Normal distribution

$$P(Z > x) = 1 - P(Z < x)$$

$$P(a < Z < b) = P(Z < b) - P(Z < a)$$

Distributions of sample statistics – if required conditions are met then

Sample mean follows normal distribution with mean μ and variance $\frac{\sigma^2}{n}$

Sample proportion follows normal distribution with mean p and variance $\frac{p(1-p)}{n}$

Sample variance: variable $\frac{(n-1)\hat{s}^2}{\sigma^2}$ follows chi-squared distribution with n-1 degrees of freedom

Interval estimation for population mean

$$P\left(\bar{x} - z_\alpha \frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + z_\alpha \frac{\sigma}{\sqrt{n}}\right) = 1 - \alpha$$

$$P\left(\bar{x} - z_\alpha \frac{s}{\sqrt{n}} < \mu < \bar{x} + z_\alpha \frac{s}{\sqrt{n}}\right) = 1 - \alpha$$

$$P\left(\bar{x} - t_\alpha \frac{\hat{s}}{\sqrt{n}} < \mu < \bar{x} + t_\alpha \frac{\hat{s}}{\sqrt{n}}\right) = 1 - \alpha$$

Interval estimation for population proportion

$$P\left(\hat{p} - z_\alpha \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} < p < \hat{p} + z_\alpha \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}\right) = 1 - \alpha$$

Interval estimation for population variance

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