

Exam 01 Formula Sheet

If needed, you would be provided any of the following formulas on the exam.

- Sample standard deviation: $s = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2}$
- Sample variance: $s^2 = \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2$
- **Chebyshev's inequality** tells us the proportion of values in the range “average $\pm k$ SDs” is at least $1 - \frac{1}{k^2}$
- **Inclusion-Exclusion:** $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- **Complement of union:** $(A \cup B)^C = A^C \cap B^C$
- **Complement of intersection:** $(A \cap B)^C = A^C \cup B^C$
- Conditional probability: $P(A|B) = \frac{P(A \cap B)}{P(B)}$
- Law of total probability: $P(A) = P(A \cap B_1) + P(A \cap B_2) + \dots + P(A \cap B_k)$
- If X has a binomial distribution, then $P(X = k) = \binom{n}{k} p^k (1-p)^{n-k}$
- If X has a Poisson distribution, then $P(X = k) = \frac{\lambda^k e^{-\lambda}}{k!}$
- Given n and parameter values, write out the expression for expectation and variance of Bernoulli, Binomial, and Poisson random variables. (Formulas for each given.)
- For $Z \sim \text{Bern}(p)$, $E(Z) = p$ and $\text{Var}(Z) = p(1-p)$
- For $Z \sim \text{Binom}(n, p)$, $E(Z) = np$ and $\text{Var}(Z) = np(1-p)$
- For $Z \sim \text{Pois}(\lambda)$, $E(Z) = \text{Var}(Z) = \lambda$