

| Name of test              | One sample Z-test                                                                                                                                                                                                                     | One sample t-test                                                                                                                                                           | Two sample t-test :Dependent groups (Matched pairs)                                                                                                                       | Two sample t-test: Independent groups – Unequal variance                                                                                                                                                                                                                                                                       | Two sample t-test: Independent groups – Equal variance                                                                                                                                                                                                                                                                     |
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| 1. Hypotheses             | $H_0 : \mu = \text{a certain value}$<br>$H_A : \mu < \text{the certain value}$ OR<br>$H_A : \mu > \text{the certain value}$ OR<br>$H_A : \mu \neq \text{the certain value}$                                                           | $H_0 : \mu = \text{a certain value}$<br>$H_A : \mu < \text{the certain value}$ OR<br>$H_A : \mu > \text{the certain value}$ OR<br>$H_A : \mu \neq \text{the certain value}$ | $H_0 : \mu_D = 0$<br>$H_A : \mu_D > 0$ OR<br>$H_A : \mu_D < 0$ OR<br>$H_A : \mu_D \neq 0$                                                                                 | $H_0 : \mu_1 = \mu_2$<br>$H_A : \mu_1 > \mu_2$ OR<br>$H_A : \mu_1 < \mu_2$ OR<br>$H_A : \mu_1 \neq \mu_2$                                                                                                                                                                                                                      | $H_0 : \mu_1 = \mu_2$<br>$H_A : \mu_1 > \mu_2$ OR<br>$H_A : \mu_1 < \mu_2$ OR<br>$H_A : \mu_1 \neq \mu_2$                                                                                                                                                                                                                  |
| 2. Name of test & alpha   | One-sample z-test, $\alpha = .05$                                                                                                                                                                                                     | One-sample t-test, $\alpha = .05$                                                                                                                                           | Two-sample t-test: dependent, $\alpha = .05$                                                                                                                              | Two-sample t-test: Independent – Unequal variances, $\alpha = .05$                                                                                                                                                                                                                                                             | Two-sample t-test: Independent – Equal variances, $\alpha = .05$                                                                                                                                                                                                                                                           |
| 3. Collect data           | Collect data                                                                                                                                                                                                                          | Collect data                                                                                                                                                                | Collect data                                                                                                                                                              | Collect data                                                                                                                                                                                                                                                                                                                   | Collect data                                                                                                                                                                                                                                                                                                               |
| 4. Assump.                | 1. Data are collected with a SRS<br>2. Variable is interval/ratio<br>3. Sampling distribution is normal.<br>-if population distr. is known to be normal OR<br>-if $n \geq 30$ , then sampling is normal (by CLT)<br>4. Sigma is known | 1. Data are collected with a SRS<br>2. Variable is interval/ratio<br>3. Sampling distribution is approximately normal.                                                      | 1. Data are collected with a SRS<br>2. Variable is interval/ratio<br>3. Sampling distribution of the differences is approximately normal.<br>4. Two samples are dependent | 1. Both groups collected with a SRS<br>2. Variable is interval/ratio<br>3. Both sampling distributions are approximately normal.<br>4. Two samples are independent<br>5. Variances are unequal.<br>- Assess this by forming the ratio of (larger variance) / (smaller variance)<br>If this ratio $> 2$ , then conclude unequal | 1. Both groups collected with a SRS<br>2. Variable is interval/ratio<br>3. Both sampling distributions are approximately normal.<br>4. Two samples are independent<br>5. Variances are equal.<br>- Assess this by forming the ratio of (larger variance) / (smaller variance)<br>If this ratio $< 2$ , then conclude equal |
| 5. Test Statistic         | $Z = \frac{\bar{x} - \mu}{\left(\frac{\sigma}{\sqrt{n}}\right)}$                                                                                                                                                                      | $t = \frac{\bar{x} - \mu}{\left(\frac{s}{\sqrt{n}}\right)}$                                                                                                                 | $t = \frac{\bar{x}_D - \mu_D}{\frac{s_D}{\sqrt{n}}}$                                                                                                                      | $t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$                                                                                                                                                                                                                           | $t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}}}$<br>$s_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{(n_1 - 1) + (n_2 - 1)}$                                                                                                                                            |
| & DF                      | DF : not applicable for z-scores                                                                                                                                                                                                      | DF : n-1                                                                                                                                                                    | DF : n-1 : n = # of pairs                                                                                                                                                 | DF : smaller of (n <sub>1</sub> -1) or (n <sub>2</sub> -1)                                                                                                                                                                                                                                                                     | DF : (n <sub>1</sub> -1) + (n <sub>2</sub> -1)                                                                                                                                                                                                                                                                             |
| 6. p-value                | p-value: look up on table A.1 for area that is more extreme<br>Note: need to double this value if 2-tailed                                                                                                                            | p-value: look up on table A.3 (will probably get a range)<br>Note: need to double this value if 2-tailed                                                                    | p-value: look up on table A.3 (will probably get a range)<br>Note: need to double this value if 2-tailed                                                                  | p-value: look up on table A.3 (will probably get a range)<br>Note: need to double this value if 2-tailed                                                                                                                                                                                                                       | p-value: look up on table A.3 (will probably get a range)<br>Note: need to double this value if 2-tailed                                                                                                                                                                                                                   |
| 7. Compare &              | If $p \leq \alpha$ , then “We reject the null hypothesis”                                                                                                                                                                             | If $p \leq \alpha$ , then “We reject the null hypothesis”                                                                                                                   | If $p \leq \alpha$ , then “We reject the null hypothesis”                                                                                                                 | If $p \leq \alpha$ , then “We reject the null hypothesis”                                                                                                                                                                                                                                                                      | If $p \leq \alpha$ , then “We reject the null hypothesis”                                                                                                                                                                                                                                                                  |
| 8. Statistical conclusion | If $p > \alpha$ , then “We fail to reject the null hypothesis”                                                                                                                                                                        | If $p > \alpha$ , then “We fail to reject the null hypothesis”                                                                                                              | If $p > \alpha$ , then “We fail to reject the null hypothesis”                                                                                                            | If $p > \alpha$ , then “We fail to reject the null hypothesis”                                                                                                                                                                                                                                                                 | If $p > \alpha$ , then “We fail to reject the null hypothesis”                                                                                                                                                                                                                                                             |

| Name of test                  | One sample Z-test                                                                                                                                          | One sample t-test                                                                                                                                          | Two sample t-test :Dependent groups (Matched pairs)                                                                                                                                                      | Two sample t-test: Independent groups – Unequal variance                                                                                                                                                      | Two sample t-test: Independent groups – Equal variance                                                                                                                                                        |
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| 9. Interpret<br><br>Reject Ho | There <u>is</u> significant evidence that the true average height for Wyoming is (different than / greater than / less than) 66 inches, $\alpha = .05$     | There <u>is</u> significant evidence that the true average height for Wyoming is (different than / greater than / less than) 66 inches, $\alpha = .05$     | There <u>is</u> significant evidence that the <u>true average difference</u> in IQ for before -after is (different than / greater than / less than) 0 points, $\alpha = .05$ . Thus, the IQ's increased. | There is significant evidence that the <u>true average</u> salary for <u>men</u> is (different than / greater than / less than) the <u>true average</u> salary for <u>women</u> , $\alpha = .05$ ."           | There is significant evidence that the <u>true average</u> salary for <u>men</u> is (different than / greater than / less than) the <u>true average</u> salary for <u>women</u> , $\alpha = .05$ ."           |
| FTR Ho                        | There is <u>not</u> significant evidence that the true average height for Wyoming is (different than / greater than / less than) 66 inches, $\alpha = .05$ | There is <u>not</u> significant evidence that the true average height for Wyoming is (different than / greater than / less than) 66 inches, $\alpha = .05$ | There is <u>not</u> significant evidence that the <u>true average difference</u> in IQ for before -after is (different than / greater than / less than) 0 points, $\alpha = .05$                         | There is <u>not</u> significant evidence that the <u>true average</u> salary for <u>men</u> is (different than / greater than / less than) the <u>true average</u> salary for <u>women</u> , $\alpha = .05$ . | There is <u>not</u> significant evidence that the <u>true average</u> salary for <u>men</u> is (different than / greater than / less than) the <u>true average</u> salary for <u>women</u> , $\alpha = .05$ . |
| Confidence Interval           | $\mu = \bar{x} \pm Z^* \left( \frac{\sigma}{\sqrt{n}} \right)$<br>z* based on xx% CI                                                                       | $\mu = \bar{x} \pm t^* \left( \frac{s}{\sqrt{n}} \right)$<br>t* based on xx% CI and DF                                                                     | $\mu_D = \bar{x}_D \pm t^* \left( \frac{s_D}{\sqrt{n}} \right)$<br>t* based on xx% CI and DF                                                                                                             | $(\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$<br>t* based on xx% CI and DF                                                                                                   | $(\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}}$<br>t* based on xx% CI and DF                                                                                                   |
| CI Interpret                  | We are 95% confident that the true average bacteria level for BBB brand milk is between 2455 and 2694 bacterial/mL.                                        | We are 95% confident that the true average bacteria level for BBB brand milk is between 2455 and 2694 bacterial/mL.                                        | We are 95% confident that the true <u>average difference</u> in Blood pressure between Before and After biofeedback training is between 3.29 and 17.1 mm of mercury.                                     | We are 95% confident that the true <u>difference in average time</u> to extinguish a gasoline fire (type I- type II) is between -7.42 and +1.76 minutes.                                                      | We are 95% confident that the true <u>difference in average time</u> to extinguish a gasoline fire (type I- type II) is between -7.42 and +1.76 minutes.                                                      |