EXAM-DAY · 90-MIN REVISION CARD

Probability Distributions

Print this · Fold it · Carry to the exam-hall gate · Revise once · Then walk in.

FORMULAS & KEY RESULTS

PROBABILITY DISTRIBUTION: each p_i in [0,1] AND $\Sigma p_i = 1$

EXPECTED VALUE: $E(X) = \Sigma x_i \cdot p_i$ (the long-run mean)

VARIANCE: $Var(X) = E(X^2) - [E(X)]^2 = \Sigma x_i^2 \cdot p_i - \mu^2$; SD: $\sigma = \sqrt{Var(X)}$

BINOMIAL B(n,p): $P(X = k) = C(n,k) \cdot p^k \cdot (1-p)^{(n-k)}$ for $k = 0, 1, \cdots, n$

BINOMIAL mean & variance: $E(X) = n \cdot p$; $Var(X) = n \cdot p \cdot (1-p)$

POISSON Po(λ): $P(X = k) = e^{(-\lambda)} \cdot \lambda^k / k!$ for $k = 0, 1, 2, \ldots$

POISSON mean & variance: $E(X) = Var(X) = \lambda$; approximates B(n,p) when n large, p small, $\lambda = np$

NORMAL N(μ, σ^2): bell curve, symmetric about μ; ~68%/95%/99.7% within $1\sigma/2\sigma/3\sigma$

STANDARDISATION: $z = (X - \mu)/\sigma$; $P(X \leqslant a) = \Phi((a - \mu)/\sigma)$; $P(Z > z) = 1 - \Phi(z)$

COMPLEMENT TRICK: $P(X \geqslant 1) = 1 - P(X = 0)$; P(at least one) = 1 − P(none)

USEFUL nCr: C(5,2)=10, C(5,3)=10, C(10,3)=120, C(10,5)=252

USEFUL e values: $e^{(-1)} \approx 0.368$, $e^{(-2)} \approx 0.135$, $e^{(-3)} \approx 0.050$

TOP 5 PYQ PATTERNS

1 Construct probability distribution from a small experiment
3 marks · 80% of years
List sample space · count outcomes for each X-value · build the table · CHECK $\Sigma p_i = 1$.

2 E(X) and Var(X) from a distribution table
3 marks · 85% of years
$E(X) = \Sigma x_i \cdot p_i$ · $E(X^2) = \Sigma x_i^2 \cdot p_i$ · $Var = E(X^2) - [E(X)]^2$. Tabulate to avoid slips.

3 Binomial P(X = k) and/or mean & variance
5 marks · 95% of years
Identify n, p · PMF $C(n,k)\, p^k\, (1-p)^{(n-k)}$ · mean = np, variance = np(1−p). Don't forget the nCr factor.

4 Poisson rare-event count
4 marks · 70% of years
Identify λ · use given $e^{(-\lambda)}$ hint · $P(X = k) = e^{(-\lambda)} \cdot \lambda^k/k!$ · $P(X \geqslant 1) = 1 - P(X = 0)$.

5 Normal distribution z-table look-up
4 marks · 75% of years
Standardise $z = (X - \mu)/\sigma$ · use $\Phi(z)$ directly (left tail) · take $1 - \Phi(z)$ for right tail · between: $\Phi(b) - \Phi(a)$.

90-MIN REVISION FLOW

0-12 min
Memorise the spine: $\Sigma p_i = 1$; $E(X) = \Sigma x_i p_i$; $Var = E(X^2) - \mu^2$; binomial PMF and (np, np(1−p)); Poisson PMF and (λ, λ); $z = (X-\mu)/\sigma$.

12-30 min
Drill 2 distribution-table problems: compute the table, verify $\Sigma = 1$, then find E(X) and Var(X) in two columns.

30-55 min
Solve 2 binomial 5-mark long-answers end-to-end: identify (n, p), compute P(X = k) with the nCr factor, then mean and variance.

55-72 min
Do 1 Poisson 4-mark question (use given $e^{(-\lambda)}$) and 1 normal-distribution 4-mark question (standardise and read $\Phi(z)$).

72-90 min
Self-check from memory: the binomial PMF, mean and variance of B(n,p), the Poisson PMF, and the standardisation formula. If all four are solid, you are chapter-ready.

Confidence, not anxiety. You've practised this all year. Trust your steps. Don't change strategy on exam morning. Helpline: **+91 70330 05444** · **readyforboards.com**