sum of Elementary Events:** The sum of probabilities of all elementary events of an experiment is ALWAYS equal to 1.

🔥 TINKU SIR TRICK #1: THE "CHECK-YOUR-ANSWER" SANITY TEST

In CBSE Board Exams, after calculating any probability answer, run these **3 Ultra-Fast Checks**:

1. **Fraction Check:** Numerator MUST be $\leq$ Denominator. If your fraction is $\frac{7}{5}$, stop! It's WRONG!
2. **Range Check:** Answer MUST lie between \$0\$ and \$1\$ (or \$0\%\$ to \$100\%\$).
3. **Negative Check:** Probability can NEVER be negative! Options like -0.5 or $-\frac{2}{3}$ are instant elimination traps in MCQs!

🚀 ONEPATH HACK #1: THE "NOT" SHORTCUT (COMPLEMENT POWER)

Whenever a question asks for "At least one", "At most", or "Probability of NOT getting...", calculate the opposite simple event $P(E)$ first, then subtract from \$1\$!

$$P(\text{At least 1 success}) = 1 - P(\text{Zero success})$$

Saves up to 70% calculation time in complex dice and card problems!

● COMMON MISTAKE #1: PERCENTAGE VS FRACTION CONFUSION

✗ **WRONG:** Writing $P(E) = 80$ (leaving percentage sign) or $P(E) = 1.5$.

✓ **CORRECT:** $P(E) = 0.8$ or $\frac{4}{5}$ or 80% . Always express probability as a proper fraction, simplified fraction, or decimal ≤ 1 .

3. THE BIG 4 EXPERIMENTAL MODELS (COMPLETE BREAKDOWN)

MODEL A: COIN TOSS EXPERIMENTS

Total outcomes formula for tossing n fair coins: $N = 2^n$

Number of Coins (n)	Total Outcomes (2^n)	Sample Space (S)
1 Coin ($2^1 = 2$)	2	{H, T}
2 Coins ($2^2 = 4$)	4	{HH, HT, TH, TT}
3 Coins ($2^3 = 8$)	8	{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT}

TINKU SIR TRICK #2: 3-COIN SAMPLE SPACE BINARY TRICK

Struggling to remember all 8 outcomes of 3 coins? Use the **4-2-1 Pattern**!

- **Column 1 (H/T in 4s):** H H H H T T T T
- **Column 2 (H/T in 2s):** H H T T H H T T
- **Column 3 (H/T in 1s):** H T H T H T H T

Read across row-by-row $\rightarrow$ You get all 8 flawless outcomes in 5 seconds!

MODEL B: DICE EXPERIMENTS (1 & 2 DICE)

Total outcomes for rolling n standard 6-sided dice: $N = 6^n$

- **1 Die ($6^1 = 6$):** $S = \{1, 2, 3, 4, 5, 6\}$
- **2 Dice ($6^2 = 36$):** Complete 6×6 Grid below!

Die 1 \ Die 2	1	2	3	4	5	6
1	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
2	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
3	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
4	(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
5	(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
6	(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

🔥 TINKU SIR TRICK #3: TWO DICE SUM PYRAMID (INSTANT SUM SOLVER)

When two dice are thrown, the minimum possible sum is \$2\$ and maximum sum is \$12\$. Instead of counting outcomes from the 36-grid, memorize this **Symmetric Frequency Pyramid**:

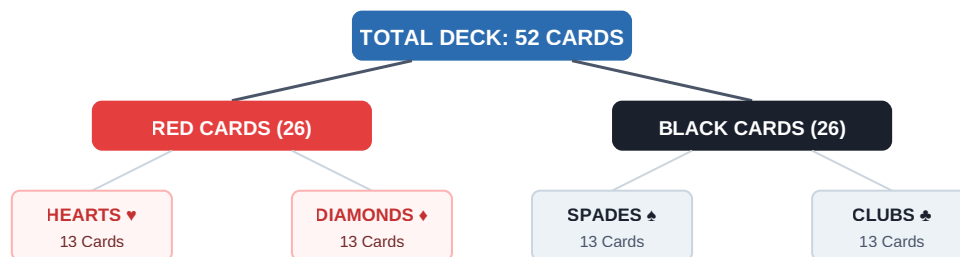
Sum (\$S\$)	2	3	4	5	6	7	8	9	10	11	12
Favorable Outcomes (\$n\$)	1	2	3	4	5	6	5	4	3	2	1

Rule: For Sum \$\$\$ from 2 to 7, Number of outcomes = $S - 1$. For Sum \$\$\$ from 8 to 12, Number of outcomes = $13 - S$.

Example: Probability of getting sum 9? $13 - 9 = 4$ outcomes! $P(\text{Sum } 9) = \frac{4}{36} = \frac{1}{9}$. Done in 2 seconds!

MODEL C: PLAYING CARDS DECK (52 CARDS MASTER CHART)

A standard deck consists of **52 cards** (excluding Jokers), divided into 2 colors and 4 suits:



Card Breakdown Rules:

- **Suit Composition (13 cards per suit):** Ace (A), 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack (J), Queen (Q), King (K).
- **Face Cards (Picture Cards):** Jack (J), Queen (Q), King (K).
→ $3 \text{ Face Cards per suit} \times 4 \text{ suits} = 12 \text{ Face Cards total}$ (6 Red Face Cards, 6 Black Face Cards).
- **Number Cards (Honour/Digit Cards):** 2 to 10 (9 per suit $\times 4 = 36$ cards).
- **Aces:** 4 Aces total (2 Red, 2 Black). Note: *Ace is NOT counted as a Face Card in CBSE!*

● COMMON MISTAKE #2: IS ACE A FACE CARD?

✗ **WRONG:** Counting Ace as a face card, giving 16 face cards in total.

✓ **CORRECT:** Ace has no picture face drawn on it! Total Face Cards = **12** (J, Q, K only). Aces = 4.

MODEL D: CALENDAR & LEAP YEAR PROBLEMS

Year Type	Total Days	Weeks + Extra Days	Probability of 53 Sundays / Mondays / etc.
Ordinary Year	365 Days	52 Weeks + 1 Extra Day	$P(53 \text{ ext{ specific day}}) = \mathbf{\frac{1}{7}}$
Leap Year	366 Days	52 Weeks + 2 Extra Days	$P(53 \text{ ext{ specific day}}) = \mathbf{\frac{2}{7}}$

ONEPATH HACK #2: INSTANT LEAP YEAR RULE

For 53 specific days in ANY year problem:

- **Ordinary Year:** Answer is ALWAYS $\mathbf{\frac{1}{7}}$.
- **Leap Year:** Answer for 53 of a SINGLE day (e.g. 53 Sundays) is ALWAYS $\mathbf{\frac{2}{7}}$.
- **Leap Year (53 Sundays AND 53 Mondays):** Extra days must be (Sunday, Monday) $\rightarrow$ Answer is $\mathbf{\frac{1}{7}}$.

4. QUESTION IDENTIFICATION SYSTEM ("QUESTION DEKHO $\rightarrow$ TYPE PEHCHANO")

Master this lookup table to instantly trigger the exact solving algorithm during the exam!

If the Question Contains / Mentions...	Identify Event Type	Target Formula / Method to Apply
"At least one Head" (2 or 3 coins)	Coin Outcome Set	Use $1 - P(\text{ext{No Heads}})$ or count all except TT / TTT.
"Sum on two dice is prime / divisible by 5"	2-Dice Combination	Filter sums $\{2,3,5,7,11\}$ or $\{5,10\}$ using 36-grid / Pyramid.
"Neither a King nor a Red card is drawn"	Card Removal / Exclusion	$n(\text{ext{Favorable}}) = 52 - [\text{ext{Red cards (26)}} + \text{ext{Black Kings (2)}}]$.
"Defective bulbs in a box / Quality check"	Item Selection	$P(\text{ext{Good}}) = 1 - P(\text{ext{Defective}}) = \frac{n(\text{ext{Total}}) - n(\text{ext{Defective}})}{n(\text{ext{Total}})}$.
"Area probability / Dart board game"	Geometric Probability	$P(E) = \frac{\text{Area of Favorable Target Region}}{\text{Total Area of Board}}$.

5. STEP-BY-STEP SOLVED EXAMPLES (CBSE BOARD PATTERN)

VERIFIED CBSE PYQ

3 MARKS

EXAMPLE 1: CARDS EXCLUSION & COMBINED PROBABILITY

QUESTION: All the black face cards are removed from a pack of 52 playing cards. A card is drawn at random from the remaining pack. Find the probability that the drawn card is:

(i) a face card (ii) a red card (iii) a black card.

 **CONCEPT IDENTIFICATION:** Playing cards subtraction model.

 **GIVEN & REDUCTION:**

Total initial cards = 52.

Black face cards removed = 3 Spades (J, Q, K) + 3 Clubs (J, Q, K) = **6 cards removed**.

Remaining total cards in deck, $n(S) = 52 - 6 = \mathbf{46}$.

 **STEP-BY-STEP SOLUTION:**

(i) Probability of getting a face card:

Total face cards initially = 12.

Since 6 black face cards are removed, remaining face cards = $12 - 6 = 6$ (all red).

$$P(\text{Face Card}) = \frac{6}{46} = \mathbf{\frac{3}{23}}$$

(ii) Probability of getting a red card:

No red cards were removed! So, favorable red cards = 26.

$$P(\text{Red Card}) = \frac{26}{46} = \mathbf{\frac{13}{23}}$$

(iii) Probability of getting a black card:

Initial black cards = 26. Removed black face cards = 6.

Remaining black cards = $26 - 6 = 20$.

$$P(\text{Black Card}) = \frac{20}{46} = \mathbf{\frac{10}{23}}$$

 **ONEPATH VERIFICATION HACK**

Notice that Red Cards + Black Cards = Total remaining cards!

Check: $\frac{13}{23} + \frac{10}{23} = \frac{23}{23} = 1$. Verification complete! Full 3 Marks guaranteed!

EXAMPLE 2: GEOMETRIC PROBABILITY (TARGET BOARD GAME)

QUESTION: A target board consists of a rectangle of dimensions $20 \text{ cm} \times 10 \text{ cm}$. Inside this rectangle, a circle of diameter 7 cm is drawn. A dart is dropped at random on the board. Find the probability that the dart lands inside the circle. (Use $\pi = \frac{22}{7}$)

STEP-BY-STEP SOLUTION:

Step 1: Total Area of Sample Space (Rectangle):

$$\text{Area of Rectangle } A_{\text{total}} = \text{length} \times \text{breadth} = 20 \times 10 = 200 \text{ cm}^2$$

Step 2: Favorable Area (Circle):

Diameter = 7 cm $\implies$ Radius $r = \frac{7}{2} \text{ cm}$.

$$\text{Area of Circle } A_{\text{favorable}} = \pi r^2 = \frac{22}{7} \times \left(\frac{7}{2}\right)^2 = \frac{22}{7} \times \frac{49}{4} = 154 \text{ cm}^2$$

Step 3: Calculate Probability:

$$P(\text{Dart lands inside circle}) = \frac{\text{Area of Circle}}{\text{Area of Rectangle}} = \frac{154}{200} = \frac{77}{100} = 0.77$$

6. VERIFIED CBSE BOARD PYQS (2023 - 2026) & EXAM PATTERNS

CBSE 2024 (1 MARK MCQ) Q1. If the probability of an event E is p , then the probability of its complementary event $\bar{E}$ is:

- (A) $p - 1$ (B) $1 - p$ (C) $1 - \frac{1}{p}$ (D) $\frac{1}{p}$

Solution: We know $P(E) + P(\bar{E}) = 1 \implies P(\bar{E}) = 1 - P(E) = 1 - p$. **Correct Option: (B)**

CBSE 2023 (2 MARKS) Q2. Two dice are tossed together. Find the probability of getting a doublet of even numbers.

Solution: Total outcomes $n(S) = 36$.

Doublets are $(1,1), (2,2), (3,3), (4,4), (5,5), (6,6)$.

Even doublets are $(2,2), (4,4), (6,6) \implies n(E) = 3$.

$$P(\text{Even Doublet}) = \frac{3}{36} = \frac{1}{12}$$

CBSE 2025 PATTERN / COMPETENCY Q3. A box contains 90 discs numbered from 1 to 90. If one disc is drawn at random, find the probability that it bears a prime number less than 20.

Solution: Total outcomes $n(S) = 90$.

Prime numbers less than 20 are: $\{2, 3, 5, 7, 11, 13, 17, 19\} \implies n(E) = 8$.

$$P(\text{Prime} < 20) = \frac{8}{90} = \frac{4}{45}$$

7. CHAPTER VISUAL MIND MAP (2-MINUTE QUICK REVISION)

PROBABILITY CLASS 10 (MASTER MAP)



1. DEFINITION & FORMULA

- $P(E) = \text{Favorable Outcomes} / \text{Total Outcomes}$
- $0 \leq P(E) \leq 1$
- $P(E) + P(\text{NOT } E) = 1$ [Complement Rule]

2. EVENT TYPES

- Impossible Event $\rightarrow P(E) = 0$
- Sure / Certain Event $\rightarrow P(E) = 1$
- Elementary Events Sum = 1

3. CORE MODELS

- Coins $\rightarrow \text{Total} = 2^n$ (1 Coin: 2, 2 Coins: 4, 3 Coins: 8)
- Dice $\rightarrow \text{Total} = 6^n$ (1 Die: 6, 2 Dice: 36 Grid)
- Cards (52 Deck)
 - 26 Red | 26 Black
 - 4 Suits (13 each): Hearts ♥, Diamonds ♦, Spades ♠, Clubs ♣
 - 12 Face Cards (4J, 4Q, 4K) | 4 Aces (NOT face cards!)
- Leap Year
 - Ordinary Year (365d) $\rightarrow$ 53 Days Prob = $1/7$
 - Leap Year (366d) $\rightarrow$ 53 Days Prob = $2/7$

4. EXAM TRICKS & HACKS

- Tinku Sir Pyramid $\rightarrow$ Instant sum of 2 dice
- OnePath Complement Hack $\rightarrow P(\text{At least } 1) = 1 - P(\text{None})$

8. ⚠ STUDENTS OFTEN MAKE THESE MISTAKES (EXAM TRAPS)

1 Trap: Forgetting to reduce fractions to simplest form.

- ✗ Writing $\frac{4}{36}$ as final answer without simplifying.
- ✓ Always simplify to $\frac{1}{9}$ or write both!

2 Trap: Misinterpreting "At least" vs "At most".

- ✗ "At least 2 Heads" in 3 coins taken as ONLY 2 Heads.
- ✓ "At least 2" means ≥ 2 (includes 2 and 3 Heads: HHT, HTH, THH, HHH).
- ✓ "At most 2" means ≤ 2 (includes 0, 1, and 2 Heads).

3 Trap: Counting Ace as a Face Card in Card problems.

- ✗ Total face cards = 16.
- ✓ Total face cards = 12. Aces are separate honours cards.

9. ONEPATH ONE-PAGE REVISION SHEET (LAST-MINUTE REVISION)

TOP EXAM FORMULAS & CONSTANTS AT A GLANCE

Theoretical Probability Formula	$P(E) = \frac{n(E)}{n(S)}$
Complement Law	$P(E) + P(\bar{E}) = 1 \iff P(\bar{E}) = 1 - P(E)$
Range of Probability	$0 \leq P(E) \leq 1$
Total Outcomes (n Coins)	2^n (1 Coin: 2, 2 Coins: 4, 3 Coins: 8)
Total Outcomes (n Dice)	6^n (1 Die: 6, 2 Dice: 36)
52-Deck Breakdown	26 Red, 26 Black, 12 Face Cards (3x4), 4 Aces
53 Sundays Probability	Ordinary Year = $\frac{1}{7}$ Leap Year = $\frac{2}{7}$

10. TOP 10 BOARD PRACTICE QUESTIONS (WITH ANSWERS)

- [MCQ]** Which of the following cannot be the probability of an event?
(A) $\frac{2}{3}$ (B) -1.5 (C) 15% (D) 0.7
Ans: (B) Probability cannot be negative.
- [2 Marks]** A die is thrown once. Find the probability of getting a prime number.
Ans: Primes on die = {2, 3, 5} = 3. $P = \frac{3}{6} = \frac{1}{2}$.
- [2 Marks]** A card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting a queen of black suit.
Ans: Black Queens = 2 (Spade, Club). $P = \frac{2}{52} = \frac{1}{26}$.
- [3 Marks]** Two dice are thrown at the same time. What is the probability that the sum of the two numbers appearing on top is 10?
Ans: Favorable = {(4,6), (5,5), (6,4)} = 3. $P = \frac{3}{36} = \frac{1}{12}$.
- [3 Marks]** A box contains 5 red marbles, 8 white marbles and 4 green marbles. One marble is taken out. Find the probability that the marble drawn will NOT be green.
Ans: Total = 17. Green = 4. Non-green = 13. $P = \frac{13}{17}$.

11. 🚩 FINAL CHAPTER REVISION CHECKLIST

- | | |
|--|--|
| ✓ Concept of Theoretical Probability & Sample Space | ✓ Mastered 2-Dice 36-Grid & Sum Pyramid |
| ✓ Probability Range ($0 \leq P \leq 1$) & Impossible/Sure events | ✓ 52 Cards Deck & 12 Face Cards Breakdown |
| ✓ Complementary Events Law $P(E) + P(\bar{E}) = 1$ | ✓ Ordinary vs Leap Year 53-day probability |
| ✓ Tinku Sir Tricks & OnePath Complement Hacks | ✓ Solved 2023–2026 CBSE PYQs & HOTS Examples |



CONGRATULATIONS! YOU HAVE MASTERED PROBABILITY!

Designed with ❤️ by **Tinku Sir & OnePath Academy** for CBSE Board Aspirants.