Stevens Institute of Technology

SYS-601 Homework #2 Solution

Submit the following using the online submission system: 1) Cover sheet with name, date, and collaborators, 2) Written responses in PDF format, 3) All work (e.g. .xlsx or .py files).

2.1 Origami Statistics [15 points]

This problem works with a dataset for origami products manufactured during class available from the CSV file `origami.csv`.

(a) 10 pts Using the full dataset on time to manufacture an origami **boat**:

(i) 1 pt Compute the mean ($\bar{x}$). $\bar{x} = 93.0$ s

(ii) 1 pt Compute the median. median $= 65.8$ s

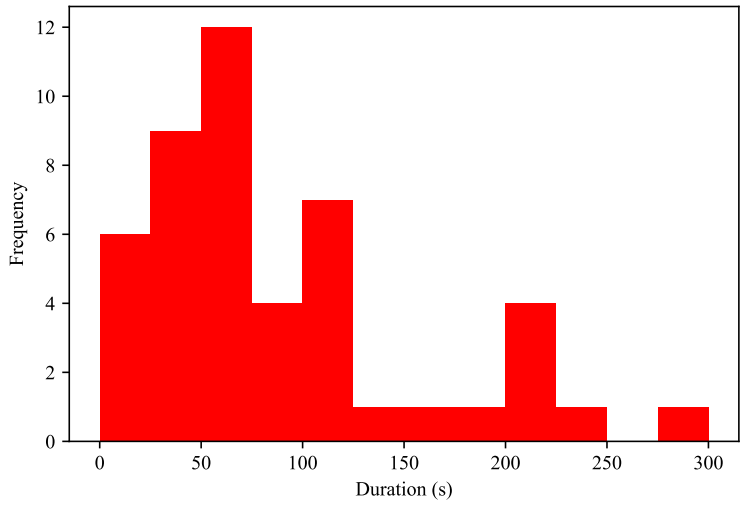
(iii) 2 pts Compute the 5th and 95th percentile (P_5, P_{95}).
$P_5 = 14.0$ s, $P_{95} = 230.5$ s

(iv) 2 pts Compute the 1st, 2nd, and 3rd quartile (Q_1, Q_2, Q_3).
$Q_1 = 42.8$ s, $Q_2 = 65.8$ s, $Q_3 = 116.2$ s

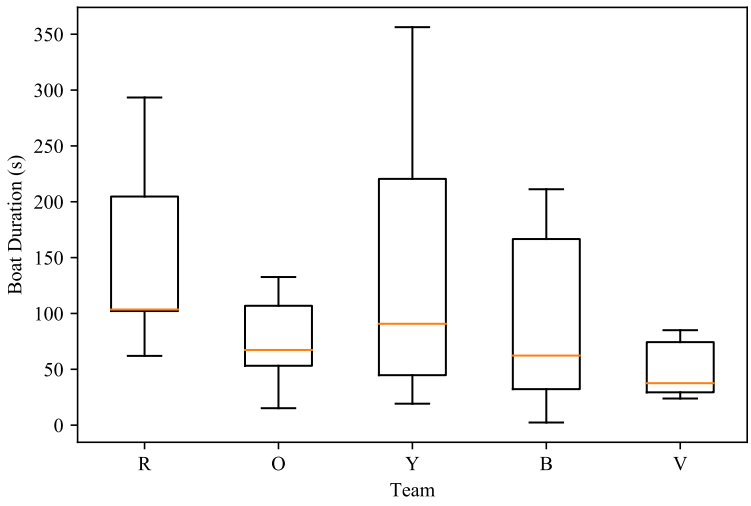
(v) 1 pt Compute the interquartile range (IQR). $IQR = 73.3$ s

(vi) 1 pt Compute the sample variance and sample standard deviation (s^2, s).
$s^2 = 5995.9$ s^2, $s = 77.4$ s

(vii) 2 pts Create a histogram with appropriate bins.



(b) 5 pts For **each** team manufacturing at least 5 origami boats, create a box-and-whiskers plot where whiskers show extremes within 1.5 × IQR. For example, if three teams produced at least 5 boats each, your answer should have three separate box plots.

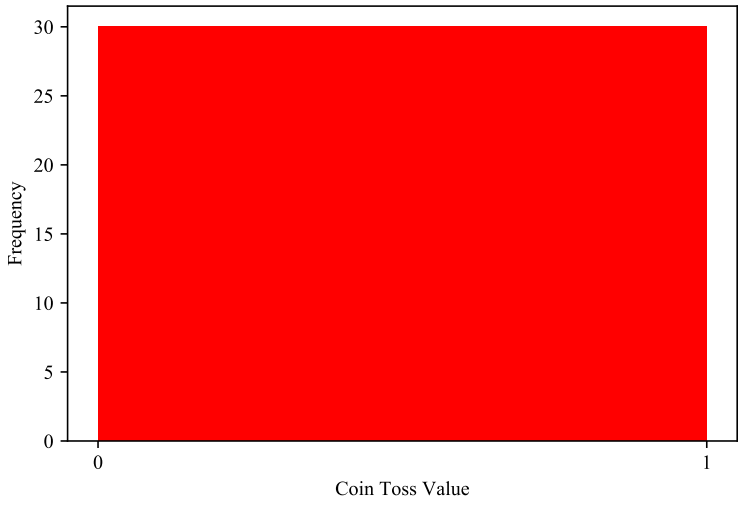


2.2 Coin Flip Statistics [5 points]

Flip a coin $N = 30$ times. Record a "dummy" variable x for each toss indicating an outcome of either heads (1) or tails (0).

(a) 2 PTS Compute the sample mean ($\bar{x}$) and standard deviation (s).
$\bar{x} = 0.5$, $s = 0.51$ (both will vary depending on sample)

(b) 2 PTS Create a histogram with appropriate bins.



(c) 1 PTS What would you expect the population mean (μ) to be?
Both heads and tails are equally likely, so it is reasonable to expect $\mu = 0.5$.