UCL Statistics for Uncensored Full Data Sets			
User Selected Options			
Date/Time of Computation	10/29/2015 11:41		
From File	EPC_013Surf_i.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
PCB, Total			
General Statistics			
Total Number of Observations		11	Number of Distinct Observations	4
			Number of Missing Observations	0
Minimum		0.05	Mean	3.714
Maximum		5	Median	5
SD		2.209	Std. Error of Mean	0.666
Coefficient of Variation		0.595	Skewness	-1.21
Normal GOF Test				
Shapiro Wilk Test Statistic		0.591	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value		0.85	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic		0.447	Lilliefors GOF Test	
5% Lilliefors Critical Value		0.267	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL			95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL		4.921	95% Adjusted-CLT UCL (Chen-1995)	4.55
			95% Modified-t UCL (Johnson-1978)	4.88
Gamma GOF Test				
A-D Test Statistic		2.344	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value		0.756	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic		0.468	Kolmogrov-Smirnoff Gamma GOF Test	
5% K-S Critical Value		0.263	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)		0.893	k star (bias corrected MLE)	0.71
Theta hat (MLE)		4.16	Theta star (bias corrected MLE)	5.232
nu hat (MLE)		19.64	nu star (bias corrected)	15.62
MLE Mean (bias corrected)		3.714	MLE Sd (bias corrected)	4.408
			Approximate Chi Square Value (0.05)	7.692
Adjusted Level of Significance		0.0278	Adjusted Chi Square Value	6.804
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))		7.539	95% Adjusted Gamma UCL (use when n<50)	8.523
Lognormal GOF Test				
Shapiro Wilk Test Statistic		0.614	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value		0.85	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic		0.435	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value		0.267	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.996	Mean of logged Data	0.656
Maximum of Logged Data	1.609	SD of logged Data	1.743
Assuming Lognormal Distribution			
95% H-UCL	109.5	90% Chebyshev (MVUE) UCL	18.17
95% Chebyshev (MVUE) UCL	23.34	97.5% Chebyshev (MVUE) UCL	30.51
99% Chebyshev (MVUE) UCL	44.6		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	4.809	95% Jackknife UCL	4.921
95% Standard Bootstrap UCL	N/A	95% Bootstrap-t UCL	N/A
95% Hall's Bootstrap UCL	N/A	95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A		
90% Chebyshev(Mean, Sd) UCL	5.712	95% Chebyshev(Mean, Sd) UCL	6.617
97.5% Chebyshev(Mean, Sd) UCL	7.873	99% Chebyshev(Mean, Sd) UCL	10.34
Suggested UCL to Use			
99% Chebyshev (Mean, Sd) UCL	10.34		
Recommended UCL exceeds the maximum observation			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.			
For additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			
Silver			
General Statistics			
Total Number of Observations	11	Number of Distinct Observations	4
		Number of Missing Observations	0
Minimum	0.036	Mean	36.09
Maximum	50	Median	50
SD	22.24	Std. Error of Mean	6.705
Coefficient of Variation	0.616	Skewness	-1.152
Normal GOF Test			
Shapiro Wilk Test Statistic	0.625	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.85	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.37	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.267	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	

95% Student's-t UCL	48.25	95% Adjusted-CLT UCL (Chen-1995)	44.63
		95% Modified-t UCL (Johnson-1978)	47.86
Gamma GOF Test			
A-D Test Statistic	2.203	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.768	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.43	Kolmogrov-Smirnoff Gamma GOF Test	
5% K-S Critical Value	0.266	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.68	k star (bias corrected MLE)	0.555
Theta hat (MLE)	53.09	Theta star (bias corrected MLE)	65.02
nu hat (MLE)	14.96	nu star (bias corrected)	12.21
MLE Mean (bias corrected)	36.09	MLE Sd (bias corrected)	48.45
		Approximate Chi Square Value (0.05)	5.367
Adjusted Level of Significance	0.0278	Adjusted Chi Square Value	4.649
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	82.13	95% Adjusted Gamma UCL (use when n<50)	94.82
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.612	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.85	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.401	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.267	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-3.324	Mean of logged Data	2.694
Maximum of Logged Data	3.912	SD of logged Data	2.324
Assuming Lognormal Distribution			
95% H-UCL	16835	90% Chebyshev (MVUE) UCL	382.2
95% Chebyshev (MVUE) UCL	500.5	97.5% Chebyshev (MVUE) UCL	664.7
99% Chebyshev (MVUE) UCL	987.2		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	47.12	95% Jackknife UCL	48.25
95% Standard Bootstrap UCL	N/A	95% Bootstrap-t UCL	N/A
95% Hall's Bootstrap UCL	N/A	95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A		
90% Chebyshev(Mean, Sd) UCL	56.21	95% Chebyshev(Mean, Sd) UCL	65.32
97.5% Chebyshev(Mean, Sd) UCL	77.97	99% Chebyshev(Mean, Sd) UCL	102.8
Suggested UCL to Use			
99% Chebyshev (Mean, Sd) UCL	102.8		
Recommended UCL exceeds the maximum observation			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			

and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
For additional insight the user may want to consult a statistician.											
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be											
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.											
Vanadium											
General Statistics											
Total Number of Observations					11	Number of Distinct Observations					10
						Number of Missing Observations					0
Minimum					85	Mean					104.5
Maximum					138	Median					101
SD					16.33	Std. Error of Mean					4.924
Coefficient of Variation					0.156	Skewness					0.866
Normal GOF Test											
Shapiro Wilk Test Statistic					0.923	Shapiro Wilk GOF Test					
5% Shapiro Wilk Critical Value					0.85	Data appear Normal at 5% Significance Level					
Lilliefors Test Statistic					0.222	Lilliefors GOF Test					
5% Lilliefors Critical Value					0.267	Data appear Normal at 5% Significance Level					
Data appear Normal at 5% Significance Level											
Assuming Normal Distribution											
95% Normal UCL						95% UCLs (Adjusted for Skewness)					
95% Student's-t UCL					113.5	95% Adjusted-CLT UCL (Chen-1995)					114
						95% Modified-t UCL (Johnson-1978)					113.7
Gamma GOF Test											
A-D Test Statistic					0.335	Anderson-Darling Gamma GOF Test					
5% A-D Critical Value					0.728	Detected data appear Gamma Distributed at 5% Significance Level					
K-S Test Statistic					0.211	Kolmogrov-Smirnoff Gamma GOF Test					
5% K-S Critical Value					0.255	Detected data appear Gamma Distributed at 5% Significance Level					
Detected data appear Gamma Distributed at 5% Significance Level											
Gamma Statistics											
k hat (MLE)					47.51	k star (bias corrected MLE)					34.62
Theta hat (MLE)					2.2	Theta star (bias corrected MLE)					3.02
nu hat (MLE)					1045	nu star (bias corrected)					761.5
MLE Mean (bias corrected)					104.5	MLE Sd (bias corrected)					17.77
						Approximate Chi Square Value (0.05)					698.5
Adjusted Level of Significance					0.0278	Adjusted Chi Square Value					688.7
Assuming Gamma Distribution											
95% Approximate Gamma UCL (use when n>=50))					114	95% Adjusted Gamma UCL (use when n<50)					115.6
Lognormal GOF Test											
Shapiro Wilk Test Statistic					0.945	Shapiro Wilk Lognormal GOF Test					
5% Shapiro Wilk Critical Value					0.85	Data appear Lognormal at 5% Significance Level					
Lilliefors Test Statistic					0.199	Lilliefors Lognormal GOF Test					
5% Lilliefors Critical Value					0.267	Data appear Lognormal at 5% Significance Level					
Data appear Lognormal at 5% Significance Level											
Lognormal Statistics											

Minimum of Logged Data				4.443	Mean of logged Data					4.639
Maximum of Logged Data				4.927	SD of logged Data					0.151
Assuming Lognormal Distribution										
95% H-UCL				114.1	90% Chebyshev (MVUE) UCL					118.8
95% Chebyshev (MVUE) UCL				125.3	97.5% Chebyshev (MVUE) UCL					134.2
99% Chebyshev (MVUE) UCL				151.9						
Nonparametric Distribution Free UCL Statistics										
Data appear to follow a Discernible Distribution at 5% Significance Level										
Nonparametric Distribution Free UCLs										
95% CLT UCL				112.6	95% Jackknife UCL					113.5
95% Standard Bootstrap UCL				112	95% Bootstrap-t UCL					116
95% Hall's Bootstrap UCL				117.9	95% Percentile Bootstrap UCL					112.7
95% BCA Bootstrap UCL				112.9						
90% Chebyshev(Mean, Sd) UCL				119.3	95% Chebyshev(Mean, Sd) UCL					126
97.5% Chebyshev(Mean, Sd) UCL				135.3	99% Chebyshev(Mean, Sd) UCL					153.5
Suggested UCL to Use										
95% Student's-t UCL				113.5						
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.										
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)										
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.										
For additional insight the user may want to consult a statistician.										