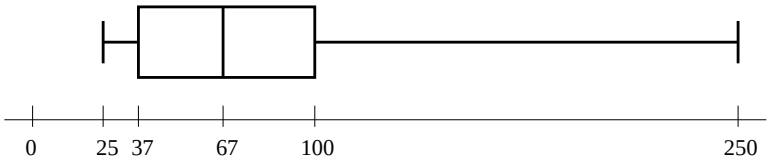
AMS 102: HOMEWORK 3

SOLUTIONS

Chapter 5

5.3. Total score for the morning: $25 \times 82 = 2050$. Total score for the evening: $15 \times 74 = 1110$. Average score$= \dfrac{\text{total score for both classes}}{\text{number of students}} = \dfrac{2050 + 1110}{25 + 15} = \dfrac{3160}{40} = 79.$

5.12. (a)



(b) Since the median is $67,000$ and Q1 is $37,000$, more than 50% but less than 75% of households have income higher than $56,000$. More precise data cannot be obtained from the five-number summary.

(c) 37K (this is Q1; 25% of incomes are below Q1).

5.17. (b) Greater standard deviation implies that maintenance cost has higher variability, that is the actual cost may be further away from the mean for Model A than for Model B.

5.29. Total score for Lab 1: $70 \times 52 = 3640$. Denote mean score for Lab 2 by x. Then total score for Lab 2: $30x$. Mean score for both labs: $\dfrac{3640 + 30x}{70 + 30} = 64$. Thus $3640 + 30x = 6400$. We get that $30x = 6400 - 3640 = 2760$ and $x = 2760/30 = 92$.

5.30. (a) Data Set I:

Mean: $\dfrac{2 + 3 + 4 + 6 + 6 + 6 + 7 + 7 - 9 + 9}{10} = 4.1.$

Median: for $-9, 2, 3, 4, 6, 6, 6, 7, 7, 9,$ the median is $\dfrac{6 + 6}{2} = 6.$

Mode: 6.

Data Set II:

Mean: $\dfrac{6 + 8 + 4 + 8 + 9 + 6 + 42}{7} \approx 11.9.$

Median: for $4, 6, 6, 8, 8, 9, 42,$ the median is 8 (middle value).

Mode: 6 and 8.

(b) The mean is a poor measure of central tendency for Data Set II because it is very much influenced by the outlier 42.

5.32. (a) Sample median for $7, 9, 10, 10, 11, 13$: $\dfrac{10+10}{2} = 10$.

Sample mean: $\dfrac{11+10+13+9+10+7}{6} = 10$.

Range: $13 - 7 = 6$.

Sample standard deviation:

$$\sqrt{\frac{(11-10)^2+(10-10)^2+(13-10)^2+(9-10)^2+(10-10)^2+(7-10)^2}{6-1}} = \sqrt{\frac{20}{5}} = \sqrt{4} = 2.$$

80^{th} percentile: 80% of observations are at or below the value. For this data set, 80% means 4.8 observations, that is we need to take the fifth (4.8 rounded up) observation. Answer: 11.

(b) The range and the sample standard deviation.

5.39. (a) 60 bottles per minute

(b) 52 bottles per minute (this is Q3)

(c) Sample mean: $\dfrac{\sum x}{20} = \dfrac{1281}{20} = 64.05$. Sample standard deviation: $\sqrt{\dfrac{n\sum x^2 - (\sum x)^2}{n(n-1)}} = \sqrt{\dfrac{20 \times 82,237 - (1281)^2}{20 \times 19}} \approx 3.15$.

The new model stuffs approximately 64.05 bottles per minute give or take 3.15 bottles.

(d) Data: 58, 60, 61, 61, 62, 62, 62, 62, 63, 64, 64, 65, 65, 65, 66, 67, 67, 68, 69, 70

Min: 58, Q1: $(62+62)/2 = 62$, Q2: $(64+64)/2 = 64$, Q3: $(66+67)/2 = 66.5$, Max: 70

IQR: $66.5 - 62 = 4.5$. Inner fences: 64 ± 6.75 (57.25 and 70.25), so no outliers according to the 1.5×IQR rule.