Sanyam Agrawal - SE21UCSE192 - CSE3

CNS Assignment 2

Q2) rand function provided as part of python (uses Mersenne Twister) - χ^2 Test and KS Test

```
PS C:\Users\pc\Desktop\Crypto\MINOR_2\192> python .\Q2_Chi^2_KS_Test.py
Operating System: Windows
Kernel Version: 11

----- Chi-Square Test Results -----
Run 1:
  Chi-square Statistic = 998.80
  Chi-square Table Value (95% CI) = 1073.64, (99% CI) = 1105.92
  Conclusion: Random (99% confidence)

Run 2:
  Chi-square Statistic = 1021.20
  Chi-square Table Value (95% CI) = 1073.64, (99% CI) = 1105.92
  Conclusion: Random (99% confidence)

Run 3:
  Chi-square Statistic = 1096.00
  Chi-square Table Value (95% CI) = 1073.64, (99% CI) = 1105.92
  Conclusion: Random (99% confidence)

Run 4:
  Chi-square Statistic = 1047.20
  Chi-square Table Value (95% CI) = 1073.64, (99% CI) = 1105.92
  Conclusion: Random (99% confidence)

Run 5:
  Chi-square Statistic = 958.80
  Chi-square Table Value (95% CI) = 1073.64, (99% CI) = 1105.92
  Conclusion: Random (99% confidence)

Run 6:
  Chi-square Statistic = 1027.60
  Chi-square Table Value (95% CI) = 1073.64, (99% CI) = 1105.92
  Conclusion: Random (99% confidence)
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Run 7:
  Chi-square Statistic = 1028.00
  Chi-square Table Value (95% CI) = 1073.64, (99% CI) = 1105.92
  Conclusion: Random (99% confidence)

Run 8:
  Chi-square Statistic = 989.20
  Chi-square Table Value (95% CI) = 1073.64, (99% CI) = 1105.92
  Conclusion: Random (99% confidence)

Run 9:
  Chi-square Statistic = 1010.00
  Chi-square Table Value (95% CI) = 1073.64, (99% CI) = 1105.92
  Conclusion: Random (99% confidence)

Run 10:
  Chi-square Statistic = 1034.00
  Chi-square Table Value (95% CI) = 1073.64, (99% CI) = 1105.92
  Conclusion: Random (99% confidence)

Run 11:
  Chi-square Statistic = 1026.00
  Chi-square Table Value (95% CI) = 1073.64, (99% CI) = 1105.92
  Conclusion: Random (99% confidence)

Run 12:
  Chi-square Statistic = 998.80
  Chi-square Table Value (95% CI) = 1073.64, (99% CI) = 1105.92
  Conclusion: Random (99% confidence)

Run 13:
  Chi-square Statistic = 964.80
  Chi-square Table Value (95% CI) = 1073.64, (99% CI) = 1105.92
  Conclusion: Random (99% confidence)

----- Kolmogorov-Smirnov (KS) Test Results -----
Run 1:
  KS-statistic = 0.2295
  KS Table Value (95% CI) = 0.2483, (99% CI) = 0.2976
  Conclusion: Random (99% confidence)

Run 2:
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  KS-statistic = 0.1352
  KS Table Value (95% CI) = 0.2483, (99% CI) = 0.2976
  Conclusion: Random (99% confidence)

Run 3:
  KS-statistic = 0.1999
  KS Table Value (95% CI) = 0.2483, (99% CI) = 0.2976
  Conclusion: Random (99% confidence)

Run 4:
  KS-statistic = 0.1333
  KS Table Value (95% CI) = 0.2483, (99% CI) = 0.2976
  Conclusion: Random (99% confidence)

Run 5:
  KS-statistic = 0.0965
  KS Table Value (95% CI) = 0.2483, (99% CI) = 0.2976
  Conclusion: Random (99% confidence)

Run 6:
  KS-statistic = 0.0991
  KS Table Value (95% CI) = 0.2483, (99% CI) = 0.2976
  Conclusion: Random (99% confidence)

Run 7:
  KS-statistic = 0.1311
  KS Table Value (95% CI) = 0.2483, (99% CI) = 0.2976
  Conclusion: Random (99% confidence)

Run 8:
  KS-statistic = 0.2035
  KS Table Value (95% CI) = 0.2483, (99% CI) = 0.2976
  Conclusion: Random (99% confidence)

Run 9:
  KS-statistic = 0.1538
  KS Table Value (95% CI) = 0.2483, (99% CI) = 0.2976
  Conclusion: Random (99% confidence)

Run 10:
  KS-statistic = 0.1014
  KS Table Value (95% CI) = 0.2483, (99% CI) = 0.2976
  Conclusion: Random (99% confidence)
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Run 11:
  KS-statistic = 0.0994
  KS Table Value (95% CI) = 0.2483, (99% CI) = 0.2976
  Conclusion: Random (99% confidence)

Run 12:
  KS-statistic = 0.1237
  KS Table Value (95% CI) = 0.2483, (99% CI) = 0.2976
  Conclusion: Random (99% confidence)

Run 13:
  KS-statistic = 0.0676
  KS Table Value (95% CI) = 0.2483, (99% CI) = 0.2976
  Conclusion: Random (99% confidence)
```

Q3) rand function provided as part of Java language - chi-square test

```
PS C:\Users\pc\Desktop\Crypto\MINOR_2\192> java .\Q3_ChiSquareTest.java
Operating System: Windows 11
Kernel Version: 10.0

Seed 123:
  Chi-Square Statistic = 958.00
  Chi-Square Table Value (95% CI) = 1051.39, (99% CI) = 1180.79
  Conclusion: Random (95% confidence)

Seed 456:
  Chi-Square Statistic = 1005.20
  Chi-Square Table Value (95% CI) = 1051.39, (99% CI) = 1180.79
  Conclusion: Random (95% confidence)

Seed 789:
  Chi-Square Statistic = 960.80
  Chi-Square Table Value (95% CI) = 1051.39, (99% CI) = 1180.79
  Conclusion: Random (95% confidence)

Seed 234:
  Chi-Square Statistic = 964.40
  Chi-Square Table Value (95% CI) = 1051.39, (99% CI) = 1180.79
```

```
  Conclusion: Random (95% confidence)

Seed 567:
  Chi-Square Statistic = 970.40
  Chi-Square Table Value (95% CI) = 1051.39, (99% CI) = 1180.79
  Conclusion: Random (95% confidence)

Seed 890:
  Chi-Square Statistic = 1026.00
  Chi-Square Table Value (95% CI) = 1051.39, (99% CI) = 1180.79
  Conclusion: Random (95% confidence)

Seed 345:
  Chi-Square Statistic = 989.60
  Chi-Square Table Value (95% CI) = 1051.39, (99% CI) = 1180.79
  Conclusion: Random (95% confidence)

Seed 678:
  Chi-Square Statistic = 999.20
  Chi-Square Table Value (95% CI) = 1051.39, (99% CI) = 1180.79
  Conclusion: Random (95% confidence)

Seed 901:
  Chi-Square Statistic = 1004.80
  Chi-Square Table Value (95% CI) = 1051.39, (99% CI) = 1180.79
  Conclusion: Random (95% confidence)

Seed 432:
  Chi-Square Statistic = 1083.60
  Chi-Square Table Value (95% CI) = 1051.39, (99% CI) = 1180.79
  Conclusion: Not Random (95% confidence) but Random (99% confidence)

Seed 765:
  Chi-Square Statistic = 1076.40
  Chi-Square Table Value (95% CI) = 1051.39, (99% CI) = 1180.79
  Conclusion: Not Random (95% confidence) but Random (99% confidence)

Seed 109:
  Chi-Square Statistic = 989.60
  Chi-Square Table Value (95% CI) = 1051.39, (99% CI) = 1180.79
  Conclusion: Random (95% confidence)

Seed 654:
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```
  Chi-Square Statistic = 943.20
  Chi-Square Table Value (95% CI) = 1051.39, (99% CI) = 1180.79
  Conclusion: Random (95% confidence)
```

Q3) rand function provided as part of Java language - Kolmogorov-Smirnov Test

```
PS C:\Users\pc\Desktop\Crypto\MINOR_2\192> java
.\Q3_KolmogorovSmirnovTest.java
Operating System: Windows 11
Kernel Version: 10.0

Seed: 123
KS Statistic = 0.1062
95% Confidence Threshold = 0.2483
99% Confidence Threshold = 0.2976
Conclusion: Random (99% confidence)

Seed: 456
KS Statistic = 0.1272
95% Confidence Threshold = 0.2483
99% Confidence Threshold = 0.2976
Conclusion: Random (99% confidence)

Seed: 789
KS Statistic = 0.0911
95% Confidence Threshold = 0.2483
99% Confidence Threshold = 0.2976
Conclusion: Random (99% confidence)

Seed: 234
KS Statistic = 0.1229
95% Confidence Threshold = 0.2483
99% Confidence Threshold = 0.2976
Conclusion: Random (99% confidence)

Seed: 567
KS Statistic = 0.1266
95% Confidence Threshold = 0.2483
99% Confidence Threshold = 0.2976
Conclusion: Random (99% confidence)

Seed: 890
```

```
KS Statistic = 0.1735
95% Confidence Threshold = 0.2483
99% Confidence Threshold = 0.2976
Conclusion: Random (99% confidence)

Seed: 345
KS Statistic = 0.2065
95% Confidence Threshold = 0.2483
99% Confidence Threshold = 0.2976
Conclusion: Random (99% confidence)

Seed: 678
KS Statistic = 0.0951
95% Confidence Threshold = 0.2483
99% Confidence Threshold = 0.2976
Conclusion: Random (99% confidence)

Seed: 901
KS Statistic = 0.1387
95% Confidence Threshold = 0.2483
99% Confidence Threshold = 0.2976
Conclusion: Random (99% confidence)

Seed: 432
KS Statistic = 0.0906
95% Confidence Threshold = 0.2483
99% Confidence Threshold = 0.2976
Conclusion: Random (99% confidence)

Seed: 765
KS Statistic = 0.1687
95% Confidence Threshold = 0.2483
99% Confidence Threshold = 0.2976
Conclusion: Random (99% confidence)

Seed: 109
KS Statistic = 0.2363
95% Confidence Threshold = 0.2483
99% Confidence Threshold = 0.2976
Conclusion: Random (99% confidence)

Seed: 654
KS Statistic = 0.1107
```

```
95% Confidence Threshold = 0.2483
99% Confidence Threshold = 0.2976
Conclusion: Random (99% confidence)
```