

Probability

CBSE Class 12 Maths · Knowledge organiser

KEY DEFINITIONS

Conditional probability

$P(A | B) = P(A \cap B)/P(B)$, the probability of A given B.

Independent events

$P(A \cap B) = P(A)P(B)$.

Bayes' theorem

Finds the probability of a cause given that an event has happened.

YOU SHOULD BE ABLE TO...

- Compute conditional probabilities from counts and formulas, use the multiplication theorem and find k in a probability distribution.
- Test independence, apply total probability and Bayes' theorem, and find the mean of a random variable at board 2- and 3-mark level.
- Write complete 5-mark Bayes and random-variable answers (events defined, tree/table, formula, conclusion) and handle probability case studies.
- Handle proofs about conditional probability and independence, sequential evidence in Bayes, and distributions built from without-replacement experiments.

COMMON MISTAKES

- ✗ Dividing by the wrong event: in $P(A | B)$ the given event B goes in the denominator.
- ✗ Assuming independence without justification, or confusing it with mutually exclusive.
- ✗ In Bayes' questions, forgetting a branch in the denominator or not defining $E_1, E_2, \dots$ and A.
- ✗ Probability distributions whose probabilities do not add to 1 — always check.

KEY FORMULAS

Conditional	$P(E F) = \frac{P(E \cap F)}{P(F)}, P(F) \neq 0$
Properties	$P(S F) = 1, P(E' F) = 1 - P(E F)$
Multiplication rule	$P(E \cap F) = P(E)P(F E) = P(F)P(E F)$
Independent	$P(E \cap F) = P(E)P(F)$
Union	$P(E \cup F) = P(E) + P(F) - P(E \cap F)$
Total probability (partition $E_1, \dots, E_n$)	$P(A) = \sum_{j=1}^n P(E_j)P(A E_j)$
Bayes' theorem	$P(E_i A) = \frac{P(E_i)P(A E_i)}{\sum_{j=1}^n P(E_j)P(A E_j)}$
Random variable	$p_i \geq 0, \sum p_i = 1, E(X) = \mu = \sum x_i p_i$

WORKED EXAMPLE

A card is drawn from a pack of 52. Given it is a face card (J, Q, K), the probability that it is a king is $\frac{4}{12} = \frac{1}{3}$.