$$P\left\{\bar{X} - u_{1-\alpha/2}\frac{\sigma}{\sqrt{n}} < \mu < \bar{X} + u_{1-\alpha/2}\frac{\sigma}{\sqrt{n}}\right\} = 1-\alpha$$

$$P\left\{\bar{X} - t_{\alpha;\,n-1}\frac{S}{\sqrt{n-1}} < \mu < \bar{X} + t_{\alpha;\,n-1}\frac{S}{\sqrt{n-1}}\right\} = 1-\alpha$$

lub

$$P\left\{\bar{X} - t_{\alpha;\,n-1}\frac{\hat{S}}{\sqrt{n}} < \mu < \bar{X} + t_{\alpha;\,n-1}\frac{\hat{S}}{\sqrt{n}}\right\} = 1-\alpha$$

$$P\left\{\bar{X} - u_{1-\alpha/2}\frac{S}{\sqrt{n}} < \mu < \bar{X} + u_{1-\alpha/2}\frac{S}{\sqrt{n}}\right\} = 1-\alpha$$

$$P\left\{\frac{nS^2}{\chi^2_{\alpha/2,n-1}} < \sigma^2 < \frac{nS^2}{\chi^2_{1-\alpha/2,n-1}}\right\} = 1-\alpha$$

lub

$$P\left\{\frac{(n-1)\hat{S}^2}{\chi^2_{\alpha/2,n-1}} < \sigma^2 < \frac{(n-1)\hat{S}^2}{\chi^2_{1-\alpha/2,n-1}}\right\} = 1-\alpha$$

$$P\left\{\frac{S}{1+\frac{u_{1-\alpha/2}}{\sqrt{2n}}} < \sigma^2 < \frac{S}{1-\frac{u_{1-\alpha/2}}{\sqrt{2n}}}\right\} = 1-\alpha$$

lub

$$P\left\{S - u_{1-\alpha/2}\frac{S}{\sqrt{2n}} < \sigma < S + u_{1-\alpha/2}\frac{S}{\sqrt{2n}}\right\} = 1-\alpha$$

$$P\left\{\frac{m}{n} - u_{1-\alpha/2}\sqrt{\frac{\frac{m}{n}\left(1-\frac{m}{n}\right)}{n}} < p < \frac{m}{n} + u_{1-\alpha/2}\sqrt{\frac{\frac{m}{n}\left(1-\frac{m}{n}\right)}{n}}\right\} = 1-\alpha$$

$$n \geq \left[\frac{u^2_{1-\alpha/2}\sigma^2}{d^2}\right] + 1$$

$$n \geq \left[\frac{t^2_{\alpha;\,n_0-1}\hat{S}^2}{d^2}\right] + 1$$

$$n \geq \left[\frac{u^2_{1-\alpha/2}}{4d^2}\right] + 1$$

$$n \geq \left[\frac{u^2_{1-\alpha/2}p_0(1-p_0)}{d^2}\right] + 1$$

$H_0: \mu = \mu_0$ względem hipotezy alternatywnej:
(1) $H_1: \mu \neq \mu_0$ lub (2) $H_1: \mu > \mu_0$ lub (3) $H_1: \mu < \mu_0$

$$U = \frac{\bar{X} - \mu_0}{\sigma}\sqrt{n} \sim N(0,1)$$

(1) $P\left(|U| \geq u_{1-\alpha/2}\right) = \alpha$
(2) $P(U \geq u_{1-\alpha}) = \alpha$
(3) $P(U \leq -u_{1-\alpha}) = \alpha$

$$t = \frac{\bar{X} - \mu_0}{S}\sqrt{n-1} = \frac{\bar{X} - \mu_0}{\hat{S}}\sqrt{n} \sim t - Studenta\ o\ n-1\ stopniach\ swobody$$

(1) $P\left(|t| \geq t_{\alpha;\,n-1}\right) = \alpha$
(2) $P\left(t \geq t_{2\alpha;\,n-1}\right) = \alpha$
(3) $P\left(t \leq -t_{2\alpha;\,n-1}\right) = \alpha$

$$U = \frac{\bar{X} - \mu_0}{S}\sqrt{n} \sim N(0,1)$$

$H_0: \sigma^2 = \sigma_0^2$ względem hipotezy alternatywnej:
$H_1: \sigma^2 > \sigma_0^2$

$$\chi^2 = \frac{nS^2}{\sigma_0^2} = \frac{(n-1)\hat{S}^2}{\sigma_0^2} \sim \chi^2\ o\ n-1\ stopniach\ swobody$$

$$P(\chi^2 \geq \chi^2_{\alpha,n-1}) = \alpha$$

$$U = \sqrt{\frac{2nS^2}{\sigma_0^2}} - \sqrt{2n-3} \sim N(0,1)$$

$H_0: p = p_0$ względem hipotezy alternatywnej:
(1) $H_1: p \neq p_0$ lub (2) $H_1: p > p_0$ lub (3) $H_1: p < p_0$

$$U = \frac{\frac{m}{n} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} \sim N(0,1)$$

$H_0: \mu_1 = \mu_2$ względem hipotezy alternatywnej:
(2) $H_1: \mu_1 \neq \mu_2$ lub (2) $H_1: \mu_1 > \mu_2$ lub (3) $H_1: \mu_1 < \mu_2$

$$U = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \sim N(0,1)$$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{n_1S_1^2 + n_2S_2^2}{n_1+n_2-2} * \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \sim t - Studenta\ o\ n_1+n_2-2\ stopniach\ swobody$$

$$U = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} \sim N(0,1)$$

$H_0: \bar{z} = 0$ względem hipotezy alternatywnej:

(1) $H_1: \bar{z} \neq 0$ lub (2) $H_1: \bar{z} > 0$ lub (3) $H_1: \bar{z} < 0$

Z = X – Y

$$t = \frac{\bar{Z}}{S_Z}\sqrt{n-1} \sim t - Studenta\ o\ n-1\ stopniach\ swobody$$

$H_0: {\sigma_1}^2 = \sigma_2^2$ względem hipotezy alternatywnej:

$H_1: {\sigma_1}^2 > \sigma_2^2$

$$F = \frac{\hat{S}_1^2}{\hat{S}_2^2} \sim F - Snedecora\ o\ n_1 - 1\ i\ n_2 - 1\ stopniach\ swobody$$

$$P\left(F \geq F_{\alpha, n_1 - 1,\ n_2 - 1}\right) = \alpha$$

$H_0: p_1 = p_2$ względem hipotezy alternatywnej:

(1) $H_1: p_1 \neq p_2$ lub (2) $H_1: p_1 > p_2$ lub (3) $H_1: p_1 < p_2$

$$U = \frac{\frac{m_1}{n_1} - \frac{m_2}{n_2}}{\sqrt{\frac{\tilde{p}(1-\tilde{p})}{\tilde{n}}}} \sim N(0,1)$$

$$\tilde{p} = \frac{m_1 + m_2}{n_1 + n_2}; \qquad \tilde{n} = \frac{n_1 * n_2}{n_1 + n_2}$$

$H_0: P\left(X = x_i, Y = y_j\right) = P(X = x_i) * P\left(Y = y_j\right)$ dla każdego i, j

względem hipotezy alternatywnej:

$H_1: P\left(X = x_i, Y = y_j\right) \neq P(X = x_i) * P\left(Y = y_j\right)$

$$\chi^2 = \sum_{i=1}^{k}\sum_{j=1}^{s}\frac{\left(n_{ij} - \hat{n}_{ij}\right)^2}{\hat{n}_{ij}} \sim \chi^2\ o\ (k-1)*(s-1)\ stopniach\ swobody,$$

: $\hat{n}_{ij} = \frac{n_{i.} * n_{.j}}{n}$

: $P\left(\chi^2 \geq \chi^2_{\alpha,(k-1)*(s-1)}\right) = \alpha$

$$H_0: F(x) = F_0(x)$$

$$H_1: F(x) \neq F_0(x)$$

: $\chi^2 = \sum_{i=1}^{k}\frac{(n_i - np_i)^2}{np_i} \sim \chi^2\ o\ k - r - 1\ stopniach\ swobody,$

$$P\left(\chi^2 \geq \chi^2_{\alpha,\ k-r-1}\right) = \alpha$$

$$S^2 = \frac{1}{N}\sum_{i=1}^{n}(x_i - \bar{x})^2 * n_i$$

$$\hat{s}^2 = \frac{\sum_{i=1}^{k}\left(x_i - \bar{x}\right)^2 \cdot n_i}{n-1}$$