CHAPTER 3

- Population mean, raw data

$$\mu = \frac{\Sigma X}{N} \quad [3\text{–}1]$$

- Sample mean, raw data

$$\bar{X} = \frac{\Sigma X}{n} \quad [3\text{–}2]$$

- Weighted mean

$$\bar{X}_w = \frac{w_1X_1 + w_2X_2 + \cdots + w_nX_n}{w_1 + w_2 + \cdots + w_n} \quad [3\text{–}3]$$

- Geometric mean

$$GM = \sqrt[n]{(X_1)(X_2)(X_3)\cdots(X_n)} \quad [3\text{–}4]$$

- Geometric mean rate of increase

$$GM = \sqrt[n]{\frac{\text{Value at end of period}}{\text{Value at start of period}}} - 1 \quad [3\text{–}5]$$

- Range = Highest value − Lowest value **[3–6]**
- Mean deviation

$$MD = \frac{\Sigma|X - \bar{X}|}{n} \quad [3\text{–}7]$$

- Population variance

$$\sigma^2 = \frac{\Sigma(X - \mu)^2}{N} \quad [3\text{–}8]$$

- Population standard deviation

$$\sigma = \sqrt{\frac{\Sigma(X - \mu)^2}{N}} \quad [3\text{–}9]$$

- Sample variance (deviation)

$$s^2 = \frac{\Sigma(X - \bar{X})^2}{n - 1} \quad [3\text{–}10]$$

- Sample variance (direct)

$$s^2 = \frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n - 1} \quad [3\text{–}11]$$

- Sample standard deviation (direct)

$$s = \sqrt{\frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n - 1}} \quad [3\text{–}12]$$

- Coefficient of variation

$$CV = \frac{s}{\bar{X}}(100) \quad [3\text{–}13]$$

- Coefficient of skewness

$$sk = \frac{3(\bar{X} - \text{median})}{s} \quad [3\text{–}14]$$

- Location of percentile

$$L_p = (n + 1)\frac{P}{100} \quad [3\text{–}15]$$

- Sample mean grouped data

$$\bar{X} = \frac{\Sigma fM}{n} \quad [3\text{–}16]$$

- Sample standard deviation, grouped data

$$s = \sqrt{\frac{\Sigma fM - \frac{(\Sigma fM)^2}{n}}{n - 1}} \quad [3\text{–}17]$$

CHAPTER 4

- Special rule of addition

$$P(A \text{ or } B) = P(A) + P(B) \quad [4\text{–}2]$$

- Complement rule

$$P(A) = 1 - P(\sim A) \quad [4\text{–}3]$$

- General rule of addition

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) \quad [4\text{–}4]$$

- Special rule of multiplication

$$P(A \text{ and } B) = P(A)P(B) \quad [4\text{–}5]$$

- General rule of multiplication

$$P(A \text{ and } B) = P(A)P(B|A) \quad [4\text{–}6]$$

- Number of permutations

$${}_nP_r = \frac{n!}{(n - r)!} \quad [4\text{–}8]$$

- Number of combinations

$${}_nC_r = \frac{n!}{r!(n - r)!} \quad [4\text{–}9]$$

CHAPTER 5

- Mean of a probability distribution

$$\mu = \Sigma[xP(x)] \quad [5\text{–}1]$$

- Variance of a probability distribution

$$\sigma^2 = \Sigma[(x - \mu)^2P(x)] \quad [5\text{–}2]$$

- Binomial distribution

$$P(x) = {}_nC_x\, p^x(1 - p)^{n-x} \quad [5\text{–}3]$$

- Mean of a binomial distribution

$$\mu = np \quad [5\text{–}4]$$

- Variance of a binomial distribution

$$\sigma^2 = np\,(1 - p) \quad [5\text{–}5]$$

- Hypergeometric probability distribution

$$P(x) = \frac{({}_SC_x)({}_{N-S}C_{n-x})}{{}_NC_n} \quad [5\text{–}6]$$

- Poisson probability distribution

$$P(x) = \frac{\mu^x e^{-\mu}}{x!} \quad [5\text{–}7]$$

CHAPTER 6

- Standard normal value

$$z = \frac{X - \mu}{\sigma} \quad [6\text{–}1]$$

CHAPTER 7

- Standard error of mean

$$\sigma_{\overline{X}} = \frac{\sigma}{\sqrt{n}} \qquad \textbf{[7–1]}$$

- z-value, μ and σ known

$$z = \frac{\overline{X} - \mu}{\sigma/\sqrt{n}} \qquad \textbf{[7–2]}$$

- z-value, population shape and σ unknown

$$z = \frac{\overline{X} - \mu}{s/\sqrt{n}} \qquad \textbf{[7–3]}$$

CHAPTER 8

- Confidence interval for μ, $n > 30$

$$\overline{X} \pm z\frac{s}{\sqrt{n}} \qquad \textbf{[8–1]}$$

- Confidence interval for μ, σ unknown

$$\overline{X} \pm t\frac{s}{\sqrt{n}} \qquad \textbf{[8–2]}$$

- Confidence interval for proportion

$$\hat{p} \pm z\,\sigma_p \text{ where } \sigma_p = \sqrt{\frac{p(1-p)}{n}} \qquad \textbf{[8–4]}$$

- Standard error of sample proportion

$$s_p = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \qquad \textbf{[8–5]}$$

- Confidence interval for population proportion

$$\hat{p} \pm z\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \qquad \textbf{[8–6]}$$

- Sample size for estimating population mean

$$n = \left(\frac{zs}{E}\right)^2 \qquad \textbf{[8–9]}$$

- Sample size for population proportion

$$n = \hat{p}(1-\hat{p})\left(\frac{z}{E}\right)^2 \qquad \textbf{[8–10]}$$

CHAPTER 9

- z distribution as a test statistic

$$z = \frac{\overline{X} - \mu}{\sigma/\sqrt{n}} \qquad \textbf{[9–1]}$$

- z statistic, σ unknown

$$z = \frac{\overline{X} - \mu}{s/\sqrt{n}} \qquad \textbf{[9–2]}$$

- Test of hypothesis, one proportion

$$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} \qquad \textbf{[9–4]}$$

- One sample test of mean, small sample

$$t = \frac{\overline{X} - \mu}{s/\sqrt{n}} \qquad \textbf{[9–5]}$$

CHAPTER 10

- Test statistic for difference between two large sample means

$$z = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \qquad \textbf{[10–2]}$$

- Two-sample test of proportions

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\frac{p_c(1-p_c)}{n_1} + \frac{p_c(1-p_c)}{n_2}}} \qquad \textbf{[10–3]}$$

- Pooled proportion

$$p_c = \frac{X_1 + X_2}{n_1 + n_2} \qquad \textbf{[10–4]}$$

- Pooled variance

$$s_p^2 = \frac{(n_1 - 1)\,s_1^2 + (n_2 - 1)\,s_2^2}{n_1 + n_2 - 2} \qquad \textbf{[10–5]}$$

- Two-sample test of means—small samples

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{s_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \qquad \textbf{[10–6]}$$

- Paired t test

$$t = \frac{\overline{d}}{s_d/\sqrt{n}} \qquad \textbf{[10–7]}$$

CHAPTER 11

- Test for equal variance

$$F = \frac{s_1^2}{s_2^2} \qquad \textbf{[11–1]}$$

- Sum of squares, total

$$\text{SS total} = \Sigma X^2 - \frac{(\Sigma X)^2}{n} \qquad \textbf{[11–2]}$$

- Sum of squares, treatments

$$\text{SST} = \Sigma\left[\frac{T_c^2}{n_c}\right] - \frac{(\Sigma X)^2}{n} \qquad \textbf{[11–3]}$$

- Sum of squares, error

$$\text{SSE} = \text{SS total} - \text{SST} \qquad \textbf{[11–4]}$$

- Confidence interval for means

$$(\overline{X}_1 - \overline{X}_2) \pm t\sqrt{\text{MSE}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)} \qquad \textbf{[11–5]}$$

CHAPTER 12

- Coefficient of correlation

$$r = \frac{n(\Sigma XY) - (\Sigma X)(\Sigma Y)}{\sqrt{[n(\Sigma X^2) - (\Sigma X)^2]\,[n(\Sigma Y^2) - (\Sigma Y)^2]}} \qquad \textbf{[12–2]}$$

- Correlation test of hypothesis

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \qquad \textbf{[12–3]}$$

- Slope of a regression line

$$b = \frac{n(\Sigma XY) - (\Sigma X)(\Sigma Y)}{n(\Sigma X^2) - (\Sigma X)^2} \qquad \textbf{[12–5]}$$

- Intercept of a regression line

$$a = \frac{\Sigma Y}{n} - b\left(\frac{\Sigma X}{n}\right) \qquad \textbf{[12–6]}$$

- Standard error of estimate

$$s_{y\cdot x} = \sqrt{\frac{\Sigma Y^2 - a(\Sigma Y) - b(\Sigma XY)}{n-2}} \qquad \textbf{[12–8]}$$

- Confidence interval

$$Y' \pm t(s_{y \cdot x})\sqrt{\frac{1}{n} + \frac{(X - \bar{X})^2}{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}} \qquad [12\text{–}9]$$

- Prediction interval

$$Y' \pm t(s_{y \cdot x})\sqrt{1 + \frac{1}{n} + \frac{(X - \bar{X})^2}{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}} \qquad [12\text{–}10]$$

CHAPTER 13

- Multiple regression equation

$$Y' = a + b_1X_1 + b_2X_2 + \cdots + b_kX_k \qquad [13\text{–}3]$$

- Multiple standard error

$$s_{y \cdot 12 \cdots k} = \sqrt{\frac{\Sigma(Y - Y')^2}{n - (k + 1)}} \qquad [13\text{–}4]$$

- Coefficient of multiple determination

$$R^2 = \frac{\text{SSR}}{\text{SS total}} \qquad [13\text{–}5]$$

- Global test of hypothesis

$$F = \frac{\text{SSR}/k}{\text{SSE}/(n - (k + 1))} \qquad [13\text{–}6]$$

- Testing for a particular regression coefficient

$$t = \frac{b_i - 0}{s_{b_i}} \qquad [13\text{–}7]$$

CHAPTER 14

- Chi-square test statistic

$$\chi^2 = \Sigma\left[\frac{(f_o - f_e)^2}{f_e}\right] \qquad [14\text{–}1]$$

- Expected frequency

$$f_e = \frac{\text{(Row total)(Column total)}}{\text{Grand total}} \qquad [14\text{–}2]$$