Math/Stat319 for chapter 8

1. Normal + known variance σ^2 , exact $1-\alpha$ CI is :

$$(\bar{x} - z_{\alpha/2}\sigma/\sqrt{n}, \quad \bar{x} + z_{\alpha/2}\sigma/\sqrt{n})$$

2. General + known variance σ^2 + large sample size, approximate $1-\alpha$ CI is :

$$(\bar{x} - z_{\alpha/2}\sigma/\sqrt{n}, \quad \bar{x} + z_{\alpha/2}\sigma/\sqrt{n})$$

3. General + unknown variance + large sample size, approximate $1-\alpha$ CI is:

$$(\bar{x} - z_{\alpha/2}s/\sqrt{n}, \quad \bar{x} + z_{\alpha/2}s/\sqrt{n})$$

4. Application of 3 to population proportion p, when $np > 10$ and $n(1-p) > 10$:

   (a) Approximate $1-\alpha$ Traditional CI

$$(\hat{p} - z_{\alpha/2}\sqrt{\hat{p}(1-\hat{p})}/\sqrt{n}, \quad \hat{p} - z_{\alpha/2}\sqrt{\hat{p}(1-\hat{p})}/\sqrt{n})$$

   (b) Approximate $1-\alpha$ Score CI (default in book)

$$\frac{\hat{p} + \frac{z_{\alpha/2}^2}{2n}}{1 + \frac{z_{\alpha/2}^2}{n}} \pm z_{\alpha/2}\frac{\sqrt{\frac{\hat{p}(1-\hat{p})}{n} + \frac{z_{\alpha/2}^2}{4n^2}}}{1 + \frac{z_{\alpha/2}^2}{n}}$$

5. One-sided situation, take 3 as an example, with large sample size, General + unknown variance + large sample size, approximately

   (a) $1-\alpha$ upper confidence bound for μ is: $\mu < \bar{x} + z_\alpha \frac{s}{\sqrt{n}}$

   (b) $1-\alpha$ lower confidence bound for μ is: $\mu > \bar{x} - z_\alpha \frac{s}{\sqrt{n}}$

6. Normal + unknown variance + small sample size n, exactly $1-\alpha$ CI is :

$$(\bar{x} - t_{\alpha/2,n-1}\frac{s}{\sqrt{n}}, \quad \bar{x} + t_{\alpha/2,n-1}\frac{s}{\sqrt{n}})$$

7. Sample size calculation for Normal + known variance σ^2, $1-\alpha$ CI. (This is the only situation required.)

   Given the width w_0, the sample size that ensures w_0 for $1-\alpha$ CI is

$$n = \left(2z_{\alpha/2}\frac{\sigma}{w_0}\right)^2$$