

CLASS 11 MATHEMATICS — FORMULA SHEET

Chapter 14 : Probability (NCERT)

14.1 Basic Terms

Term	Definition
Random experiment	An experiment with more than one possible outcome that can't be predicted with certainty
Sample space (S)	Set of all possible outcomes
Sample point	Each element (outcome) of the sample space
Event	A subset of the sample space
Equally likely outcomes	Outcomes with the same chance of occurring
Trial	A single performance of the experiment

14.2 Types of Events

Type	Definition
Sure (certain) event	The whole sample space S ; probability 1
Impossible event	Empty set $\varnothing$; probability 0
Simple (elementary) event	Event with a single outcome
Compound event	Event with more than one outcome
Complementary event (A')	'Not A' = $S - A$
Mutually exclusive	$A \cap B = \varnothing$ (cannot occur together)
Exhaustive events	Their union covers all of S
Independent events	Occurrence of one does not affect the other

14.3 Probability — Definitions & Range

Concept	Formula
Probability of event A	$P(A) = (\text{favourable outcomes}) \div (\text{total outcomes})$
Range of probability	$0 \leq P(A) \leq 1$
Sure event	$P(S) = 1$
Impossible event	$P(\varnothing) = 0$
Sum over sample space	$\sum P(\text{outcomes}) = 1$
Complement rule	$P(A') = 1 - P(A)$
Odds in favour	$P(A) : P(A')$

14.4 Addition Theorem (Union of Events)

Concept	Formula
Union of two events	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
Mutually exclusive	$P(A \cup B) = P(A) + P(B)$ (since $A \cap B = \varnothing$)
Three events	$P(A \cup B \cup C) = \Sigma P(A) - \Sigma P(A \cap B) + P(A \cap B \cap C)$
Either A or B (not both)	$P(A) + P(B) - 2P(A \cap B)$
Neither A nor B	$P(A' \cap B') = 1 - P(A \cup B)$
Only A (not B)	$P(A) - P(A \cap B)$

14.5 Common Sample Spaces

Experiment	Total Outcomes
One coin tossed	2 (H, T)
Two coins / one coin twice	4 (HH, HT, TH, TT)
n coins tossed	2^n
One die rolled	6
Two dice rolled	36
n dice rolled	6^n
Drawing 1 card from a deck	52 (4 suits $\times$ 13)
Face cards in a deck	12 (J, Q, K of each suit)

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Basic probability	$P(A)$ = favourable / total. Always between 0 and 1.
Complement	$P(\text{not } A) = 1 - P(A)$. Often easier to find the complement first.
Addition theorem	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$. Subtract the overlap once.
Mutually exclusive	$A \cap B = \varnothing$, so just add: $P(A \cup B) = P(A) + P(B)$.
Independent events	$P(A \cap B) = P(A) \cdot P(B)$ when one doesn't affect the other.
Coins & dice	n coins $\rightarrow 2^n$ outcomes ; n dice $\rightarrow 6^n$ outcomes.
Card deck	52 cards: 26 red, 26 black, 12 face cards, 4 aces.
'At least one'	$P(\text{at least one}) = 1 - P(\text{none})$. The complement trick saves time.