Formulae for STAT319

1. $\bar{x} \equiv \frac{1}{n}\sum x; \quad s^2 \equiv \frac{s_{xx}}{n-1},$ where $s_{xx} \equiv \sum (x-\bar{x})^2 = \sum x^2 - \frac{1}{n}\left(\sum x\right)^2;$

2. The Poisson distribution $f(x) = \frac{(\lambda t)^x}{x!} e^{-\lambda t}; \; x = 0,1,...; \; E(X) = \lambda t, \; V(X) = \lambda t.$

3. $E(X) \equiv \int_{-\infty}^{\infty} x\, f(x)dx,$ often denoted by simply $\mu.$ $\quad E(X^2) = \int_{-\infty}^{\infty} x^2 f(x)dx, \quad \sigma^2 \equiv E(X^2) - \mu^2.$

4. The Exponential Distribution: $f(x) = \frac{1}{\beta} e^{-x/\beta}, \quad 0 \le x; \; E(X) = \beta, \; V(X) = \beta^2.$

5. Waiting Time Distribution: $f(t) = \lambda e^{-\lambda t}, \quad 0 \le t; \; E(X) = 1/\lambda, \; V(X) = 1/\lambda^2,$

6. If $X \sim N(\mu, \sigma^2),$ then $\frac{\sum X - n\mu}{\sqrt{n\sigma^2}} = \frac{\bar{X} - \mu}{\sqrt{\sigma^2/n}} = Z$ where $Z \sim N(0,1).$

7. $T = \frac{\bar{X} - \mu}{\sqrt{S^2/n}}$, with degrees of freedom $\nu = n-1.$

8. $\frac{\hat{p} - p}{\sqrt{pq/n}} = Z;$ Weak; $\frac{\hat{p} - p}{\sqrt{\hat{p}\hat{q}/n}} = Z.$ (Weaker)

9. CI for μ, (σ known, any n, normal): $\bar{x} \mp z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right).$

10. ACI for μ, (σ known, large n, nonnormal): $\bar{x} \mp z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right).$

11. sample size for estimating μ : $n = \frac{z_{\alpha/2}^2}{e^2}\sigma^2,$ where $P(|\bar{X} - \mu| \le e) = 1 - \alpha.$

12. CI for μ, (σ unknown, large n, nonnormal): $\bar{x} \mp z_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right).$

13. CI for μ, (σ unknown, any $n \ge 2$, normal): $\bar{x} \mp t_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right)$ for any $n \ge 2$.

14. CI for p when n large: $\hat{p} \mp z_{\alpha/2}\sqrt{\hat{p}\hat{q}/n}.$

15. Large sample size for estimating p : $n = \frac{z_{\alpha/2}^2}{e^2}\hat{p}\hat{q}$ where e is the error in estimation.