Formulas

Note: As far as possible, these expressions use notation that is common in many statistics textbooks, but in almost every case there are some books that use a different notation. Also, the same symbol might have different meanings in different expressions. Not all of these will be needed on the test.

1. $\chi^2 = \sum_{i=1}^{m} \frac{(O_i - E_i)^2}{E_i} = \sum_{i=1}^{m} \frac{(O_i - np_i)^2}{np_i}$ is distributed as $\chi^2(m-1)$.

2. $\bar{x} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$

3. $\bar{x} \pm t_{\alpha/2}(n-1) \frac{s}{\sqrt{n}}$

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

5. $\hat{p}_A - \hat{p}_B \pm z_{\alpha/2} \sqrt{\frac{\hat{p}_A(1-\hat{p}_A)}{n_A} + \frac{\hat{p}_B(1-\hat{p}_B)}{n_B}}$

6. $s^2 = \frac{1}{n-1} \sum_{i=1}^{n} (x_i - \bar{x})^2$

7. $s^2 = \frac{SS(resid)}{n-2}$

8. $\hat{\mu}(x) = \bar{y} + \hat{\beta}(x - \bar{x})$

9. $\hat{\beta} = \frac{S_{xy}}{S_{xx}}$

10. $S_{xy} = \sum_{i=1}^{n} (x_i - \bar{x})(y_i - \bar{y})$

11. $S_{xx} = \sum_{i=1}^{n} (x_i - \bar{x})^2$

12. $S_{yy} = \sum_{i=1}^{n} (y_i - \bar{y})^2$

13. $SS(resid) = \sum_{i=1}^{n} (y_i - \hat{\mu}(x_i))^2 = S_{yy} - \hat{\beta}^2 S_{xx}$

14. $\hat{\beta} \pm t_{\alpha/2}(n-2) \frac{s}{\sqrt{S_{xx}}}$

15. $\hat{\mu}(x) \pm t_{\alpha/2}(n-2)\, s \sqrt{\frac{1}{n} + \frac{(x - \bar{x})^2}{S_{xx}}}$

16. $\chi^2 = \sum_{i=1}^{r}\sum_{j=1}^{c}\frac{(Y_{ij} - n\hat{p}_{i.}\hat{p}_{.j})^2}{n\hat{p}_{i.}\hat{p}_{.j}}$ is distributed as $\chi^2((r-1)(c-1))$.

17. Reject $H_0 : \sigma^2 = \sigma_0^2$ in favor of $H_1 : \sigma^2 < \sigma_0^2$ if $s^2 < \sigma_0^2 \frac{\chi^2_{1-\alpha}(n-1)}{n-1}$.

18. $n > z^2_{\alpha/2}\frac{\hat{p}(1-\hat{p})}{\varepsilon^2}$

19. $n > z^2_{\alpha/2}\frac{\sigma^2}{\varepsilon^2}$

20. $n > 9\max(\frac{p}{1-p}, \frac{1-p}{p})$

21. Reject $H_0 : \mu = \mu_0$ in favor of $H_1 : \mu > \mu_0$ if $\overline{x} > \mu_0 + z_\alpha \frac{\sigma}{\sqrt{n}}$.