Formulas for Elementary Statistics

$\bar{x} = \frac{\sum x_i}{n}$ $\quad$ $m = \frac{\sum x_i}{N}$ $\quad$ $\bar{x}_w = \frac{\sum w_i x_i}{\sum w_i}$ $\quad$ $\bar{\bar{x}} = \frac{\sum n_i \bar{x}_i}{\sum n_i}$

$s^2 = \frac{\sum (x_i - m)^2}{N}$ $\quad$ $s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$ $\quad$ $S_{xx} = \sum x_i^2 - \frac{\left(\sum x_i\right)^2}{n}$ $\quad$ $s = \sqrt{\frac{S_{xx}}{n-1}}$

$z = \frac{x - \bar{x}}{s}$ $\quad$ $z = \frac{x - m}{s}$

$CV = \frac{s}{\bar{X}} 100\%$ $\quad$ $CV = \frac{s}{m} 100\%$

$n\,\mathrm{Pr} = \frac{n!}{(n-r)!}$ $\quad$ $nCr = \frac{n!}{r!\,(n-r)!}$

$E = a_1 p_1 + a_2 p_2 + \ldots + a_k p_k$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$f(x) = \binom{n}{x} p^x (1-p)^{n-x}$, for $x = 0, 1, \ldots, n$. $\quad$ $m = np$ $\quad$ $s^2 = np(1-p)$

$f(x) = \frac{e^{-l}\, l^x}{x!}$, $x = 0, 1, 2\ldots..$

$m = \sum x_i f(x_i)$ $\quad$ $s^2 = \sum (x_i - m)^2 f(x_i)$

$m_{\bar{X}} = m$ $\quad$ $s_{\bar{X}} = \frac{s}{\sqrt{n}}$ $\quad$ $s_{\bar{X}} = \frac{s}{\sqrt{n}} \sqrt{\frac{N-n}{N-1}}$

$z = \frac{x - m}{s}$ $\quad$ $z = \frac{\bar{x} - m}{s / \sqrt{n}}$

$$E = z_{a/2}\frac{s}{\sqrt{n}} \qquad E = t_{a/2,(n-1)}\frac{s}{\sqrt{n}} \qquad E = z_{a/2}\sqrt{\frac{\frac{x}{n}\left(1-\frac{x}{n}\right)}{n}}$$

$$n = \left(\frac{z_{a/2}s}{E}\right)^2 \qquad n = p(1-p)\left(\frac{z_{a/2}}{E}\right)^2 \qquad n = \frac{1}{4}\left(\frac{z_{a/2}}{E}\right)^2$$

$$\bar{x} \pm z_{a/2}\frac{s}{\sqrt{n}} \qquad \bar{x} \pm t_{a/2,(n-1)}\frac{s}{\sqrt{n}} \qquad \frac{x}{n} \pm z_{a/2}\sqrt{\frac{\frac{x}{n}\left(1-\frac{x}{n}\right)}{n}}$$

$$H_o : m = m_0 \qquad H_o : m = m_0 \qquad H_o : m = m_0$$
$$H_A : m > m_0 \qquad H_A : m < m_0 \qquad H_A : m \neq m_0$$

$$z = \frac{\bar{x} - m_0}{s/\sqrt{n}}$$

$$t = \frac{\bar{x} - m_0}{s/\sqrt{n}}$$

$$H_o : m_1 = m_2 \qquad H_o : m_1 = m_2 \qquad H_o : m_1 = m_2$$
$$H_A : m_1 > m_2 \qquad H_A : m_1 < m_2 \qquad H_A : m_1 \neq m_2$$

$$z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \qquad s_p = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$$

$$H_o : p = p_0 \qquad H_o : p = p_0 \qquad H_o : p = p_0$$
$$H_A : p > p_0 \qquad H_A : p < p_0 \qquad H_A : p \neq p_0$$

$$z = \frac{x - np_0}{\sqrt{np_0(1 - p_o)}}$$

$$H_o : p_1 = p_2 \qquad H_o : p_1 = p_2 \qquad H_o : p_1 = p_2$$
$$H_A : p_1 > p_2 \qquad H_A : p_1 < p_2 \qquad H_A : p_1 \neq p_2$$

$$z = \frac{\frac{x_1}{n_1} - \frac{x_2}{n_2}}{\sqrt{\hat{p}(1 - \hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \qquad \hat{p} = \frac{x_1 + x_2}{n_1 + n_2}$$

$$c^2 = \sum \frac{(o - e)^2}{e}$$

$$S_{xx} = \sum x_i^2 - \frac{\left(\sum x_i\right)^2}{n} \qquad S_{yy} = \sum y_i^2 - \frac{\left(\sum y_i\right)^2}{n}$$

$$S_{xy} = \sum x_i y_i - \frac{\left(\sum x_i\right)\left(\sum y_i\right)}{n} \qquad b = \frac{S_{xy}}{S_{xx}} \qquad a = \overline{y} - b\overline{x}$$

$$r = \frac{S_{xy}}{\sqrt{S_{xx}\ S_{yy}}}$$