Assignment_C

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Q.1] 1. Perform the following steps and comment on the observation.

Step I. Generate one U(-100,100) random number. Call it m

```
## [1] "m = -47"
```

Step II. Generate one U(10,50) random number. Call it s.

```
## [1] "s = 20"
```

Step III. Generate one U(10,25) random number. Call it n.

```
## [1] "n = 13"
```

Step IV. Generate 1000 N(m,s) random numbers. Call this the population.

```
## [1] -59.52908 -43.32713 -63.71257 -15.09438 -40.40984 -63.40937
```

Step V. Sample n numbers without replacement from the population.

```
##  [1] "Head of sample:  -41.5989019812554"
##  [2] "Head of sample:  -41.4417173509891"
##  [3] "Head of sample:  -30.0149922823928"
##  [4] "Head of sample:  -67.6580047716401"
##  [5] "Head of sample:  -38.8119632069813"
##  [6] "Head of sample:  -60.1782399955601"
##  [7] "Head of sample:  -65.6903515831049"
##  [8] "Head of sample:  -46.9516838211305"
##  [9] "Head of sample:  -33.2079955613181"
## [10] "Head of sample:  -47.7848000546634"
## [11] "Head of sample:  -53.6181560136553"
## [12] "Head of sample:  -53.6800168473309"
## [13] "Head of sample:  -42.781854714974"
```

Step VI. Construct 90%, 95%, and 99% confidence intervals for the population mean.

```
## [1] "For 90% interval: "
```

```
##
##  One-sample z-Test
##
## data:  population
## z = -74.682, p-value < 2.2e-16
## alternative hypothesis: true mean is not equal to 0
```

```
## 90 percent confidence interval:
##  -48.27326 -46.19267
## sample estimates:
## mean of x
## -47.23296
```

```
## [1] "For 95% interval: "
```

```
##
##  One-sample z-Test
##
## data:  population
## z = -74.682, p-value < 2.2e-16
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  -48.47255 -45.99337
## sample estimates:
## mean of x
## -47.23296
```

```
## [1] "For 99% interval: "
```

```
##
##  One-sample z-Test
##
## data:  population
## z = -74.682, p-value < 2.2e-16
## alternative hypothesis: true mean is not equal to 0
## 99 percent confidence interval:
##  -48.86206 -45.60387
## sample estimates:
## mean of x
## -47.23296
```

Step VII. Construct 90%, 95%, and 99% confidence intervals for the population variance.

```
## [1] "degree of freedom =  999"
```

```
## [1] "Population variance = 428.420318187078"
```

```
## [1] "For 90% interval: "
```

```
##
## Results of Hypothesis Test
## --------------------------
##
## Null Hypothesis:                 variance = 20
##
## Alternative Hypothesis:          True variance is not equal to 20
##
## Test Name:                       Chi-Squared Test on Variance
##
## Estimated Parameter(s):          variance = 428.4203
##
## Data:                            population
##
```

```
## Test Statistic:                 Chi-Squared = 21399.59
##
## Test Statistic Parameter:       df = 999
##
## P-value:                        0
##
## 90% Confidence Interval:        LCL = 398.6353
##                                 UCL = 461.8795
## [1] "For 95% interval: "
##
## Results of Hypothesis Test
## --------------------------
##
## Null Hypothesis:                variance = 20
##
## Alternative Hypothesis:         True variance is not equal to 20
##
## Test Name:                      Chi-Squared Test on Variance
##
## Estimated Parameter(s):         variance = 428.4203
##
## Data:                           population
##
## Test Statistic:                 Chi-Squared = 21399.59
##
## Test Statistic Parameter:       df = 999
##
## P-value:                        0
##
## 95% Confidence Interval:        LCL = 393.1989
##                                 UCL = 468.6209
## [1] "For 99% interval: "
##
## Results of Hypothesis Test
## --------------------------
##
## Null Hypothesis:                variance = 20
##
## Alternative Hypothesis:         True variance is not equal to 20
##
## Test Name:                      Chi-Squared Test on Variance
##
## Estimated Parameter(s):         variance = 428.4203
##
## Data:                           population
##
## Test Statistic:                 Chi-Squared = 21399.59
##
## Test Statistic Parameter:       df = 999
##
## P-value:                        0
##
```

```
## 99% Confidence Interval:         LCL = 382.8567
##                                  UCL = 482.1786
```

Step VIII. Repeat steps V & VI 100/500/1000 times and count the number of times (and percentage) that the population mean is captured by the confidence interval.

```
## [1] "For n=100: Count =  93 , Percentage =  93 %"
```

```
## [1] "For n=500: Count =  476 , Percentage =  95.2 %"
```

```
## [1] "For n=1000: Count =  954 , Percentage =  95.4 %"
```

Step IX. Repeat steps V & VII 100/500/1000 times and count the number of times (and percentage) that the population variance is captured by the confidence interval.

```
## [1] "For n=100: Count =  98 , Percentage =  98 %"
```

```
## [1] "For n=500: Count =  473 , Percentage =  94.6 %"
```

```
## [1] "For n=1000: Count =  954 , Percentage =  95.4 %"
```

Q.2] In a filament cut test, a razor blade was tested six different times with ultimate forces corresponding to 8.5, 13.9, 7.4, 10.3, 15.7, 4.0.

a] find 95% confidence interval on mean using standard t-distribution

```
## [1] "For 95% interval: "
```

```
##
## Results of Hypothesis Test
## --------------------------
##
## Null Hypothesis:                 mean = 0
##
## Alternative Hypothesis:          True mean is not equal to 0
##
## Test Name:                       One Sample t-test
##
## Estimated Parameter(s):          mean of x = 9.966667
##
## Data:                            forces
##
## Test Statistic:                  t = 5.666986
##
## Test Statistic Parameter:        df = 5
##
## P-value:                         0.002379959
##
## 95% Confidence Interval:         LCL =  5.445722
##                                  UCL = 14.487611
```

b] Find a 95% confidence interval on the mean using Efron's percentile method.

```
## BOOTSTRAP CONFIDENCE INTERVAL CALCULATIONS
## Based on 1000 bootstrap replicates
##
## CALL :
## boot.ci(boot.out = bs, conf = 0.95, type = "perc")
##
## Intervals :
## Level     Percentile
## 95%   ( 6.817, 13.300 )
## Calculations and Intervals on Original Scale
```

c] Find a 95% confidence interval on the mean using the BCa method and the ABC method.

```
## [1] "BCa test"
```

```
## BOOTSTRAP CONFIDENCE INTERVAL CALCULATIONS
## Based on 1000 bootstrap replicates
##
## CALL :
## boot.ci(boot.out = bsBCa, conf = 0.95, type = "bca")
##
## Intervals :
## Level       BCa
## 95%   ( 6.633, 13.000 )
## Calculations and Intervals on Original Scale
```

```
## [1] "ABC test"
```

```
## [1]  0.950000  6.863332 13.157697
```

d] Find a 95% confidence interval on the mean using the percentile-t method.

```
## [1] "percentile-t  test:"
```

```
##          2.5%    97.5%
## mean 5.616667 14.31667
```