

## Project1\_Answers.txt

### QUESTION 1

The Mean of LGM is 0.499444

The Standard Deviation of LGM is 0.288513

The Mean of Inbuilt is 0.497515

The Standard Deviation of Inbuilt is 0.289374

The mean and standard deviation between the two methods are very similar.

The small difference might be due to the choice of the seed and the default random generator might not be using the same parameters as the LGM method

### Histogram

```
-1  || *****
0   || *****
1   || *****
2   || *****
```

### QUESTION 2

The Mean of Bernoulli is 0.2014

The Standard Deviation of Bernoulli is 1.02997

### Histogram

```
16  || *
19  || *
20  || *
21  || *
22  || ***
23  || ****
24  || *****
25  || *****
26  || *****
27  || *****
28  || *****
29  || *****
30  || *****
31  || *****
32  || *****
33  || ****
34  || ****
35  || **
36  || *
37  || *
38  || *
```

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### QUESTION 3

Probability that binomial value is atleast 40 is 0

The mathematical formula which needs to be used is  $P(X \geq 40, p) = P(X=40) + P(X=41) + P(X=42) + P(X=43) + P(X=44)$ ,

where  $P(X=k, p) = \binom{44}{k} (p^k) ((1-p)^{(1-k)})$

Probability using math formula that binomial value is atleast 40 is 4.82366e-05

The probability from mathematical formula is very small and is almost equal to 0, which is the value from the statistical method.

This is because to get 40 true values out of 44 independent observations is very low, i.e.  $(0.64)^{40} \sim 0$

### QUESTION 4

Probability that exponential distribution is greater than 1 0.5081

Probability that exponential distribution is greater than 4 0.0706

### Histogram

```
<=0  || *****
<=1  || *****
<=2  || *****
<=3  || *****
<=4  || ****
<=5  || **
<=6  || **
<=7  || *
<=8  || *
<=9  || *
<=10 || *
<=11 || *
<=12 || *
<=13 || *
<=14 || 
<=15 || 
<=16 || *
<=17 ||
```

Mean of exponential distribution is 1.50164

Std Deviation of exponential distribution is 1.51054

### QUESTION 5

The mean of box muller normal distribution is -0.00133455

The standard deviation of box muller normal distribution is 1.00771

The mean of polar marsaglia normal distribution is 0.0036287

The standard deviation of polar marsaglia normal distribution is 0.979747

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Timing difference between Polar Marsaglia and Box Muller in seconds for 5000 normal random numbers is 0.069

Timing difference between Polar Marsaglia and Box Muller in seconds for 10000 normal random numbers is 0.129

It can be clearly seen that the Box muller method is more efficient as the number of random numbers to be generated increases

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