

H2 Mathematics
Probability and Statistics Section
A Comprehensive Checklist of Skills and Concepts
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Syllabus topic 6: Permutations, combinations and probability

6.1 Checklist on Permutations and combinations

- Application of multiplication and addition principles.
- Solving problems involving arrangements related to words, lines, circles and beads.
- Solving problems involving restrictions and repetitions.

6.2 Checklist on Probability

- Application of multiplication and addition principles.
- Appreciation of mutually exclusive and independent events.
- Solving problems involving conditional probabilities.
- Solving problems involving the use of tables of outcomes (e.g. sum of two die scores), Venn diagrams and tree diagrams.
- Solving problems involving the use of an infinite geometric progression. For example: A and B play a game in which they each throw a die in turn until someone throws a six. Find the probability that A wins if he starts the game.
- Application of permutations and combinations in finding probabilities.

Syllabus topic 7: Binomial, Poisson and normal distributions

7.1 Checklist on Binomial and Poisson distributions

- Application of $E(X)$ and $\text{Var}(X)$.
- Finding Binomial and Poisson probabilities.
- Solving problems involving conditional probabilities.
- Commenting on the appropriateness of using Binomial/Poisson distribution for a random variable.

- Finding unknowns (n , p for Binomial or mean for Poisson) based on given probabilities.
- Finding probabilities involving the sum of Poisson variables.
- Solving problems involving a combination of Binomial and Poisson distributions.
- Using the Poisson distribution to approximate the Binomial distribution.

7.2 Checklist on Normal distribution

- Finding Normal probabilities.
- Solving problems involving conditional probabilities.
- Commenting on the appropriateness of using Normal distribution for a random variable.
- Finding unknowns (mean, standard deviation or variance) based on given probabilities.
- Finding unknowns like the value of k that satisfies $P(X > k) = \text{given probability}$.
- Solving problems involving the linear combination of independent Normal variables, i.e. $aX + bY$.
- Appreciating the difference between nX and $X_1 + X_2 + \dots + X_n$.
- Using the Normal distribution to approximate the Binomial distribution with continuity correction.
- Using the Normal distribution to approximate the Poisson distribution with continuity correction.

Syllabus topic 8: Sampling and hypothesis testing

8.1 Checklist on Sampling

- Commenting on the appropriateness of sampling methods (random, systematic, stratified, quota) for given contexts.
- Solving problems involving the sampling distribution from a normal distribution.
- Application of the Central Limit Theorem.

8.2 Checklist on Hypothesis testing

- Finding of unbiased estimates of the population mean and variance from a sample.
- Appreciation of the meaning of p -value and level of significance.
- Solving problems involving the t -test and z -test.
- Obtaining inequalities involving the level of significance, sample size or population mean.

Syllabus topic 9: Correlation and regression

- Sketching a scatter diagram and using it to comment on the relationship between variables or to identify a data pair which should be regarded as suspect.
- Appreciation of the cases where the product moment correlation coefficient (r) is negative, positive, zero.
- Finding the equations of regression lines and r from the given data.
- Finding unknowns, e.g. pair of unknown x , y values, given the data.
- Using equations of regression lines to estimate values and commenting on their reliability.
- Application of a square, reciprocal or logarithmic transformation to achieve linearity for non-linear relationships between variables.