

Equations to know for Quizzes and Exam (Chapters 1 to 9)

Sample mean $\bar{x} = \frac{\sum x_i}{n}$

Sample Standard Deviation $\sqrt{s^2} = s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$

Coefficient of Variation

$$\frac{s}{\bar{x}} * (100)\%$$

Probability

Addition Rule If $A \cap B \neq \emptyset$ $p(A \cup B) = p(A) + p(B) - p(A \cap B)$

Multiplication Rule Independent Events $p(A \cap B) = p(A) \cdot p(B)$

Dependent Events $p(A \cap B) = p(A) \cdot p(B|A)$

Conditional Probability

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

Bayes' theorem: $P(A|B) = [P(B|A) * P(A)] / P(B)$, where $P(A|B)$ is the probability of event A given event B has occurred.

or

$$P(A | B) = \frac{P(B | A) \cdot P(A)}{P(B)}$$

Know how to construct a joint probability table.

Expected Value $E(X) = x_1p_1 + x_2p_2 + x_3p_3 + \dots + x_np_n$.

Variance The variance summarizes the variability in the values of a random variable.

$$\text{Var}(x) = \sigma^2 = \sum (x - \mu)^2 f(x)$$

Binomial probability distribution:

$$P(x) = \frac{n!}{x!(n-x)!} p^x (1-p)^{n-x} \text{ for } x = 1, 2, \dots, n$$

Know how to read a binomial table.

Mean, variance, and standard deviation of a binomial random variable:

$$\begin{aligned}\mu &= np \\ \sigma^2 &= np(1-p) \\ \sigma &= \sqrt{np(1-p)}\end{aligned}$$

The probability that a Poisson random variable assumes a value of x in a specific interval is:

$$P(x) = \frac{e^{-\mu} \mu^x}{x!} \text{ for } x = 0, 1, 2, \dots$$

Know how to read a Poisson Table.

Uniform Probability Distribution

$$f(x) = 1/(b-a) \text{ for } a \leq x \leq b$$

where: a = smallest value the variable can

Standard deviation or Standard error of the mean (standard deviation known)

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{N}}$$

Standard deviation or Standard error of the mean (standard deviation unknown – sample)

$$s_{\bar{x}} = \frac{s}{\sqrt{n}}$$

Z-Score for a Single Value	Z-Score for a Sample Mean σ known
$z = \frac{(x - \mu)}{\sigma}$	$z = \frac{(\bar{x} - \mu)}{\frac{\sigma}{\sqrt{n}}}$

Sample Standard error for proportions

$$\sigma_{\bar{p}} = \sqrt{\frac{\bar{p}(1 - \bar{p})}{n}}$$