	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			3/2/2015 7:27:47 PM								
5	From File			EPC_013Sub_EU02.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	Arsenic											
12												
13	General Statistics											
14	Total Number of Observations					12	Number of Distinct Observations					3
15							Number of Missing Observations					0
16	Minimum					2.99	Mean					9.358
17	Maximum					10	Median					10
18	SD					2.015	Std. Error of Mean					0.582
19	Coefficient of Variation					0.215	Skewness					-3.406
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic					0.371	Shapiro Wilk GOF Test					
23	5% Shapiro Wilk Critical Value					0.859	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.458	Lilliefors GOF Test					
25	5% Lilliefors Critical Value					0.256	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					10.4	95% Adjusted-CLT UCL (Chen-1995)					9.703
31							95% Modified-t UCL (Johnson-1978)					10.31
32												
33	Gamma GOF Test											
34	A-D Test Statistic					3.79	Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value					0.731	Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.463	Kolmogrov-Smirnoff Gamma GOF Test					
37	5% K-S Critical Value					0.245	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)					12.59	k star (bias corrected MLE)					9.496
42	Theta hat (MLE)					0.743	Theta star (bias corrected MLE)					0.985
43	nu hat (MLE)					302.1	nu star (bias corrected)					227.9
44	MLE Mean (bias corrected)					9.358	MLE Sd (bias corrected)					3.037
45							Approximate Chi Square Value (0.05)					194
46	Adjusted Level of Significance					0.029	Adjusted Chi Square Value					189.2
47												
48	Assuming Gamma Distribution											
49	95% Approximate Gamma UCL (use when n>=50))					11	95% Adjusted Gamma UCL (use when n<50)					11.27
50												
51	Lognormal GOF Test											
52	Shapiro Wilk Test Statistic					0.354	Shapiro Wilk Lognormal GOF Test					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.859	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.456	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.256	Data Not Lognormal at 5% Significance Level					
56	**Data Not Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	1.095	Mean of logged Data					2.196
60					Maximum of Logged Data	2.303	SD of logged Data					0.347
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	11.74	90% Chebyshev (MVUE) UCL					12.39
64					95% Chebyshev (MVUE) UCL	13.7	97.5% Chebyshev (MVUE) UCL					15.51
65					99% Chebyshev (MVUE) UCL	19.08						
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	10.31	95% Jackknife UCL					10.4
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	11.1	95% Chebyshev(Mean, Sd) UCL					11.89
76					97.5% Chebyshev(Mean, Sd) UCL	12.99	99% Chebyshev(Mean, Sd) UCL					15.15
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	10.4	or 95% Modified-t UCL					10.31
80												
81	**Recommended UCL exceeds the maximum observation**											
82												
83	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
84	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
85	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
86	For additional insight the user may want to consult a statistician.											
87												
88	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
89	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
90												
91												
92	**Iron**											
93												
94	**General Statistics**											
95					Total Number of Observations	12	Number of Distinct Observations					12
96							Number of Missing Observations					0
97					Minimum	17903	Mean					22708
98					Maximum	30751	Median					21530
99					SD	3931	Std. Error of Mean					1135
100					Coefficient of Variation	0.173	Skewness					1.559
101												
102	**Normal GOF Test**											
103					Shapiro Wilk Test Statistic	0.75	**Shapiro Wilk GOF Test**					
104					5% Shapiro Wilk Critical Value	0.859	Data Not Normal at 5% Significance Level					

	A	B	C	D	E	F	G	H	I	J	K	L
105					Lilliefors Test Statistic	0.307	**Lilliefors GOF Test**					
106					5% Lilliefors Critical Value	0.256	Data Not Normal at 5% Significance Level					
107	**Data Not Normal at 5% Significance Level**											
108												
109	**Assuming Normal Distribution**											
110	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
111					95% Student's-t UCL	24745	95% Adjusted-CLT UCL (Chen-1995)					25120
112							95% Modified-t UCL (Johnson-1978)					24831
113												
114	**Gamma GOF Test**											
115					A-D Test Statistic	1.314	**Anderson-Darling Gamma GOF Test**					
116					5% A-D Critical Value	0.73	Data Not Gamma Distributed at 5% Significance Level					
117					K-S Test Statistic	0.293	**Kolmogrov-Smirnoff Gamma GOF Test**					
118					5% K-S Critical Value	0.245	Data Not Gamma Distributed at 5% Significance Level					
119	**Data Not Gamma Distributed at 5% Significance Level**											
120												
121	**Gamma Statistics**											
122					k hat (MLE)	41.05	k star (bias corrected MLE)					30.85
123					Theta hat (MLE)	553.1	Theta star (bias corrected MLE)					736.2
124					nu hat (MLE)	985.3	nu star (bias corrected)					740.3
125					MLE Mean (bias corrected)	22708	MLE Sd (bias corrected)					4089
126							Approximate Chi Square Value (0.05)					678.2
127					Adjusted Level of Significance	0.029	Adjusted Chi Square Value					669.1
128												
129	**Assuming Gamma Distribution**											
130					95% Approximate Gamma UCL (use when n>=50))	24788	95% Adjusted Gamma UCL (use when n<50)					25125
131												
132	**Lognormal GOF Test**											
133					Shapiro Wilk Test Statistic	0.8	**Shapiro Wilk Lognormal GOF Test**					
134					5% Shapiro Wilk Critical Value	0.859	Data Not Lognormal at 5% Significance Level					
135					Lilliefors Test Statistic	0.283	**Lilliefors Lognormal GOF Test**					
136					5% Lilliefors Critical Value	0.256	Data Not Lognormal at 5% Significance Level					
137	**Data Not Lognormal at 5% Significance Level**											
138												
139	**Lognormal Statistics**											
140					Minimum of Logged Data	9.793	Mean of logged Data					10.02
141					Maximum of Logged Data	10.33	SD of logged Data					0.159
142												
143	**Assuming Lognormal Distribution**											
144					95% H-UCL	24777	90% Chebyshev (MVUE) UCL					25822
145					95% Chebyshev (MVUE) UCL	27239	97.5% Chebyshev (MVUE) UCL					29207
146					99% Chebyshev (MVUE) UCL	33071						
147												
148	**Nonparametric Distribution Free UCL Statistics**											
149	**Data do not follow a Discernible Distribution (0.05)**											
150												
151	**Nonparametric Distribution Free UCLs**											
152					95% CLT UCL	24574	95% Jackknife UCL					24745
153					95% Standard Bootstrap UCL	24470	95% Bootstrap-t UCL					27838
154					95% Hall's Bootstrap UCL	39494	95% Percentile Bootstrap UCL					24643
155					95% BCA Bootstrap UCL	25019						
156					90% Chebyshev(Mean, Sd) UCL	26112	95% Chebyshev(Mean, Sd) UCL					27654

	A	B	C	D	E	F	G	H	I	J	K	L
157					97.5% Chebyshev(Mean, Sd) UCL	29794				99% Chebyshev(Mean, Sd) UCL		33997
158												
159						Suggested UCL to Use						
160					95% Student's-t UCL	24745				or 95% Modified-t UCL		24831
161												
162					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
163					These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)							
164					and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.							
165					For additional insight the user may want to consult a statistician.							
166												
167												
168	Manganese											
169												
170						General Statistics						
171					Total Number of Observations	12				Number of Distinct Observations		12
172										Number of Missing Observations		0
173					Minimum	456				Mean		928.7
174					Maximum	2156				Median		709
175					SD	569.1				Std. Error of Mean		164.3
176					Coefficient of Variation	0.613				Skewness		1.824
177												
178						Normal GOF Test						
179					Shapiro Wilk Test Statistic	0.678				Shapiro Wilk GOF Test		
180					5% Shapiro Wilk Critical Value	0.859				Data Not Normal at 5% Significance Level		
181					Lilliefors Test Statistic	0.332				Lilliefors GOF Test		
182					5% Lilliefors Critical Value	0.256				Data Not Normal at 5% Significance Level		
183						Data Not Normal at 5% Significance Level						
184												
185						Assuming Normal Distribution						
186					95% Normal UCL					95% UCLs (Adjusted for Skewness)		
187					95% Student's-t UCL	1224				95% Adjusted-CLT UCL (Chen-1995)		1291
188										95% Modified-t UCL (Johnson-1978)		1238
189												
190						Gamma GOF Test						
191					A-D Test Statistic	1.297				Anderson-Darling Gamma GOF Test		
192					5% A-D Critical Value	0.735				Data Not Gamma Distributed at 5% Significance Level		
193					K-S Test Statistic	0.266				Kolmogrov-Smirnoff Gamma GOF Test		
194					5% K-S Critical Value	0.246				Data Not Gamma Distributed at 5% Significance Level		
195						Data Not Gamma Distributed at 5% Significance Level						
196												
197						Gamma Statistics						
198					k hat (MLE)	4.154				k star (bias corrected MLE)		3.171
199					Theta hat (MLE)	223.5				Theta star (bias corrected MLE)		292.8
200					nu hat (MLE)	99.71				nu star (bias corrected)		76.11
201					MLE Mean (bias corrected)	928.7				MLE Sd (bias corrected)		521.5
202										Approximate Chi Square Value (0.05)		57.02
203					Adjusted Level of Significance	0.029				Adjusted Chi Square Value		54.5
204												
205						Assuming Gamma Distribution						
206					95% Approximate Gamma UCL (use when n>=50))	1240				95% Adjusted Gamma UCL (use when n<50)		1297
207												
208						Lognormal GOF Test						

	A	B	C	D	E	F	G	H	I	J	K	L
209					Shapiro Wilk Test Statistic	0.815	**Shapiro Wilk Lognormal GOF Test**					
210					5% Shapiro Wilk Critical Value	0.859	Data Not Lognormal at 5% Significance Level					
211					Lilliefors Test Statistic	0.229	**Lilliefors Lognormal GOF Test**					
212					5% Lilliefors Critical Value	0.256	Data appear Lognormal at 5% Significance Level					
213	**Data appear Approximate Lognormal at 5% Significance Level**											
214												
215	**Lognormal Statistics**											
216					Minimum of Logged Data	6.122				Mean of logged Data		6.709
217					Maximum of Logged Data	7.676				SD of logged Data		0.482
218												
219	**Assuming Lognormal Distribution**											
220					95% H-UCL	1253				90% Chebyshev (MVUE) UCL		1300
221					95% Chebyshev (MVUE) UCL	1476				97.5% Chebyshev (MVUE) UCL		1721
222					99% Chebyshev (MVUE) UCL	2201						
223												
224	**Nonparametric Distribution Free UCL Statistics**											
225	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
226												
227	**Nonparametric Distribution Free UCLs**											
228					95% CLT UCL	1199				95% Jackknife UCL		1224
229					95% Standard Bootstrap UCL	1183				95% Bootstrap-t UCL		1955
230					95% Hall's Bootstrap UCL	2963				95% Percentile Bootstrap UCL		1190
231					95% BCA Bootstrap UCL	1300						
232					90% Chebyshev(Mean, Sd) UCL	1422				95% Chebyshev(Mean, Sd) UCL		1645
233					97.5% Chebyshev(Mean, Sd) UCL	1955				99% Chebyshev(Mean, Sd) UCL		2563
234												
235	**Suggested UCL to Use**											
236					95% Student's-t UCL	1224				or 95% Modified-t UCL		1238
237												
238	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
239	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
240	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
241	For additional insight the user may want to consult a statistician.											
242												
243												
244	**Uranium-238**											
245												
246	**General Statistics**											
247					Total Number of Observations	12				Number of Distinct Observations		5
248										Number of Missing Observations		0
249					Minimum	0.513				Mean		0.892
250					Maximum	1.4				Median		0.892
251					SD	0.2				Std. Error of Mean		0.0576
252					Coefficient of Variation	0.224				Skewness		0.972
253												
254	**Normal GOF Test**											
255					Shapiro Wilk Test Statistic	0.727	**Shapiro Wilk GOF Test**					
256					5% Shapiro Wilk Critical Value	0.859	Data Not Normal at 5% Significance Level					
257					Lilliefors Test Statistic	0.333	**Lilliefors GOF Test**					
258					5% Lilliefors Critical Value	0.256	Data Not Normal at 5% Significance Level					
259	**Data Not Normal at 5% Significance Level**											
260												

	A	B	C	D	E	F	G	H	I	J	K	L
261	Assuming Normal Distribution											
262	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
263					95% Student's-t UCL	0.995				95% Adjusted-CLT UCL (Chen-1995)		1.004
264										95% Modified-t UCL (Johnson-1978)		0.998
265												
266	Gamma GOF Test											
267					A-D Test Statistic	1.733	Anderson-Darling Gamma GOF Test					
268					5% A-D Critical Value	0.732	Data Not Gamma Distributed at 5% Significance Level					
269					K-S Test Statistic	0.362	Kolmogrov-Smirnoff Gamma GOF Test					
270					5% K-S Critical Value	0.245	Data Not Gamma Distributed at 5% Significance Level					
271	Data Not Gamma Distributed at 5% Significance Level											
272												
273	Gamma Statistics											
274					k hat (MLE)	22.1				k star (bias corrected MLE)		16.63
275					Theta hat (MLE)	0.0404				Theta star (bias corrected MLE)		0.0536
276					nu hat (MLE)	530.4				nu star (bias corrected)		399.1
277					MLE Mean (bias corrected)	0.892				MLE Sd (bias corrected)		0.219
278										Approximate Chi Square Value (0.05)		353.8
279					Adjusted Level of Significance	0.029				Adjusted Chi Square Value		347.3
280												
281	Assuming Gamma Distribution											
282				95% Approximate Gamma UCL (use when n>=50))		1.006				95% Adjusted Gamma UCL (use when n<50)		1.025
283												
284	Lognormal GOF Test											
285					Shapiro Wilk Test Statistic	0.746	Shapiro Wilk Lognormal GOF Test					
286					5% Shapiro Wilk Critical Value	0.859	Data Not Lognormal at 5% Significance Level					
287					Lilliefors Test Statistic	0.374	Lilliefors Lognormal GOF Test					
288					5% Lilliefors Critical Value	0.256	Data Not Lognormal at 5% Significance Level					
289	Data Not Lognormal at 5% Significance Level											
290												
291	Lognormal Statistics											
292					Minimum of Logged Data	-0.667				Mean of logged Data		-0.137
293					Maximum of Logged Data	0.336				SD of logged Data		0.226
294												
295	Assuming Lognormal Distribution											
296					95% H-UCL	1.015				90% Chebyshev (MVUE) UCL		1.067
297					95% Chebyshev (MVUE) UCL	1.147				97.5% Chebyshev (MVUE) UCL		1.257
298					99% Chebyshev (MVUE) UCL	1.473						
299												
300	Nonparametric Distribution Free UCL Statistics											
301	Data do not follow a Discernible Distribution (0.05)											
302												
303	Nonparametric Distribution Free UCLs											
304					95% CLT UCL	0.987				95% Jackknife UCL		0.995
305					95% Standard Bootstrap UCL	0.982				95% Bootstrap-t UCL		1.002
306					95% Hall's Bootstrap UCL	1.114				95% Percentile Bootstrap UCL		0.986
307					95% BCA Bootstrap UCL	1.004						
308					90% Chebyshev(Mean, Sd) UCL	1.065				95% Chebyshev(Mean, Sd) UCL		1.143
309					97.5% Chebyshev(Mean, Sd) UCL	1.252				99% Chebyshev(Mean, Sd) UCL		1.465
310												
311	Suggested UCL to Use											
312					95% Student's-t UCL	0.995				or 95% Modified-t UCL		0.998

	A	B	C	D	E	F	G	H	I	J	K	L
313												
314	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
315	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
316	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
317	For additional insight the user may want to consult a statistician.											
318												
319												
320	**Vanadium**											
321												
322	**General Statistics**											
323	Total Number of Observations					12	Number of Distinct Observations					10
324							Number of Missing Observations					0
325	Minimum					71	Mean					87.83
326	Maximum					108	Median					88
327	SD					11.58	Std. Error of Mean					3.344
328	Coefficient of Variation					0.132	Skewness					0.169
329												
330	**Normal GOF Test**											
331	Shapiro Wilk Test Statistic					0.938	**Shapiro Wilk GOF Test**					
332	5% Shapiro Wilk Critical Value					0.859	Data appear Normal at 5% Significance Level					
333	Lilliefors Test Statistic					0.172	**Lilliefors GOF Test**					
334	5% Lilliefors Critical Value					0.256	Data appear Normal at 5% Significance Level					
335	**Data appear Normal at 5% Significance Level**											
336												
337	**Assuming Normal Distribution**											
338	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
339	95% Student's-t UCL					93.84	95% Adjusted-CLT UCL (Chen-1995)					93.51
340							95% Modified-t UCL (Johnson-1978)					93.87
341												
342	**Gamma GOF Test**											
343	A-D Test Statistic					0.434	**Anderson-Darling Gamma GOF Test**					
344	5% A-D Critical Value					0.73	Detected data appear Gamma Distributed at 5% Significance Level					
345	K-S Test Statistic					0.191	**Kolmogrov-Smirnoff Gamma GOF Test**					
346	5% K-S Critical Value					0.245	Detected data appear Gamma Distributed at 5% Significance Level					
347	**Detected data appear Gamma Distributed at 5% Significance Level**											
348												
349	**Gamma Statistics**											
350	k hat (MLE)					62.8	k star (bias corrected MLE)					47.16
351	Theta hat (MLE)					1.399	Theta star (bias corrected MLE)					1.863
352	nu hat (MLE)					1507	nu star (bias corrected)					1132
353	MLE Mean (bias corrected)					87.83	MLE Sd (bias corrected)					12.79
354							Approximate Chi Square Value (0.05)					1055
355	Adjusted Level of Significance					0.029	Adjusted Chi Square Value					1043
356												
357	**Assuming Gamma Distribution**											
358	95% Approximate Gamma UCL (use when n>=50))					94.25	95% Adjusted Gamma UCL (use when n<50)					95.28
359												
360	**Lognormal GOF Test**											
361	Shapiro Wilk Test Statistic					0.939	**Shapiro Wilk Lognormal GOF Test**					
362	5% Shapiro Wilk Critical Value					0.859	Data appear Lognormal at 5% Significance Level					
363	Lilliefors Test Statistic					0.189	**Lilliefors Lognormal GOF Test**					
364	5% Lilliefors Critical Value					0.256	Data appear Lognormal at 5% Significance Level					

	A	B	C	D	E	F	G	H	I	J	K	L
365	Data appear Lognormal at 5% Significance Level											
366												
367	Lognormal Statistics											
368					Minimum of Logged Data	4.263				Mean of logged Data		4.467
369					Maximum of Logged Data	4.682				SD of logged Data		0.132
370												
371	Assuming Lognormal Distribution											
372					95% H-UCL	94.41				90% Chebyshev (MVUE) UCL		97.9
373					95% Chebyshev (MVUE) UCL	102.5				97.5% Chebyshev (MVUE) UCL		108.8
374					99% Chebyshev (MVUE) UCL	121.2						
375												
376	Nonparametric Distribution Free UCL Statistics											
377	Data appear to follow a Discernible Distribution at 5% Significance Level											
378												
379	Nonparametric Distribution Free UCLs											
380					95% CLT UCL	93.33				95% Jackknife UCL		93.84
381					95% Standard Bootstrap UCL	93.07				95% Bootstrap-t UCL		94.2
382					95% Hall's Bootstrap UCL	93.07				95% Percentile Bootstrap UCL		93
383					95% BCA Bootstrap UCL	93.25						
384					90% Chebyshev(Mean, Sd) UCL	97.86				95% Chebyshev(Mean, Sd) UCL		102.4
385					97.5% Chebyshev(Mean, Sd) UCL	108.7				99% Chebyshev(Mean, Sd) UCL		121.1
386												
387	Suggested UCL to Use											
388					95% Student's-t UCL	93.84						
389												
390	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
391	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
392	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
393	For additional insight the user may want to consult a statistician.											
394												