EXERCISE: DESCRIPTIVE STATISTICS

Abstract. Solve these problems, and mark your chosen answer on the form provided.

Patterns of Randomness

In a series of dice-tossing experiments, students demonstrated a variety of random processes. The frequencies of the numbers generated in these experiments are displayed in these barplots:

1. A Uniform Distribution

A single roll of the die has an equal probability of coming up with any of the six spots. Which plot represents this experiment and its shape?

(a) V, right-skewed
(b) III, symmetric
(c) I, flat (*platykurtic*)
(d) II, right-skewed
(e) IV, left-skewed

2. A Summation Distribution

One experiment tallied the sums of a set of 4 random rolls. Which plot represents this experiment and its shape?

(a) III, symmetric
(b) I, flat (*platykurtic*)
(c) II, right-skewed
(d) V, right-skewed
(e) IV, left-skewed
3. A Record Distribution

One experiment tallied the largest values from a set of 4 random rolls. Which plot represents this experiment, and how would you describe its shape?

(a) I, flat \((\text{platykurtic})\)
(b) II, right-skewed
(c) IV, left-skewed
(d) V, right-skewed
(e) III, symmetric

4. Interquartile Range

Consider this sample, represented by a stem and leaf plot (all values are whole numbers in the range 0…11):

\[
\begin{array}{c}
0 | 00 \\
1 | 00 \\
2 | 0000 \\
3 | 00000000000 \\
4 | 00000000 \\
5 | 00 \\
6 | 0000 \\
7 | 000 \\
8 | \\
9 | 0 \\
10 | 0 \\
11 | 0 \\
\end{array}
\]

Are there any outlier observations?

(a) yes, 9, 10, and 11  
(b) yes, 11 only  
(c) yes, the two 0’s and 11  
(d) no  
(e) yes, 10 and 11

5. The Sample Mean and Standard Deviation

For this sample of \(n = 10\) counts, what are the estimated mean and standard deviation?

\[
\begin{array}{cccccccc}
8 & 9 & 9 & 8 & 6 & 11 & 9 & 8 & 9 & 7 \\
\end{array}
\]

(a) 7.5, 7.99  
(b) 8.4, 1.35  
(c) 9.0, 1.28  
(d) 8.4, 1.82  
(e) 8.5, 8.50

Some Useful Formulas

Boxplots and Fences.

\[
IQR = Q_3 - Q_1 \quad lower = Q_1 - 1.5 IQR \quad upper = Q_3 + 1.5 IQR
\]

Mean and Variance.

\[
\bar{y} = \frac{1}{n} \sum_{i=1}^{n} y_i \quad s^2 = \frac{1}{n - 1} \sum_{i=1}^{n} (y_i - \bar{y})^2 = \frac{1}{n - 1} \left[ \sum_{i=1}^{n} y_i^2 - n \bar{y}^2 \right]
\]