Formulas

Chapter 3

$\bar{x} = \frac{\sum x}{n}$ Mean

$\bar{x} = \frac{\sum(f*x_m)}{\sum f}$ Mean (frequency distribution)

$s = \sqrt{\frac{n(\sum x^2)-(\sum x)^2}{n(n-1)}}$ Standard deviation (shortcut)

$s = \sqrt{\frac{n[\sum(f*x_m^2)]-[\sum f*x_m]^2}{n(n-1)}}$ Standard deviation

s^2 Variance

$IQR = Q_3 - Q_1$ Interquartile Range

$Q_1 - 1.5(IQR)$ and $Q_3 + 1.5(IQR)$ Outliers

Chapter 4

P(E) = $\frac{\text{\# of ways E can occur}}{\text{sample space (n)}}$ Probability

P(A or B) = P(A) + P(B) if A, B are mutually exclusive

P(A or B) = P(A) + P(B) – P(A and B) if A, B are not mutually exclusive

P(A and B) = P(A)·P(B) if A, B are independent

P(A and B) = P(A) ·P(B|A) if A, B are dependent

P(B|A) = $\frac{\text{P(A and B)}}{\text{P(A)}}$ Conditional probability

P(A) = 1 – P($\bar{A}$) Rule of complements

$_nP_r = \frac{n!}{(n-r)!}$ Permutation (no elements alike)

$\frac{n!}{n_1!n_2!\cdots n_k!}$ Permutation (elements alike)

$_nC_r = \frac{n!}{(n-r)!r!}$ Combinations

Chapter 5

μ = $\sum[x \cdot P(x)]$ Mean (Probability Distribution)

$\sigma = \sqrt{\sum[x^2 \cdot P(x)] - \mu^2}$ Standard Deviation (Probability Distribution)

E(X) = μ Expected Value

P(X) = $_nC_x \cdot p^x q^{n-x}$ Binomial Probability

μ = np Mean (binomial)

$\sigma^2 = npq$ Variance (binomial)

$\sigma = \sqrt{npq}$ Standard deviation (binomial)

P(X) = $\frac{e^{-\mu}\mu^x}{x!}$ Poisson

Chapter 6

$z = \frac{x-\bar{x}}{s}$ or $z = \frac{x-\mu}{\sigma}$ z-score

$z = \frac{\bar{x}-\mu}{\frac{\sigma}{\sqrt{n}}}$ Central Limit Theorem

Chapter 7

Confidence Intervals

$\hat{p} - E < p < \hat{p} + E,$ Proportion

E = $z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}}$

$\bar{x} - E < \mu < \bar{x} + E,$ Mean

E = $t_{\alpha/2}\frac{s}{\sqrt{n}}$ (σ unknown)

Or E = $z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$ (σ known)

$\frac{(n-1)s^2}{\chi_R^2} < \sigma^2 < \frac{(n-1)s^2}{\chi_L^2}$, Variance

Sample size

n = $\frac{z_{\alpha/2}^2 0.25}{E^2}$ (unknown proportion)

n = $\frac{z_{\alpha/2}^2\,\hat{p}\hat{q}}{E^2}$ (known proportion)

n = $\left(\frac{z_{\alpha/2}\sigma}{E}\right)^2$

Chapter 8

Test Statistics (one population)

z = $\frac{\hat{p}-p}{\sqrt{\frac{pq}{n}}}$ Proportion

t = $\frac{\bar{x}-\mu}{\frac{s}{\sqrt{n}}}$ Mean - σ unknown

z = $\frac{\bar{x}-\mu}{\frac{\sigma}{\sqrt{n}}}$ Mean - σ known

Chapter 9
Confidence Intervals (two populations)

$(\hat{p}_1 - \hat{p}_2) - E < p_1 - p_2 < (\hat{p}_1 - \hat{p}_2) + E$, Proportions

E = $z_{\alpha/2}\sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}}$

$(\overline{x_1} - \overline{x_2}) - E < \mu_1 - \mu_2 < (\overline{x_1} - \overline{x_2}) + E$, Mean

$E = t_{\alpha/2}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$, if σ_1, σ_2, are unknown

$df = n_1 - 1$ OR df = $n_2 - 1$ whichever is smaller

OR $E = z_{\alpha/2}\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$, if σ_1, σ_2, are known

$\bar{d} - E < \mu_d < \bar{d} + E$, matched pairs

E = $t_{\alpha/2} \cdot \frac{s_d}{\sqrt{n}}$, df = n - 1

Test Statistics (two populations)

z = $\frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\frac{\bar{p}\bar{q}}{n_1} + \frac{\bar{p}\bar{q}}{n_2}}}$, two proportions

$\bar{p} = \frac{x_1 + x_2}{n_1 + n_2}$

t = $\frac{(\overline{x_1} - \overline{x_2}) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$, two means if σ_1, σ_2, are unknown

$df = n_1 - 1$ OR df = $n_2 - 1$ whichever is smaller

$z = \frac{(\overline{x_1} - \overline{x_2}) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$, two means if σ_1, σ_2, are known

t = $\frac{\bar{d} - \mu_d}{\frac{s_d}{\sqrt{n}}}$, matched pairs

F = $\frac{s_1^2}{s_2^2}$, s_1^2 is the larger of the two variances

numerator $df = n_1 - 1$ and denominator df = $n_2 - 1$

Chapter 10
Linear Correlation test-statistic

t = $\frac{r}{\sqrt{\frac{1-r^2}{n-2}}}$ $df = n - 2$

Chapter 11
Goodness-of-fit

$\chi^2 = \sum \frac{(O-E)^2}{E}$ $df = k - 1$

Contingency Tables

E = $\frac{(row\ total)(column\ total)}{grand\ total}$

df = (r – 1)(c – 1)

Chapter 12
ANOVA

F = $\frac{variance\ between\ samples}{varance\ within\ sampleds}$