COR 142 C

Sections 3.5

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Using Boxplots to Display Summaries

- **Five-number summary:** Description of minimum, Q_1, mean, median (Q_2), Q_3, and maximum.
- **Boxplot:** A visual display of the five number summary.

Example 3.5.1. The first table below reports the average monthly high temperature for St. Augustine, FL and Mt. Pleasant, MI. The second table displays the five-number summaries for both cities.

City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
St. Augustine	67	68	73	79	83	88	90	89	86	81	74	70
Mt. Pleasant	29	31	42	56	69	78	83	81	72	59	46	43

	Minimum	**Q1**	**Medium**	**Q3**	**Maximum**
St. Augustine	67.00	72.25	80.00	86.50	90.00
Mt. Pleasant	29.00	42.75	57.50	73.50	83.00

Finding Outliers

1. Finding the **fences** (or “cutoffs”) for usual data values:

- Lower fence = $Q_1 - 1.5 \times \text{IQR}$
- Upper fence = $Q_3 + 1.5 \times \text{IQR}$

2. The observed values that are less than the lower fence or greater than the upper fence are the **outliers**.

Finding Outliers

Example 3.5.2. Find the upper and lower fences for St. Augustine temperature from Example 3.5.1. Were there any outliers in the data?

Answer: From the five-number summary table, we know that $Q_1 = 67, Q_3 = 86.5$, so

$$IQR = Q_3 - Q_1 = 86.5 - 67 = 19.5$$

$$\text{lower fence} = Q_1 - 1.5 \cdot IQR = 67 - 1.5 \cdot 19.6 = 37.75$$

$$\text{upper fence} = Q_3 + 1.5 \cdot IQR = 86.5 + 1.5 \cdot 19.6 = 115.75$$

Example 3.5.2. (continued)

Since the minimum temperature is greater than the lower fence and the maximum temperature is less than the upper fence, there are no outliers.