Abdullah Gul University

Math-301

(PROBABILITY & STATISTICS)

Fall 2022

**Homework**

Name & Surname: Zehra Moğulkoç
ID Number: 110510223

| Q1 (100)	Total (100)

Initials:

<table>
<tr><td>Q 1.

(40 pt.)</td><td>The population data are separately given for each student as in the table below. To see the effect of sample size (from 1 to 30) on the sampling distribution, please, first, randomly construct the sampling distribution for each sample size. For this construction, it is recommended to use a program (such as Matlab). Then, for each sampling distribution, calculate the mean and variance in order to compare with the mean and variance of the population distribution. At the end, please, prepare a report about the effect of sample size (from 1 to 30) on the sampling distribution by using figures.</td></tr>
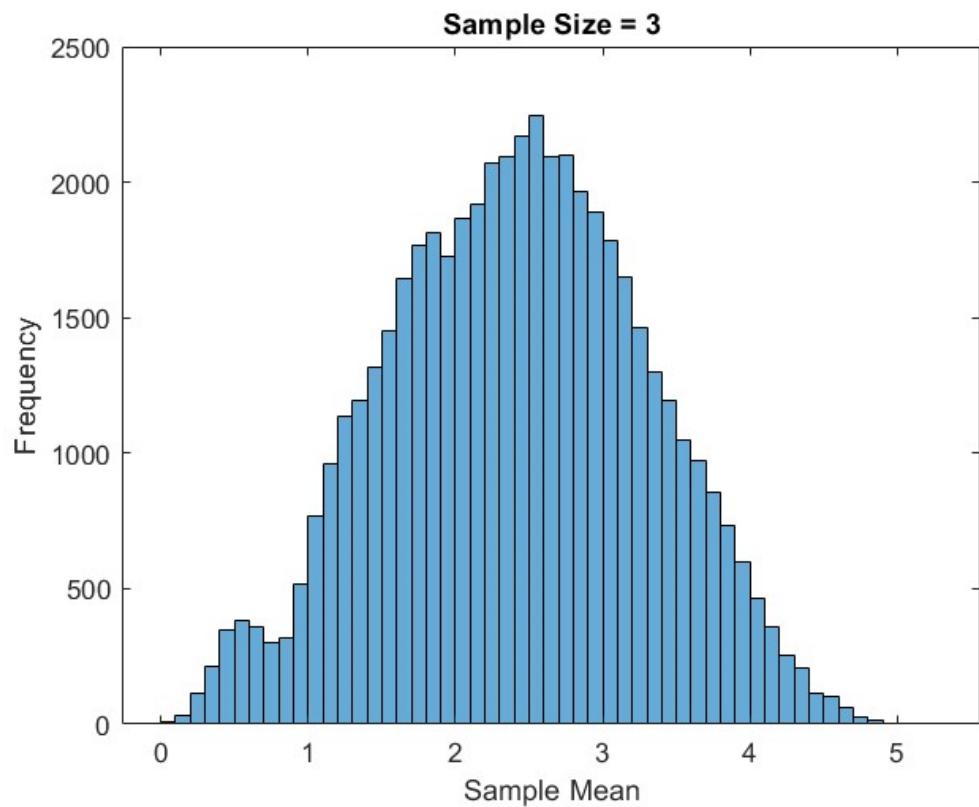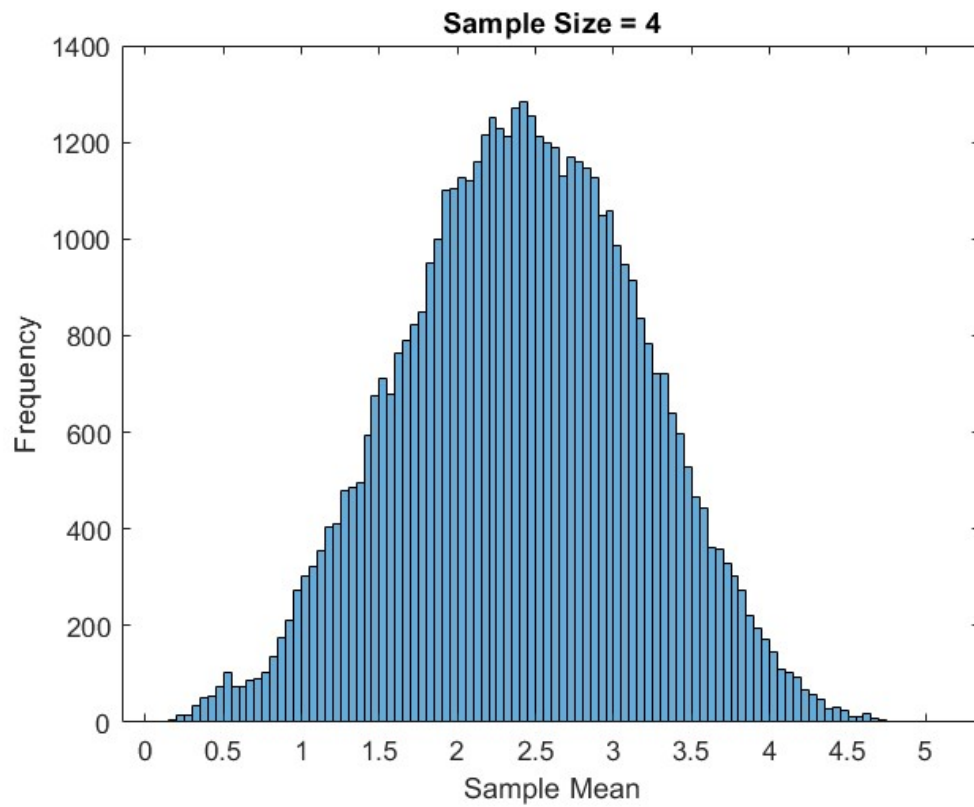</table>

>> statistics_homework
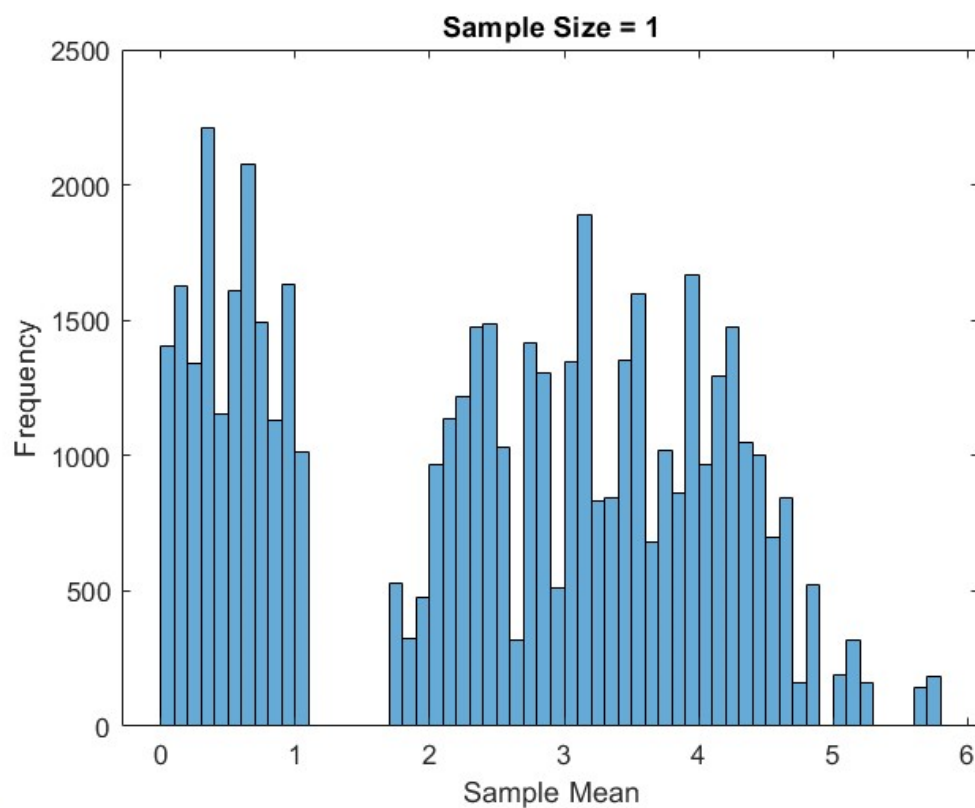
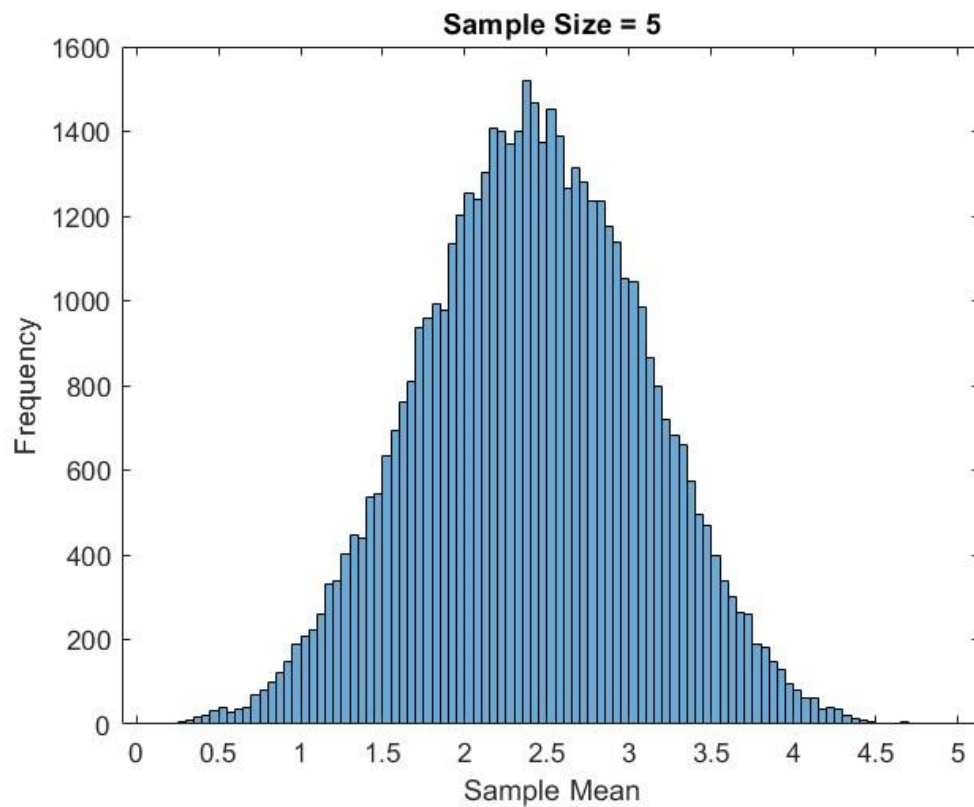Sample size: 1 Mean: 2.4144
Sample size: 1 Variance: 2.326
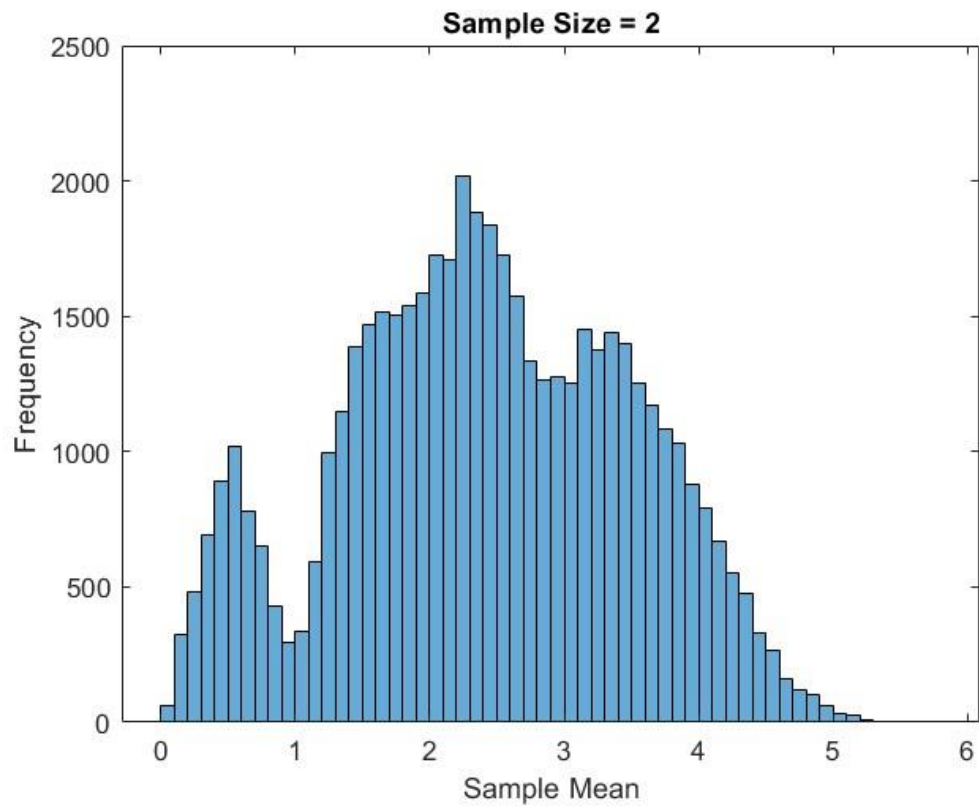
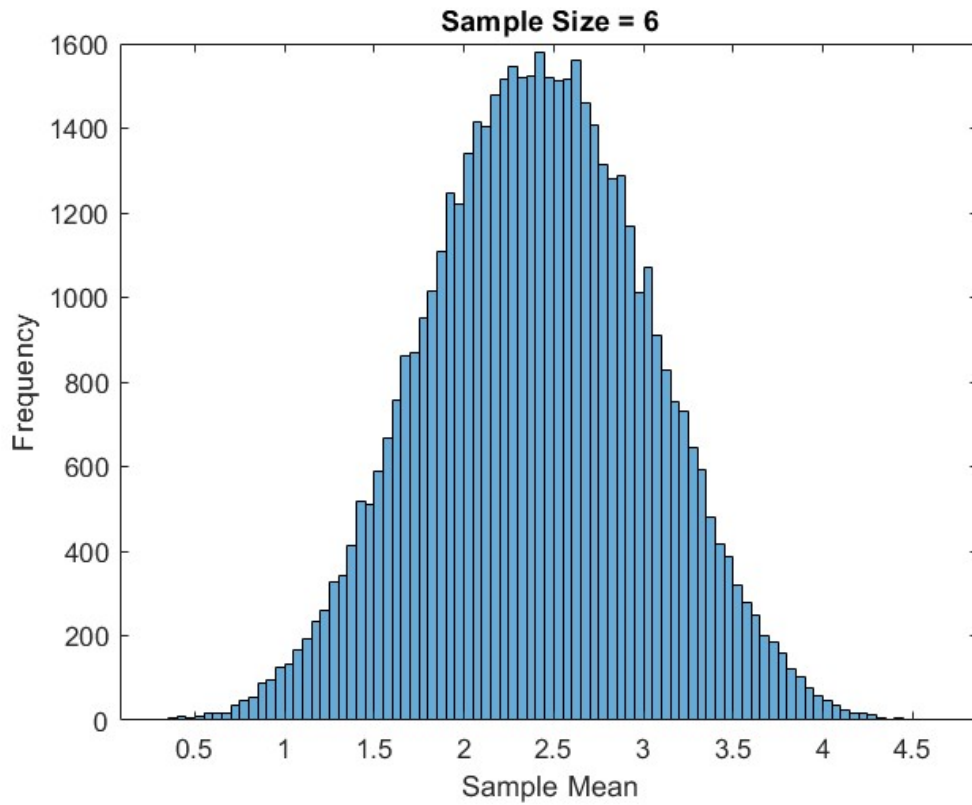Sample size: 2 Mean: 2.4176
Sample size: 2 Variance: 1.1658

Sample size: 3 Mean: 2.4156
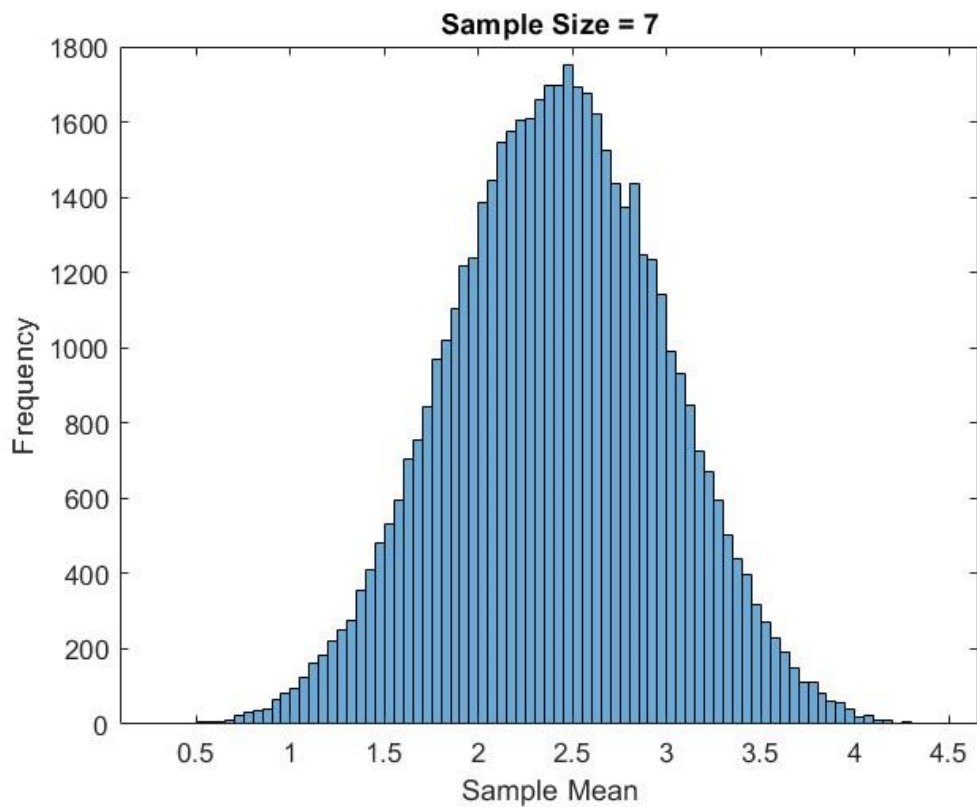Sample size: 3 Variance: 0.77215

Sample size: 4 Mean: 2.4163
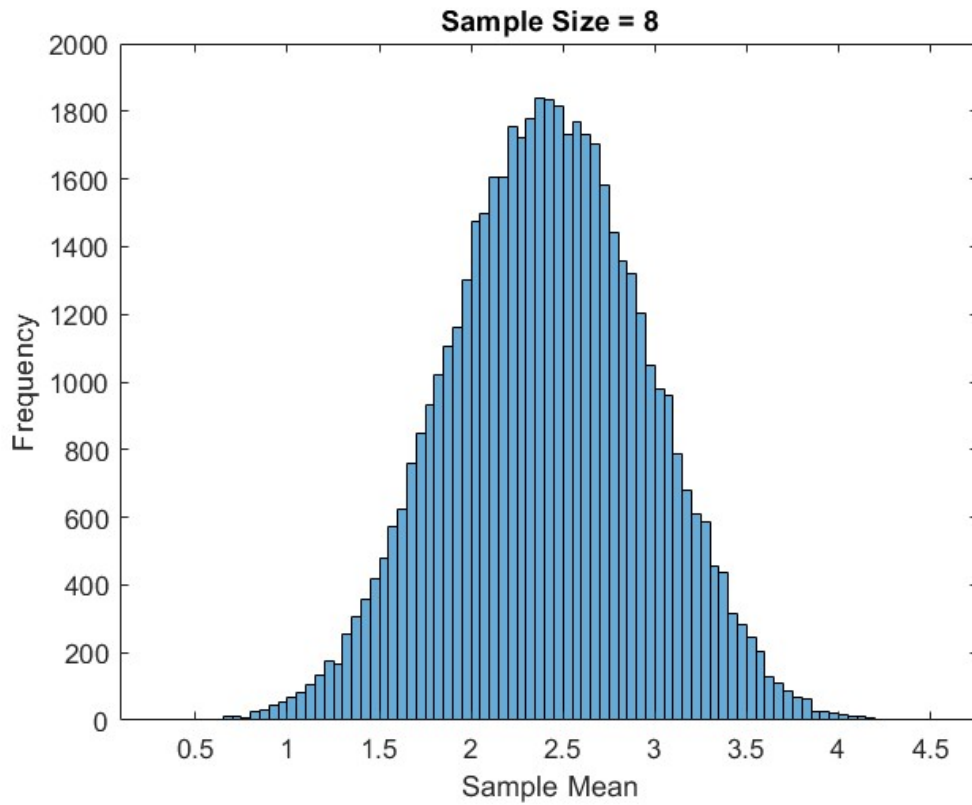Sample size: 4 Variance: 0.58173

Sample size: 5 Mean: 2.4111
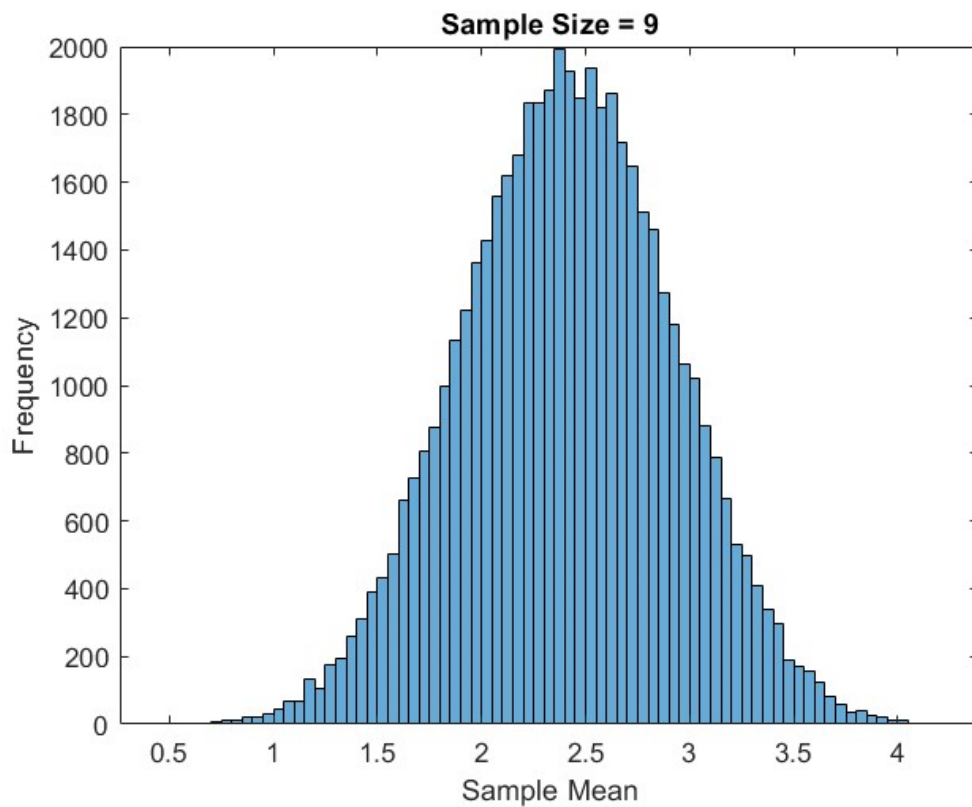Sample size: 5 Variance: 0.46145

Sample Size = 6

Sample size: 6 Mean: 2.4096
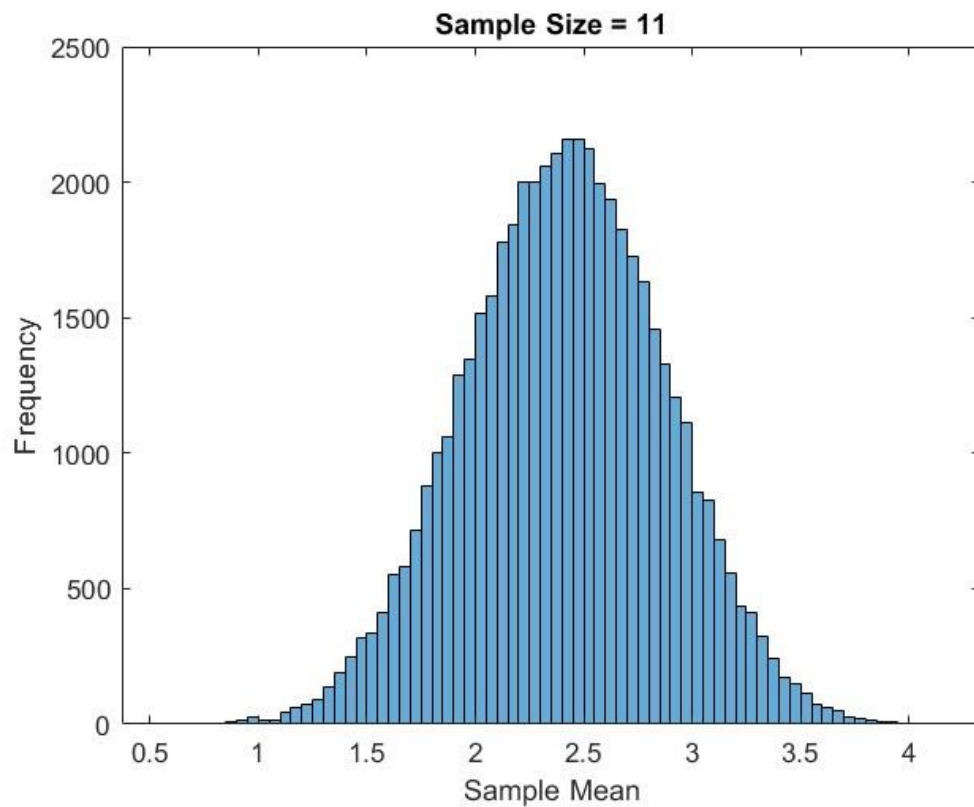Sample size: 6 Variance: 0.38255
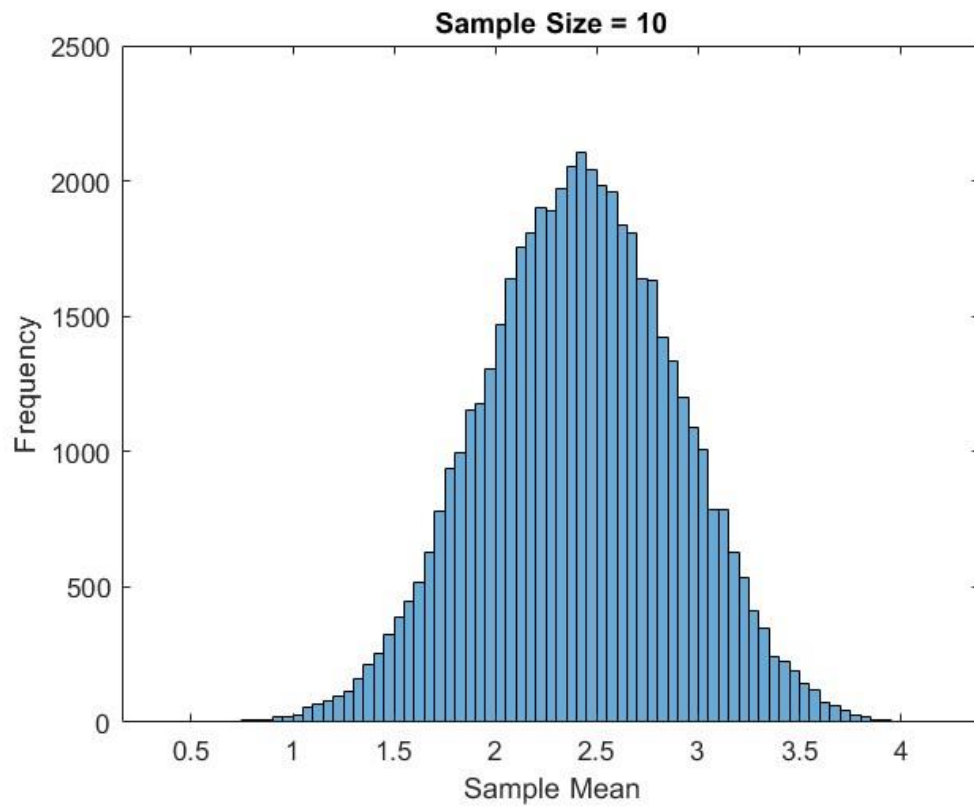

Sample Size = 7

Sample size: 7 Mean: 2.4143
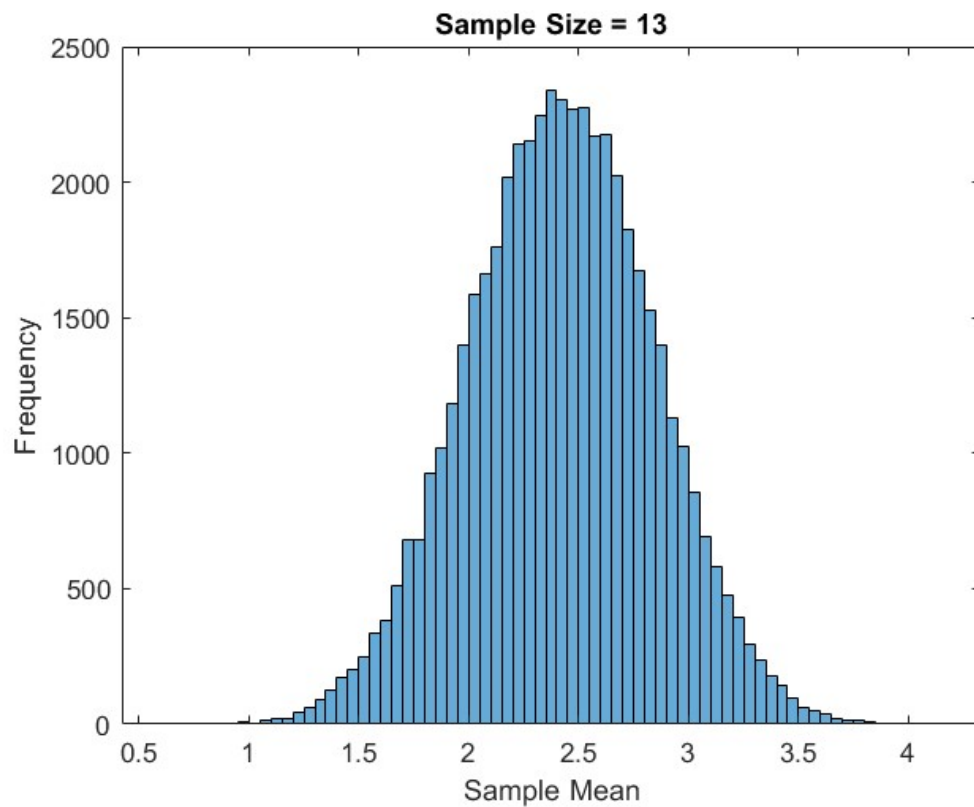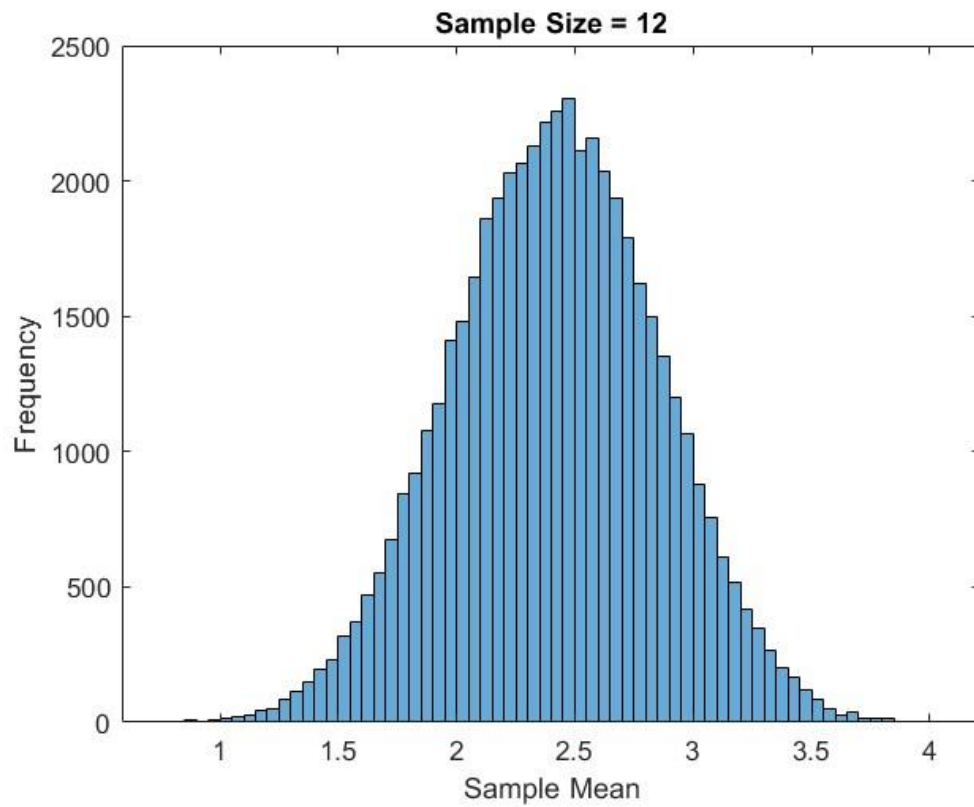Sample size: 7 Variance: 0.32937
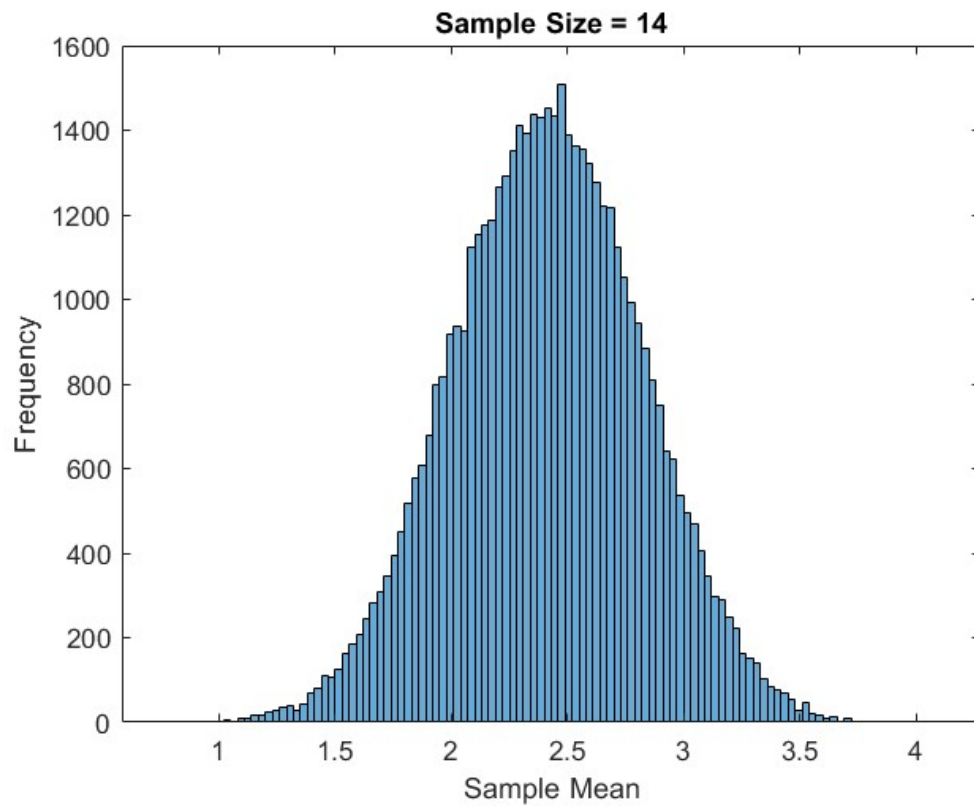
Sample size: 8 Mean: 2.4165
Sample size: 8 Variance: 0.28987

Sample size: 9 Mean: 2.4128
Sample size: 9 Variance: 0.2584

Sample size: 10 Mean: 2.4147
Sample size: 10 Variance: 0.23062

Sample size: 11 Mean: 2.412
Sample size: 11 Variance: 0.21241

Sample size: 12 Mean: 2.4142
Sample size: 12 Variance: 0.19252

Sample size: 13 Mean: 2.4182
Sample size: 13 Variance: 0.1779

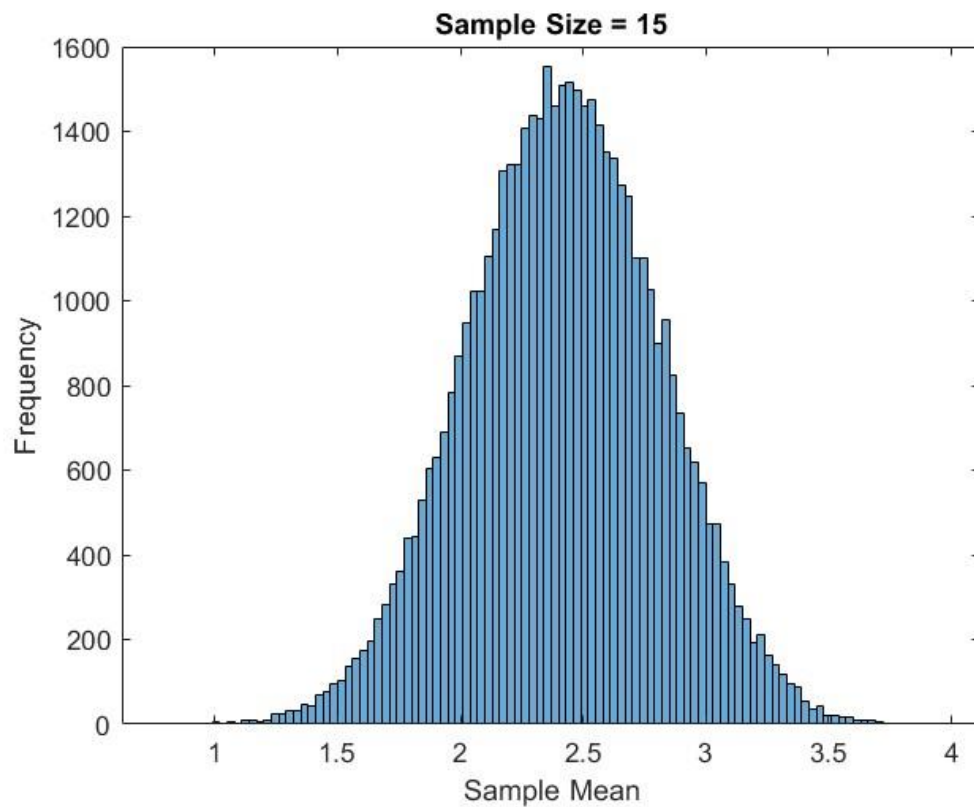Sample size: 14 Mean: 2.4119
Sample size: 14 Variance: 0.16656

Sample size: 15 Mean: 2.4184
Sample size: 15 Variance: 0.15381

Sample size: 16 Mean: 2.4144
Sample size: 16 Variance: 0.14574

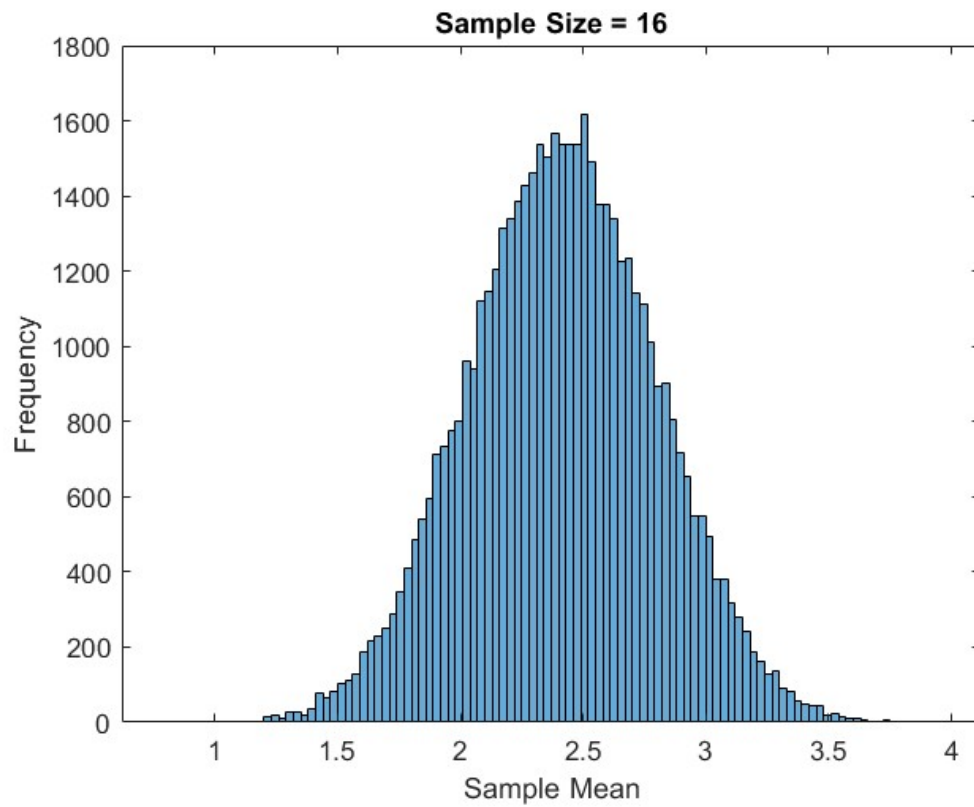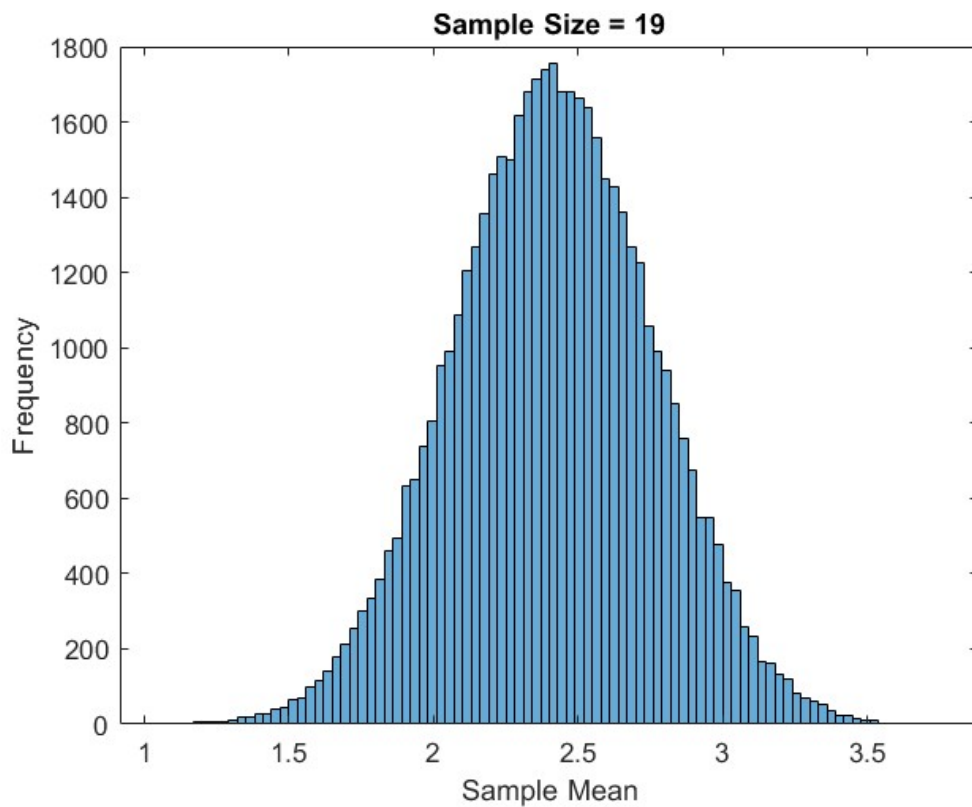Sample size: 17 Mean: 2.414
Sample size: 17 Variance: 0.13618

Sample Size = 18

Sample size: 18 Mean: 2.4187
Sample size: 18 Variance: 0.13045

Sample Size = 19
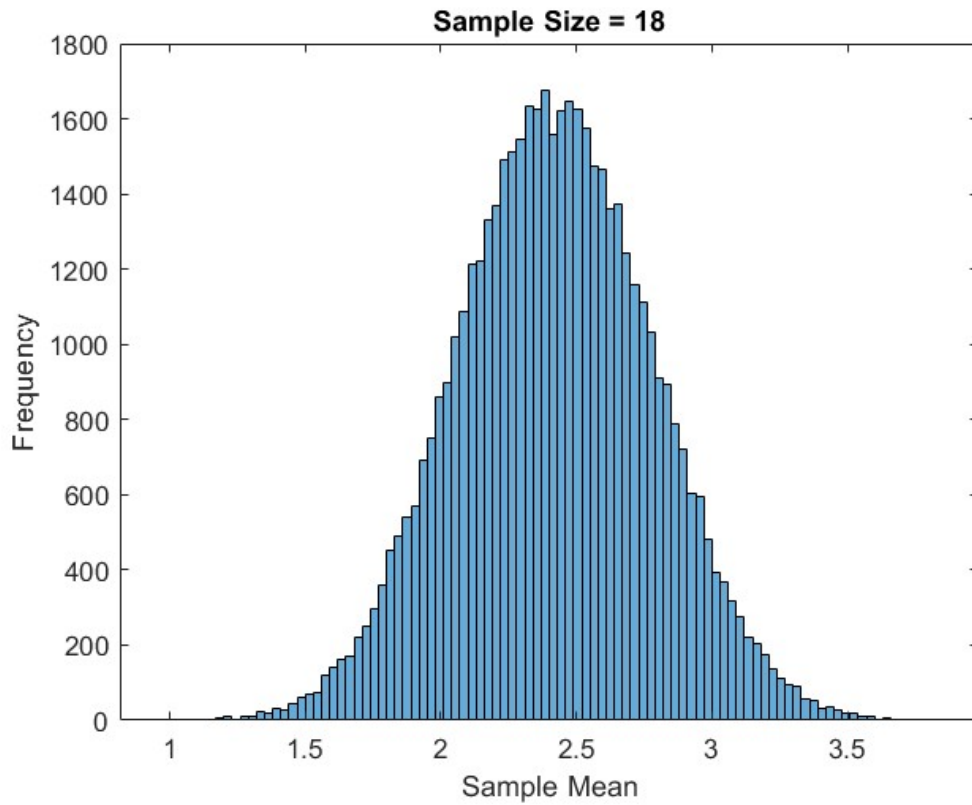
Sample size: 19 Mean: 2.4123
Sample size: 19 Variance: 0.12054
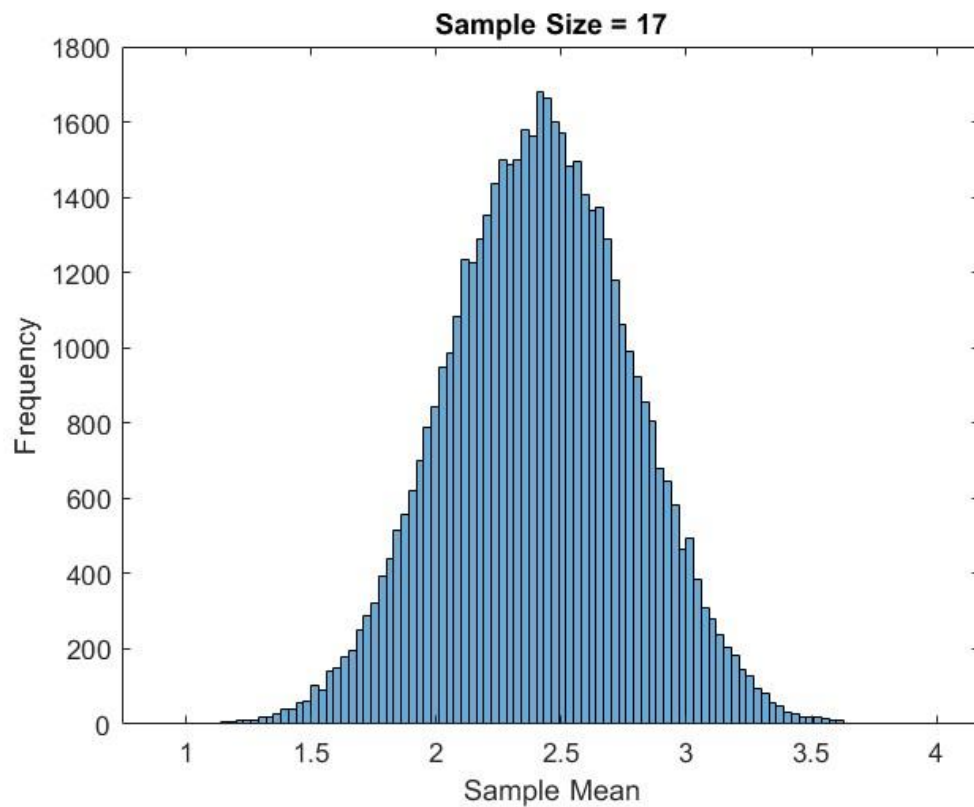
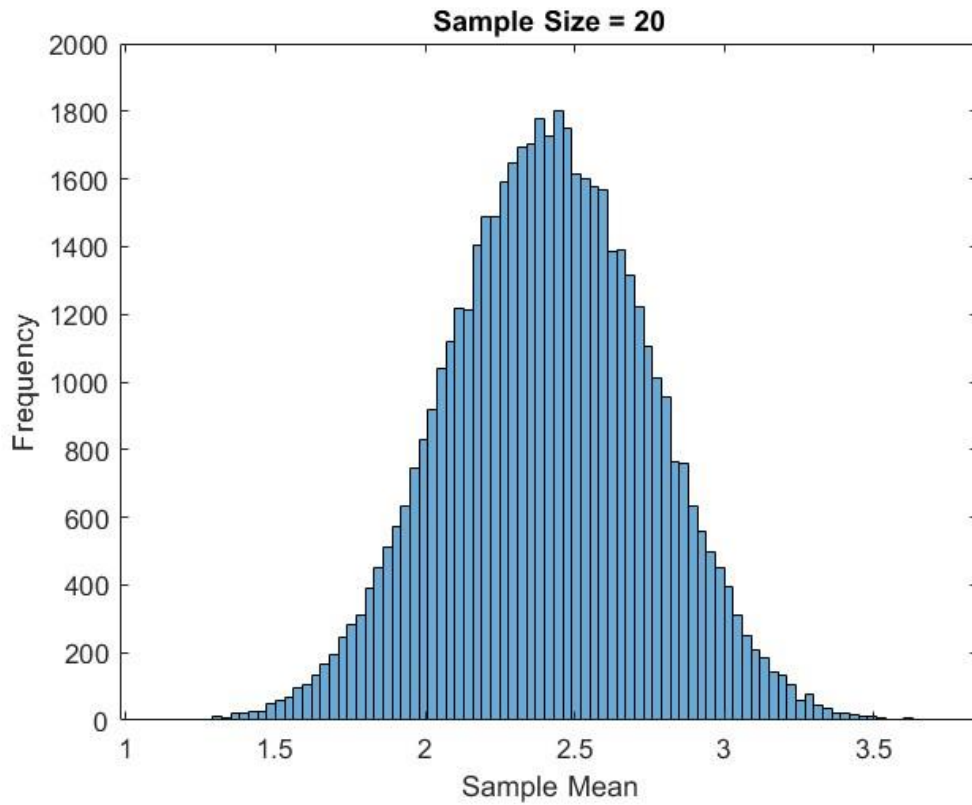Sample size: 20 Mean: 2.4115
Sample size: 20 Variance: 0.11533

Sample size: 21 Mean: 2.4136
Sample size: 21 Variance: 0.10979

Sample size: 22 Mean: 2.4119
Sample size: 22 Variance: 0.10509

Sample size: 23 Mean: 2.4154
Sample size: 23 Variance: 0.10021

Sample Size = 24

Sample size: 24 Mean: 2.4133
Sample size: 24 Variance: 0.096394

Sample Size = 25

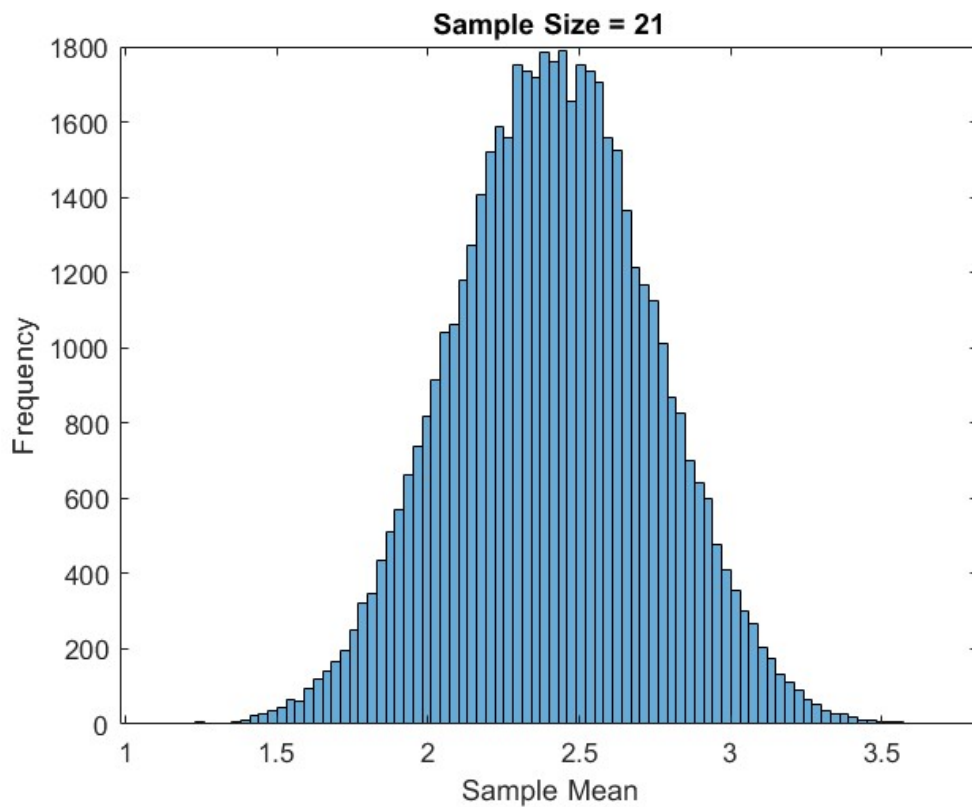Sample size: 25 Mean: 2.4134
Sample size: 25 Variance: 0.092319

Sample Size = 26

Sample size: 26 Mean: 2.4149
Sample size: 26 Variance: 0.089795

Sample Size = 27

Sample size: 27 Mean: 2.4141
Sample size: 27 Variance: 0.085158

Sample Size = 28

Sample size: 28 Mean: 2.4136
Sample size: 28 Variance: 0.082876

Sample Size = 29

Sample size: 29 Mean: 2.414
Sample size: 29 Variance: 0.079751
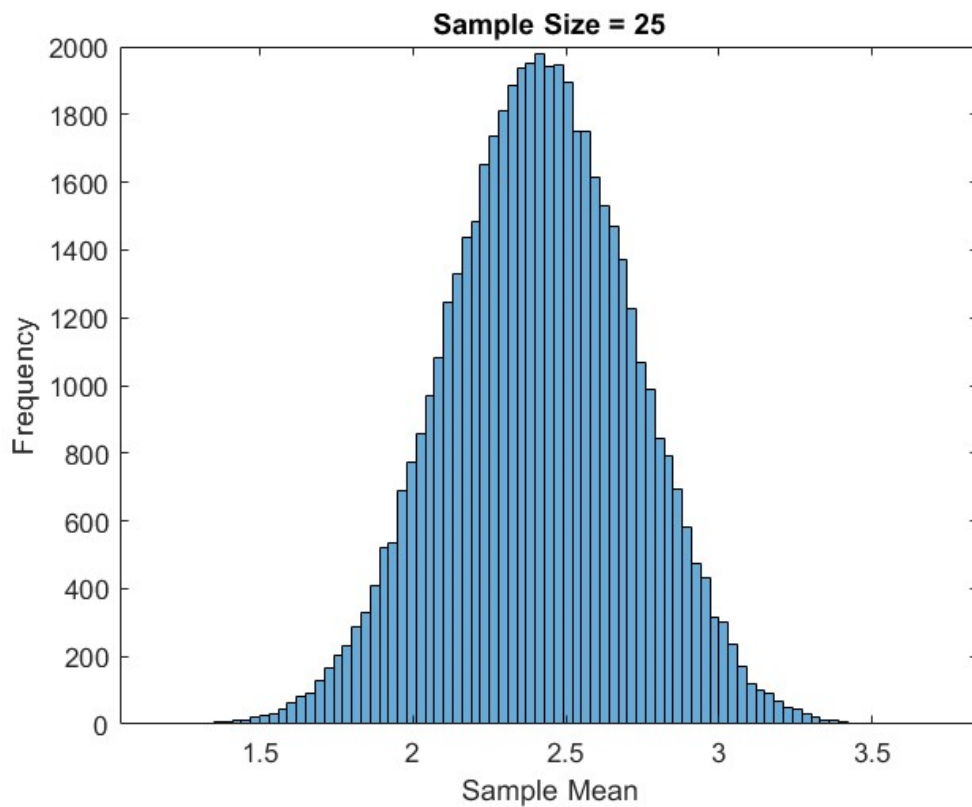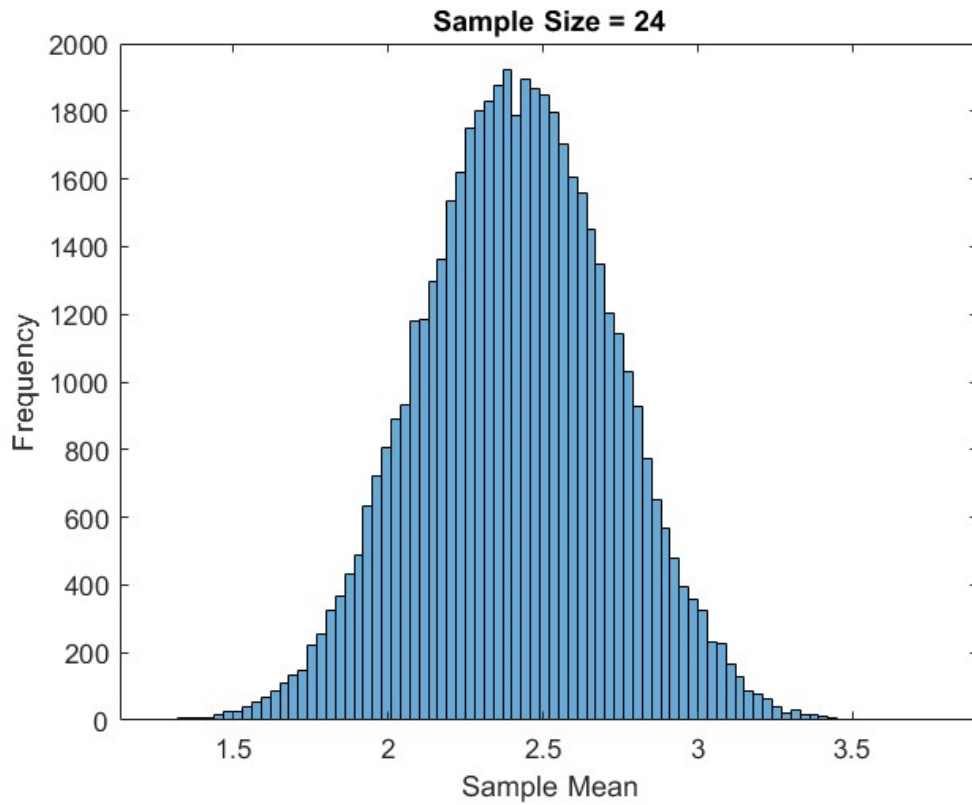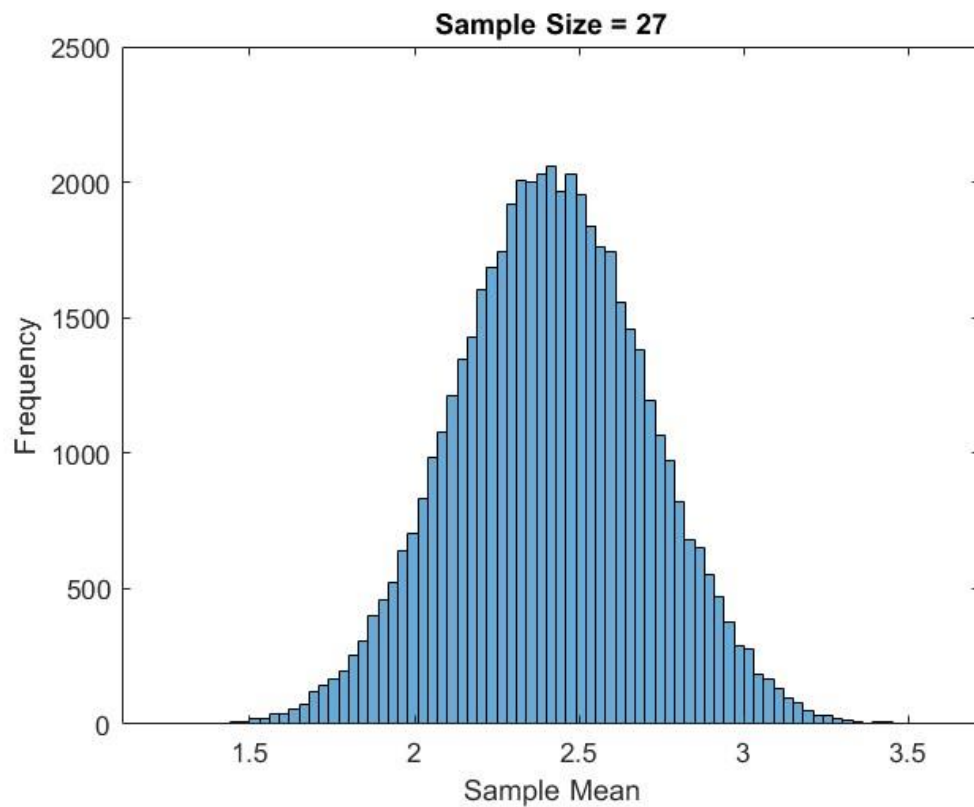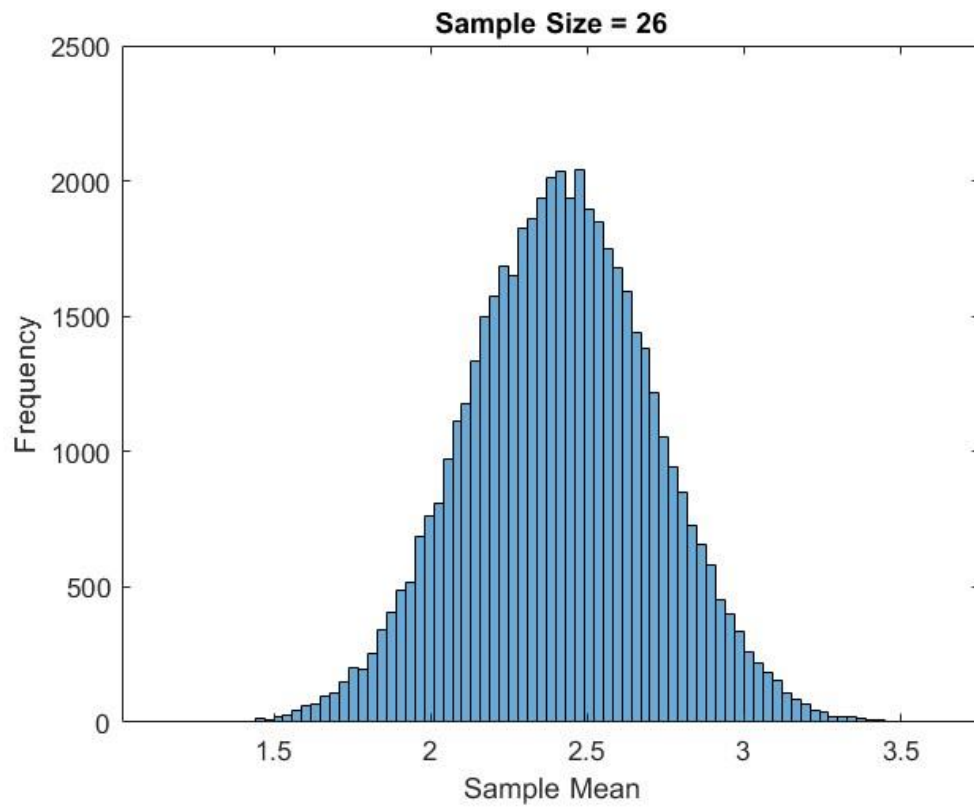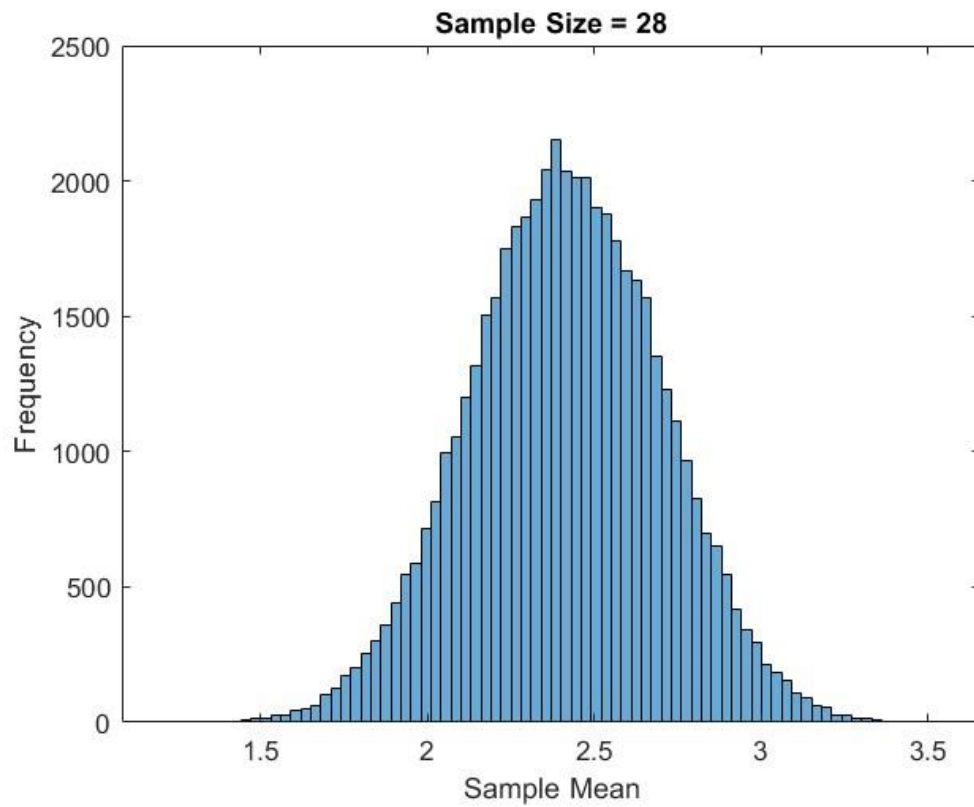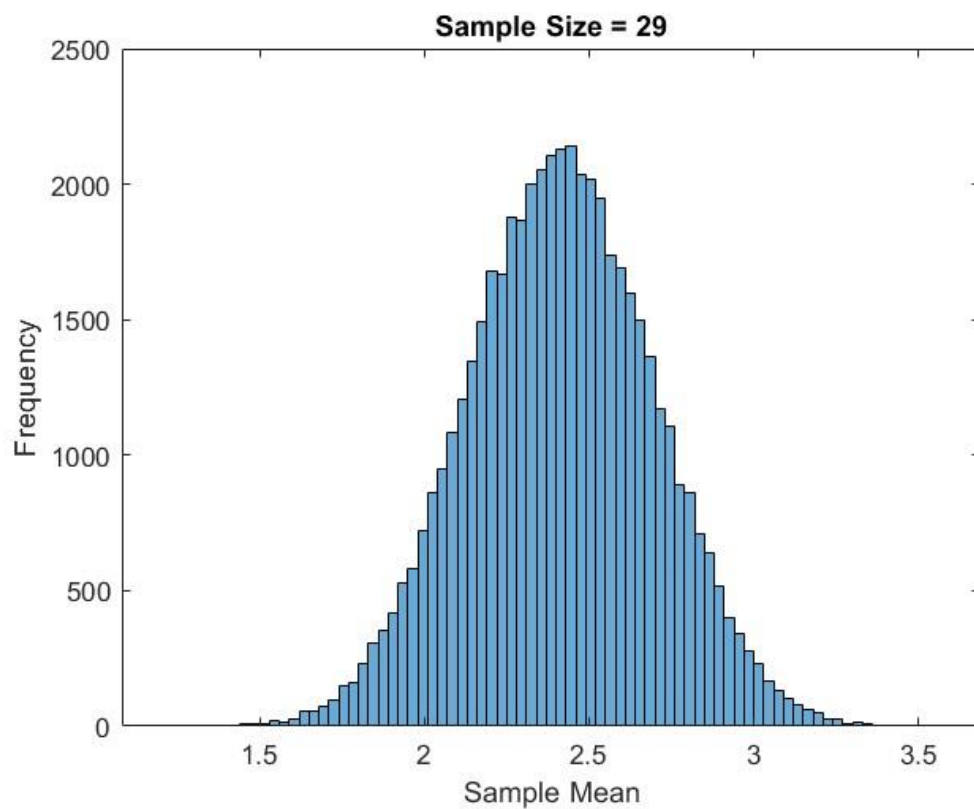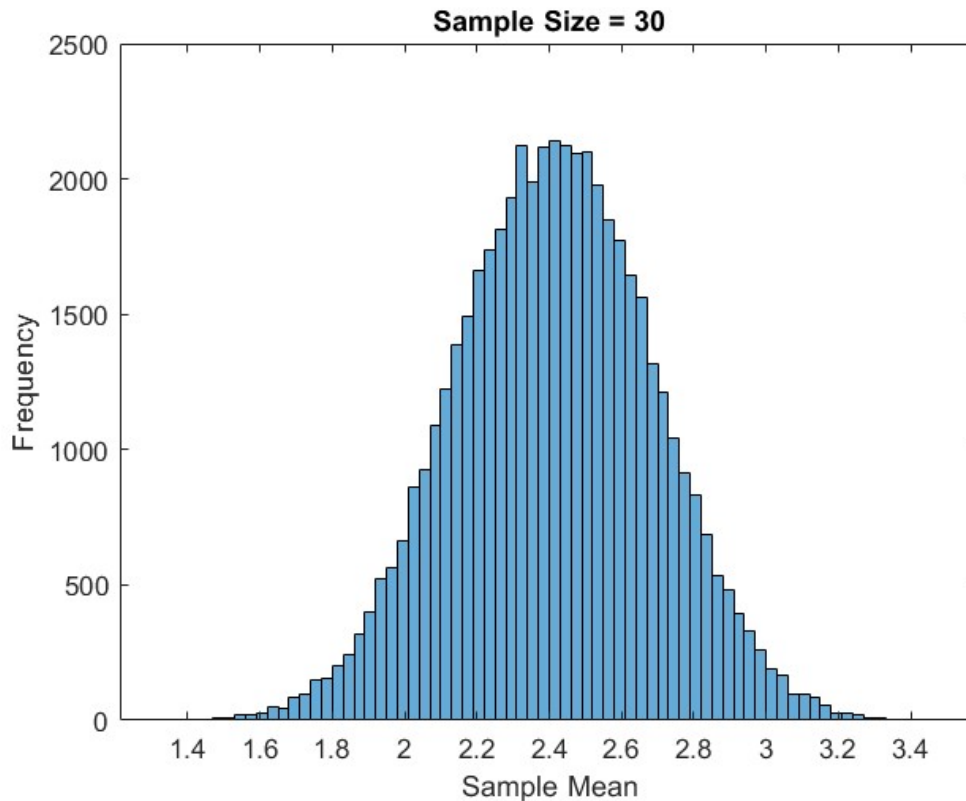
Sample size: 30 Mean: 2.4133
Sample size: 30 Variance: 0.076225

Population Mean: 2.4143
Population Variance: 2.3231

Conclusion:

In this report, sampling distributions were calculated for different input sizes (from1 to 30) of the data in R2 line 17. For each sample size, 50000 random samples were calculated. When we compare the population mean and the sampling means; The mean error gets smaller as the sample size increases.

When sample size is two, sample mean is 2.4176, population mean is 2.4143. The difference is 0,00217. When sample size is 30, the error is 0,001. Since the number of samples is large for each size, the difference appears less, but in fact when the sample size is 30 the error is less as negligible. This means less sampling error.

It is observed that the variance gets smaller as the sample size increases. When sample size is one, variance is 2.326. When sample size is 30, variance is 0.076225. Population variance is 2.3231 which closer to the less number size variance.

As the sample size increases, the interval width became narrower.

As the sample size increased, the shape of the histogram became closer to the normal distribution.