# Statistics 221H - Formula Sheet

$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$ $\quad s = \sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n-1}}$ $\quad r = \frac{1}{n-1}\sum_{i=1}^{n}\frac{(x_i-\bar{x})}{s_x}\frac{(y_i-\bar{y})}{s_y}$ $\quad z = \frac{x-\mu}{\sigma}$ $\quad x = \mu + z\sigma$

## Means

| | | |
|---|---|---|
| $z = \frac{\bar{x}-\mu_0}{\sigma/\sqrt{n}}$ | $\bar{x} \pm z^* \frac{\sigma}{\sqrt{n}}$ | $n = \left(\frac{z^*\sigma}{m}\right)^2$ |
| $t = \frac{\bar{x}-\mu_0}{s/\sqrt{n}}$ | $\bar{x} \pm t^* \frac{s}{\sqrt{n}}$ | |
| $df = n-1$ | $df = n-1$ | |
| $t = \frac{\bar{x}_1-\bar{x}_2}{s_p\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}$ | $\bar{x}_1 - \bar{x}_2 \pm s_p t^* \sqrt{\frac{1}{n_1}+\frac{1}{n_2}}$ | $s_p^2 = \frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}$ |
| $df = n_1+n_2-2$ | $df = n_1+n_2-2$ | |

## Proportions

$z = \frac{\hat{p}-p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$ $\quad \hat{p} \pm z^*\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$ $\quad n = \left(\frac{z^*}{m}\right)^2 p^*(1-p^*)$

$z = \frac{\hat{p_1}-\hat{p_2}}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$ $\quad \hat{p_1} - \hat{p_2} \pm z^*\sqrt{\frac{\hat{p_1}(1-\hat{p_1})}{n_1} + \frac{\hat{p_2}(1-\hat{p_2})}{n_2}}$

$$\hat{p} = \frac{\text{successes in pop. 1+successes in pop. 2}}{n_1+n_2}$$

## Chi-square

$$\chi^2 = \sum \frac{(\text{observed count}-\text{expected count})^2}{\text{expected count})} \qquad \text{expected count} = \frac{\text{row total}\times\text{column total}}{\text{table total}}$$

$$\text{with } df = (r-1)\times(c-1)$$

## Regression

| | |
|---|---|
| $t = \frac{b_1}{SE_{b_1}}$ | $b_1 \pm t^*(SE_{b_1})$ |
| $df = n-2$ | $df = n-2$ |