**INDICATOR 2**

| Treatment → | A | B | C | D | E | F | G | H |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Input Data → | 0.75 1.0 1.0 0.8 0.75 1.0 0.666667 1.0 1.0 1.0 0.857 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.889 1.0 1.0 1.0 1.0 1.0 1.0 1.0 0.75 0.375 | 1.0 1.0 0.916667 0.875 0.8 1.0 0.923077 1.0 0.818 0.8 1.0 1.0 0.833 0.917 0.778 1.0 0.75 1.0 0.889 1.0 1.0 0.778 1.0 0.8 0.889 0.875 1.0 1.0 1.0 1.0 0.833 1.0 | 1.0 0.875 1.0 0.571429 1.0 0.833333 1.0 1.0 0.889 1.0 0.8 1.0 1.0 0.667 1.0 0.75 1.0 0.8 1.0 1.0 1.0 1.0 1.0 1.0 0.857 1.0 1.0 1.0 0.75 1.0 1.0 0.875 | 0.818182 1.0 0.6 0.5 0.9 0.5 0.875 1.0 0.25 0.833 1.0 1.0 0.714 0.583 1.0 0.9 0.727 1.0 1.0 1.0 0.714 0.833 0.857 0.889 0.667 0.923 1.0 1.0 0.75 0.667 0.667 1.0 | 0.904762 0.733333 0.571429 0.882353 1.0 0.6 0.692308 0.923077 0.905 0.947 0.8 0.917 1.0 0.929 0.375 1.0 0.455 0.923 0.846 0.933 1.0 1.0 1.0 1.0 0.692 0.8 1.0 0.444 0.857 0.5 0.667 0.786 | 0.545455 0.833333 1.0 0.892857 0.823529 0.857143 0.846154 0.615385 0.88 0.692 0.833 0.5 0.938 0.889 0.8 0.389 0.533 0.75 0.857 1.0 0.7 0.864 1.0 0.824 1.0 0.833 1.0 0.786 0.375 1.0 0.769 0.842 | 0.428571 0.4 0.809524 0.615385 0.428571 0.36 0.7 0.740741 0.548 0.533 0.478 0.286 0.9 0.444 0.636 0.923 0.955 0.235 0.333 0.833 0.154 0.533 0.75 0.636 0.733 0.444 0.909 0.333 1.0 0.75 0.571 0.929 | 0.833333 0.5 0.25 0.388889 0.727273 0.722222 0.333333 0.283019 0.8 0.286 0.455 0.96 0.056 0.769 1.0 0.136 0.565 0.688 0.727 0.333 1.0 0.857 0.0 0.333 0.333 0.538 0.0 0.833 0.2 0.778 0.778 0.5 |

**Descriptive statistics of the k=8 independent treatments:**

| **Treatment →** | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **Pooled Total** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **observations N** | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 256 |
| **sum ∑xi** | 29.8377 | 29.4747 | 29.6678 | 26.1672 | 26.0833 | 25.4679 | 19.3288 | 16.9631 | 202.9903 |
| **mean ¯x** | 0.9324 | 0.9211 | 0.9271 | 0.8177 | 0.8151 | 0.7959 | 0.6040 | 0.5301 | 0.7929 |
| **sum of squares ∑x2i** | 28.4373 | 27.3951 | 27.9269 | 22.5272 | 22.3615 | 21.2045 | 13.3579 | 11.7354 | 174.9459 |
| **sample variance s2** | 0.0199 | 0.0079 | 0.0136 | 0.0364 | 0.0355 | 0.0302 | 0.0543 | 0.0885 | 0.0549 |
| **sample std. dev. s** | 0.1410 | 0.0891 | 0.1166 | 0.1909 | 0.1885 | 0.1737 | 0.2330 | 0.2975 | 0.2342 |
| **std. dev. of mean SE¯x** | 0.0249 | 0.0158 | 0.0206 | 0.0337 | 0.0333 | 0.0307 | 0.0412 | 0.0526 | 0.0146 |

**One-way ANOVA of your k=8 independent treatments:**

| source | sum of squares SS | degrees of freedom νν | mean square MS | F statistic | p-value |
| --- | --- | --- | --- | --- | --- |
| treatment | 5.1127 | 7 | 0.7304 | 20.4076 | 1.1102e-16 |
| error | 8.8759 | 248 | 0.0358 |  |  |
| total | 13.9886 | 255 |  |  |  |

**Conclusion from Anova:**

The p-value corresponing to the F-statistic of one-way ANOVA is lower than 0.05, suggesting that the one or more treatments are significantly different. The Tukey HSD test, Scheffé, Bonferroni and Holm multiple comparison tests follow. These post-hoc tests would likely identify which of the pairs of treatments are significantly differerent from each other.

**Post-hoc Turkey HSD Test Calculator results:**

| treatments pair | Tukey HSD Q statistic | Tukey HSD p-value | Tukey HSD inferfence |
| --- | --- | --- | --- |
| A vs B | 0.3391 | 0.8999947 | insignificant |
| A vs C | 0.1588 | 0.8999947 | insignificant |
| A vs D | 3.4298 | 0.2338904 | insignificant |
| A vs E | 3.5082 | 0.2086014 | insignificant |
| A vs F | 4.0833 | 0.0798919 | insignificant |
| A vs G | 9.8198 | 0.0010053 | \*\* p<0.01 |
| A vs H | 12.0304 | 0.0010053 | \*\* p<0.01 |
| B vs C | 0.1804 | 0.8999947 | insignificant |
| B vs D | 3.0907 | 0.3652725 | insignificant |
| B vs E | 3.1691 | 0.3311229 | insignificant |
| B vs F | 3.7441 | 0.1440528 | insignificant |
| B vs G | 9.4807 | 0.0010053 | \*\* p<0.01 |
| B vs H | 11.6912 | 0.0010053 | \*\* p<0.01 |
| C vs D | 3.2710 | 0.2908725 | insignificant |
| C vs E | 3.3495 | 0.2616403 | insignificant |
| C vs F | 3.9245 | 0.1061877 | insignificant |
| C vs G | 9.6610 | 0.0010053 | \*\* p<0.01 |
| C vs H | 11.8716 | 0.0010053 | \*\* p<0.01 |
| D vs E | 0.0784 | 0.8999947 | insignificant |
| D vs F | 0.6535 | 0.8999947 | insignificant |
| D vs G | 6.3900 | 0.0010053 | \*\* p<0.01 |
| D vs H | 8.6006 | 0.0010053 | \*\* p<0.01 |
| E vs F | 0.5751 | 0.8999947 | insignificant |
| E vs G | 6.3116 | 0.0010053 | \*\* p<0.01 |
| E vs H | 8.5222 | 0.0010053 | \*\* p<0.01 |
| F vs G | 5.7365 | 0.0016962 | \*\* p<0.01 |
| F vs H | 7.9471 | 0.0010053 | \*\* p<0.01 |
| G vs H | 2.2106 | 0.7443301 | insignificant |

**Scheffé multiple comparison:**

|  |  |  |  |
| --- | --- | --- | --- |
| treatments pair | Scheffé TT-statistic | Scheffé p-value | Scheffé inferfence |
| A vs B | 0.2398 | 0.9999996 | insignificant |
| A vs C | 0.1123 | 1.0000000 | insignificant |
| A vs D | 2.4252 | 0.5548421 | insignificant |
| A vs E | 2.4807 | 0.5235409 | insignificant |
| A vs F | 2.8873 | 0.3084131 | insignificant |
| A vs G | 6.9436 | 1.7142e-07 | \*\* p<0.01 |
| A vs H | 8.5068 | 2.2587e-11 | \*\* p<0.01 |
| B vs C | 0.1275 | 1.0000000 | insignificant |
| B vs D | 2.1854 | 0.6870097 | insignificant |
| B vs E | 2.2409 | 0.6573650 | insignificant |
| B vs F | 2.6475 | 0.4308202 | insignificant |
| B vs G | 6.7038 | 5.9074e-07 | \*\* p<0.01 |
| B vs H | 8.2670 | 9.7203e-11 | \*\* p<0.01 |
| C vs D | 2.3130 | 0.6178117 | insignificant |
| C vs E | 2.3684 | 0.5868431 | insignificant |
| C vs F | 2.7750 | 0.3635503 | insignificant |
| C vs G | 6.8314 | 3.0742e-07 | \*\* p<0.01 |
| C vs H | 8.3945 | 4.4892e-11 | \*\* p<0.01 |
| D vs E | 0.0554 | 1.0000000 | insignificant |
| D vs F | 0.4621 | 0.9999675 | insignificant |
| D vs G | 4.5184 | 0.0059837 | \*\* p<0.01 |
| D vs H | 6.0815 | 1.2109e-05 | \*\* p<0.01 |
| E vs F | 0.4066 | 0.9999865 | insignificant |
| E vs G | 4.4629 | 0.0071595 | \*\* p<0.01 |
| E vs H | 6.0261 | 1.5628e-05 | \*\* p<0.01 |
| F vs G | 4.0563 | 0.0243050 | \* p<0.05 |
| F vs H | 5.6194 | 9.4186e-05 | \*\* p<0.01 |
| G vs H | 1.5631 | 0.9303866 | insignificant |

**Bonferroni and Holm results: all pairs simultaineously compared:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| treatments pair | Bonferroni and Holm TT-statistic | Bonferroni p-value | Bonferroni inferfence | Holm p-value | Holm inferfence |
| A vs B | 0.2398 | 22.6991870 | insignificant | 3.2427410 | insignificant |
| A vs C | 0.1123 | 25.4997602 | insignificant | 1.8214114 | insignificant |
| A vs D | 2.4252 | 0.4483722 | insignificant | 0.1921595 | insignificant |
| A vs E | 2.4807 | 0.3857626 | insignificant | 0.1791040 | insignificant |
| A vs F | 2.8873 | 0.1183961 | insignificant | 0.0676549 | insignificant |
| A vs G | 6.9436 | 9.3336e-10 | \*\* p<0.01 | 8.3336e-10 | \*\* p<0.01 |
| A vs H | 8.5068 | 4.9738e-14 | \*\* p<0.01 | 4.9738e-14 | \*\* p<0.01 |
| B vs C | 0.1275 | 25.1613771 | insignificant | 2.6958618 | insignificant |
| B vs D | 2.1854 | 0.8341957 | insignificant | 0.2383416 | insignificant |
| B vs E | 2.2409 | 0.7257326 | insignificant | 0.2332712 | insignificant |
| B vs F | 2.6475 | 0.2415923 | insignificant | 0.1207961 | insignificant |
| B vs G | 6.7038 | 3.8071e-09 | \*\* p<0.01 | 3.1272e-09 | \*\* p<0.01 |
| B vs H | 8.2670 | 2.3626e-13 | \*\* p<0.01 | 2.1938e-13 | \*\* p<0.01 |
| C vs D | 2.3130 | 0.6032080 | insignificant | 0.2154314 | insignificant |
| C vs E | 2.3684 | 0.5216841 | insignificant | 0.2049473 | insignificant |
| C vs F | 2.7750 | 0.1663130 | insignificant | 0.0890963 | insignificant |
| C vs G | 6.8314 | 1.8097e-09 | \*\* p<0.01 | 1.5511e-09 | \*\* p<0.01 |
| C vs H | 8.3945 | 9.9476e-14 | \*\* p<0.01 | 9.5923e-14 | \*\* p<0.01 |
| D vs E | 0.0554 | 26.7631054 | insignificant | 0.9558252 | insignificant |
| D vs F | 0.4621 | 18.0441664 | insignificant | 3.8666071 | insignificant |
| D vs G | 4.5184 | 0.0002702 | \*\* p<0.01 | 0.0001833 | \*\* p<0.01 |
| D vs H | 6.0815 | 1.2531e-07 | \*\* p<0.01 | 9.8454e-08 | \*\* p<0.01 |
| E vs F | 0.4066 | 19.1697942 | insignificant | 3.4231775 | insignificant |
| E vs G | 4.4629 | 0.0003437 | \*\* p<0.01 | 0.0002209 | \*\* p<0.01 |
| E vs H | 6.0261 | 1.6914e-07 | \*\* p<0.01 | 1.2686e-07 | \*\* p<0.01 |
| F vs G | 4.0563 | 0.0018708 | \*\* p<0.01 | 0.0011358 | \*\* p<0.01 |
| F vs H | 5.6194 | 1.4384e-06 | \*\* p<0.01 | 1.0274e-06 | \*\* p<0.01 |
| G vs H | 1.5631 | 3.3403408 | insignificant | 0.8350852 | insignificant |