

Class Exercise

1. Coffee Consumption

A survey was conducted at a local office asking employees how many cups of coffee they consumed over a 5-day work week. The results are presented in the frequency table below ($n = 80$):

Cups	Freq	Cum. Freq
0	5	5
2	14	19
4	22	41
6	18	59
8	12	71
10	7	78
12	2	80

- Bottom 10% (P_{10}):** Location $0.10 \times 81 = 8.1$. Value is 2 cups. **Top 10% (P_{90}):** Location $0.90 \times 81 = 72.9$. Value is 10 cups.
- Quartiles:** Q_1 (Location $0.25 \times 81 = 20.25$): 4 cups. Q_2 (Location $0.5 \times 81 = 40.5$): 4 cups. Q_3 (Location $0.75 \times 81 = 60.75$): 8 cups.
- IQR:** $Q_3 - Q_1 = 8 - 4 = 4$ cups. The middle 50% of the coffee drinkers drink between 4 and 8 cups a work week.

2. Percentile Definition

You have a dataset of $n = 24$ data points. Which integer percentiles are not defined for your dataset?

Using the formula $L = \frac{(n+1)P}{100}$, we have that the first data point (location $L = 1$) is at percentile

$$P = \frac{100 \cdot 1}{n + 1} = \frac{100}{25} = 4$$

Thus percentiles P_1, P_2, P_3 are not defined in this dataset. Similarly we have that the last (24th) data point is at percentile

$$P = \frac{100 \cdot 24}{n + 1} = \frac{2400}{25} = 96$$

Hence, percentiles P_{97}, P_{98}, P_{99} are not defined either.

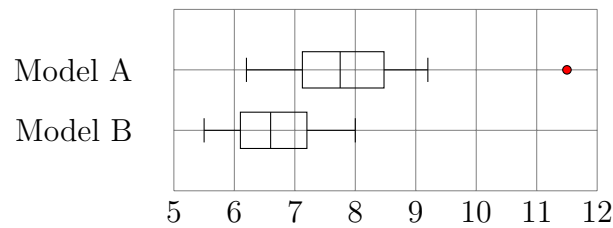
3. Laptop Battery Life Comparison

Model A ($n = 20$): $Q_1 = 7.1 + 0.25(7.2 - 7.1) = 7.125$, $Med = 7.7 + 0.5(7.8 - 7.7) = 7.75$, $Q_3 = 8.4 + 0.75(8.5 - 8.4) = 8.475$.

Model B ($n = 15$): $Q_1 = 6.1$, $Med = 6.6$, $Q_3 = 7.2$.

- a. **Model A Outliers:** $IQR = 8.475 - 7.125 = 1.35$.
 Lower fence: $= 7.125 - 1.5 \times 1.35 = 5.1$: No outliers on the left.
 Upper fence $= 8.475 + 1.5(1.35) = 10.5$: **Outlier identified: 11.5**
- b. **Model B Outliers:** $IQR = 7.2 - 6.1 = 1.1$.
 Lower fence: $= 6.1 - 1.5 \times 1.1 = 4.45$: No outliers on the left.
 Upper fence $= 7.2 + 1.5 \times 1.1 = 8.85$; No Outliers on the right.

c. **Box-and-Whisker Plots:**



- d. **Comparison:** Model B has a smaller IQR (1.1 vs 1.35), suggesting it is slightly more consistent in its range, though both are similar. However, Model A generally lasts longer, as its median (7.75) is higher than Model B's entire IQR.