	Parametric Tests (distribution assumptions / normal) Interval/Ratio data	Non-parametric Tests (distribution-free / discrete) Nominal/Ordinal data
One Sample Difference Tests	**1 sample difference of means Z or t test (p121)**	**One Sample difference of proportions (p124)**
	• Compare a random sample mean to a population mean for difference • Requirements and assumptions: 1. Random Sample 2. Population normally distributed 3. Variable measured in interval/ratio • H_o: $\mu = \mu_H$ (hypothesized mean) • $Z=\frac{(\bar{x}-\mu)}{\sigma_{\bar{x}}}$ (t test the same)	• Compare a random sample proportion to a population proportion for difference • Requirements and assumptions: 1. Random Sample 2. Variable is in binary categories • H_o: $\rho = \rho_H$ (hypothesized proportion) • $Z=\frac{(p-\rho)}{\sigma_\rho}$
Two Samples Difference Tests	**2 samples difference of means Z/t test (p131)**	**Wilcoxon Rank Sum W Test (p133)**
	• Compare two independent random sample means for difference • Requirements and assumptions: 1. Two independent random samples 2. Both populations normally distributed 3. Variable measured in interval/ratio • H_o: $\mu_1 = \mu_2$ (hypothesized mean) • $Z=\frac{(\bar{x}_1-\bar{x}_2)}{\sigma_{\bar{x}_1-\bar{x}_2}}$ (t test the same)	• Compare two independent random sample rank sums for difference • Requirements and assumptions: 1. Two independent random samples 2. Both population distribution have the same shape 3. Variable measured at ordinal scale • H_o: The distribution of measurements for the first population is equal to that of the second population • $Z_W=\frac{W_i-\bar{W}_i}{s_W}$
		2 sample difference of proportions (p137)
		• Compare two independent random sample proportions for difference • Requirements and assumptions: 1. Two independent random samples 2. Variable is in binary categories • H_o: $\rho_1 = \rho_2$ • $Z_\rho=\frac{p_1-p_2}{\sigma_{\bar{p}_1-\bar{p}_2}}$
Matched Pairs Difference Tests	**Matched pairs t-test (p141)**	**Wilcoxon Signed-ranks test (p142)**
	• Compare matched pairs from a random sample for difference • Requirements and assumptions: 1. Random sample 2. Data are collected for 2 different samples or at 2 different time periods 3. Population is normally distributed 4. Variable(s) is(are) interval/ratio • H_o: $\delta = 0$ • $t_{mp}=\frac{\bar{d}}{\sigma_d}$	• Compare matched pairs from a random sample for difference • Requirements and assumptions: 1. Random sample 2. Data are collected for two different variables or at two different time periods 3. Variable(s) is(are) at ordinal scale • H_o: The ranked matched-pair differences of the population are equal • $Z_W=\frac{T-\frac{n(n+1)}{4}}{\sqrt{\frac{n(n+1)(2n+1)}{24}}}$

	Parametric Tests (distribution assumptions / normal) Interval/Ratio data	Non-parametric Tests (distribution-free / discrete) Nominal/Ordinal data
Three or more samples Difference Tests	**ANalysis Of VAriance (one-way) (p146)** • Compare three or more (k) independent random sample means for difference • Requirements and assumptions: 1. Three or more (k) independent samples 2. Each population is normally distributed 3. Variables measured in interval/ratio • H_o: $\mu_1 = \mu_2 = ... = \mu_k$ • $FZ = \frac{MS_{BETWEEN}}{MS_{WITHIN}}$	**Kruskal-Wallis test (p149)** • Compare three or more (k) independent random sample mean ranks for difference • Requirements and assumptions: 1. Three or more (k) independent samples 2. Each population is continually distributed 3. Variables in ordinal scale • H_o: The populations from which the three or more (k) samples have been drawn are all identical • $H = \frac{\left[\frac{12}{N(N+1)} \sum_{i=1}^{k} \frac{R_i^2}{n_i}\right] - 3(N+1)}{1 - \frac{\sum T}{N^3 - N}}$
Goodness-of-fit Tests Association	**Kolmogorov-Smirnov Goodness-of-fit (p156)** • Compare random sample frequency counts of a single variable with expected frequency counts (goodness-of-fit) • Requirements and assumptions: 1. Single random sample 2. Population is continuously distributed (test less valid with discrete distribution) 3. Variable in ordinal scale • H_o: Population from which sample has been drawn fits an expected frequency distribution; no difference between observed and expected frequencies • $D = maximum\|CRF_o(x) - CRF_e(x)\|$	**Chi-square test (p155)** • Compare random sample frequency counts of a single variable with expected frequency counts (goodness-of-fit) • Requirements and assumptions: 1. Single random sample 2. Variables are organized by nominal or ordinal categories; frequency counts by category are input to statistical test 3. If two categories, both expected frequency counts must be at least 5; if three or more, no more than 1/5 of the expected frequency count should be less than 2 • H_o: Population from which sample has been drawn fits an expected frequency distribution; no difference between observed and expected frequencies • $\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i}$ **Contingency Analysis (χ^2) (p166)** • Compare random sample frequency counts of two variables for statistical independence • Requirements and assumptions: 1. Single random sample 2. Variables are organized by normal or ordinal categories; frequency counts by category are input to statistical test 3. No more than 1/5 of the expected frequency count should be less than 5 and none of the expected frequencies should be less than 2 • H_o:There is no relationship between two variables in the population from which sample has been drawn (variables are statistically independent) • $\chi^2 = \sum_{i=1}^{k} \sum_{j=1}^{k} \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$

	Parametric Tests (distribution assumptions / normal) Interval/Ratio data	Non-parametric Tests (distribution-free / discrete) Nominal/Ordinal data
Correlation	**Pearson Product Moment (p196)** • Determine if an association exists between two variables • Requirements and assumptions: 1. Random sample of paired variables 2. Variables have a linear association 3. Variables measured in interval/ratio 4. Variables are bivariate normally distributed • H_o: $\rho = 0$ • $t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$	**Spearman Rand Correlation Analysis (p201)** • Determine if an association exists between two variables • Requirements and assumptions: 1. Random sample of paired variables 2. Variables have a monotonically increasing or decreasing association 3. Variables in ordinal scale • H_o: $\rho_s = 0$ • $Z_{r_s} = r_s\sqrt{n-1}$
Prediction - Regression	**Simple Linear Regression (p211)** • Determine if an independent variable (x) accounts for a significant portion of the total variation in a dependent variable (y) • Requirements and assumptions: 1. Variables in interval/ration 2. Fixed-x model: Values of (x) chosen by the investigator, and values of (y) randomly selected for each (x). Random-x model: Values of both (x) and (y) randomly selected 3. Variables have a linear association 4. For every value of (x), the distribution of residuals (y-ŷ) should be normal, and the mean of the residuals should equal zero 5. For every value of (x), the variance of residual error is equal (homoscedastic) 6. the value of each residual is independent of all other residual values (no autocorrelation) • H_o: $\rho^2 = 0$ • $F = \frac{r^2(n-2)}{1-r^2}$	

	Point Patterns	Area Patterns
	Nearest Neighbor Analysis • Determine whether a random (Poisson) process has generated a point pattern • Requirements and assumptions: 1. Random sample of points from population 2. Sample points are independently selected • H_o: $NND = NND_R$ • $Z_n = \frac{\overline{NND} - \overline{NND_R}}{\sigma_{\overline{NND}}}$ **Quadrat Analysis** • Determine whether a random (Poisson) process has generated a point pattern • Requirements and assumptions: 1. Random sample of points from population 2. Sample points are independently selected • H_o: $VMR = 1$ • $\chi^2 = VMR(m-1)$	**Joint Count Statistics** • Determine whether a random (Poisson) process has generated a binary area pattern • Requirements and assumptions: 1. Each area is assigned to single category 2. Each pair of areas must be defined as either adjacent or not in a consistent manner • H_o: $O_{BW} = E_{BW}$ • $Z_b = \frac{O_{BW} - E_{BW}}{\sigma_{BW}}$