Chapter 3: Numerical Summaries of Data

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

Population mean:
$$\mu = \frac{\sum x}{N}$$

Range:
Range = largest value − smallest value

Coefficient of variation:
$$\text{CV} = \frac{\sigma}{\mu}$$

***z*-score:**
$$z = \frac{x - \mu}{\sigma}$$

Interquartile range:
$\text{IQR} = Q_3 - Q_1 =$ third quartile − first quartile

Sample variance:
$$s^2 = \frac{\sum(x - \bar{x})^2}{n - 1}$$

Chapter 8: Confidence Intervals

Confidence interval for a mean, standard deviation known:
$$\bar{x} - z_{\alpha/2}\frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$$

Sample size to construct an interval for μ with margin of error m:
$$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{m}\right)^2$$

Confidence interval for a mean, standard deviation unknown:
$$\bar{x} - t_{\alpha/2}\frac{s}{\sqrt{n}} < \mu < \bar{x} + t_{\alpha/2}\frac{s}{\sqrt{n}}$$

Confidence interval for a proportion:
$$\hat{p} - z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} < p < \hat{p} + z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

Chapter 9: Hypothesis Testing

Test statistic for a mean, standard deviation known:
$$z = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$$

Test statistic for a mean, standard deviation unknown:
$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$$

Test statistic for a proportion:
$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$

Chapter 10: Two-Sample Confidence Intervals

Confidence interval for the difference between two means, independent samples:

$$\bar{x}_1 - \bar{x}_2 - t_{\alpha/2}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} < \mu_1 - \mu_2 < \bar{x}_1 - \bar{x}_2 + t_{\alpha/2}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

Confidence interval for the difference between two means, matched pairs:

$$\bar{d} - t_{\alpha/2}\frac{s_d}{\sqrt{n}} < \mu_d < \bar{d} + t_{\alpha/2}\frac{s_d}{\sqrt{n}}$$

Confidence interval for the difference between two proportions:

$$\hat{p}_1 - \hat{p}_2 - z_{\alpha/2}\sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$

$$< p_1 - p_2 < \hat{p}_1 - \hat{p}_2 + z_{\alpha/2}\sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$

Chapter 11: Two-Sample Hypothesis Tests

Test statistic for the difference between two means, independent samples:

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Test statistic for the difference between two means, matched pairs:

$$t = \frac{\bar{d} - \mu_0}{s_d/\sqrt{n}}$$

Test statistic for the difference between two proportions:

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

where $\hat{p}$ is the pooled proportion $\hat{p} = \dfrac{x_1 + x_2}{n_1 + n_2}$

Chapter 15: Nonparametric Statistics

Test statistic for the sign test:

$$z = \frac{x + 0.5 - n/2}{\sqrt{n}/2} \quad \text{if } n > 25$$

If $n \leq 25$, the test statistic is x, the number of times the less frequent sign occurs.

Mean of S, the sum of the ranks for the rank-sum test:

$$\mu_S = \frac{n_1(n_1 + n_2 + 1)}{2}$$

Standard deviation of S, the sum of the ranks for the rank-sum test:

$$\sigma_S = \sqrt{\frac{n_1 n_2(n_1 + n_2 + 1)}{12}}$$

Test statistic for the rank-sum test:

$$z = \frac{S - \mu_S}{\sigma_S}$$