L1025 Formulae Sheet

1. The sampling distribution of the sample mean is given by $\bar{x} \sim N(\mu, \frac{\sigma^2}{n})$ if x is Normally distributed and/or the sample is large.
2. The sampling distribution of the sample proportion is given by $p \sim N(\pi, \frac{\pi(1-\pi)}{n})$ if the sample is large.
3. Chebyshev's rule states that at least 100 (1– 1/k^2) percent (%) of observations lie within k standard deviations above and below the mean.
4. The z-score for a random variable, x, is given by $z = \frac{x-\mu}{\sigma}$.
5. The 100(1-α)% Confidence Interval of μ is given by $\bar{x} \pm z\alpha/_2 \frac{s}{\sqrt{n}}$ when n is large.
6. The 100(1- α)% Confidence Interval of μ is given by $\bar{x} \pm t_{\left(\frac{\alpha}{2}, n-1\right)} \frac{s}{\sqrt{n}}$ when n is small.
7. The 100(1-α)% Confidence Interval of π is given by $p \pm z\alpha/_2 \sqrt{\frac{p(1-p)}{n}}$.
8. The 100(1-α)% Confidence Interval for the difference between two means is given by $(\bar{x}_1 - \bar{x}_2) \pm z\alpha/_2 \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$ when n_1 and n_2 are large.
9. The 100(1--α)% Confidence Interval for the difference between two means is given by $(\bar{x}_1 - \bar{x}_2) \pm t_{\left(\frac{\alpha}{2}, n_1+n_2-2\right)} \sqrt{\frac{S^2}{n_1} + \frac{S^2}{n_2}}$ when n_1 and/or n_2 are small, and where $S^2 = \frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}$.
10. The 100(1--α)% Confidence Interval for the difference between two proportions is given by $(p_1 - p_2) \pm z\alpha/_2 \sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}$.
11. The test statistic for the population mean is $z = \frac{\bar{x}-\mu}{\sqrt{\frac{s^2}{n}}}$ when n is large.

12.The test statistic for the population mean is $t = \frac{\bar{x}-\mu}{\sqrt{\frac{s^2}{n}}}$ when n is small.

13.The test statistic for the population proportion is $z = \frac{p-\pi}{\sqrt{\frac{\pi(1-\pi)}{n}}}$.

14.The test statistic for the difference between two means is $z = \frac{(\bar{x}_1 - \bar{x}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}}$ when n_1 and n_2 are large.

15. The test statistic for the difference between two means is $t = \frac{(\bar{x}_1-\bar{x}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{S^2}{n_1}+\frac{S^2}{n_2}}}$ when n_1 and/or n_2 are small, and where $S^2 = \frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}$.

16.The test statistic for the difference between two proportions is $z = \frac{(p_1-p_2)-(\pi_1-\pi_2)}{\sqrt{\frac{\hat{\pi}(1-\hat{\pi})}{n_1}+\frac{\hat{\pi}(1-\hat{\pi})}{n_2}}}$ where $\hat{\pi} = \frac{n_1p_1+n_2p_2}{n_1+n_2}$.

17. The Pearson Correlation Coefficient is calculated as $r = \frac{n\sum XY-\sum X\sum Y}{\sqrt{(n\sum X^2-(\sum X)^2)(n\sum Y^2-(\sum Y)^2)}}$.

18.The test statistic for the correlation coefficient is $t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$.

19. The Ordinary Least Squares estimators for the slope and intercept coefficients in a simple regression are $b = \frac{n\sum XY-\sum X\sum Y}{n\sum X^2-(\sum X)^2}$ and $a = \bar{Y} - b\bar{X}$.

20. The test statistic for the regression parameter β is given by $t = \frac{b-\beta}{s_b}$ where $s_b = \sqrt{\frac{s_e^2}{\sum(X-\bar{X})^2}}$ and $s_e^2 = \frac{ESS}{n-2}$.

21. TSS=RSS + ESS

END