Homework for Module 5

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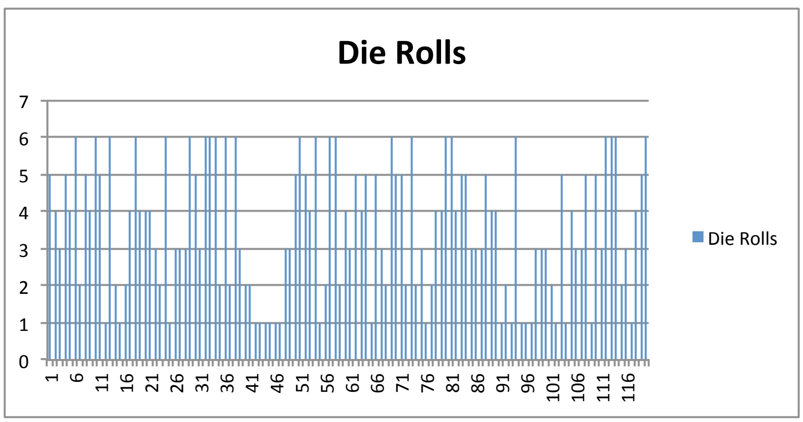
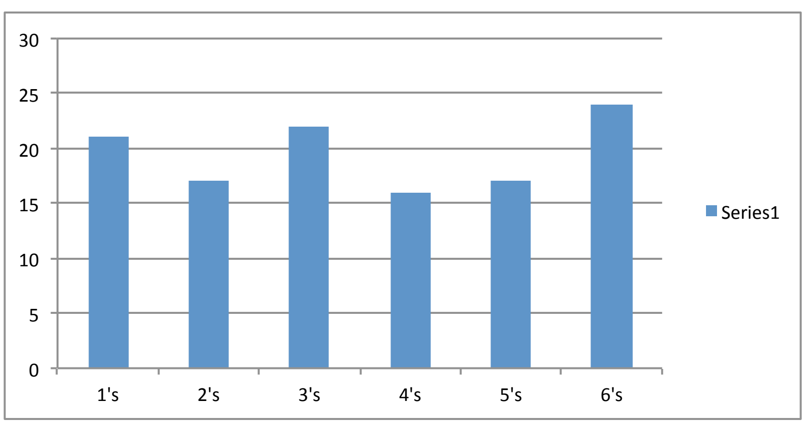
6.1.1

a) The population is defined by the set of all possible rolls of the dice. $(X : x \mid x \in \{1, 2, 3, 4, 5, 6\})$

b) There are no additional factors that should be taken into account. For fair dice, there are no issues pertaining to the way in which the sample has been controlled.

6.2.5 There appear to be no outliers and the data set looks like I would expect it to.

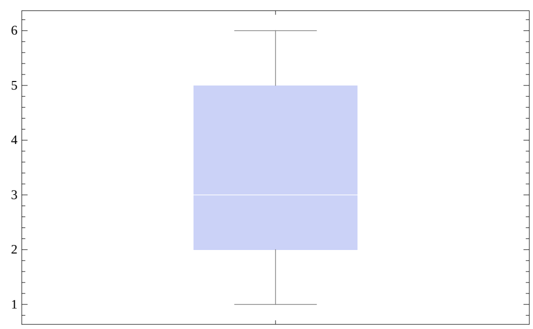




6.3.4 There appear to be no anomolies in the sample statistics. The results are appropriate for the sample size.

Table 1: Summary Statistics

Mean	3.567
Standard Error	0.161
Median	3.5
Mode	6
Standard Deviation	1.767
Sample Variance	3.122
Kurtosis	-1.319
Skewness	-0.033
Range	5
Minimum	1
Maximum	6
Sum	428
Count	120



7.2.9 To find the standard deviation, σ, of $\frac{X_1+X_2}{2}$ first calculate $\mathrm{Var}(\frac{X_1+X_2}{2})$.

$$\begin{aligned}
\mathrm{Var}\frac{X_1+X_2}{2} &= \frac{\mathrm{Var}(x_1 + \mathrm{Var}(x_2}{4} \\
&= \frac{5.39^2 + 9.43^2}{4} \\
&\approx 29.49 \\
\sigma &= \sqrt{29.49} \\
&\approx 5.43
\end{aligned}$$

7.3.3

a)

$$P(\mid N(0, \frac{7}{15}) \mid \leq 0.4) \approx 0.4418$$

b)

$$P(\mid N(0, \frac{7}{50}) \mid \leq 0.4) \approx 0.7150$$

7.3.7 Applying the definition of t-statistic from page 311,

a)

$$P(\frac{|t_{21-1}|}{\sqrt{21}} \leq c) = 0.95$$

And now solving for c

$$\begin{aligned} c &= \frac{t_{0.025,20}}{\sqrt{21}} \\ &\approx 0.4552 \end{aligned}$$

b)

$$P(\frac{|t_{21-1}|}{\sqrt{21}} \leq c) = 0.99$$

And now solving for c

$$\begin{aligned} c &= \frac{t_{0.005,20}}{\sqrt{21}} \\ &\approx 0.6209 \end{aligned}$$

7.3.10

a) Point estimate of the probability of rolling a 6:

$$\frac{24}{120} = 0.2$$

b) Standared error of point estimate:

$$\begin{aligned} \text{s.e.}\hat{p} &= \sqrt{\frac{\hat{p}1 - \hat{p}}{n}} \\ &= \sqrt{\frac{0.2 \times 0.8}{120}} \\ &\approx 0.036515 \end{aligned}$$

7.6.12 Using sample size $n = 80$ and $p = 0.48$, given, calculate:

$$P(0.48 - 0.1 \leq \hat{p} \leq 0.48 + 0.1) \simeq P(80 \times 0.38 \leq B(80, 0.48) \leq 80 \times 0.58)$$

Then apply the Normal approximation to $B(n, p)$ from page 240:

$$
\begin{aligned}
\Phi(\frac{46.4 + 0.5 - 80 \times 0.48}{\sqrt{80 \times 0.48 \times 0.52}}) - \Phi(\frac{30.4 + 0.5 - 80 \times 0.48}{\sqrt{80 \times 0.48 \times 0.52}}) = \\
&\approx \Phi(1.9022) - \Phi(-1.6784) \\
&\approx 0.9714 - 0.0466 \\
&\approx 0.9248
\end{aligned}
$$