| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | UCL Statistics for Uncensored Full Data Sets | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | User Selected Options | | | | | | | | | | | |
| 4 | Date/Time of Computation | | | 3/10/2015 11:11:01 AM | | | | | | | | |
| 5 | From File | | | EPC_026SurfR2.xls | | | | | | | | |
| 6 | Full Precision | | | OFF | | | | | | | | |
| 7 | Confidence Coefficient | | | 95% | | | | | | | | |
| 8 | Number of Bootstrap Operations | | | 2000 | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | Chromium | | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 13 | General Statistics | | | | | | | | | | | |
| 14 | Total Number of Observations | | | | | 13 | Number of Distinct Observations | | | | | 4 |
| 15 | | | | | | | Number of Missing Observations | | | | | 0 |
| 16 | Minimum | | | | | 5.13 | Mean | | | | | 13.47 |
| 17 | Maximum | | | | | 34 | Median | | | | | 12 |
| 18 | SD | | | | | 6.577 | Std. Error of Mean | | | | | 1.824 |
| 19 | Coefficient of Variation | | | | | 0.488 | Skewness | | | | | 2.789 |
| 20 | | | | | | | | | | | | |
| 21 | Normal GOF Test | | | | | | | | | | | |
| 22 | Shapiro Wilk Test Statistic | | | | | 0.544 | Shapiro Wilk GOF Test | | | | | |
| 23 | 5% Shapiro Wilk Critical Value | | | | | 0.866 | Data Not Normal at 5% Significance Level | | | | | |
| 24 | Lilliefors Test Statistic | | | | | 0.435 | Lilliefors GOF Test | | | | | |
| 25 | 5% Lilliefors Critical Value | | | | | 0.246 | Data Not Normal at 5% Significance Level | | | | | |
| 26 | Data Not Normal at 5% Significance Level | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |
| 28 | Assuming Normal Distribution | | | | | | | | | | | |
| 29 | 95% Normal UCL | | | | | | 95% UCLs (Adjusted for Skewness) | | | | | |
| 30 | 95% Student's-t UCL | | | | | 16.72 | 95% Adjusted-CLT UCL (Chen-1995) | | | | | 17.98 |
| 31 | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | | | 16.96 |
| 32 | | | | | | | | | | | | |
| 33 | Gamma GOF Test | | | | | | | | | | | |
| 34 | A-D Test Statistic | | | | | 2.526 | Anderson-Darling Gamma GOF Test | | | | | |
| 35 | 5% A-D Critical Value | | | | | 0.735 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 36 | K-S Test Statistic | | | | | 0.409 | Kolmogrov-Smirnoff Gamma GOF Test | | | | | |
| 37 | 5% K-S Critical Value | | | | | 0.237 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 38 | Data Not Gamma Distributed at 5% Significance Level | | | | | | | | | | | |
| 39 | | | | | | | | | | | | |
| 40 | Gamma Statistics | | | | | | | | | | | |
| 41 | k hat (MLE) | | | | | 6.507 | k star (bias corrected MLE) | | | | | 5.057 |
| 42 | Theta hat (MLE) | | | | | 2.07 | Theta star (bias corrected MLE) | | | | | 2.664 |
| 43 | nu hat (MLE) | | | | | 169.2 | nu star (bias corrected) | | | | | 131.5 |
| 44 | MLE Mean (bias corrected) | | | | | 13.47 | MLE Sd (bias corrected) | | | | | 5.991 |
| 45 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 106 |
| 46 | Adjusted Level of Significance | | | | | 0.0301 | Adjusted Chi Square Value | | | | | 102.7 |
| 47 | | | | | | | | | | | | |
| 48 | Assuming Gamma Distribution | | | | | | | | | | | |
| 49 | 95% Approximate Gamma UCL (use when n>=50)) | | | | | 16.71 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 17.24 |
| 50 | | | | | | | | | | | | |
| 51 | Lognormal GOF Test | | | | | | | | | | | |
| 52 | Shapiro Wilk Test Statistic | | | | | 0.657 | Shapiro Wilk Lognormal GOF Test | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 53 | | | | | 5% Shapiro Wilk Critical Value | 0.866 | | Data Not Lognormal at 5% Significance Level | | | | |
| 54 | | | | | Lilliefors Test Statistic | 0.386 | | **Lilliefors Lognormal GOF Test** | | | | |
| 55 | | | | | 5% Lilliefors Critical Value | 0.246 | | Data Not Lognormal at 5% Significance Level | | | | |
| 56 | | | | | **Data Not Lognormal at 5% Significance Level** | | | | | | | |
| 57 | | | | | | | | | | | | |
| 58 | | | | | **Lognormal Statistics** | | | | | | | |
| 59 | | | | | Minimum of Logged Data | 1.635 | | | | Mean of logged Data | | 2.522 |
| 60 | | | | | Maximum of Logged Data | 3.526 | | | | SD of logged Data | | 0.395 |
| 61 | | | | | | | | | | | | |
| 62 | | | | | **Assuming Lognormal Distribution** | | | | | | | |
| 63 | | | | | 95% H-UCL | 16.9 | | | | 90% Chebyshev (MVUE) UCL | | 17.84 |
| 64 | | | | | 95% Chebyshev (MVUE) UCL | 19.87 | | | | 97.5% Chebyshev (MVUE) UCL | | 22.68 |
| 65 | | | | | 99% Chebyshev (MVUE) UCL | 28.2 | | | | | | |
| 66 | | | | | | | | | | | | |
| 67 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 68 | | | | | **Data do not follow a Discernible Distribution (0.05)** | | | | | | | |
| 69 | | | | | | | | | | | | |
| 70 | | | | | **Nonparametric Distribution Free UCLs** | | | | | | | |
| 71 | | | | | 95% CLT UCL | 16.47 | | | | 95% Jackknife UCL | | 16.72 |
| 72 | | | | | 95% Standard Bootstrap UCL | N/A | | | | 95% Bootstrap-t UCL | | N/A |
| 73 | | | | | 95% Hall's Bootstrap UCL | N/A | | | | 95% Percentile Bootstrap UCL | | N/A |
| 74 | | | | | 95% BCA Bootstrap UCL | N/A | | | | | | |
| 75 | | | | | 90% Chebyshev(Mean, Sd) UCL | 18.94 | | | | 95% Chebyshev(Mean, Sd) UCL | | 21.42 |
| 76 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 24.86 | | | | 99% Chebyshev(Mean, Sd) UCL | | 31.62 |
| 77 | | | | | | | | | | | | |
| 78 | | | | | **Suggested UCL to Use** | | | | | | | |
| 79 | | | | | 95% Student's-t UCL | 16.72 | | | | or 95% Modified-t UCL | | 16.96 |
| 80 | | | | | | | | | | | | |
| 81 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 82 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 83 | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | |
| 84 | | | | | For additional insight the user may want to consult a statistician. | | | | | | | |
| 85 | | | | | | | | | | | | |
| 86 | | | | | | | | | | | | |
| 87 | Iron | | | | | | | | | | | |
| 88 | | | | | | | | | | | | |
| 89 | | | | | **General Statistics** | | | | | | | |
| 90 | | | | | Total Number of Observations | 13 | | | | Number of Distinct Observations | | 13 |
| 91 | | | | | | | | | | Number of Missing Observations | | 0 |
| 92 | | | | | Minimum | 6836 | | | | Mean | | 25057 |
| 93 | | | | | Maximum | 37876 | | | | Median | | 26008 |
| 94 | | | | | SD | 7531 | | | | Std. Error of Mean | | 2089 |
| 95 | | | | | Coefficient of Variation | 0.301 | | | | Skewness | | -0.687 |
| 96 | | | | | | | | | | | | |
| 97 | | | | | **Normal GOF Test** | | | | | | | |
| 98 | | | | | Shapiro Wilk Test Statistic | 0.914 | | **Shapiro Wilk GOF Test** | | | | |
| 99 | | | | | 5% Shapiro Wilk Critical Value | 0.866 | | Data appear Normal at 5% Significance Level | | | | |
| 100 | | | | | Lilliefors Test Statistic | 0.175 | | **Lilliefors GOF Test** | | | | |
| 101 | | | | | 5% Lilliefors Critical Value | 0.246 | | Data appear Normal at 5% Significance Level | | | | |
| 102 | | | | | **Data appear Normal at 5% Significance Level** | | | | | | | |
| 103 | | | | | | | | | | | | |
| 104 | | | | | **Assuming Normal Distribution** | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 106 | | | | | 95% Student's-t UCL | 28779 | | | | 95% Adjusted-CLT UCL (Chen-1995) | | 28067 |
| 107 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | 28713 |
| 108 | | | | | | | | | | | | |
| 109 | **Gamma GOF Test** | | | | | | | | | | | |
| 110 | | | | | A-D Test Statistic | 0.92 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 111 | | | | | 5% A-D Critical Value | 0.735 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 112 | | | | | K-S Test Statistic | 0.234 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 113 | | | | | 5% K-S Critical Value | 0.237 | Detected data appear Gamma Distributed at 5% Significance Level | | | | | |
| 114 | **Detected data follow Appr. Gamma Distribution at 5% Significance Level** | | | | | | | | | | | |
| 115 | | | | | | | | | | | | |
| 116 | **Gamma Statistics** | | | | | | | | | | | |
| 117 | | | | | k hat (MLE) | 8.26 | | | | k star (bias corrected MLE) | | 6.405 |
| 118 | | | | | Theta hat (MLE) | 3034 | | | | Theta star (bias corrected MLE) | | 3912 |
| 119 | | | | | nu hat (MLE) | 214.8 | | | | nu star (bias corrected) | | 166.5 |
| 120 | | | | | MLE Mean (bias corrected) | 25057 | | | | MLE Sd (bias corrected) | | 9901 |
| 121 | | | | | | | | | | Approximate Chi Square Value (0.05) | | 137.7 |
| 122 | | | | | Adjusted Level of Significance | 0.0301 | | | | Adjusted Chi Square Value | | 134 |
| 123 | | | | | | | | | | | | |
| 124 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 125 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 30305 | | | | 95% Adjusted Gamma UCL (use when n<50) | | 31150 |
| 126 | | | | | | | | | | | | |
| 127 | **Lognormal GOF Test** | | | | | | | | | | | |
| 128 | | | | | Shapiro Wilk Test Statistic | 0.74 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 129 | | | | | 5% Shapiro Wilk Critical Value | 0.866 | Data Not Lognormal at 5% Significance Level | | | | | |
| 130 | | | | | Lilliefors Test Statistic | 0.269 | **Lilliefors Lognormal GOF Test** | | | | | |
| 131 | | | | | 5% Lilliefors Critical Value | 0.246 | Data Not Lognormal at 5% Significance Level | | | | | |
| 132 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 133 | | | | | | | | | | | | |
| 134 | **Lognormal Statistics** | | | | | | | | | | | |
| 135 | | | | | Minimum of Logged Data | 8.83 | | | | Mean of logged Data | | 10.07 |
| 136 | | | | | Maximum of Logged Data | 10.54 | | | | SD of logged Data | | 0.415 |
| 137 | | | | | | | | | | | | |
| 138 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 139 | | | | | 95% H-UCL | 32684 | | | | 90% Chebyshev (MVUE) UCL | | 34446 |
| 140 | | | | | 95% Chebyshev (MVUE) UCL | 38503 | | | | 97.5% Chebyshev (MVUE) UCL | | 44134 |
| 141 | | | | | 99% Chebyshev (MVUE) UCL | 55194 | | | | | | |
| 142 | | | | | | | | | | | | |
| 143 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 144 | **Data appear to follow a Discernible Distribution at 5% Significance Level** | | | | | | | | | | | |
| 145 | | | | | | | | | | | | |
| 146 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 147 | | | | | 95% CLT UCL | 28492 | | | | 95% Jackknife UCL | | 28779 |
| 148 | | | | | 95% Standard Bootstrap UCL | 28375 | | | | 95% Bootstrap-t UCL | | 28339 |
| 149 | | | | | 95% Hall's Bootstrap UCL | 28486 | | | | 95% Percentile Bootstrap UCL | | 28251 |
| 150 | | | | | 95% BCA Bootstrap UCL | 28122 | | | | | | |
| 151 | | | | | 90% Chebyshev(Mean, Sd) UCL | 31323 | | | | 95% Chebyshev(Mean, Sd) UCL | | 34161 |
| 152 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 38101 | | | | 99% Chebyshev(Mean, Sd) UCL | | 45840 |
| 153 | | | | | | | | | | | | |
| 154 | **Suggested UCL to Use** | | | | | | | | | | | |
| 155 | | | | | 95% Student's-t UCL | 28779 | | | | | | |
| 156 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 157 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 158 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 159 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 160 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 161 | | | | | | | | | | | | |
| 162 | **Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be** | | | | | | | | | | | |
| 163 | **reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.** | | | | | | | | | | | |
| 164 | | | | | | | | | | | | |
| 165 | | | | | | | | | | | | |
| 166 | **PAH, Total** | | | | | | | | | | | |
| 167 | | | | | | | | | | | | |
| 168 | **General Statistics** | | | | | | | | | | | |
| 169 | Total Number of Observations | | | | | 13 | Number of Distinct Observations | | | | | 3 |
| 170 | | | | | | | Number of Missing Observations | | | | | 0 |
| 171 | Minimum | | | | | 0.109 | Mean | | | | | 0.182 |
| 172 | Maximum | | | | | 0.255 | Median | | | | | 0.182 |
| 173 | SD | | | | | 0.0299 | Std. Error of Mean | | | | | 0.00828 |
| 174 | Coefficient of Variation | | | | | 0.164 | Skewness | | | | | -8.03E-16 |
| 175 | | | | | | | | | | | | |
| 176 | **Normal GOF Test** | | | | | | | | | | | |
| 177 | Shapiro Wilk Test Statistic | | | | | 0.574 | **Shapiro Wilk GOF Test** | | | | | |
| 178 | 5% Shapiro Wilk Critical Value | | | | | 0.866 | Data Not Normal at 5% Significance Level | | | | | |
| 179 | Lilliefors Test Statistic | | | | | 0.423 | **Lilliefors GOF Test** | | | | | |
| 180 | 5% Lilliefors Critical Value | | | | | 0.246 | Data Not Normal at 5% Significance Level | | | | | |
| 181 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 182 | | | | | | | | | | | | |
| 183 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 184 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 185 | 95% Student's-t UCL | | | | | 0.197 | 95% Adjusted-CLT UCL (Chen-1995) | | | | | 0.195 |
| 186 | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | | | 0.197 |
| 187 | | | | | | | | | | | | |
| 188 | **Gamma GOF Test** | | | | | | | | | | | |
| 189 | A-D Test Statistic | | | | | 3.1 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 190 | 5% A-D Critical Value | | | | | 0.733 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 191 | K-S Test Statistic | | | | | 0.445 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 192 | 5% K-S Critical Value | | | | | 0.236 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 193 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 194 | | | | | | | | | | | | |
| 195 | **Gamma Statistics** | | | | | | | | | | | |
| 196 | k hat (MLE) | | | | | 37 | k star (bias corrected MLE) | | | | | 28.52 |
| 197 | Theta hat (MLE) | | | | | 0.00491 | Theta star (bias corrected MLE) | | | | | 0.00638 |
| 198 | nu hat (MLE) | | | | | 962.1 | nu star (bias corrected) | | | | | 741.4 |
| 199 | MLE Mean (bias corrected) | | | | | 0.182 | MLE Sd (bias corrected) | | | | | 0.0341 |
| 200 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 679.2 |
| 201 | Adjusted Level of Significance | | | | | 0.0301 | Adjusted Chi Square Value | | | | | 670.8 |
| 202 | | | | | | | | | | | | |
| 203 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 204 | 95% Approximate Gamma UCL (use when n>=50)) | | | | | 0.198 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 0.201 |
| 205 | | | | | | | | | | | | |
| 206 | **Lognormal GOF Test** | | | | | | | | | | | |
| 207 | Shapiro Wilk Test Statistic | | | | | 0.554 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 208 | 5% Shapiro Wilk Critical Value | | | | | 0.866 | Data Not Lognormal at 5% Significance Level | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 209 | | | | | Lilliefors Test Statistic | 0.454 | **Lilliefors Lognormal GOF Test** | | | | | |
| 210 | | | | | 5% Lilliefors Critical Value | 0.246 | Data Not Lognormal at 5% Significance Level | | | | | |
| 211 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 212 | | | | | | | | | | | | |
| 213 | **Lognormal Statistics** | | | | | | | | | | | |
| 214 | | | | | Minimum of Logged Data | -2.219 | | | | Mean of logged Data | | -1.718 |
| 215 | | | | | Maximum of Logged Data | -1.367 | | | | SD of logged Data | | 0.177 |
| 216 | | | | | | | | | | | | |
| 217 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 218 | | | | | 95% H-UCL | 0.2 | | | | 90% Chebyshev (MVUE) UCL | | 0.209 |
| 219 | | | | | 95% Chebyshev (MVUE) UCL | 0.221 | | | | 97.5% Chebyshev (MVUE) UCL | | 0.238 |
| 220 | | | | | 99% Chebyshev (MVUE) UCL | 0.271 | | | | | | |
| 221 | | | | | | | | | | | | |
| 222 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 223 | **Data do not follow a Discernible Distribution (0.05)** | | | | | | | | | | | |
| 224 | | | | | | | | | | | | |
| 225 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 226 | | | | | 95% CLT UCL | 0.195 | | | | 95% Jackknife UCL | | 0.197 |
| 227 | | | | | 95% Standard Bootstrap UCL | N/A | | | | 95% Bootstrap-t UCL | | N/A |
| 228 | | | | | 95% Hall's Bootstrap UCL | N/A | | | | 95% Percentile Bootstrap UCL | | N/A |
| 229 | | | | | 95% BCA Bootstrap UCL | N/A | | | | | | |
| 230 | | | | | 90% Chebyshev(Mean, Sd) UCL | 0.207 | | | | 95% Chebyshev(Mean, Sd) UCL | | 0.218 |
| 231 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 0.234 | | | | 99% Chebyshev(Mean, Sd) UCL | | 0.264 |
| 232 | | | | | | | | | | | | |
| 233 | **Suggested UCL to Use** | | | | | | | | | | | |
| 234 | | | | | 95% Student's-t UCL | 0.197 | | | | or 95% Modified-t UCL | | 0.197 |
| 235 | | | | | | | | | | | | |
| 236 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 237 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 238 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 239 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 240 | | | | | | | | | | | | |
| 241 | **Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be** | | | | | | | | | | | |
| 242 | **reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.** | | | | | | | | | | | |
| 243 | | | | | | | | | | | | |
| 244 | | | | | | | | | | | | |
| 245 | **PCB, Total** | | | | | | | | | | | |
| 246 | | | | | | | | | | | | |
| 247 | **General Statistics** | | | | | | | | | | | |
| 248 | | | | | Total Number of Observations | 13 | | | | Number of Distinct Observations | | 4 |
| 249 | | | | | | | | | | Number of Missing Observations | | 0 |
| 250 | | | | | Minimum | 0.031 | | | | Mean | | 3.971 |
| 251 | | | | | Maximum | 5 | | | | Median | | 5 |
| 252 | | | | | SD | 1.967 | | | | Std. Error of Mean | | 0.546 |
| 253 | | | | | Coefficient of Variation | 0.495 | | | | Skewness | | -1.497 |
| 254 | | | | | | | | | | | | |
| 255 | **Normal GOF Test** | | | | | | | | | | | |
| 256 | | | | | Shapiro Wilk Test Statistic | 0.56 | **Shapiro Wilk GOF Test** | | | | | |
| 257 | | | | | 5% Shapiro Wilk Critical Value | 0.866 | Data Not Normal at 5% Significance Level | | | | | |
| 258 | | | | | Lilliefors Test Statistic | 0.469 | **Lilliefors GOF Test** | | | | | |
| 259 | | | | | 5% Lilliefors Critical Value | 0.246 | Data Not Normal at 5% Significance Level | | | | | |
| 260 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
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| 261 | | | | | | | | | | | | |
| 262 | | | | | | Assuming Normal Distribution | | | | | | |
| 263 | | | | 95% Normal UCL | | | | | | 95% UCLs (Adjusted for Skewness) | | |
| 264 | | | | | 95% Student's-t UCL | 4.943 | | | | 95% Adjusted-CLT UCL (Chen-1995) | | 4.626 |
| 265 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | 4.905 |
| 266 | | | | | | | | | | | | |
| 267 | | | | | | Gamma GOF Test | | | | | | |
| 268 | | | | | A-D Test Statistic | 2.935 | | | | Anderson-Darling Gamma GOF Test | | |
| 269 | | | | | 5% A-D Critical Value | 0.754 | | | | Data Not Gamma Distributed at 5% Significance Level | | |
| 270 | | | | | K-S Test Statistic | 0.483 | | | | Kolmogrov-Smirnoff Gamma GOF Test | | |
| 271 | | | | | 5% K-S Critical Value | 0.242 | | | | Data Not Gamma Distributed at 5% Significance Level | | |
| 272 | | | | | | Data Not Gamma Distributed at 5% Significance Level | | | | | | |
| 273 | | | | | | | | | | | | |
| 274 | | | | | | Gamma Statistics | | | | | | |
| 275 | | | | | k hat (MLE) | 1.245 | | | | k star (bias corrected MLE) | | 1.009 |
| 276 | | | | | Theta hat (MLE) | 3.189 | | | | Theta star (bias corrected MLE) | | 3.935 |
| 277 | | | | | nu hat (MLE) | 32.37 | | | | nu star (bias corrected) | | 26.24 |
| 278 | | | | | MLE Mean (bias corrected) | 3.971 | | | | MLE Sd (bias corrected) | | 3.953 |
| 279 | | | | | | | | | | Approximate Chi Square Value (0.05) | | 15.56 |
| 280 | | | | | Adjusted Level of Significance | 0.0301 | | | | Adjusted Chi Square Value | | 14.4 |
| 281 | | | | | | | | | | | | |
| 282 | | | | | | Assuming Gamma Distribution | | | | | | |
| 283 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 6.695 | | | | 95% Adjusted Gamma UCL (use when n<50) | | 7.235 |
| 284 | | | | | | | | | | | | |
| 285 | | | | | | Lognormal GOF Test | | | | | | |
| 286 | | | | | Shapiro Wilk Test Statistic | 0.543 | | | | Shapiro Wilk Lognormal GOF Test | | |
| 287 | | | | | 5% Shapiro Wilk Critical Value | 0.866 | | | | Data Not Lognormal at 5% Significance Level | | |
| 288 | | | | | Lilliefors Test Statistic | 0.444 | | | | Lilliefors Lognormal GOF Test | | |
| 289 | | | | | 5% Lilliefors Critical Value | 0.246 | | | | Data Not Lognormal at 5% Significance Level | | |
| 290 | | | | | | Data Not Lognormal at 5% Significance Level | | | | | | |
| 291 | | | | | | | | | | | | |
| 292 | | | | | | Lognormal Statistics | | | | | | |
| 293 | | | | | Minimum of Logged Data | -3.474 | | | | Mean of logged Data | | 0.926 |
| 294 | | | | | Maximum of Logged Data | 1.609 | | | | SD of logged Data | | 1.506 |
| 295 | | | | | | | | | | | | |
| 296 | | | | | | Assuming Lognormal Distribution | | | | | | |
| 297 | | | | | 95% H-UCL | 40.88 | | | | 90% Chebyshev (MVUE) UCL | | 16.1 |
| 298 | | | | | 95% Chebyshev (MVUE) UCL | 20.35 | | | | 97.5% Chebyshev (MVUE) UCL | | 26.25 |
| 299 | | | | | 99% Chebyshev (MVUE) UCL | 37.83 | | | | | | |
| 300 | | | | | | | | | | | | |
| 301 | | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | |
| 302 | | | | | | Data do not follow a Discernible Distribution (0.05) | | | | | | |
| 303 | | | | | | | | | | | | |
| 304 | | | | | | Nonparametric Distribution Free UCLs | | | | | | |
| 305 | | | | | 95% CLT UCL | 4.868 | | | | 95% Jackknife UCL | | 4.943 |
| 306 | | | | | 95% Standard Bootstrap UCL | N/A | | | | 95% Bootstrap-t UCL | | N/A |
| 307 | | | | | 95% Hall's Bootstrap UCL | N/A | | | | 95% Percentile Bootstrap UCL | | N/A |
| 308 | | | | | 95% BCA Bootstrap UCL | N/A | | | | | | |
| 309 | | | | | 90% Chebyshev(Mean, Sd) UCL | 5.607 | | | | 95% Chebyshev(Mean, Sd) UCL | | 6.349 |
| 310 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 7.378 | | | | 99% Chebyshev(Mean, Sd) UCL | | 9.399 |
| 311 | | | | | | | | | | | | |
| 312 | | | | | | Suggested UCL to Use | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 313 | | | | | 99% Chebyshev (Mean, Sd) UCL | 9.399 | | | | | | |
| 314 | | | | | | | | | | | | |
| 315 | | | | | **Recommended UCL exceeds the maximum observation** | | | | | | | |
| 316 | | | | | | | | | | | | |
| 317 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 318 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 319 | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | |
| 320 | | | | | For additional insight the user may want to consult a statistician. | | | | | | | |
| 321 | | | | | | | | | | | | |
| 322 | | | | | **Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be** | | | | | | | |
| 323 | | | | | **reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.** | | | | | | | |
| 324 | | | | | | | | | | | | |
| 325 | | | | | | | | | | | | |
| 326 | **Uranium** | | | | | | | | | | | |
| 327 | | | | | | | | | | | | |
| 328 | | | | | **General Statistics** | | | | | | | |
| 329 | | | | | Total Number of Observations | 13 | | | Number of Distinct Observations | | | 7 |
| 330 | | | | | | | | | Number of Missing Observations | | | 0 |
| 331 | | | | | Minimum | 9.4 | | | Mean | | | 131.7 |
| 332 | | | | | Maximum | 473 | | | Median | | | 10 |
| 333 | | | | | SD | 179.8 | | | Std. Error of Mean | | | 49.87 |
| 334 | | | | | Coefficient of Variation | 1.365 | | | Skewness | | | 1.079 |
| 335 | | | | | | | | | | | | |
| 336 | | | | | **Normal GOF Test** | | | | | | | |
| 337 | | | | | Shapiro Wilk Test Statistic | 0.706 | | | **Shapiro Wilk GOF Test** | | | |
| 338 | | | | | 5% Shapiro Wilk Critical Value | 0.866 | | | Data Not Normal at 5% Significance Level | | | |
| 339 | | | | | Lilliefors Test Statistic | 0.366 | | | **Lilliefors GOF Test** | | | |
| 340 | | | | | 5% Lilliefors Critical Value | 0.246 | | | Data Not Normal at 5% Significance Level | | | |
| 341 | | | | | **Data Not Normal at 5% Significance Level** | | | | | | | |
| 342 | | | | | | | | | | | | |
| 343 | | | | | **Assuming Normal Distribution** | | | | | | | |
| 344 | | | | | **95% Normal UCL** | | | | **95% UCLs (Adjusted for Skewness)** | | | |
| 345 | | | | | 95% Student's-t UCL | 220.6 | | | 95% Adjusted-CLT UCL (Chen-1995) | | | 229.7 |
| 346 | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | 223.1 |
| 347 | | | | | | | | | | | | |
| 348 | | | | | **Gamma GOF Test** | | | | | | | |
| 349 | | | | | A-D Test Statistic | 1.865 | | | **Anderson-Darling Gamma GOF Test** | | | |
| 350 | | | | | 5% A-D Critical Value | 0.791 | | | Data Not Gamma Distributed at 5% Significance Level | | | |
| 351 | | | | | K-S Test Statistic | 0.396 | | | **Kolmogrov-Smirnoff Gamma GOF Test** | | | |
| 352 | | | | | 5% K-S Critical Value | 0.25 | | | Data Not Gamma Distributed at 5% Significance Level | | | |
| 353 | | | | | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | |
| 354 | | | | | | | | | | | | |
| 355 | | | | | **Gamma Statistics** | | | | | | | |
| 356 | | | | | k hat (MLE) | 0.496 | | | k star (bias corrected MLE) | | | 0.433 |
| 357 | | | | | Theta hat (MLE) | 265.5 | | | Theta star (bias corrected MLE) | | | 304.2 |
| 358 | | | | | nu hat (MLE) | 12.9 | | | nu star (bias corrected) | | | 11.26 |
| 359 | | | | | MLE Mean (bias corrected) | 131.7 | | | MLE Sd (bias corrected) | | | 200.2 |
| 360 | | | | | | | | | Approximate Chi Square Value (0.05) | | | 4.742 |
| 361 | | | | | Adjusted Level of Significance | 0.0301 | | | Adjusted Chi Square Value | | | 4.156 |
| 362 | | | | | | | | | | | | |
| 363 | | | | | **Assuming Gamma Distribution** | | | | | | | |
| 364 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 312.7 | | | 95% Adjusted Gamma UCL (use when n<50) | | | 356.8 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 365 | | | | | | | | | | | | |
| 366 | | | | | | Lognormal GOF Test | | | | | | |
| 367 | | | | | Shapiro Wilk Test Statistic | 0.693 | | | Shapiro Wilk Lognormal GOF Test | | | |
| 368 | | | | | 5% Shapiro Wilk Critical Value | 0.866 | | | Data Not Lognormal at 5% Significance Level | | | |
| 369 | | | | | Lilliefors Test Statistic | 0.386 | | | Lilliefors Lognormal GOF Test | | | |
| 370 | | | | | 5% Lilliefors Critical Value | 0.246 | | | Data Not Lognormal at 5% Significance Level | | | |
| 371 | | | | | | Data Not Lognormal at 5% Significance Level | | | | | | |
| 372 | | | | | | | | | | | | |
| 373 | | | | | | Lognormal Statistics | | | | | | |
| 374 | | | | | Minimum of Logged Data | 2.241 | | | Mean of logged Data | | | 3.599 |
| 375 | | | | | Maximum of Logged Data | 6.159 | | | SD of logged Data | | | 1.746 |
| 376 | | | | | | | | | | | | |
| 377 | | | | | | Assuming Lognormal Distribution | | | | | | |
| 378 | | | | | 95% H-UCL | 1412 | | | 90% Chebyshev (MVUE) UCL | | | 348.6 |
| 379 | | | | | 95% Chebyshev (MVUE) UCL | 446.3 | | | 97.5% Chebyshev (MVUE) UCL | | | 581.8 |
| 380 | | | | | 99% Chebyshev (MVUE) UCL | 848 | | | | | | |
| 381 | | | | | | | | | | | | |
| 382 | | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | |
| 383 | | | | | | Data do not follow a Discernible Distribution (0.05) | | | | | | |
| 384 | | | | | | | | | | | | |
| 385 | | | | | | Nonparametric Distribution Free UCLs | | | | | | |
| 386 | | | | | 95% CLT UCL | 213.8 | | | 95% Jackknife UCL | | | 220.6 |
| 387 | | | | | 95% Standard Bootstrap UCL | 209.5 | | | 95% Bootstrap-t UCL | | | 246.1 |
| 388 | | | | | 95% Hall's Bootstrap UCL | 200.4 | | | 95% Percentile Bootstrap UCL | | | 214.3 |
| 389 | | | | | 95% BCA Bootstrap UCL | 228.8 | | | | | | |
| 390 | | | | | 90% Chebyshev(Mean, Sd) UCL | 281.3 | | | 95% Chebyshev(Mean, Sd) UCL | | | 349.1 |
| 391 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 443.2 | | | 99% Chebyshev(Mean, Sd) UCL | | | 628 |
| 392 | | | | | | | | | | | | |
| 393 | | | | | | Suggested UCL to Use | | | | | | |
| 394 | | | | | 99% Chebyshev (Mean, Sd) UCL | 628 | | | | | | |
| 395 | | | | | | | | | | | | |
| 396 | | | | | | Recommended UCL exceeds the maximum observation | | | | | | |
| 397 | | | | | | | | | | | | |
| 398 | | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | |
| 399 | | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | |
| 400 | | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | |
| 401 | | | | | | For additional insight the user may want to consult a statistician. | | | | | | |
| 402 | | | | | | | | | | | | |
| 403 | | | | | | | | | | | | |
| 404 | Uranium-234 | | | | | | | | | | | |
| 405 | | | | | | | | | | | | |
| 406 | | | | | | General Statistics | | | | | | |
| 407 | | | | | Total Number of Observations | 13 | | | Number of Distinct Observations | | | 4 |
| 408 | | | | | | | | | Number of Missing Observations | | | 0 |
| 409 | | | | | Minimum | 0.299 | | | Mean | | | 4.475 |
| 410 | | | | | Maximum | 12.2 | | | Median | | | 4.475 |
| 411 | | | | | SD | 2.734 | | | Std. Error of Mean | | | 0.758 |
| 412 | | | | | Coefficient of Variation | 0.611 | | | Skewness | | | 1.655 |
| 413 | | | | | | | | | | | | |
| 414 | | | | | | Normal GOF Test | | | | | | |
| 415 | | | | | Shapiro Wilk Test Statistic | 0.637 | | | Shapiro Wilk GOF Test | | | |
| 416 | | | | | 5% Shapiro Wilk Critical Value | 0.866 | | | Data Not Normal at 5% Significance Level | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 417 | | | | | Lilliefors Test Statistic | 0.423 | **Lilliefors GOF Test** | | | | | |
| 418 | | | | | 5% Lilliefors Critical Value | 0.246 | Data Not Normal at 5% Significance Level | | | | | |
| 419 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 420 | | | | | | | | | | | | |
| 421 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 422 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 423 | | | | | 95% Student's-t UCL | 5.827 | 95% Adjusted-CLT UCL (Chen-1995) | | | | | 6.095 |
| 424 | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | | | 5.885 |
| 425 | | | | | | | | | | | | |
| 426 | **Gamma GOF Test** | | | | | | | | | | | |
| 427 | | | | | A-D Test Statistic | 2.416 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 428 | | | | | 5% A-D Critical Value | 0.743 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 429 | | | | | K-S Test Statistic | 0.437 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 430 | | | | | 5% K-S Critical Value | 0.239 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 431 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 432 | | | | | | | | | | | | |
| 433 | **Gamma Statistics** | | | | | | | | | | | |
| 434 | | | | | k hat (MLE) | 2.135 | k star (bias corrected MLE) | | | | | 1.694 |
| 435 | | | | | Theta hat (MLE) | 2.096 | Theta star (bias corrected MLE) | | | | | 2.643 |
| 436 | | | | | nu hat (MLE) | 55.51 | nu star (bias corrected) | | | | | 44.03 |
| 437 | | | | | MLE Mean (bias corrected) | 4.475 | MLE Sd (bias corrected) | | | | | 3.439 |
| 438 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 29.81 |
| 439 | | | | | Adjusted Level of Significance | 0.0301 | Adjusted Chi Square Value | | | | | 28.16 |
| 440 | | | | | | | | | | | | |
| 441 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 442 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 6.61 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 6.999 |
| 443 | | | | | | | | | | | | |
| 444 | **Lognormal GOF Test** | | | | | | | | | | | |
| 445 | | | | | Shapiro Wilk Test Statistic | 0.632 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 446 | | | | | 5% Shapiro Wilk Critical Value | 0.866 | Data Not Lognormal at 5% Significance Level | | | | | |
| 447 | | | | | Lilliefors Test Statistic | 0.455 | **Lilliefors Lognormal GOF Test** | | | | | |
| 448 | | | | | 5% Lilliefors Critical Value | 0.246 | Data Not Lognormal at 5% Significance Level | | | | | |
| 449 | **Data Not Lognormal at 5% Significance Level** | | | | | | | | | | | |
| 450 | | | | | | | | | | | | |
| 451 | **Lognormal Statistics** | | | | | | | | | | | |
| 452 | | | | | Minimum of Logged Data | -1.207 | Mean of logged Data | | | | | 1.246 |
| 453 | | | | | Maximum of Logged Data | 2.501 | SD of logged Data | | | | | 0.912 |
| 454 | | | | | | | | | | | | |
| 455 | **Assuming Lognormal Distribution** | | | | | | | | | | | |
| 456 | | | | | 95% H-UCL | 10.73 | 90% Chebyshev (MVUE) UCL | | | | | 9.156 |
| 457 | | | | | 95% Chebyshev (MVUE) UCL | 11.01 | 97.5% Chebyshev (MVUE) UCL | | | | | 13.59 |
| 458 | | | | | 99% Chebyshev (MVUE) UCL | 18.66 | | | | | | |
| 459 | | | | | | | | | | | | |
| 460 | **Nonparametric Distribution Free UCL Statistics** | | | | | | | | | | | |
| 461 | **Data do not follow a Discernible Distribution (0.05)** | | | | | | | | | | | |
| 462 | | | | | | | | | | | | |
| 463 | **Nonparametric Distribution Free UCLs** | | | | | | | | | | | |
| 464 | | | | | 95% CLT UCL | 5.723 | 95% Jackknife UCL | | | | | 5.827 |
| 465 | | | | | 95% Standard Bootstrap UCL | N/A | 95% Bootstrap-t UCL | | | | | N/A |
| 466 | | | | | 95% Hall's Bootstrap UCL | N/A | 95% Percentile Bootstrap UCL | | | | | N/A |
| 467 | | | | | 95% BCA Bootstrap UCL | N/A | | | | | | |
| 468 | | | | | 90% Chebyshev(Mean, Sd) UCL | 6.75 | 95% Chebyshev(Mean, Sd) UCL | | | | | 7.781 |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 469 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 9.211 | | | | 99% Chebyshev(Mean, Sd) UCL | | 12.02 |
| 470 | | | | | | | | | | | | |
| 471 | | | | | Suggested UCL to Use | | | | | | | |
| 472 | | | | | 95% Chebyshev (Mean, Sd) UCL | 7.781 | | | | | | |
| 473 | | | | | | | | | | | | |
| 474 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 475 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 476 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 477 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 478 | | | | | | | | | | | | |
| 479 | | | | | | | | | | | | |
| 480 | Uranium-235 | | | | | | | | | | | |
| 481 | | | | | | | | | | | | |
| 482 | | | | | General Statistics | | | | | | | |
| 483 | | | | | Total Number of Observations | 13 | | | | Number of Distinct Observations | | 4 |
| 484 | | | | | | | | | | Number of Missing Observations | | 0 |
| 485 | | | | | Minimum | 0.0335 | | | | Mean | | 0.687 |
| 486 | | | | | Maximum | 1.96 | | | | Median | | 0.687 |
| 487 | | | | | SD | 0.45 | | | | Std. Error of Mean | | 0.125 |
| 488 | | | | | Coefficient of Variation | 0.656 | | | | Skewness | | 1.67 |
| 489 | | | | | | | | | | | | |
| 490 | | | | | Normal GOF Test | | | | | | | |
| 491 | | | | | Shapiro Wilk Test Statistic | 0.631 | | | | Shapiro Wilk GOF Test | | |
| 492 | | | | | 5% Shapiro Wilk Critical Value | 0.866 | | | | Data Not Normal at 5% Significance Level | | |
| 493 | | | | | Lilliefors Test Statistic | 0.423 | | | | Lilliefors GOF Test | | |
| 494 | | | | | 5% Lilliefors Critical Value | 0.246 | | | | Data Not Normal at 5% Significance Level | | |
| 495 | | | | | Data Not Normal at 5% Significance Level | | | | | | | |
| 496 | | | | | | | | | | | | |
| 497 | | | | | Assuming Normal Distribution | | | | | | | |
| 498 | | | | | 95% Normal UCL | | | | | 95% UCLs (Adjusted for Skewness) | | |
| 499 | | | | | 95% Student's-t UCL | 0.909 | | | | 95% Adjusted-CLT UCL (Chen-1995) | | 0.954 |
| 500 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | 0.919 |
| 501 | | | | | | | | | | | | |
| 502 | | | | | Gamma GOF Test | | | | | | | |
| 503 | | | | | A-D Test Statistic | 2.546 | | | | Anderson-Darling Gamma GOF Test | | |
| 504 | | | | | 5% A-D Critical Value | 0.748 | | | | Data Not Gamma Distributed at 5% Significance Level | | |
| 505 | | | | | K-S Test Statistic | 0.449 | | | | Kolmogrov-Smirnoff Gamma GOF Test | | |
| 506 | | | | | 5% K-S Critical Value | 0.24 | | | | Data Not Gamma Distributed at 5% Significance Level | | |
| 507 | | | | | Data Not Gamma Distributed at 5% Significance Level | | | | | | | |
| 508 | | | | | | | | | | | | |
| 509 | | | | | Gamma Statistics | | | | | | | |
| 510 | | | | | k hat (MLE) | 1.657 | | | | k star (bias corrected MLE) | | 1.326 |
| 511 | | | | | Theta hat (MLE) | 0.415 | | | | Theta star (bias corrected MLE) | | 0.518 |
| 512 | | | | | nu hat (MLE) | 43.07 | | | | nu star (bias corrected) | | 34.46 |
| 513 | | | | | MLE Mean (bias corrected) | 0.687 | | | | MLE Sd (bias corrected) | | 0.596 |
| 514 | | | | | | | | | | Approximate Chi Square Value (0.05) | | 22.04 |
| 515 | | | | | Adjusted Level of Significance | 0.0301 | | | | Adjusted Chi Square Value | | 20.63 |
| 516 | | | | | | | | | | | | |
| 517 | | | | | Assuming Gamma Distribution | | | | | | | |
| 518 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 1.074 | | | | 95% Adjusted Gamma UCL (use when n<50) | | 1.147 |
| 519 | | | | | | | | | | | | |
| 520 | | | | | Lognormal GOF Test | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 521 | | | | | Shapiro Wilk Test Statistic | 0.614 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 522 | | | | | 5% Shapiro Wilk Critical Value | 0.866 | Data Not Lognormal at 5% Significance Level | | | | | |
| 523 | | | | | Lilliefors Test Statistic | 0.466 | **Lilliefors Lognormal GOF Test** | | | | | |
| 524 | | | | | 5% Lilliefors Critical Value | 0.246 | Data Not Lognormal at 5% Significance Level | | | | | |
| 525 | | | | | **Data Not Lognormal at 5% Significance Level** | | | | | | | |
| 526 | | | | | | | | | | | | |
| 527 | | | | | **Lognormal Statistics** | | | | | | | |
| 528 | | | | | Minimum of Logged Data | -3.396 | Mean of logged Data | | | | | -0.707 |
| 529 | | | | | Maximum of Logged Data | 0.673 | SD of logged Data | | | | | 1.09 |
| 530 | | | | | | | | | | | | |
| 531 | | | | | **Assuming Lognormal Distribution** | | | | | | | |
| 532 | | | | | 95% H-UCL | 2.297 | 90% Chebyshev (MVUE) UCL | | | | | 1.66 |
| 533 | | | | | 95% Chebyshev (MVUE) UCL | 2.033 | 97.5% Chebyshev (MVUE) UCL | | | | | 2.551 |
| 534 | | | | | 99% Chebyshev (MVUE) UCL | 3.568 | | | | | | |
| 535 | | | | | | | | | | | | |
| 536 | | | | | **Nonparametric Distribution Free UCL Statistics** | | | | | | | |
| 537 | | | | | **Data do not follow a Discernible Distribution (0.05)** | | | | | | | |
| 538 | | | | | | | | | | | | |
| 539 | | | | | **Nonparametric Distribution Free UCLs** | | | | | | | |
| 540 | | | | | 95% CLT UCL | 0.892 | 95% Jackknife UCL | | | | | 0.909 |
| 541 | | | | | 95% Standard Bootstrap UCL | N/A | 95% Bootstrap-t UCL | | | | | N/A |
| 542 | | | | | 95% Hall's Bootstrap UCL | N/A | 95% Percentile Bootstrap UCL | | | | | N/A |
| 543 | | | | | 95% BCA Bootstrap UCL | N/A | | | | | | |
| 544 | | | | | 90% Chebyshev(Mean, Sd) UCL | 1.061 | 95% Chebyshev(Mean, Sd) UCL | | | | | 1.231 |
| 545 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 1.467 | 99% Chebyshev(Mean, Sd) UCL | | | | | 1.929 |
| 546 | | | | | | | | | | | | |
| 547 | | | | | **Suggested UCL to Use** | | | | | | | |
| 548 | | | | | 95% Chebyshev (Mean, Sd) UCL | 1.231 | | | | | | |
| 549 | | | | | | | | | | | | |
| 550 | | | | | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | |
| 551 | | | | | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | |
| 552 | | | | | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | |
| 553 | | | | | For additional insight the user may want to consult a statistician. | | | | | | | |
| 554 | | | | | | | | | | | | |
| 555 | | | | | | | | | | | | |
| 556 | **Uranium-238** | | | | | | | | | | | |
| 557 | | | | | | | | | | | | |
| 558 | | | | | **General Statistics** | | | | | | | |
| 559 | | | | | Total Number of Observations | 13 | Number of Distinct Observations | | | | | 4 |
| 560 | | | | | | | Number of Missing Observations | | | | | 0 |
| 561 | | | | | Minimum | 1.68 | Mean | | | | | 37.31 |
| 562 | | | | | Maximum | 108 | Median | | | | | 37.31 |
| 563 | | | | | SD | 24.99 | Std. Error of Mean | | | | | 6.932 |
| 564 | | | | | Coefficient of Variation | 0.67 | Skewness | | | | | 1.671 |
| 565 | | | | | | | | | | | | |
| 566 | | | | | **Normal GOF Test** | | | | | | | |
| 567 | | | | | Shapiro Wilk Test Statistic | 0.628 | **Shapiro Wilk GOF Test** | | | | | |
| 568 | | | | | 5% Shapiro Wilk Critical Value | 0.866 | Data Not Normal at 5% Significance Level | | | | | |
| 569 | | | | | Lilliefors Test Statistic | 0.423 | **Lilliefors GOF Test** | | | | | |
| 570 | | | | | 5% Lilliefors Critical Value | 0.246 | Data Not Normal at 5% Significance Level | | | | | |
| 571 | | | | | **Data Not Normal at 5% Significance Level** | | | | | | | |
| 572 | | | | | | | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 573 | | | | | | Assuming Normal Distribution | | | | | | |
| 574 | | | | 95% Normal UCL | | | | | 95% UCLs (Adjusted for Skewness) | | | |
| 575 | | | | | 95% Student's-t UCL | 49.66 | | | | 95% Adjusted-CLT UCL (Chen-1995) | | 52.14 |
| 576 | | | | | | | | | | 95% Modified-t UCL (Johnson-1978) | | 50.2 |
| 577 | | | | | | | | | | | | |
| 578 | | | | | | Gamma GOF Test | | | | | | |
| 579 | | | | | A-D Test Statistic | 2.633 | | | Anderson-Darling Gamma GOF Test | | | |
| 580 | | | | | 5% A-D Critical Value | 0.751 | | | Data Not Gamma Distributed at 5% Significance Level | | | |
| 581 | | | | | K-S Test Statistic | 0.455 | | | Kolmogrov-Smirnoff Gamma GOF Test | | | |
| 582 | | | | | 5% K-S Critical Value | 0.241 | | | Data Not Gamma Distributed at 5% Significance Level | | | |
| 583 | | | | | | Data Not Gamma Distributed at 5% Significance Level | | | | | | |
| 584 | | | | | | | | | | | | |
| 585 | | | | | | Gamma Statistics | | | | | | |
| 586 | | | | | k hat (MLE) | 1.485 | | | k star (bias corrected MLE) | | | 1.193 |
| 587 | | | | | Theta hat (MLE) | 25.13 | | | Theta star (bias corrected MLE) | | | 31.26 |
| 588 | | | | | nu hat (MLE) | 38.61 | | | nu star (bias corrected) | | | 31.03 |
| 589 | | | | | MLE Mean (bias corrected) | 37.31 | | | MLE Sd (bias corrected) | | | 34.15 |
| 590 | | | | | | | | | Approximate Chi Square Value (0.05) | | | 19.3 |
| 591 | | | | | Adjusted Level of Significance | 0.0301 | | | Adjusted Chi Square Value | | | 18 |
| 592 | | | | | | | | | | | | |
| 593 | | | | | | Assuming Gamma Distribution | | | | | | |
| 594 | | | | | 95% Approximate Gamma UCL (use when n>=50)) | 59.97 | | | 95% Adjusted Gamma UCL (use when n<50) | | | 64.33 |
| 595 | | | | | | | | | | | | |
| 596 | | | | | | Lognormal GOF Test | | | | | | |
| 597 | | | | | Shapiro Wilk Test Statistic | 0.595 | | | Shapiro Wilk Lognormal GOF Test | | | |
| 598 | | | | | 5% Shapiro Wilk Critical Value | 0.866 | | | Data Not Lognormal at 5% Significance Level | | | |
| 599 | | | | | Lilliefors Test Statistic | 0.47 | | | Lilliefors Lognormal GOF Test | | | |
| 600 | | | | | 5% Lilliefors Critical Value | 0.246 | | | Data Not Lognormal at 5% Significance Level | | | |
| 601 | | | | | | Data Not Lognormal at 5% Significance Level | | | | | | |
| 602 | | | | | | | | | | | | |
| 603 | | | | | | Lognormal Statistics | | | | | | |
| 604 | | | | | Minimum of Logged Data | 0.519 | | | Mean of logged Data | | | 3.246 |
| 605 | | | | | Maximum of Logged Data | 4.682 | | | SD of logged Data | | | 1.185 |
| 606 | | | | | | | | | | | | |
| 607 | | | | | | Assuming Lognormal Distribution | | | | | | |
| 608 | | | | | 95% H-UCL | 153.7 | | | 90% Chebyshev (MVUE) UCL | | | 99.35 |
| 609 | | | | | 95% Chebyshev (MVUE) UCL | 122.7 | | | 97.5% Chebyshev (MVUE) UCL | | | 155.1 |
| 610 | | | | | 99% Chebyshev (MVUE) UCL | 218.8 | | | | | | |
| 611 | | | | | | | | | | | | |
| 612 | | | | | | Nonparametric Distribution Free UCL Statistics | | | | | | |
| 613 | | | | | | Data do not follow a Discernible Distribution (0.05) | | | | | | |
| 614 | | | | | | | | | | | | |
| 615 | | | | | | Nonparametric Distribution Free UCLs | | | | | | |
| 616 | | | | | 95% CLT UCL | 48.71 | | | 95% Jackknife UCL | | | 49.66 |
| 617 | | | | | 95% Standard Bootstrap UCL | N/A | | | 95% Bootstrap-t UCL | | | N/A |
| 618 | | | | | 95% Hall's Bootstrap UCL | N/A | | | 95% Percentile Bootstrap UCL | | | N/A |
| 619 | | | | | 95% BCA Bootstrap UCL | N/A | | | | | | |
| 620 | | | | | 90% Chebyshev(Mean, Sd) UCL | 58.1 | | | 95% Chebyshev(Mean, Sd) UCL | | | 67.52 |
| 621 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 80.6 | | | 99% Chebyshev(Mean, Sd) UCL | | | 106.3 |
| 622 | | | | | | | | | | | | |
| 623 | | | | | | Suggested UCL to Use | | | | | | |
| 624 | | | | | 95% Chebyshev (Mean, Sd) UCL | 67.52 | | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 625 | | | | | | | | | | | | |
| 626 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 627 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 628 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 629 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 630 | | | | | | | | | | | | |
| 631 | | | | | | | | | | | | |
| 632 | **Vanadium** | | | | | | | | | | | |
| 633 | | | | | | | | | | | | |
| 634 | **General Statistics** | | | | | | | | | | | |
| 635 | Total Number of Observations | | | | | 13 | Number of Distinct Observations | | | | | 13 |
| 636 | | | | | | | Number of Missing Observations | | | | | 0 |
| 637 | Minimum | | | | | 5 | Mean | | | | | 113.3 |
| 638 | Maximum | | | | | 184 | Median | | | | | 119 |
| 639 | SD | | | | | 39.41 | Std. Error of Mean | | | | | 10.93 |
| 640 | Coefficient of Variation | | | | | 0.348 | Skewness | | | | | -1.481 |
| 641 | | | | | | | | | | | | |
| 642 | **Normal GOF Test** | | | | | | | | | | | |
| 643 | Shapiro Wilk Test Statistic | | | | | 0.793 | **Shapiro Wilk GOF Test** | | | | | |
| 644 | 5% Shapiro Wilk Critical Value | | | | | 0.866 | Data Not Normal at 5% Significance Level | | | | | |
| 645 | Lilliefors Test Statistic | | | | | 0.266 | **Lilliefors GOF Test** | | | | | |
| 646 | 5% Lilliefors Critical Value | | | | | 0.246 | Data Not Normal at 5% Significance Level | | | | | |
| 647 | **Data Not Normal at 5% Significance Level** | | | | | | | | | | | |
| 648 | | | | | | | | | | | | |
| 649 | **Assuming Normal Distribution** | | | | | | | | | | | |
| 650 | **95% Normal UCL** | | | | | | **95% UCLs (Adjusted for Skewness)** | | | | | |
| 651 | 95% Student's-t UCL | | | | | 132.8 | 95% Adjusted-CLT UCL (Chen-1995) | | | | | 126.5 |
| 652 | | | | | | | 95% Modified-t UCL (Johnson-1978) | | | | | 132 |
| 653 | | | | | | | | | | | | |
| 654 | **Gamma GOF Test** | | | | | | | | | | | |
| 655 | A-D Test Statistic | | | | | 2.452 | **Anderson-Darling Gamma GOF Test** | | | | | |
| 656 | 5% A-D Critical Value | | | | | 0.74 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 657 | K-S Test Statistic | | | | | 0.346 | **Kolmogrov-Smirnoff Gamma GOF Test** | | | | | |
| 658 | 5% K-S Critical Value | | | | | 0.238 | Data Not Gamma Distributed at 5% Significance Level | | | | | |
| 659 | **Data Not Gamma Distributed at 5% Significance Level** | | | | | | | | | | | |
| 660 | | | | | | | | | | | | |
| 661 | **Gamma Statistics** | | | | | | | | | | | |
| 662 | k hat (MLE) | | | | | 2.887 | k star (bias corrected MLE) | | | | | 2.272 |
| 663 | Theta hat (MLE) | | | | | 39.25 | Theta star (bias corrected MLE) | | | | | 49.88 |
| 664 | nu hat (MLE) | | | | | 75.05 | nu star (bias corrected) | | | | | 59.07 |
| 665 | MLE Mean (bias corrected) | | | | | 113.3 | MLE Sd (bias corrected) | | | | | 75.18 |
| 666 | | | | | | | Approximate Chi Square Value (0.05) | | | | | 42.4 |
| 667 | Adjusted Level of Significance | | | | | 0.0301 | Adjusted Chi Square Value | | | | | 40.39 |
| 668 | | | | | | | | | | | | |
| 669 | **Assuming Gamma Distribution** | | | | | | | | | | | |
| 670 | 95% Approximate Gamma UCL (use when n>=50)) | | | | | 157.9 | 95% Adjusted Gamma UCL (use when n<50) | | | | | 165.7 |
| 671 | | | | | | | | | | | | |
| 672 | **Lognormal GOF Test** | | | | | | | | | | | |
| 673 | Shapiro Wilk Test Statistic | | | | | 0.482 | **Shapiro Wilk Lognormal GOF Test** | | | | | |
| 674 | 5% Shapiro Wilk Critical Value | | | | | 0.866 | Data Not Lognormal at 5% Significance Level | | | | | |
| 675 | Lilliefors Test Statistic | | | | | 0.387 | **Lilliefors Lognormal GOF Test** | | | | | |
| 676 | 5% Lilliefors Critical Value | | | | | 0.246 | Data Not Lognormal at 5% Significance Level | | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 677 | Data Not Lognormal at 5% Significance Level | | | | | | | | | | | |
| 678 | | | | | | | | | | | | |
| 679 | Lognormal Statistics | | | | | | | | | | | |
| 680 | | | | | Minimum of Logged Data | 1.609 | | | | Mean of logged Data | | 4.547 |
| 681 | | | | | Maximum of Logged Data | 5.215 | | | | SD of logged Data | | 0.899 |
| 682 | | | | | | | | | | | | |
| 683 | Assuming Lognormal Distribution | | | | | | | | | | | |
| 684 | | | | | 95% H-UCL | 283 | | | | 90% Chebyshev (MVUE) UCL | | 244.1 |
| 685 | | | | | 95% Chebyshev (MVUE) UCL | 293.1 | | | | 97.5% Chebyshev (MVUE) UCL | | 361.3 |
| 686 | | | | | 99% Chebyshev (MVUE) UCL | 495.1 | | | | | | |
| 687 | | | | | | | | | | | | |
| 688 | Nonparametric Distribution Free UCL Statistics | | | | | | | | | | | |
| 689 | Data do not follow a Discernible Distribution (0.05) | | | | | | | | | | | |
| 690 | | | | | | | | | | | | |
| 691 | Nonparametric Distribution Free UCLs | | | | | | | | | | | |
| 692 | | | | | 95% CLT UCL | 131.3 | | | | 95% Jackknife UCL | | 132.8 |
| 693 | | | | | 95% Standard Bootstrap UCL | 130.3 | | | | 95% Bootstrap-t UCL | | 128.9 |
| 694 | | | | | 95% Hall's Bootstrap UCL | 128.3 | | | | 95% Percentile Bootstrap UCL | | 129.4 |
| 695 | | | | | 95% BCA Bootstrap UCL | 126.5 | | | | | | |
| 696 | | | | | 90% Chebyshev(Mean, Sd) UCL | 146.1 | | | | 95% Chebyshev(Mean, Sd) UCL | | 161 |
| 697 | | | | | 97.5% Chebyshev(Mean, Sd) UCL | 181.6 | | | | 99% Chebyshev(Mean, Sd) UCL | | 222.1 |
| 698 | | | | | | | | | | | | |
| 699 | Suggested UCL to Use | | | | | | | | | | | |
| 700 | | | | | 95% Chebyshev (Mean, Sd) UCL | 161 | | | | | | |
| 701 | | | | | | | | | | | | |
| 702 | Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. | | | | | | | | | | | |
| 703 | These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) | | | | | | | | | | | |
| 704 | and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. | | | | | | | | | | | |
| 705 | For additional insight the user may want to consult a statistician. | | | | | | | | | | | |
| 706 | | | | | | | | | | | | |
| 707 | Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be | | | | | | | | | | | |
| 708 | reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets. | | | | | | | | | | | |
| 709 | | | | | | | | | | | | |