

# Formula sheet for statistical inference

Feel free to ask questions on Piazza about the sheet at any point, or send the GSIs an email if you spot an error. Thank you.

## One sample

$$\bar{x} \pm z^* \frac{\sigma}{\sqrt{n}}$$

$$z = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$$

$$\bar{x} \pm t^* \frac{s}{\sqrt{n}}$$

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$$

$$\bar{x}_d \pm t^* \frac{s_d}{\sqrt{n}}$$

$$t = \frac{\bar{x}_d - 0}{s_d/\sqrt{n}}$$

$$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$\tilde{p} \pm z^* \sqrt{\frac{\tilde{p}(1-\tilde{p})}{n+4}}$$

$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$

$$\chi^2 = \sum_{i=1}^k \frac{(O_i - E_i)^2}{E_i}$$

## Two sample

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

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

$$df = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{1}{n_1-1} \left(\frac{s_1^2}{n_1}\right)^2 + \frac{1}{n_2-1} \left(\frac{s_2^2}{n_2}\right)^2}$$

$$(\hat{p}_1 - \hat{p}_2) \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$

$$(\tilde{p}_1 - \tilde{p}_2) \pm z^* \sqrt{\frac{\tilde{p}_1(1-\tilde{p}_1)}{n_1+2} + \frac{\tilde{p}_2(1-\tilde{p}_2)}{n_2+2}}$$

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

$$\chi^2 = \sum_{i=1}^k \frac{(O_i - E_i)^2}{E_i}$$