- Hardy - Weinberg principle

e.g.) incidence of aa genotype is 1% $q^2 = 0.01$ $q = 0.1$

$p + q = 1$ so $p = 0.9$ incidence of AA genotype $p^2 = 0.81$

$p^2 + 2pq + q^2$ $2pq = 2(0.1)(0.9) = 0.18$ incidence of Aa genotype $= 0.18$

- t - test

↳ used to determine weather 2 sets of data with a roughly normal distribution are signifficantly different

$$S = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}} \quad s^2 = \frac{\Sigma(x-\bar{x})^2}{n-1} \quad \bar{x} = \frac{\Sigma x}{n} \quad t = \frac{|\bar{x}_1 - \bar{x}_2|}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$\bar{x}$ - mean S - standard deviation n - number of entries

↳ degrees of freedom $= v$ $v = (n_1 - 1) + (n_2 - 1) = n_1 + n_2 - 2$

↳ p - probability that the null hypothesis is only correct by chance

choose $p = 0.05$ at v combined degrees of freedom

↳ if $t_{calculated} > t_{table}$ then we reject the Ho so there is significant difference between 2 sets of data

↳ Ho - there is no significant difference between the 2 sets

↳ if value of $t = 0$ Ho is 100% correct so sets of data are same

- χ^2 - test

↳ used to determine weather differences between resuts of theoretical cross and observations are significant

↳ work out expected number of individuals with each phenotype - E

↳ find the observed number of individuals with each phenotype - O

↳ degrees of freedom v = no of phenotypes -1

↳ find value of $\chi^2 = \Sigma \frac{(O-E)^2}{E}$

↳ Ho - there is no significant difference between predicted and observed results

↳ if $\chi^2 = 0$ Ho is 100% true

↳ use value of $p = 0.05$ if $\chi^2_{calculated} > \chi^2_{table}$ reject Ho so there is significant difference and theory is not valid

- Spearman's rank correlation
  - to find if there is correlation between 2 sets of data such as % cover by 2 species in different quadrats
  - H_0 - there is no correlation

$$r_s = 1 - \left(\frac{6 \sum D^2}{n^3 - n} \right)$$

D - difference between each rank
n - number of ranks

  - if close to +1 = strong positive correlation
    -1 = strong negative correlation
    0 = no correlation

- Pearson's linear correlation
  - data of 2 continuous normally distributed variables
  - plot a scatter graph to verify the datasets are linear

$$r = \frac{\sum xy - n\bar{x}\bar{y}}{n S_x S_y}$$

x - entry of 1 dataset
$\bar{x}$ - mean
S - standard deviation

$$S = \sqrt{\frac{\sum (x-\bar{x})^2}{n-1}}$$

  - same interpretation as spearmans rank correlation gives value between +1 and -1