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In [11]:

```
import  matplotlib.pyplot  as  plt
import  math
import  random
import  statistics

size = [ 100 , 1000 , 10000 , 100000 ]

range_1 = []
range_2 = []

print ( "Without arithmetic variates:" )
print ( "" )


for  test  in  size :
  sample = []
  for  i  in  range ( test ):
    l = random . random ()
    l = math . sqrt ( l )
    l = math . exp ( l )
    sample . append ( l )
  p = statistics . mean ( sample )
  s = math .sqrt ( statistics . variance ( sample ))
  print ( "Sample size is:" ,  test )
  print ( "Sample Mean is:" ,  statistics . mean ( sample ))
  print ( "Sample Variance is:" ,  statistics . variance ( sample ))
  print ( "Sample Standard Deviation is:" ,  math . sqrt ( statistics . variance
( sample)))
  print ( "Sample 95 % c onfidance interval {" , p - ( 1.96 * s ) / math . sqrt
( test ), "," ,  p + ( 1.96 * s ) / math . sqrt ( test ), " } " )
  range_1 . append (( 2 * 1.96 * s ) / math . sqrt (test ))
  print ( "" )
print ( "" )
print ( "" )
print ( "" )
print ( "" )
print ( "With arithmetic variates:" )
print ( "" )

for  test  in  size :
  sample = []
  for  i  in  range ( test ):
    l = random . random ()
    z = l

    l = math . sqrt ( l )

    l = math . exp ( l )
    k = math . sqrt ( 1 - z )
    k = math . exp ( k )
    l = ( l + k ) / 2
    sample . append ( l )
  p = statistics . mean ( sample )
  s = math . sqrt ( statistics .variance ( sample ))
  print ( "The sample size is:" ,  test )
  print ( "The sample Mean is:" ,  statistics . mean ( sample ))
  print ( "The sample Variance is:" ,  statistics . variance ( sample ) )
  print ( "The sample Standard Deviation is:" ,  math . sqrt ( statistics . vari
ance ( sample )))
```

```
  print ("Sample 95 % c onfidance interval {" ,  p - ( 1.96 * s ) / math . sqrt
( test ), "," ,  p + ( 1.96 * s ) / math . sqrt ( test ), "}" )
  range_2 . append (( 2 * 1.96 * s ) / math . sqrt ( test ))
  print ("" )


print ( "The comparison of 95 % c onfidence intervals:" )
for  i  in  range ( 4 ):
  print ( "The sample size =" ,  size [ i ], ";" ,  "The ratio of length of conf
idence intervals to that of controlled sample is: " ,  range_1 [ i ] / range_2 [
i ])
```

Without arithmetic variates:

Sample size is: 100
Sample Mean is: 1.850411813573966
Sample Variance is: 0.21124783737215086
Sample Standard Deviation is: 0.45961705513628504
Sample 95% confidence interval {1.7603268707672541, 1.94049675638067
79}

Sample size is: 1000
Sample Mean is: 2.010320509960111
Sample Variance is: 0.18145952415113162
Sample Standard Deviation is: 0.42598066171028426
Sample 95% confidence interval {1.9839179550083836, 2.03672306491183
84}

Sample size is: 10000
Sample Mean is: 2.0061938545875284
Sample Variance is: 0.1917253322017147
Sample Standard Deviation is: 0.4378645135218367
Sample 95% confidence interval {1.9976117101225004, 2.01477599905255
64}

Sample size is: 100000
Sample Mean is: 1.998364426112556
Sample Variance is: 0.19503351166673957
Sample Standard Deviation is: 0.4416259861769228
Sample 95% confidence interval {1.9956271998916912, 2.00110165233342
1}

With arithmetic variates:

The sample size is: 100
The sample Mean is: 1.9997405435510565
The sample Variance is: 0.0009856302432479636
The sample Standard Deviation is: 0.0313947486571873
Sample 95% confidence interval {1.9935871728142478, 2.00589391428786
53}

The sample size is: 1000
The sample Mean is: 1.9988302165221077
The sample Variance is: 0.0010834309923911103
The sample Standard Deviation is: 0.03291551294437184
Sample 95% confidence interval {1.9967900918934711, 2.00087034115074
45}

The sample size is: 10000
The sample Mean is: 1.9996006659584844
The sample Variance is: 0.001105334373881387
The sample Standard Deviation is: 0.0332465693550686
Sample 95% confidence interval {1.998949033199125, 2.00025229871784
4}

The sample size is: 100000
The sample Mean is: 2.000020518120897
The sample Variance is: 0.0010751581465523353
The sample Standard Deviation is: 0.03278960424513134

```
Sample 95% confidence interval {1.9998172860482364, 2.00022375019355
76}

The comparison of 95% confidence intervals:
The sample size = 100; The ratio of length of confidence intervals t
o that of controlled sample is: 14.63993421814076
The sample size = 1000; The ratio of length of confidence intervals
 to that of controlled sample is: 12.941638261272237
The sample size = 10000; The ratio of length of confidence intervals
to that of controlled sample is: 13.170216416782926
The sample size = 100000; The ratio of length of confidence interval
s to that of controlled sample is: 13.468475644761593
```

In []: