

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	e/Time of Computation		8/13/2015 1:50:18 PM									
5	From File		ProUCLinput_12-004(a)_0-5.xls									
6	Full Precision		OFF									
7	Confidence Coefficient		95%									
8	f Bootstrap Operations		2000									
9												
10												
11	Aluminum											
12												
13	General Statistics											
14	Total Number of Observations				31		Number of Distinct Observations				31	
15							Number of Missing Observations				0	
16	Minimum				1600		Mean				5327	
17	Maximum				18300		Median				4600	
18	SD				3534		Std. Error of Mean				634.7	
19	Coefficient of Variation				0.66		Skewness				1.74	
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic				0.85		Shapiro Wilk GOF Test					
23	5% Shapiro Wilk Critical Value				0.92		Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic				0.14		Lilliefors GOF Test					
25	5% Lilliefors Critical Value				0.15		Data appear Normal at 5% Significance Level					
26	Data appear Approximate 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				6405		95% Adjusted-CLT UCL (Chen-1995)				6583	
31							95% Modified-t UCL (Johnson-1978)				6438	
32												
33	Gamma GOF Test											
34	A-D Test Statistic				0.42		Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value				0.75		data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic				0.11		Kolmogrov-Smirnoff Gamma GOF Test					
37	5% K-S Critical Value				0.15		data appear Gamma Distributed at 5% Significance Level					
38	Detected data appear Gamma Distributed at 5% Significance Level											
39												
40	Gamma Statistics											
41	k hat (MLE)				2.77		k star (bias corrected MLE)				2.53	
42	Theta hat (MLE)				1917		Theta star (bias corrected MLE)				2105	
43	nu hat (MLE)				172.3		nu star (bias corrected)				156.9	
44	MLE Mean (bias corrected)				5327		MLE Sd (bias corrected)				3349	
45							Approximate Chi Square Value (0.05)				129	
46	Adjusted Level of Significance				0.04		Adjusted Chi Square Value				127.6	
47												
48	Assuming Gamma Distribution											
49	Approximate Gamma UCL (use when n>=50))				6482		Adjusted Gamma UCL (use when n<50)				6554	
50												
51	Lognormal GOF Test											
52	Shapiro Wilk Test Statistic				0.95		Shapiro Wilk Lognormal GOF Test					
53	5% Shapiro Wilk Critical Value				0.92		Data appear Lognormal at 5% Significance Level					
54	Lilliefors Test Statistic				0.11		Lilliefors Lognormal GOF Test					
55	5% Lilliefors Critical Value				0.15		Data appear Lognormal at 5% Significance Level					
56	Data appear Lognormal at 5% Significance Level											
57												
58	Lognormal Statistics											
59	Minimum of Logged Data				7.37		Mean of logged Data				8.39	
60	Maximum of Logged Data				9.81		SD of logged Data				0.62	
61												
62	Assuming Lognormal Distribution											
63	95% H-UCL				6778		90% Chebyshev (MVUE) UCL				7252	

	A	B	C	D	E	F	G	H	I	J	K	L	
64		95% Chebyshev (MVUE) UCL				8125	97.5% Chebyshev (MVUE) UCL				9337		
65		99% Chebyshev (MVUE) UCL				11717							
66													
67		Nonparametric Distribution Free UCL Statistics											
68		Data appear to follow a Discernible Distribution at 5% Significance Level											
69													
70		Nonparametric Distribution Free UCLs											
71		95% CLT UCL				6371	95% Jackknife UCL				6405		
72		95% Standard Bootstrap UCL				6364	95% Bootstrap-t UCL				6729		
73		95% Hall's Bootstrap UCL				6993	95% Percentile Bootstrap UCL				6394		
74		95% BCA Bootstrap UCL				6539							
75		90% Chebyshev(Mean, Sd) UCL				7231	95% Chebyshev(Mean, Sd) UCL				8094		
76		97.5% Chebyshev(Mean, Sd) UCL				9291	99% Chebyshev(Mean, Sd) UCL				11642		
77													
78		Suggested UCL to Use											
79		95% Student's-t UCL				6405							
80													
81		Recommendations regarding the selection of a 95% UCL are provided to help the user to select the most appropriate											
82		recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and											
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		Antimony											
87													
88		General Statistics											
89		Total Number of Observations				31	Number of Distinct Observations				22		
90		Number of Detects				8	Number of Non-Detects				23		
91		Number of Distinct Detects				8	Number of Distinct Non-Detects				14		
92		Minimum Detect				0.36	Minimum Non-Detect				0.63		
93		Maximum Detect				1.36	Maximum Non-Detect				1.26		
94		Variance Detects				0.14	Percent Non-Detects				74.11		
95		Mean Detects				0.67	SD Detects				0.38		
96		Median Detects				0.46	CV Detects				0.56		
97		Skewness Detects				0.97	Kurtosis Detects				-0.65		
98		Mean of Logged Detects				-0.51	SD of Logged Detects				0.52		
99													
100		Normal GOF Test on Detects Only											
101		Shapiro Wilk Test Statistic				0.80	Shapiro Wilk GOF Test						
102		5% Shapiro Wilk Critical Value				0.81	Detected Data Not Normal at 5% Significance Level						
103		Lilliefors Test Statistic				0.33	Lilliefors GOF Test						
104		5% Lilliefors Critical Value				0.31	Detected Data Not Normal at 5% Significance Level						
105		Detected Data Not Normal at 5% Significance Level											
106													
107		Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
108		Mean				0.54	Standard Error of Mean				0.07		
109		SD				0.26	95% KM (BCA) UCL				0.69		
110		95% KM (t) UCL				0.67	95% KM (Percentile Bootstrap) UCL				0.67		
111		95% KM (z) UCL				0.67	95% KM Bootstrap t UCL				0.76		
112		90% KM Chebyshev UCL				0.77	95% KM Chebyshev UCL				0.88		
113		97.5% KM Chebyshev UCL				1.02	99% KM Chebyshev UCL				1.31		
114													
115		Gamma GOF Tests on Detected Observations Only											
116		A-D Test Statistic				0.74	Anderson-Darling GOF Test						
117		5% A-D Critical Value				0.71	Detected Data Not Gamma Distributed at 5% Significance Level						
118		K-S Test Statistic				0.32	Kolmogrov-Smirnoff GOF						
119		5% K-S Critical Value				0.29	Detected Data Not Gamma Distributed at 5% Significance Level						
120		Detected Data Not Gamma Distributed at 5% Significance Level											
121													
122		Gamma Statistics on Detected Data Only											
123		k hat (MLE)				4.06	k star (bias corrected MLE)				2.62		
124		Theta hat (MLE)				0.16	Theta star (bias corrected MLE)				0.25		
125		nu hat (MLE)				65.0	nu star (bias corrected)				42		
126		MLE Mean (bias corrected)				0.67	MLE Sd (bias corrected)				0.41		

	A	B	C	D	E	F	G	H	I	J	K	L
127												
128	Gamma Kaplan-Meier (KM) Statistics											
129	k hat (KM)				4.24		nu hat (KM)				263.2	
130	Approximate Chi Square Value (263.17, α)				226.6		Adjusted Chi Square Value (263.17, β)				224.7	
131	Approximate KM-UCL (use when $n \geq 50$)				0.63		Gamma Adjusted KM-UCL (use when $n < 50$)				0.63	
132												
133	Gamma ROS Statistics using Imputed Non-Detects											
134	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
135	GROS may not be used when kstar of detected data is small such as < 0.1											
136	For such situations, GROS method tends to yield inflated values of UCLs and BTVs											
137	Gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
138	Minimum				0.36		Mean				0.53	
139	Maximum				1.36		Median				0.47	
140	SD				0.22		CV				0.41	
141	k hat (MLE)				8.57		k star (bias corrected MLE)				7.76	
142	Theta hat (MLE)				0.06		Theta star (bias corrected MLE)				0.06	
143	nu hat (MLE)				531.6		nu star (bias corrected)				481.5	
144	MLE Mean (bias corrected)				0.53		MLE Sd (bias corrected)				0.19	
145							Adjusted Level of Significance (β)				0.04	
146	Approximate Chi Square Value (481.46, α)				431.6		Adjusted Chi Square Value (481.46, β)				429	
147	Gamma Approximate UCL (use when $n \geq 50$)				0.60		Gamma Adjusted UCL (use when $n < 50$)				0.60	
148												
149	Lognormal GOF Test on Detected Observations Only											
150	Shapiro Wilk Test Statistic				0.83		Shapiro Wilk GOF Test					
151	5% Shapiro Wilk Critical Value				0.81		Detected Data appear Lognormal at 5% Significance Level					
152	Lilliefors Test Statistic				0.30		Lilliefors GOF Test					
153	5% Lilliefors Critical Value				0.31		Detected Data appear Lognormal at 5% Significance Level					
154	Detected Data appear Lognormal at 5% Significance Level											
155												
156	Lognormal ROS Statistics Using Imputed Non-Detects											
157	Mean in Original Scale				0.53		Mean in Log Scale				-0.67	
158	SD in Original Scale				0.21		SD in Log Scale				0.31	
159	95% t UCL (assumes normality of ROS data)				0.60		95% Percentile Bootstrap UCL				0.60	
160	95% BCA Bootstrap UCL				0.61		95% Bootstrap t UCL				0.64	
161	95% H-UCL (Log ROS)				0.59							
162												
163	UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed											
164	KM Mean (logged)				-0.69		95% H-UCL (KM -Log)				0.61	
165	KM SD (logged)				0.38		95% Critical H Value (KM-Log)				1.84	
166	KM Standard Error of Mean (logged)				0.11							
167												
168	DL/2 Statistics											
169	DL/2 Normal					DL/2 Log-Transformed						
170	Mean in Original Scale				0.57		Mean in Log Scale				-0.60	
171	SD in Original Scale				0.20		SD in Log Scale				0.29	
172	95% t UCL (Assumes normality)				0.63		95% H-Stat UCL				0.62	
173	DL/2 is not a recommended method, provided for comparisons and historical reasons											
174												
175	Nonparametric Distribution Free UCL Statistics											
176	Detected Data appear Lognormal Distributed at 5% Significance Level											
177												
178	Suggested UCL to Use											
179	95% KM (t) UCL				0.67		95% KM (% Bootstrap) UCL				0.67	
180												
181	Recommendations regarding the selection of a 95% UCL are provided to help the user to select the most appropriate											
182	Recommendations are based upon data size, data distribution, and skewness.											
183	Recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and											
184	Simulation results will not cover all Real World data sets; for additional insight the user may want to consult											
185												
186												
187	Arsenic											
188												
189	General Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
190	Total Number of Observations					31	Number of Distinct Observations					29
191							Number of Missing Observations					0
192	Minimum					0.45	Mean					1.61
193	Maximum					3.14	Median					1.41
194	SD					0.69	Std. Error of Mean					0.12
195	Coefficient of Variation					0.43	Skewness					0.44
196												
197	Normal GOF Test											
198	Shapiro Wilk Test Statistic					0.95	Shapiro Wilk GOF Test					
199	5% Shapiro Wilk Critical Value					0.92	Data appear Normal at 5% Significance Level					
200	Lilliefors Test Statistic					0.13	Lilliefors GOF Test					
201	5% Lilliefors Critical Value					0.15	Data appear Normal at 5% Significance Level					
202	Data appear Normal at 5% Significance Level											
203												
204	Assuming Normal Distribution											
205	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
206	95% Student's-t UCL					1.82	95% Adjusted-CLT UCL (Chen-1995)					1.83
207							95% Modified-t UCL (Johnson-1978)					1.83
208												
209	Gamma GOF Test											
210	A-D Test Statistic					0.27	Anderson-Darling Gamma GOF Test					
211	5% A-D Critical Value					0.74	data appear Gamma Distributed at 5% Significance Level					
212	K-S Test Statistic					0.08	Kolmogrov-Smirnoff Gamma GOF Test					
213	5% K-S Critical Value					0.15	data appear Gamma Distributed at 5% Significance Level					
214	Detected data appear Gamma Distributed at 5% Significance Level											
215												
216	Gamma Statistics											
217	k hat (MLE)					5.30	k star (bias corrected MLE)					4.81
218	Theta hat (MLE)					0.30	Theta star (bias corrected MLE)					0.33
219	nu hat (MLE)					328.7	nu star (bias corrected)					298.2
220	MLE Mean (bias corrected)					1.61	MLE Sd (bias corrected)					0.73
221							Approximate Chi Square Value (0.05)					259.2
222	Adjusted Level of Significance					0.04	Adjusted Chi Square Value					257.2
223												
224	Assuming Gamma Distribution											
225	Approximate Gamma UCL (use when n>=50))					1.86	Adjusted Gamma UCL (use when n<50)					1.87
226												
227	Lognormal GOF Test											
228	Shapiro Wilk Test Statistic					0.96	Shapiro Wilk Lognormal GOF Test					
229	5% Shapiro Wilk Critical Value					0.92	Data appear Lognormal at 5% Significance Level					
230	Lilliefors Test Statistic					0.09	Lilliefors Lognormal GOF Test					
231	5% Lilliefors Critical Value					0.15	Data appear Lognormal at 5% Significance Level					
232	Data appear Lognormal at 5% Significance Level											
233												
234	Lognormal Statistics											
235	Minimum of Logged Data					-0.79	Mean of logged Data					0.38
236	Maximum of Logged Data					1.14	SD of logged Data					0.46
237												
238	Assuming Lognormal Distribution											
239	95% H-UCL					1.91	90% Chebyshev (MVUE) UCL					2.04
240	95% Chebyshev (MVUE) UCL					2.23	97.5% Chebyshev (MVUE) UCL					2.50
241	99% Chebyshev (MVUE) UCL					3.02						
242												
243	Nonparametric Distribution Free UCL Statistics											
244	Data appear to follow a Discernible Distribution at 5% Significance Level											
245												
246	Nonparametric Distribution Free UCLs											
247	95% CLT UCL					1.82	95% Jackknife UCL					1.82
248	95% Standard Bootstrap UCL					1.81	95% Bootstrap-t UCL					1.83
249	95% Hall's Bootstrap UCL					1.83	95% Percentile Bootstrap UCL					1.81
250	95% BCA Bootstrap UCL					1.81						
251	90% Chebyshev(Mean, Sd) UCL					1.99	95% Chebyshev(Mean, Sd) UCL					2.16
252	97.5% Chebyshev(Mean, Sd) UCL					2.39	99% Chebyshev(Mean, Sd) UCL					2.86

	A	B	C	D	E	F	G	H	I	J	K	L	
253													
254	Suggested UCL to Use												
255	95% Student's-t UCL					1.82							
256													
257	tions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate												
258	ommendations are based upon the results of the simulation studies summarized in Singh, Singh, and												
259	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets												
260	For additional insight the user may want to consult a statistician.												
261													
262													
263	Barium												
264													
265	General Statistics												
266	Total Number of Observations					31		Number of Distinct Observations					31
267								Number of Missing Observations					0
268	Minimum					10.4		Mean					68.8
269	Maximum					214		Median					48.4
270	SD					55.2		Std. Error of Mean					9.92
271	Coefficient of Variation					0.80		Skewness					1.48
272													
273	Normal GOF Test												
274	Shapiro Wilk Test Statistic					0.81		Shapiro Wilk GOF Test					
275	5% Shapiro Wilk Critical Value					0.92		Data Not Normal at 5% Significance Level					
276	Lilliefors Test Statistic					0.20		Lilliefors GOF Test					
277	5% Lilliefors Critical Value					0.15		Data Not Normal at 5% Significance Level					
278	Data Not Normal at 5% Significance Level												
279													
280	Assuming Normal Distribution												
281	95% Normal UCL					95% UCLs (Adjusted for Skewness)							
282	95% Student's-t UCL					85.7		95% Adjusted-CLT UCL (Chen-1995)					88
283								95% Modified-t UCL (Johnson-1978)					86.1
284													
285	Gamma GOF Test												
286	A-D Test Statistic					0.49		Anderson-Darling Gamma GOF Test					
287	5% A-D Critical Value					0.75		data appear Gamma Distributed at 5% Significance Level					
288	K-S Test Statistic					0.10		Kolmogorov-Smirnoff Gamma GOF Test					
289	5% K-S Critical Value					0.16		data appear Gamma Distributed at 5% Significance Level					
290	Detected data appear Gamma Distributed at 5% Significance Level												
291													
292	Gamma Statistics												
293	k hat (MLE)					1.93		k star (bias corrected MLE)					1.77
294	Theta hat (MLE)					35.5		Theta star (bias corrected MLE)					38.8
295	nu hat (MLE)					120.1		nu star (bias corrected)					109.8
296	MLE Mean (bias corrected)					68.8		MLE Sd (bias corrected)					51.7
297								Approximate Chi Square Value (0.05)					86.6
298	Adjusted Level of Significance					0.04		Adjusted Chi Square Value					85.4
299													
300	Assuming Gamma Distribution												
301	roximate Gamma UCL (use when n>=50)					87.3		Adjusted Gamma UCL (use when n<50)					88.4
302													
303	Lognormal GOF Test												
304	Shapiro Wilk Test Statistic					0.97		Shapiro Wilk Lognormal GOF Test					
305	5% Shapiro Wilk Critical Value					0.92		Data appear Lognormal at 5% Significance Level					
306	Lilliefors Test Statistic					0.06		Lilliefors Lognormal GOF Test					
307	5% Lilliefors Critical Value					0.15		Data appear Lognormal at 5% Significance Level					
308	Data appear Lognormal at 5% Significance Level												
309													
310	Lognormal Statistics												
311	Minimum of Logged Data					2.34		Mean of logged Data					3.95
312	Maximum of Logged Data					5.36		SD of logged Data					0.76
313													
314	Assuming Lognormal Distribution												
315	95% H-UCL					94.3		90% Chebyshev (MVUE) UCL					100.1

	A	B	C	D	E	F	G	H	I	J	K	L
316		95% Chebyshev (MVUE) UCL				114.2	97.5% Chebyshev (MVUE) UCL				133.8	
317		99% Chebyshev (MVUE) UCL				172.2						
318												
319	Nonparametric Distribution Free UCL Statistics											
320	Data appear to follow a Discernible Distribution at 5% Significance Level											
321												
322	Nonparametric Distribution Free UCLs											
323		95% CLT UCL				85.11	95% Jackknife UCL				85.7	
324		95% Standard Bootstrap UCL				84.69	95% Bootstrap-t UCL				89.1	
325		95% Hall's Bootstrap UCL				87.73	95% Percentile Bootstrap UCL				85.34	
326		95% BCA Bootstrap UCL				86.90						
327		90% Chebyshev(Mean, Sd) UCL				98.63	95% Chebyshev(Mean, Sd) UCL				112.1	
328		97.5% Chebyshev(Mean, Sd) UCL				130.8	99% Chebyshev(Mean, Sd) UCL				167.6	
329												
330	Suggested UCL to Use											
331		95% Adjusted Gamma UCL				88.41						
332												
333	itions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate											
334	ommendations are based upon the results of the simulation studies summarized in Singh, Singh, and											
335	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets											
336	For additional insight the user may want to consult a statistician.											
337												
338	Cadmium											
339												
340	General Statistics											
341		Total Number of Observations				31	Number of Distinct Observations				29	
342		Number of Detects				5	Number of Non-Detects				26	
343		Number of Distinct Detects				5	Number of Distinct Non-Detects				24	
344		Minimum Detect				0.11	Minimum Non-Detect				0.50	
345		Maximum Detect				0.21	Maximum Non-Detect				0.62	
346		Variance Detects				0.001	Percent Non-Detects				83.8	
347		Mean Detects				0.14	SD Detects				0.034	
348		Median Detects				0.13	CV Detects				0.26	
349		Skewness Detects				2.06	Kurtosis Detects				4.47	
350		Mean of Logged Detects				-1.94	SD of Logged Detects				0.23	
351												
352	Normal GOF Test on Detects Only											
353		Shapiro Wilk Test Statistic				0.7	Shapiro Wilk GOF Test					
354		5% Shapiro Wilk Critical Value				0.76	Detected Data Not Normal at 5% Significance Level					
355		Lilliefors Test Statistic				0.42	Lilliefors GOF Test					
356		5% Lilliefors Critical Value				0.39	Detected Data Not Normal at 5% Significance Level					
357	Detected Data Not Normal at 5% Significance Level											
358												
359	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
360		Mean				0.14	Standard Error of Mean				0.01	
361		SD				0.034	95% KM (BCA) UCL				0.17	
362		95% KM (t) UCL				0.17	95% KM (Percentile Bootstrap) UCL				0.17	
363		95% KM (z) UCL				0.17	95% KM Bootstrap t UCL				0.64	
364		90% KM Chebyshev UCL				0.19	95% KM Chebyshev UCL				0.22	
365		97.5% KM Chebyshev UCL				0.25	99% KM Chebyshev UCL				0.31	
366												
367	Gamma GOF Tests on Detected Observations Only											
368		A-D Test Statistic				0.84	Anderson-Darling GOF Test					
369		5% A-D Critical Value				0.67	ed Data Not Gamma Distributed at 5% Significance Level					
370		K-S Test Statistic				0.42	Kolmogrov-Smirnoff GOF					
371		5% K-S Critical Value				0.35	ed Data Not Gamma Distributed at 5% Significance Level					
372	Detected Data Not Gamma Distributed at 5% Significance Level											
373												
374	Gamma Statistics on Detected Data Only											
375		k hat (MLE)				21.89	k star (bias corrected MLE)				8.89	
376		Theta hat (MLE)				0.006	Theta star (bias corrected MLE)				0.01	
377		nu hat (MLE)				218.9	nu star (bias corrected)				88.9	
378		MLE Mean (bias corrected)				0.14	MLE Sd (bias corrected)				0.04	

	A	B	C	D	E	F	G	H	I	J	K	L	
379													
380	Gamma Kaplan-Meier (KM) Statistics												
381	k hat (KM)				18.41				nu hat (KM)				1143
382	Approximate Chi Square Value (N/A, α)				1065				Adjusted Chi Square Value (N/A, β)				1061
383	Approximate KM-UCL (use when $n \geq 50$)				0.15				Gamma Adjusted KM-UCL (use when $n < 50$)				0.15
384													
385	Gamma ROS Statistics using Imputed Non-Detects												
386	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs												
387	GROS may not be used when kstar of detected data is small such as < 0.1												
388	For such situations, GROS method tends to yield inflated values of UCLs and BTVs												
389	Gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimate												
390	Minimum				0.11				Mean				0.14
391	Maximum				0.21				Median				0.14
392	SD				0.013				CV				0.10
393	k hat (MLE)				100.7				k star (bias corrected MLE)				90.9
394	Theta hat (MLE)				0.001				Theta star (bias corrected MLE)				0.001
395	nu hat (MLE)				6243				nu star (bias corrected)				5640
396	MLE Mean (bias corrected)				0.14				MLE Sd (bias corrected)				0.01
397									Adjusted Level of Significance (β)				0.04
398	Approximate Chi Square Value (N/A, α)				5466				Adjusted Chi Square Value (N/A, β)				5457
399	Gamma Approximate UCL (use when $n \geq 50$)				0.15				Gamma Adjusted UCL (use when $n < 50$)				0.15
400													
401	Lognormal GOF Test on Detected Observations Only												
402	Shapiro Wilk Test Statistic				0.74				Shapiro Wilk GOF Test				
403	5% Shapiro Wilk Critical Value				0.76				Detected Data Not Lognormal at 5% Significance Level				
404	Lilliefors Test Statistic				0.40				Lilliefors GOF Test				
405	5% Lilliefors Critical Value				0.39				Detected Data Not Lognormal at 5% Significance Level				
406	Detected Data Not Lognormal at 5% Significance Level												
407													
408	Lognormal ROS Statistics Using Imputed Non-Detects												
409	Mean in Original Scale				0.14				Mean in Log Scale				-1.94
410	SD in Original Scale				0.013				SD in Log Scale				0.09
411	95% t UCL (assumes normality of ROS data)				0.14				95% Percentile Bootstrap UCL				0.14
412	95% BCA Bootstrap UCL				0.15				95% Bootstrap t UCL				0.15
413	95% H-UCL (Log ROS)				N/A								
414													
415	DL/2 Statistics												
416	DL/2 Normal								DL/2 Log-Transformed				
417	Mean in Original Scale				0.25				Mean in Log Scale				-1.39
418	SD in Original Scale				0.051				SD in Log Scale				0.26
419	95% t UCL (Assumes normality)				0.27				95% H-Stat UCL				0.28
420	DL/2 is not a recommended method, provided for comparisons and historical reasons												
421													
422	Nonparametric Distribution Free UCL Statistics												
423	Data do not follow a Discernible Distribution at 5% Significance Level												
424													
425	Suggested UCL to Use												
426	95% KM (t) UCL				0.17				95% KM (% Bootstrap) UCL				0.17
427													
428	Recommendations regarding the selection of a 95% UCL are provided to help the user to select the most appropriate												
429	Recommendations are based upon data size, data distribution, and skewness.												
430	Recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and												
431	Recommendations results will not cover all Real World data sets; for additional insight the user may want to consult												
432													
433													
434	Calcium												
435													
436	General Statistics												
437	Total Number of Observations				31				Number of Distinct Observations				30
438									Number of Missing Observations				0
439	Minimum				264				Mean				1698
440	Maximum				5100				Median				1300
441	SD				1341				Std. Error of Mean				240.9

	A	B	C	D	E	F	G	H	I	J	K	L
442	Coefficient of Variation					0.79	Skewness					1.31
443												
444	Normal GOF Test											
445	Shapiro Wilk Test Statistic					0.83	Shapiro Wilk GOF Test					
446	5% Shapiro Wilk Critical Value					0.92	Data Not Normal at 5% Significance Level					
447	Lilliefors Test Statistic					0.15	Lilliefors GOF Test					
448	5% Lilliefors Critical Value					0.15	Data appear Normal at 5% Significance Level					
449	Data appear Approximate Normal at 5% Significance Level											
450												
451	Assuming Normal Distribution											
452	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
453	95% Student's-t UCL					2107	95% Adjusted-CLT UCL (Chen-1995)					2155
454							95% Modified-t UCL (Johnson-1978)					2117
455												
456	Gamma GOF Test											
457	A-D Test Statistic					0.37	Anderson-Darling Gamma GOF Test					
458	5% A-D Critical Value					0.76	data appear Gamma Distributed at 5% Significance Level					
459	K-S Test Statistic					0.09	Kolmogorov-Smirnov Gamma GOF Test					
460	5% K-S Critical Value					0.16	data appear Gamma Distributed at 5% Significance Level					
461	Detected data appear Gamma Distributed at 5% Significance Level											
462												
463	Gamma Statistics											
464	k hat (MLE)					1.85	k star (bias corrected MLE)					1.70
465	Theta hat (MLE)					913.4	Theta star (bias corrected MLE)					998.5
466	nu hat (MLE)					115.3	nu star (bias corrected)					105.5
467	MLE Mean (bias corrected)					1698	MLE Sd (bias corrected)					1302
468							Approximate Chi Square Value (0.05)					82.7
469	Adjusted Level of Significance					0.04	Adjusted Chi Square Value					81.6
470												
471	Assuming Gamma Distribution											
472	Approximate Gamma UCL (use when n>=50))					2164	Adjusted Gamma UCL (use when n<50)					2194
473												
474	Lognormal GOF Test											
475	Shapiro Wilk Test Statistic					0.97	Shapiro Wilk Lognormal GOF Test					
476	5% Shapiro Wilk Critical Value					0.92	Data appear Lognormal at 5% Significance Level					
477	Lilliefors Test Statistic					0.07	Lilliefors Lognormal GOF Test					
478	5% Lilliefors Critical Value					0.15	Data appear Lognormal at 5% Significance Level					
479	Data appear Lognormal at 5% Significance Level											
480												
481	Lognormal Statistics											
482	Minimum of Logged Data					5.57	Mean of logged Data					7.14
483	Maximum of Logged Data					8.53	SD of logged Data					0.79
484												
485	Assuming Lognormal Distribution											
486	95% H-UCL					2394	90% Chebyshev (MVUE) UCL					2529
487	95% Chebyshev (MVUE) UCL					2897	97.5% Chebyshev (MVUE) UCL					3408
488	99% Chebyshev (MVUE) UCL					4411						
489												
490	Nonparametric Distribution Free UCL Statistics											
491	Data appear to follow a Discernible Distribution at 5% Significance Level											
492												
493	Nonparametric Distribution Free UCLs											
494	95% CLT UCL					2095	95% Jackknife UCL					2107
495	95% Standard Bootstrap UCL					2085	95% Bootstrap-t UCL					2214
496	95% Hall's Bootstrap UCL					2151	95% Percentile Bootstrap UCL					2101
497	95% BCA Bootstrap UCL					2101						
498	90% Chebyshev(Mean, Sd) UCL					2421	95% Chebyshev(Mean, Sd) UCL					2748
499	97.5% Chebyshev(Mean, Sd) UCL					3203	99% Chebyshev(Mean, Sd) UCL					4095
500												
501	Suggested UCL to Use											
502	95% Student's-t UCL					2107						
503												
504	Questions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate											

	A	B	C	D	E	F	G	H	I	J	K	L
505	Recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and											
506	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets											
507	For additional insight the user may want to consult a statistician.											
508												
509	Cesium-137											
510												
511	General Statistics											
512	Total Number of Observations					31	Number of Distinct Observations					31
513	Number of Detects					17	Number of Non-Detects					14
514	Number of Distinct Detects					17	Number of Distinct Non-Detects					14
515	Minimum Detect					0.11	Minimum Non-Detect					-0.038
516	Maximum Detect					0.97	Maximum Non-Detect					0.08
517	Variance Detects					0.05	Percent Non-Detects					45.1
518	Mean Detects					0.36	SD Detects					0.23
519	Median Detects					0.35	CV Detects					0.65
520	Skewness Detects					1.13	Kurtosis Detects					1.43
521												
522	Normal GOF Test on Detects Only											
523	Shapiro Wilk Test Statistic					0.89	Shapiro Wilk GOF Test					
524	5% Shapiro Wilk Critical Value					0.89	Detected Data Not Normal at 5% Significance Level					
525	Lilliefors Test Statistic					0.14	Lilliefors GOF Test					
526	5% Lilliefors Critical Value					0.21	Detected Data appear Normal at 5% Significance Level					
527	Detected Data appear Approximate Normal at 5% Significance Level											
528												
529	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
530	Mean					0.18	Standard Error of Mean					0.04
531	SD					0.26	95% KM (BCA) UCL					0.26
532	95% KM (t) UCL					0.26	95% KM (Percentile Bootstrap) UCL					0.25
533	95% KM (z) UCL					0.26	95% KM Bootstrap t UCL					0.27
534	90% KM Chebyshev UCL					0.32	95% KM Chebyshev UCL					0.39
535	97.5% KM Chebyshev UCL					0.48	99% KM Chebyshev UCL					0.66
536												
537	Gamma GOF Tests on Detected Observations Only											
538	A-D Test Statistic					0.43	Anderson-Darling GOF Test					
539	5% A-D Critical Value					0.74	Data appear Gamma Distributed at 5% Significance Level					
540	K-S Test Statistic					0.17	Kolmogorov-Smirnov GOF					
541	5% K-S Critical Value					0.21	Data appear Gamma Distributed at 5% Significance Level					
542	Detected data appear Gamma Distributed at 5% Significance Level											
543												
544	Gamma Statistics on Detected Data Only											
545	k hat (MLE)					2.60	k star (bias corrected MLE)					2.18
546	Theta hat (MLE)					0.13	Theta star (bias corrected MLE)					0.16
547	nu hat (MLE)					88.5	nu star (bias corrected)					74.2
548	MLE Mean (bias corrected)					0.36	MLE Sd (bias corrected)					0.24
549												
550	Gamma Kaplan-Meier (KM) Statistics											
551	k hat (KM)					0.47	nu hat (KM)					29.6
552							Adjusted Level of Significance (β)					0.04
553	Approximate Chi Square Value (29.64, α)					18.2	Adjusted Chi Square Value (29.64, β)					17.7
554	Approximate KM-UCL (use when $n \geq 50$)					0.29	Gamma Adjusted KM-UCL (use when $n < 50$)					0.30
555												
556	DL/2 Statistics											
557	Mean in Original Scale					0.20	SD in Original Scale					0.24
558	95% t UCL (Assumes normality)					0.27						
559	DL/2 is not a recommended method, provided for comparisons and historical reasons											
560												
561	Nonparametric Distribution Free UCL Statistics											
562	Detected Data appear Approximate Normal Distributed at 5% Significance Level											
563												
564	Suggested UCL to Use											
565	95% KM (t) UCL					0.26	95% KM (Percentile Bootstrap) UCL					0.25
566												
567	Recommendations regarding the selection of a 95% UCL are provided to help the user to select the most appropriate											

	A	B	C	D	E	F	G	H	I	J	K	L
568	Recommendations are based upon data size, data distribution, and skewness.											
569	Recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and											
570	Simulations results will not cover all Real World data sets; for additional insight the user may want to cons											
571												
572												
573	Chromium											
574												
575	General Statistics											
576	Total Number of Observations				31		Number of Distinct Observations				30	
577							Number of Missing Observations				0	
578	Minimum				1.98		Mean				17.04	
579	Maximum				60.4		Median				13.7	
580	SD				13.54		Std. Error of Mean				2.43	
581	Coefficient of Variation				0.79		Skewness				1.58	
582												
583	Normal GOF Test											
584	Shapiro Wilk Test Statistic				0.84		Shapiro Wilk GOF Test					
585	5% Shapiro Wilk Critical Value				0.92		Data Not Normal at 5% Significance Level					
586	Lilliefors Test Statistic				0.19		Lilliefors GOF Test					
587	5% Lilliefors Critical Value				0.15		Data Not Normal at 5% Significance Level					
588	Data Not Normal at 5% Significance Level											
589												
590	Assuming Normal Distribution											
591	95% Normal UCL				95% UCLs (Adjusted for Skewness)							
592	95% Student's-t UCL				21.14		95% Adjusted-CLT UCL (Chen-1995)				21.74	
593							95% Modified-t UCL (Johnson-1978)				21.24	
594												
595	Gamma GOF Test											
596	A-D Test Statistic				0.37		Anderson-Darling Gamma GOF Test					
597	5% A-D Critical Value				0.76		data appear Gamma Distributed at 5% Significance Level					
598	K-S Test Statistic				0.10		Kolmogorov-Smirnov Gamma GOF Test					
599	5% K-S Critical Value				0.16		data appear Gamma Distributed at 5% Significance Level					
600	Detected data appear Gamma Distributed at 5% Significance Level											
601												
602	Gamma Statistics											
603	k hat (MLE)				1.83		k star (bias corrected MLE)				1.67	
604	Theta hat (MLE)				9.30		Theta star (bias corrected MLE)				10.14	
605	nu hat (MLE)				113.6		nu star (bias corrected)				103.9	
606	MLE Mean (bias corrected)				17.04		MLE Sd (bias corrected)				13.14	
607							Approximate Chi Square Value (0.05)				81.34	
608	Adjusted Level of Significance				0.04		Adjusted Chi Square Value				80.24	
609												
610	Assuming Gamma Distribution											
611	Approximate Gamma UCL (use when n>=50)				21.74		Adjusted Gamma UCL (use when n<50)				22.04	
612												
613	Lognormal GOF Test											
614	Shapiro Wilk Test Statistic				0.96		Shapiro Wilk Lognormal GOF Test					
615	5% Shapiro Wilk Critical Value				0.92		Data appear Lognormal at 5% Significance Level					
616	Lilliefors Test Statistic				0.11		Lilliefors Lognormal GOF Test					
617	5% Lilliefors Critical Value				0.15		Data appear Lognormal at 5% Significance Level					
618	Data appear Lognormal at 5% Significance Level											
619												
620	Lognormal Statistics											
621	Minimum of Logged Data				0.68		Mean of logged Data				2.53	
622	Maximum of Logged Data				4.10		SD of logged Data				0.82	
623												
624	Assuming Lognormal Distribution											
625	95% H-UCL				24.84		90% Chebyshev (MVUE) UCL				26.14	
626	95% Chebyshev (MVUE) UCL				30.04		97.5% Chebyshev (MVUE) UCL				35.44	
627	99% Chebyshev (MVUE) UCL				46.14							
628												
629	Nonparametric Distribution Free UCL Statistics											
630	Data appear to follow a Discernible Distribution at 5% Significance Level											

	A	B	C	D	E	F	G	H	I	J	K	L
631												
632	Nonparametric Distribution Free UCLs											
633	95% CLT UCL				21.04	95% Jackknife UCL				21.14		
634	95% Standard Bootstrap UCL				21.04	95% Bootstrap-t UCL				22.14		
635	95% Hall's Bootstrap UCL				22.54	95% Percentile Bootstrap UCL				21.14		
636	95% BCA Bootstrap UCL				21.84							
637	90% Chebyshev(Mean, Sd) UCL				24.34	95% Chebyshev(Mean, Sd) UCL				27.64		
638	97.5% Chebyshev(Mean, Sd) UCL				32.24	99% Chebyshev(Mean, Sd) UCL				41.34		
639												
640	Suggested UCL to Use											
641	95% Adjusted Gamma UCL				22.04							
642												
643	Directions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate											
644	recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and											
645	Singh and Singh (2003). However, simulations results will not cover all Real World data sets											
646	For additional insight the user may want to consult a statistician.											
647												
648												
649	Cobalt											
650												
651	General Statistics											
652	Total Number of Observations				31	Number of Distinct Observations				31		
653						Number of Missing Observations				0		
654	Minimum				0.39	Mean				3.07		
655	Maximum				8.12	Median				2.57		
656	SD				2.18	Std. Error of Mean				0.39		
657	Coefficient of Variation				0.71	Skewness				0.64		
658												
659	Normal GOF Test											
660	Shapiro Wilk Test Statistic				0.90	Shapiro Wilk GOF Test						
661	5% Shapiro Wilk Critical Value				0.92	Data Not Normal at 5% Significance Level						
662	Lilliefors Test Statistic				0.19	Lilliefors GOF Test						
663	5% Lilliefors Critical Value				0.15	Data Not Normal at 5% Significance Level						
664	Data Not Normal at 5% Significance Level											
665												
666	Assuming Normal Distribution											
667	95% Normal UCL					95% UCLs (Adjusted for Skewness)						
668	95% Student's-t UCL				3.73	95% Adjusted-CLT UCL (Chen-1995)				3.76		
669						95% Modified-t UCL (Johnson-1978)				3.74		
670												
671	Gamma GOF Test											
672	A-D Test Statistic				0.53	Anderson-Darling Gamma GOF Test						
673	5% A-D Critical Value				0.76	data appear Gamma Distributed at 5% Significance Level						
674	K-S Test Statistic				0.13	Kolmogorov-Smirnov Gamma GOF Test						
675	5% K-S Critical Value				0.16	data appear Gamma Distributed at 5% Significance Level						
676	Detected data appear Gamma Distributed at 5% Significance Level											
677												
678	Gamma Statistics											
679	k hat (MLE)				1.82	k star (bias corrected MLE)				1.67		
680	Theta hat (MLE)				1.68	Theta star (bias corrected MLE)				1.83		
681	nu hat (MLE)				113.1	nu star (bias corrected)				103.5		
682	MLE Mean (bias corrected)				3.07	MLE Sd (bias corrected)				2.37		
683						Approximate Chi Square Value (0.05)				81.04		
684	Adjusted Level of Significance				0.04	Adjusted Chi Square Value				79.94		
685												
686	Assuming Gamma Distribution											
687	Approximate Gamma UCL (use when n>=50)				3.92	Adjusted Gamma UCL (use when n<50)				3.97		
688												
689	Lognormal GOF Test											
690	Shapiro Wilk Test Statistic				0.94	Shapiro Wilk Lognormal GOF Test						
691	5% Shapiro Wilk Critical Value				0.92	Data appear Lognormal at 5% Significance Level						
692	Lilliefors Test Statistic				0.13	Lilliefors Lognormal GOF Test						
693	5% Lilliefors Critical Value				0.15	Data appear Lognormal at 5% Significance Level						

	A	B	C	D	E	F	G	H	I	J	K	L
694	Data appear Lognormal at 5% Significance Level											
695												
696	Lognormal Statistics											
697	Minimum of Logged Data				-0.91		Mean of logged Data				0.82	
698	Maximum of Logged Data				2.09		SD of logged Data				0.84	
699												
700	Assuming Lognormal Distribution											
701	95% H-UCL				4.59		90% Chebyshev (MVUE) UCL				4.82	
702	95% Chebyshev (MVUE) UCL				5.55		97.5% Chebyshev (MVUE) UCL				6.57	
703	99% Chebyshev (MVUE) UCL				8.57							
704												
705	Nonparametric Distribution Free UCL Statistics											
706	Data appear to follow a Discernible Distribution at 5% Significance Level											
707												
708	Nonparametric Distribution Free UCLs											
709	95% CLT UCL				3.71		95% Jackknife UCL				3.73	
710	95% Standard Bootstrap UCL				3.70		95% Bootstrap-t UCL				3.84	
711	95% Hall's Bootstrap UCL				3.72		95% Percentile Bootstrap UCL				3.74	
712	95% BCA Bootstrap UCL				3.76							
713	90% Chebyshev(Mean, Sd) UCL				4.24		95% Chebyshev(Mean, Sd) UCL				4.78	
714	97.5% Chebyshev(Mean, Sd) UCL				5.52		99% Chebyshev(Mean, Sd) UCL				6.97	
715												
716	Suggested UCL to Use											
717	95% Adjusted Gamma UCL				3.97							
718												
719	Recommendations regarding the selection of a 95% UCL are provided to help the user to select the most appropriate											
720	recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and											
721	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets											
722	For additional insight the user may want to consult a statistician.											
723												
724												
725	Copper											
726												
727	General Statistics											
728	Total Number of Observations				31		Number of Distinct Observations				30	
729							Number of Missing Observations				0	
730	Minimum				1.76		Mean				4.71	
731	Maximum				8.83		Median				4.15	
732	SD				1.93		Std. Error of Mean				0.34	
733	Coefficient of Variation				0.41		Skewness				0.58	
734												
735	Normal GOF Test											
736	Shapiro Wilk Test Statistic				0.94		Shapiro Wilk GOF Test					
737	5% Shapiro Wilk Critical Value				0.92		Data appear Normal at 5% Significance Level					
738	Lilliefors Test Statistic				0.13		Lilliefors GOF Test					
739	5% Lilliefors Critical Value				0.15		Data appear Normal at 5% Significance Level					
740	Data appear Normal at 5% Significance Level											
741												
742	Assuming Normal Distribution											
743	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
744	95% Student's-t UCL				5.30		95% Adjusted-CLT UCL (Chen-1995)				5.32	
745							95% Modified-t UCL (Johnson-1978)				5.31	
746												
747	Gamma GOF Test											
748	A-D Test Statistic				0.21		Anderson-Darling Gamma GOF Test					
749	5% A-D Critical Value				0.74		data appear Gamma Distributed at 5% Significance Level					
750	K-S Test Statistic				0.08		Kolmogrov-Smirnoff Gamma GOF Test					
751	5% K-S Critical Value				0.15		data appear Gamma Distributed at 5% Significance Level					
752	Detected data appear Gamma Distributed at 5% Significance Level											
753												
754	Gamma Statistics											
755	k hat (MLE)				6.15		k star (bias corrected MLE)				5.57	
756	Theta hat (MLE)				0.76		Theta star (bias corrected MLE)				0.84	

	A	B	C	D	E	F	G	H	I	J	K	L
757	nu hat (MLE)					381.4	nu star (bias corrected)					345.8
758	MLE Mean (bias corrected)					4.71	MLE Sd (bias corrected)					1.99
759							Approximate Chi Square Value (0.05)					303.8
760	Adjusted Level of Significance					0.04	Adjusted Chi Square Value					301.6
761												
762	Assuming Gamma Distribution											
763	oximate Gamma UCL (use when n>=50))]					5.36	Adjusted Gamma UCL (use when n<50)]					5.40
764												
765	Lognormal GOF Test											
766	Shapiro Wilk Test Statistic					0.97	Shapiro Wilk Lognormal GOF Test					
767	5% Shapiro Wilk Critical Value					0.92	Data appear Lognormal at 5% Significance Level					
768	Lilliefors Test Statistic					0.07	Lilliefors Lognormal GOF Test					
769	5% Lilliefors Critical Value					0.15	Data appear Lognormal at 5% Significance Level					
770	Data appear Lognormal at 5% Significance Level											
771												
772	Lognormal Statistics											
773	Minimum of Logged Data					0.56	Mean of logged Data					1.46
774	Maximum of Logged Data					2.17	SD of logged Data					0.42
775												
776	Assuming Lognormal Distribution											
777	95% H-UCL					5.47	90% Chebyshev (MVUE) UCL					5.83
778	95% Chebyshev (MVUE) UCL					6.33	97.5% Chebyshev (MVUE) UCL					7.03
779	99% Chebyshev (MVUE) UCL					8.40						
780												
781	Nonparametric Distribution Free UCL Statistics											
782	Data appear to follow a Discernible Distribution at 5% Significance Level											
783												
784	Nonparametric Distribution Free UCLs											
785	95% CLT UCL					5.28	95% Jackknife UCL					5.30
786	95% Standard Bootstrap UCL					5.27	95% Bootstrap-t UCL					5.35
787	95% Hall's Bootstrap UCL					5.33	95% Percentile Bootstrap UCL					5.30
788	95% BCA Bootstrap UCL					5.30						
789	90% Chebyshev(Mean, Sd) UCL					5.75	95% Chebyshev(Mean, Sd) UCL					6.23
790	97.5% Chebyshev(Mean, Sd) UCL					6.88	99% Chebyshev(Mean, Sd) UCL					8.17
791												
792	Suggested UCL to Use											
793	95% Student's-t UCL					5.30						
794												
795	ations regarding the selection of a 95% UCL are provided to help the user to select the most appropriate											
796	ommendations are based upon the results of the simulation studies summarized in Singh, Singh, and											
797	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets											
798	For additional insight the user may want to consult a statistician.											
799												
800												
801	Lead											
802												
803	General Statistics											
804	Total Number of Observations					31	Number of Distinct Observations					29
805							Number of Missing Observations					0
806	Minimum					4.72	Mean					9.63
807	Maximum					22.6	Median					8.18
808	SD					4.25	Std. Error of Mean					0.76
809	Coefficient of Variation					0.44	Skewness					1.42
810												
811	Normal GOF Test											
812	Shapiro Wilk Test Statistic					0.86	Shapiro Wilk GOF Test					
813	5% Shapiro Wilk Critical Value					0.92	Data Not Normal at 5% Significance Level					
814	Lilliefors Test Statistic					0.18	Lilliefors GOF Test					
815	5% Lilliefors Critical Value					0.15	Data Not Normal at 5% Significance Level					
816	Data Not Normal at 5% Significance Level											
817												
818	Assuming Normal Distribution											
819	95% Normal UCL						95% UCLs (Adjusted for Skewness)					

	A	B	C	D	E	F	G	H	I	J	K	L
820	95% Student's-t UCL					10.9	95% Adjusted-CLT UCL (Chen-1995)					11.1
821							95% Modified-t UCL (Johnson-1978)					10.9
822												
823	Gamma GOF Test											
824	A-D Test Statistic					0.61	Anderson-Darling Gamma GOF Test					
825	5% A-D Critical Value					0.74	data appear Gamma Distributed at 5% Significance Level					
826	K-S Test Statistic					0.13	Kolmogrov-Smirnoff Gamma GOF Test					
827	5% K-S Critical Value					0.15	data appear Gamma Distributed at 5% Significance Level					
828	Detected data appear Gamma Distributed at 5% Significance Level											
829												
830	Gamma Statistics											
831	k hat (MLE)					6.41	k star (bias corrected MLE)					5.81
832	Theta hat (MLE)					1.50	Theta star (bias corrected MLE)					1.65
833	nu hat (MLE)					397.4	nu star (bias corrected)					360.3
834	MLE Mean (bias corrected)					9.63	MLE Sd (bias corrected)					3.99
835							Approximate Chi Square Value (0.05)					317.3
836	Adjusted Level of Significance					0.04	Adjusted Chi Square Value					315.1
837												
838	Assuming Gamma Distribution											
839	Approximate Gamma UCL (use when n>=50)					10.9	Adjusted Gamma UCL (use when n<50)					11.0
840												
841	Lognormal GOF Test											
842	Shapiro Wilk Test Statistic					0.96	Shapiro Wilk Lognormal GOF Test					
843	5% Shapiro Wilk Critical Value					0.92	Data appear Lognormal at 5% Significance Level					
844	Lilliefors Test Statistic					0.11	Lilliefors Lognormal GOF Test					
845	5% Lilliefors Critical Value					0.15	Data appear Lognormal at 5% Significance Level					
846	Data appear Lognormal at 5% Significance Level											
847												
848	Lognormal Statistics											
849	Minimum of Logged Data					1.55	Mean of logged Data					2.18
850	Maximum of Logged Data					3.11	SD of logged Data					0.39
851												
852	Assuming Lognormal Distribution											
853	95% H-UCL					10.9	90% Chebyshev (MVUE) UCL					11.6
854	95% Chebyshev (MVUE) UCL					12.6	97.5% Chebyshev (MVUE) UCL					13.9
855	99% Chebyshev (MVUE) UCL					16.5						
856												
857	Nonparametric Distribution Free UCL Statistics											
858	Data appear to follow a Discernible Distribution at 5% Significance Level											
859												
860	Nonparametric Distribution Free UCLs											
861	95% CLT UCL					10.8	95% Jackknife UCL					10.9
862	95% Standard Bootstrap UCL					10.8	95% Bootstrap-t UCL					11.1
863	95% Hall's Bootstrap UCL					11.2	95% Percentile Bootstrap UCL					10.9
864	95% BCA Bootstrap UCL					11.0						
865	90% Chebyshev(Mean, Sd) UCL					11.9	95% Chebyshev(Mean, Sd) UCL					12.9
866	97.5% Chebyshev(Mean, Sd) UCL					14.4	99% Chebyshev(Mean, Sd) UCL					17.2
867												
868	Suggested UCL to Use											
869	95% Adjusted Gamma UCL					11.0						
870												
871	Recommendations regarding the selection of a 95% UCL are provided to help the user to select the most appropriate											
872	recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Singh											
873	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets											
874	For additional insight the user may want to consult a statistician.											
875												
876												
877	Magnesium											
878												
879	General Statistics											
880	Total Number of Observations					31	Number of Distinct Observations					29
881							Number of Missing Observations					0
882	Minimum					305	Mean					1024

	A	B	C	D	E	F	G	H	I	J	K	L
883	Maximum					2570	Median					853
884	SD					638.8	Std. Error of Mean					114.7
885	Coefficient of Variation					0.62	Skewness					0.82
886												
887	Normal GOF Test											
888	Shapiro Wilk Test Statistic					0.89	Shapiro Wilk GOF Test					
889	5% Shapiro Wilk Critical Value					0.92	Data Not Normal at 5% Significance Level					
890	Lilliefors Test Statistic					0.18	Lilliefors GOF Test					
891	5% Lilliefors Critical Value					0.15	Data Not Normal at 5% Significance Level					
892	Data Not Normal at 5% Significance Level											
893												
894	Assuming Normal Distribution											
895	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
896	95% Student's-t UCL					1219	95% Adjusted-CLT UCL (Chen-1995)					1231
897							95% Modified-t UCL (Johnson-1978)					1222
898												
899	Gamma GOF Test											
900	A-D Test Statistic					0.56	Anderson-Darling Gamma GOF Test					
901	5% A-D Critical Value					0.75	data appear Gamma Distributed at 5% Significance Level					
902	K-S Test Statistic					0.15	Kolmogrov-Smirnoff Gamma GOF Test					
903	5% K-S Critical Value					0.15	data appear Gamma Distributed at 5% Significance Level					
904	Detected data appear Gamma Distributed at 5% Significance Level											
905												
906	Gamma Statistics											
907	k hat (MLE)					2.77	k star (bias corrected MLE)					2.52
908	Theta hat (MLE)					369.8	Theta star (bias corrected MLE)					405.9
909	nu hat (MLE)					171.7	nu star (bias corrected)					156.4
910	MLE Mean (bias corrected)					1024	MLE Sd (bias corrected)					644.7
911							Approximate Chi Square Value (0.05)					128.5
912	Adjusted Level of Significance					0.04	Adjusted Chi Square Value					127.1
913												
914	Assuming Gamma Distribution											
915	Approximate Gamma UCL (use when n>=50)					1247	Adjusted Gamma UCL (use when n<50)					1260
916												
917	Lognormal GOF Test											
918	Shapiro Wilk Test Statistic					0.94	Shapiro Wilk Lognormal GOF Test					
919	5% Shapiro Wilk Critical Value					0.92	Data appear Lognormal at 5% Significance Level					
920	Lilliefors Test Statistic					0.12	Lilliefors Lognormal GOF Test					
921	5% Lilliefors Critical Value					0.15	Data appear Lognormal at 5% Significance Level					
922	Data appear Lognormal at 5% Significance Level											
923												
924	Lognormal Statistics											
925	Minimum of Logged Data					5.72	Mean of logged Data					6.74
926	Maximum of Logged Data					7.85	SD of logged Data					0.63
927												
928	Assuming Lognormal Distribution											
929	95% H-UCL					1314	90% Chebyshev (MVUE) UCL					1406
930	95% Chebyshev (MVUE) UCL					1577	97.5% Chebyshev (MVUE) UCL					1814
931	99% Chebyshev (MVUE) UCL					2280						
932												
933	Nonparametric Distribution Free UCL Statistics											
934	Data appear to follow a Discernible Distribution at 5% Significance Level											
935												
936	Nonparametric Distribution Free UCLs											
937	95% CLT UCL					1213	95% Jackknife UCL					1219
938	95% Standard Bootstrap UCL					1208	95% Bootstrap-t UCL					1235
939	95% Hall's Bootstrap UCL					1224	95% Percentile Bootstrap UCL					1218
940	95% BCA Bootstrap UCL					1238						
941	90% Chebyshev(Mean, Sd) UCL					1368	95% Chebyshev(Mean, Sd) UCL					1524
942	97.5% Chebyshev(Mean, Sd) UCL					1741	99% Chebyshev(Mean, Sd) UCL					2166
943												
944	Suggested UCL to Use											
945	95% Adjusted Gamma UCL					1260						

	A	B	C	D	E	F	G	H	I	J	K	L	
946													
947	ations regarding the selection of a 95% UCL are provided to help the user to select the most appropriate												
948	mmendations are based upon the results of the simulation studies summarized in Singh, Singh, and												
949	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets												
950	For additional insight the user may want to consult a statistician.												
951													
952													
953	Nickel												
954													
955	General Statistics												
956	Total Number of Observations					31	Number of Distinct Observations					31	
957							Number of Missing Observations					0	
958	Minimum					0.83	Mean					5.07	
959	Maximum					12	Median					4.89	
960	SD					2.95	Std. Error of Mean					0.53	
961	Coefficient of Variation					0.58	Skewness					0.48	
962													
963	Normal GOF Test												
964	Shapiro Wilk Test Statistic					0.94	Shapiro Wilk GOF Test						
965	5% Shapiro Wilk Critical Value					0.92	Data appear Normal at 5% Significance Level						
966	Lilliefors Test Statistic					0.11	Lilliefors GOF Test						
967	5% Lilliefors Critical Value					0.15	Data appear Normal at 5% Significance Level						
968	Data appear Normal at 5% Significance Level												
969													
970	Assuming Normal Distribution												
971	95% Normal UCL						95% UCLs (Adjusted for Skewness)						
972	95% Student's-t UCL					5.98	95% Adjusted-CLT UCL (Chen-1995)					6.00	
973							95% Modified-t UCL (Johnson-1978)					5.98	
974													
975	Gamma GOF Test												
976	A-D Test Statistic					0.45	Anderson-Darling Gamma GOF Test						
977	5% A-D Critical Value					0.75	data appear Gamma Distributed at 5% Significance Level						
978	K-S Test Statistic					0.13	Kolmogrov-Smirnoff Gamma GOF Test						
979	5% K-S Critical Value					0.15	data appear Gamma Distributed at 5% Significance Level						
980	Detected data appear Gamma Distributed at 5% Significance Level												
981													
982	Gamma Statistics												
983	k hat (MLE)					2.64	k star (bias corrected MLE)					2.40	
984	Theta hat (MLE)					1.92	Theta star (bias corrected MLE)					2.10	
985	nu hat (MLE)					163.9	nu star (bias corrected)					149.4	
986	MLE Mean (bias corrected)					5.07	MLE Sd (bias corrected)					3.27	
987							Approximate Chi Square Value (0.05)					122.1	
988	Adjusted Level of Significance					0.04	Adjusted Chi Square Value					120.7	
989													
990	Assuming Gamma Distribution												
991	roximate Gamma UCL (use when n>=50))					6.21	Adjusted Gamma UCL (use when n<50)					6.28	
992													
993	Lognormal GOF Test												
994	Shapiro Wilk Test Statistic					0.93	Shapiro Wilk Lognormal GOF Test						
995	5% Shapiro Wilk Critical Value					0.92	Data appear Lognormal at 5% Significance Level						
996	Lilliefors Test Statistic					0.15	Lilliefors Lognormal GOF Test						
997	5% Lilliefors Critical Value					0.15	Data appear Lognormal at 5% Significance Level						
998	Data appear Lognormal at 5% Significance Level												
999													
1000	Lognormal Statistics												
1001	Minimum of Logged Data					-0.17	Mean of logged Data					1.42	
1002	Maximum of Logged Data					2.48	SD of logged Data					0.69	
1003													
1004	Assuming Lognormal Distribution												
1005	95% H-UCL					6.88	90% Chebyshev (MVUE) UCL					7.34	
1006	95% Chebyshev (MVUE) UCL					8.29	97.5% Chebyshev (MVUE) UCL					9.62	
1007	99% Chebyshev (MVUE) UCL					12.23							
1008													

	A	B	C	D	E	F	G	H	I	J	K	L
1009	Nonparametric Distribution Free UCL Statistics											
1010	Data appear to follow a Discernible Distribution at 5% Significance Level											
1011												
1012	Nonparametric Distribution Free UCLs											
1013	95% CLT UCL				5.95	95% Jackknife UCL				5.98		
1014	95% Standard Bootstrap UCL				5.93	95% Bootstrap-t UCL				6.04		
1015	95% Hall's Bootstrap UCL				5.95	95% Percentile Bootstrap UCL				5.92		
1016	95% BCA Bootstrap UCL				6.02							
1017	90% Chebyshev(Mean, Sd) UCL				6.67	95% Chebyshev(Mean, Sd) UCL				7.39		
1018	97.5% Chebyshev(Mean, Sd) UCL				8.39	99% Chebyshev(Mean, Sd) UCL				10.3		
1019												
1020	Suggested UCL to Use											
1021	95% Student's-t UCL				5.98							
1022												
1023	tions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate											
1024	mmendations are based upon the results of the simulation studies summarized in Singh, Singh, and											
1025	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets											
1026	For additional insight the user may want to consult a statistician.											
1027												
1028												
1029	Uranium											
1030												
1031	General Statistics											
1032	Total Number of Observations				31	Number of Distinct Observations				31		
1033						Number of Missing Observations				0		
1034	Minimum				0.38	Mean				2.01		
1035	Maximum				7.12	Median				1.27		
1036	SD				1.76	Std. Error of Mean				0.31		
1037	Coefficient of Variation				0.87	Skewness				1.49		
1038												
1039	Normal GOF Test											
1040	Shapiro Wilk Test Statistic				0.81	Shapiro Wilk GOF Test						
1041	5% Shapiro Wilk Critical Value				0.92	Data Not Normal at 5% Significance Level						
1042	Lilliefors Test Statistic				0.20	Lilliefors GOF Test						
1043	5% Lilliefors Critical Value				0.15	Data Not Normal at 5% Significance Level						
1044	Data Not Normal at 5% Significance Level											
1045												
1046	Assuming Normal Distribution											
1047	95% Normal UCL					95% UCLs (Adjusted for Skewness)						
1048	95% Student's-t UCL				2.54	95% Adjusted-CLT UCL (Chen-1995)				2.62		
1049						95% Modified-t UCL (Johnson-1978)				2.56		
1050												
1051	Gamma GOF Test											
1052	A-D Test Statistic				0.80	Anderson-Darling Gamma GOF Test						
1053	5% A-D Critical Value				0.76	Data Not Gamma Distributed at 5% Significance Level						
1054	K-S Test Statistic				0.13	Kolmogrov-Smirnoff Gamma GOF Test						
1055	5% K-S Critical Value				0.16	data appear Gamma Distributed at 5% Significance Level						
1056	Detected data follow Appr. Gamma Distribution at 5% Significance Level											
1057												
1058	Gamma Statistics											
1059	k hat (MLE)				1.64	k star (bias corrected MLE)				1.50		
1060	Theta hat (MLE)				1.22	Theta star (bias corrected MLE)				1.33		
1061	nu hat (MLE)				102.1	nu star (bias corrected)				93.5		
1062	MLE Mean (bias corrected)				2.01	MLE Sd (bias corrected)				1.63		
1063						Approximate Chi Square Value (0.05)				72.2		
1064	Adjusted Level of Significance				0.04	Adjusted Chi Square Value				71.2		
1065												
1066	Assuming Gamma Distribution											
1067	Approximate Gamma UCL (use when n>=50)				2.60	Adjusted Gamma UCL (use when n<50)				2.64		
1068												
1069	Lognormal GOF Test											
1070	Shapiro Wilk Test Statistic				0.94	Shapiro Wilk Lognormal GOF Test						
1071	5% Shapiro Wilk Critical Value				0.92	Data appear Lognormal at 5% Significance Level						

	A	B	C	D	E	F	G	H	I	J	K	L
1072			Lilliefors Test Statistic		0.12		Lilliefors Lognormal GOF Test					
1073			5% Lilliefors Critical Value		0.15	Data appear Lognormal at 5% Significance Level						
1074			Data appear Lognormal at 5% Significance Level									
1075												
1076			Lognormal Statistics									
1077			Minimum of Logged Data		-0.95		Mean of logged Data					0.36
1078			Maximum of Logged Data		1.96		SD of logged Data					0.82
1079												
1080			Assuming Lognormal Distribution									
1081			95% H-UCL		2.82		90% Chebyshev (MVUE) UCL					2.97
1082			95% Chebyshev (MVUE) UCL		3.41		97.5% Chebyshev (MVUE) UCL					4.03
1083			99% Chebyshev (MVUE) UCL		5.24							
1084												
1085			Nonparametric Distribution Free UCL Statistics									
1086			Data appear to follow a Discernible Distribution at 5% Significance Level									
1087												
1088			Nonparametric Distribution Free UCLs									
1089			95% CLT UCL		2.53		95% Jackknife UCL					2.54
1090			95% Standard Bootstrap UCL		2.51		95% Bootstrap-t UCL					2.68
1091			95% Hall's Bootstrap UCL		2.63		95% Percentile Bootstrap UCL					2.55
1092			95% BCA Bootstrap UCL		2.62							
1093			90% Chebyshev(Mean, Sd) UCL		2.95		95% Chebyshev(Mean, Sd) UCL					3.38
1094			97.5% Chebyshev(Mean, Sd) UCL		3.98		99% Chebyshev(Mean, Sd) UCL					5.15
1095												
1096			Suggested UCL to Use									
1097			95% Adjusted Gamma UCL		2.64							
1098												
1099			Directions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate									
1100			recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and									
1101			and Singh and Singh (2003). However, simulations results will not cover all Real World data sets									
1102			For additional insight the user may want to consult a statistician.									
1103												
1104												
1105			Uranium-234									
1106												
1107			General Statistics									
1108			Total Number of Observations		31		Number of Distinct Observations					29
1109							Number of Missing Observations					0
1110			Minimum		0.70		Mean					1.24
1111			Maximum		3.81		Median					1
1112			SD		0.61		Std. Error of Mean					0.11
1113			Coefficient of Variation		0.49		Skewness					2.66
1114												
1115			Normal GOF Test									
1116			Shapiro Wilk Test Statistic		0.73		Shapiro Wilk GOF Test					
1117			5% Shapiro Wilk Critical Value		0.92		Data Not Normal at 5% Significance Level					
1118			Lilliefors Test Statistic		0.19		Lilliefors GOF Test					
1119			5% Lilliefors Critical Value		0.15		Data Not Normal at 5% Significance Level					
1120			Data Not Normal at 5% Significance Level									
1121												
1122			Assuming Normal Distribution									
1123			95% Normal UCL			95% UCLs (Adjusted for Skewness)						
1124			95% Student's-t UCL		1.43		95% Adjusted-CLT UCL (Chen-1995)					1.48
1125							95% Modified-t UCL (Johnson-1978)					1.44
1126												
1127			Gamma GOF Test									
1128			A-D Test Statistic		1.18		Anderson-Darling Gamma GOF Test					
1129			5% A-D Critical Value		0.74		Data Not Gamma Distributed at 5% Significance Level					
1130			K-S Test Statistic		0.17		Kolmogrov-Smirnoff Gamma GOF Test					
1131			5% K-S Critical Value		0.15		Data Not Gamma Distributed at 5% Significance Level					
1132			Data Not Gamma Distributed at 5% Significance Level									
1133												
1134			Gamma Statistics									

	A	B	C	D	E	F	G	H	I	J	K	L
1135	k hat (MLE)					6.29	k star (bias corrected MLE)					5.70
1136	Theta hat (MLE)					0.19	Theta star (bias corrected MLE)					0.21
1137	nu hat (MLE)					390.3	nu star (bias corrected)					353.9
1138	MLE Mean (bias corrected)					1.24	MLE Sd (bias corrected)					0.52
1139							Approximate Chi Square Value (0.05)					311.3
1140	Adjusted Level of Significance					0.04	Adjusted Chi Square Value					309
1141												
1142	Assuming Gamma Distribution											
1143	Approximate Gamma UCL (use when n>=50))					1.41	Adjusted Gamma UCL (use when n<50)					1.42
1144												
1145	Lognormal GOF Test											
1146	Shapiro Wilk Test Statistic					0.90	Shapiro Wilk Lognormal GOF Test					
1147	5% Shapiro Wilk Critical Value					0.92	Data Not Lognormal at 5% Significance Level					
1148	Lilliefors Test Statistic					0.15	Lilliefors Lognormal GOF Test					
1149	5% Lilliefors Critical Value					0.15	Data appear Lognormal at 5% Significance Level					
1150	Data appear Approximate Lognormal at 5% Significance Level											
1151												
1152	Lognormal Statistics											
1153	Minimum of Logged Data					-0.35	Mean of logged Data					0.13
1154	Maximum of Logged Data					1.33	SD of logged Data					0.38
1155												
1156	Assuming Lognormal Distribution											
1157	95% H-UCL					1.40	90% Chebyshev (MVUE) UCL					1.49
1158	95% Chebyshev (MVUE) UCL					1.61	97.5% Chebyshev (MVUE) UCL					1.77
1159	99% Chebyshev (MVUE) UCL					2.09						
1160												
1161	Nonparametric Distribution Free UCL Statistics											
1162	Data appear to follow a Discernible Distribution at 5% Significance Level											
1163												
1164	Nonparametric Distribution Free UCLs											
1165	95% CLT UCL					1.42	95% Jackknife UCL					1.43
1166	95% Standard Bootstrap UCL					1.42	95% Bootstrap-t UCL					1.53
1167	95% Hall's Bootstrap UCL					2.16	95% Percentile Bootstrap UCL					1.43
1168	95% BCA Bootstrap UCL					1.49						
1169	90% Chebyshev(Mean, Sd) UCL					1.57	95% Chebyshev(Mean, Sd) UCL					1.72
1170	97.5% Chebyshev(Mean, Sd) UCL					1.93	99% Chebyshev(Mean, Sd) UCL					2.34
1171												
1172	Suggested UCL to Use											
1173	95% Student's-t UCL					1.43	or 95% Modified-t UCL					1.44
1174												
1175	Recommendations regarding the selection of a 95% UCL are provided to help the user to select the most appropriate											
1176	recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and											
1177	Singh and Singh (2003). However, simulations results will not cover all Real World data sets											
1178	For additional insight the user may want to consult a statistician.											
1179												
1180	Uranium-235/236											
1181												
1182	General Statistics											
1183	Total Number of Observations					31	Number of Distinct Observations					30
1184	Number of Detects					16	Number of Non-Detects					15
1185	Number of Distinct Detects					16	Number of Distinct Non-Detects					14
1186	Minimum Detect					0.07	Minimum Non-Detect					0.03
1187	Maximum Detect					0.25	Maximum Non-Detect					0.09
1188	Variance Detects					0.002	Percent Non-Detects					48.3
1189	Mean Detects					0.12	SD Detects					0.04
1190	Median Detects					0.11	CV Detects					0.38
1191	Skewness Detects					1.63	Kurtosis Detects					3.13
1192	Mean of Logged Detects					-2.16	SD of Logged Detects					0.33
1193												
1194	Normal GOF Test on Detects Only											
1195	Shapiro Wilk Test Statistic					0.83	Shapiro Wilk GOF Test					
1196	5% Shapiro Wilk Critical Value					0.88	Detected Data Not Normal at 5% Significance Level					
1197	Lilliefors Test Statistic					0.19	Lilliefors GOF Test					

	A	B	C	D	E	F	G	H	I	J	K	L	
1198	5% Lilliefors Critical Value					0.22	ected Data appear Normal at 5% Significance Level						
1199	Detected Data appear Approximate Normal at 5% Significance Level												
1200													
1201	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs												
1202	Mean					0.07	Standard Error of Mean					0.01	
1203	SD					0.05	95% KM (BCA) UCL					0.1	
1204	95% KM (t) UCL					0.09	95% KM (Percentile Bootstrap) UCL					0.09	
1205	95% KM (z) UCL					0.09	95% KM Bootstrap t UCL					0.09	
1206	90% KM Chebyshev UCL					0.10	95% KM Chebyshev UCL					0.12	
1207	97.5% KM Chebyshev UCL					0.14	99% KM Chebyshev UCL					0.18	
1208													
1209	Gamma GOF Tests on Detected Observations Only												
1210	A-D Test Statistic					0.53	Anderson-Darling GOF Test						
1211	5% A-D Critical Value					0.74	data appear Gamma Distributed at 5% Significance Level						
1212	K-S Test Statistic					0.14	Kolmogrov-Smirnoff GOF						
1213	5% K-S Critical Value					0.21	data appear Gamma Distributed at 5% Significance Level						
1214	Detected data appear Gamma Distributed at 5% Significance Level												
1215													
1216	Gamma Statistics on Detected Data Only												
1217	k hat (MLE)					8.87	k star (bias corrected MLE)					7.25	
1218	Theta hat (MLE)					0.01	Theta star (bias corrected MLE)					0.01	
1219	nu hat (MLE)					284.1	nu star (bias corrected)					232.2	
1220	MLE Mean (bias corrected)					0.12	MLE Sd (bias corrected)					0.04	
1221													
1222	Gamma Kaplan-Meier (KM) Statistics												
1223	k hat (KM)					1.94	nu hat (KM)					120.8	
1224	pproximate Chi Square Value (120.83, α)					96.4	Adjusted Chi Square Value (120.83, β)					95.2	
1225	Approximate KM-UCL (use when n>=50)					0.09	Gamma Adjusted KM-UCL (use when n<50)					0.09	
1226													
1227	Gamma ROS Statistics using Imputed Non-Detects												
1228	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs												
1229	GROS may not be used when kstar of detected data is small such as < 0.1												
1230	For such situations, GROS method tends to yield inflated values of UCLs and BTVs												
1231	Gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates												
1232	Minimum					0.01	Mean					0.07	
1233	Maximum					0.25	Median					0.07	
1234	SD					0.06	CV					0.82	
1235	k hat (MLE)					1.51	k star (bias corrected MLE)					1.38	
1236	Theta hat (MLE)					0.04	Theta star (bias corrected MLE)					0.05	
1237	nu hat (MLE)					93.7	nu star (bias corrected)					86.0	
1238	MLE Mean (bias corrected)					0.07	MLE Sd (bias corrected)					0.06	
1239							Adjusted Level of Significance (β)					0.04	
1240	Approximate Chi Square Value (86.03, α)					65.6	Adjusted Chi Square Value (86.03, β)					64.6	
1241	Gamma Approximate UCL (use when n>=50)					0.09	Gamma Adjusted UCL (use when n<50)					0.09	
1242													
1243	Lognormal GOF Test on Detected Observations Only												
1244	Shapiro Wilk Test Statistic					0.92	Shapiro Wilk GOF Test						
1245	5% Shapiro Wilk Critical Value					0.88	ected Data appear Lognormal at 5% Significance Level						
1246	Lilliefors Test Statistic					0.14	Lilliefors GOF Test						
1247	5% Lilliefors Critical Value					0.22	ected Data appear Lognormal at 5% Significance Level						
1248	Detected Data appear Lognormal at 5% Significance Level												
1249													
1250	Lognormal ROS Statistics Using Imputed Non-Detects												
1251	Mean in Original Scale					0.08	Mean in Log Scale					-2.58	
1252	SD in Original Scale					0.04	SD in Log Scale					0.50	
1253	95% t UCL (assumes normality of ROS data)					0.10	95% Percentile Bootstrap UCL					0.10	
1254	95% BCA Bootstrap UCL					0.10	95% Bootstrap t UCL					0.10	
1255	95% H-UCL (Log ROS)					0.10							
1256													
1257	Estimates using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed												
1258	KM Mean (logged)					-2.8	95% H-UCL (KM -Log)					0.10	
1259	KM SD (logged)					0.70	95% Critical H Value (KM-Log)					2.10	
1260	KM Standard Error of Mean (logged)					0.13							

	A	B	C	D	E	F	G	H	I	J	K	L
1261												
1262	DL/2 Statistics											
1263	DL/2 Normal						DL/2 Log-Transformed					
1264	Mean in Original Scale					0.07	Mean in Log Scale					-2.83
1265	SD in Original Scale					0.05	SD in Log Scale					0.76
1266	95% t UCL (Assumes normality)					0.09	95% H-Stat UCL					0.10
1267	DL/2 is not a recommended method, provided for comparisons and historical reasons											
1268												
1269	Nonparametric Distribution Free UCL Statistics											
1270	Detected Data appear Approximate Normal Distributed at 5% Significance Level											
1271												
1272	Suggested UCL to Use											
1273	95% KM (t) UCL					0.09	95% KM (Percentile Bootstrap) UCL					0.09
1274												
1275	Recommendations regarding the selection of a 95% UCL are provided to help the user to select the most appropriate											
1276	Recommendations are based upon data size, data distribution, and skewness.											
1277	Recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and											
1278	Recommendations results will not cover all Real World data sets; for additional insight the user may want to consult											
1279												
1280												
1281	Uranium-238											
1282												
1283	General Statistics											
1284	Total Number of Observations					31	Number of Distinct Observations					30
1285							Number of Missing Observations					0
1286	Minimum					0.70	Mean					1.76
1287	Maximum					6.81	Median					1.16
1288	SD					1.30	Std. Error of Mean					0.23
1289	Coefficient of Variation					0.73	Skewness					2.35
1290												
1291	Normal GOF Test											
1292	Shapiro Wilk Test Statistic					0.73	Shapiro Wilk GOF Test					
1293	5% Shapiro Wilk Critical Value					0.92	Data Not Normal at 5% Significance Level					
1294	Lilliefors Test Statistic					0.20	Lilliefors GOF Test					
1295	5% Lilliefors Critical Value					0.15	Data Not Normal at 5% Significance Level					
1296	Data Not Normal at 5% Significance Level											
1297												
1298	Assuming Normal Distribution											
1299	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
1300	95% Student's-t UCL					2.16	95% Adjusted-CLT UCL (Chen-1995)					2.26
1301							95% Modified-t UCL (Johnson-1978)					2.18
1302												
1303	Gamma GOF Test											
1304	A-D Test Statistic					1.40	Anderson-Darling Gamma GOF Test					
1305	5% A-D Critical Value					0.75	Data Not Gamma Distributed at 5% Significance Level					
1306	K-S Test Statistic					0.20	Kolmogorov-Smirnov Gamma GOF Test					
1307	5% K-S Critical Value					0.15	Data Not Gamma Distributed at 5% Significance Level					
1308	Data Not Gamma Distributed at 5% Significance Level											
1309												
1310	Gamma Statistics											
1311	k hat (MLE)					2.87	k star (bias corrected MLE)					2.62
1312	Theta hat (MLE)					0.61	Theta star (bias corrected MLE)					0.67
1313	nu hat (MLE)					178.5	nu star (bias corrected)					162.5
1314	MLE Mean (bias corrected)					1.76	MLE Sd (bias corrected)					1.09
1315							Approximate Chi Square Value (0.05)					134
1316	Adjusted Level of Significance					0.04	Adjusted Chi Square Value					132.6
1317												
1318	Assuming Gamma Distribution											
1319	Approximate Gamma UCL (use when n>=50)					2.14	Adjusted Gamma UCL (use when n<50)					2.16
1320												
1321	Lognormal GOF Test											
1322	Shapiro Wilk Test Statistic					0.90	Shapiro Wilk Lognormal GOF Test					
1323	5% Shapiro Wilk Critical Value					0.92	Data Not Lognormal at 5% Significance Level					

	A	B	C	D	E	F	G	H	I	J	K	L	
1324	Lilliefors Test Statistic					0.2	Lilliefors Lognormal GOF Test						
1325	5% Lilliefors Critical Value					0.15	Data Not Lognormal at 5% Significance Level						
1326	Data Not Lognormal at 5% Significance Level												
1327													
1328	Lognormal Statistics												
1329	Minimum of Logged Data					-0.34	Mean of logged Data					0.38	
1330	Maximum of Logged Data					1.91	SD of logged Data					0.57	
1331													
1332	Assuming Lognormal Distribution												
1333	95% H-UCL					2.14	90% Chebyshev (MVUE) UCL					2.29	
1334	95% Chebyshev (MVUE) UCL					2.54	97.5% Chebyshev (MVUE) UCL					2.90	
1335	99% Chebyshev (MVUE) UCL					3.60							
1336													
1337	Nonparametric Distribution Free UCL Statistics												
1338	Data do not follow a Discernible Distribution (0.05)												
1339													
1340	Nonparametric Distribution Free UCLs												
1341	95% CLT UCL					2.15	95% Jackknife UCL					2.16	
1342	95% Standard Bootstrap UCL					2.15	95% Bootstrap-t UCL					2.35	
1343	95% Hall's Bootstrap UCL					2.48	95% Percentile Bootstrap UCL					2.14	
1344	95% BCA Bootstrap UCL					2.26							
1345	90% Chebyshev(Mean, Sd) UCL					2.47	95% Chebyshev(Mean, Sd) UCL					2.79	
1346	97.5% Chebyshev(Mean, Sd) UCL					3.23	99% Chebyshev(Mean, Sd) UCL					4.10	
1347													
1348	Suggested UCL to Use												
1349	95% Chebyshev (Mean, Sd) UCL					2.79							
1350													
1351	itions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate												
1352	ommendations are based upon the results of the simulation studies summarized in Singh, Singh, and												
1353	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets												
1354	For additional insight the user may want to consult a statistician.												
1355													
1356													
1357	Vanadium												
1358													
1359	General Statistics												
1360	Total Number of Observations					31	Number of Distinct Observations					31	
1361							Number of Missing Observations					0	
1362	Minimum					2.7	Mean					11.7	
1363	Maximum					30.3	Median					9.48	
1364	SD					6.96	Std. Error of Mean					1.25	
1365	Coefficient of Variation					0.59	Skewness					0.83	
1366													
1367	Normal GOF Test												
1368	Shapiro Wilk Test Statistic					0.93	Shapiro Wilk GOF Test						
1369	5% Shapiro Wilk Critical Value					0.92	Data appear Normal at 5% Significance Level						
1370	Lilliefors Test Statistic					0.15	Lilliefors GOF Test						
1371	5% Lilliefors Critical Value					0.15	Data appear Normal at 5% Significance Level						
1372	Data appear Normal at 5% Significance Level												
1373													
1374	Assuming Normal Distribution												
1375	95% Normal UCL						95% UCLs (Adjusted for Skewness)						
1376	95% Student's-t UCL					13.84	95% Adjusted-CLT UCL (Chen-1995)					13.94	
1377							95% Modified-t UCL (Johnson-1978)					13.84	
1378													
1379	Gamma GOF Test												
1380	A-D Test Statistic					0.21	Anderson-Darling Gamma GOF Test						
1381	5% A-D Critical Value					0.75	data appear Gamma Distributed at 5% Significance Level						
1382	K-S Test Statistic					0.10	Kolmogrov-Smirnoff Gamma GOF Test						
1383	5% K-S Critical Value					0.15	data appear Gamma Distributed at 5% Significance Level						
1384	Detected data appear Gamma Distributed at 5% Significance Level												
1385													
1386	Gamma Statistics												

A	B	C	D	E	F	G	H	I	J	K	L
1387	k hat (MLE)				2.89	k star (bias corrected MLE)				2.63	
1388	Theta hat (MLE)				4.04	Theta star (bias corrected MLE)				4.44	
1389	nu hat (MLE)				179.5	nu star (bias corrected)				163.4	
1390	MLE Mean (bias corrected)				11.7	MLE Sd (bias corrected)				7.21	
1391						Approximate Chi Square Value (0.05)				134.9	
1392	Adjusted Level of Significance				0.04	Adjusted Chi Square Value				133.4	
1393											
1394	Assuming Gamma Distribution										
1395	Approximate Gamma UCL (use when n>=50))				14.2	Adjusted Gamma UCL (use when n<50)				14.3	
1396											
1397	Lognormal GOF Test										
1398	Shapiro Wilk Test Statistic				0.97	Shapiro Wilk Lognormal GOF Test					
1399	5% Shapiro Wilk Critical Value				0.92	Data appear Lognormal at 5% Significance Level					
1400	Lilliefors Test Statistic				0.07	Lilliefors Lognormal GOF Test					
1401	5% Lilliefors Critical Value				0.15	Data appear Lognormal at 5% Significance Level					
1402	Data appear Lognormal at 5% Significance Level										
1403											
1404	Lognormal Statistics										
1405	Minimum of Logged Data				0.99	Mean of logged Data				2.27	
1406	Maximum of Logged Data				3.41	SD of logged Data				0.63	
1407											
1408	Assuming Lognormal Distribution										
1409	95% H-UCL				15.1	90% Chebyshev (MVUE) UCL				16.2	
1410	95% Chebyshev (MVUE) UCL				18.2	97.5% Chebyshev (MVUE) UCL				20.9	
1411	99% Chebyshev (MVUE) UCL				26.3						
1412											
1413	Nonparametric Distribution Free UCL Statistics										
1414	Data appear to follow a Discernible Distribution at 5% Significance Level										
1415											
1416	Nonparametric Distribution Free UCLs										
1417	95% CLT UCL				13.7	95% Jackknife UCL				13.8	
1418	95% Standard Bootstrap UCL				13.7	95% Bootstrap-t UCL				14.0	
1419	95% Hall's Bootstrap UCL				14.0	95% Percentile Bootstrap UCL				13.7	
1420	95% BCA Bootstrap UCL				13.9						
1421	90% Chebyshev(Mean, Sd) UCL				15.4	95% Chebyshev(Mean, Sd) UCL				17.1	
1422	97.5% Chebyshev(Mean, Sd) UCL				19.5	99% Chebyshev(Mean, Sd) UCL				24.1	
1423											
1424	Suggested UCL to Use										
1425	95% Student's-t UCL				13.8						
1426											
1427	Directions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate										
1428	Recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and										
1429	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets										
1430	For additional insight the user may want to consult a statistician.										
1431											
1432											
1433	Zinc										
1434											
1435	General Statistics										
1436	Total Number of Observations				31	Number of Distinct Observations				30	
1437						Number of Missing Observations				0	
1438	Minimum				20.7	Mean				32.3	
1439	Maximum				60.6	Median				28.2	
1440	SD				10.1	Std. Error of Mean				1.83	
1441	Coefficient of Variation				0.31	Skewness				0.92	
1442											
1443	Normal GOF Test										
1444	Shapiro Wilk Test Statistic				0.88	Shapiro Wilk GOF Test					
1445	5% Shapiro Wilk Critical Value				0.92	Data Not Normal at 5% Significance Level					
1446	Lilliefors Test Statistic				0.22	Lilliefors GOF Test					
1447	5% Lilliefors Critical Value				0.15	Data Not Normal at 5% Significance Level					
1448	Data Not Normal at 5% Significance Level										
1449											

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