

Interquartile range

- a. The interquartile range. Compare the two interquartile ranges.
- b. Any outliers in either set.

The five number summary for the day and night classes is

	Minimum	Q_1	Median	Q_3	Maximum
Day	32	56	74.5	82.5	99
Night	25.5	78	81	89	98

a. The interquartile range. Compare the two interquartile ranges.

Step 1: Calculate the interquartile range (IQR) for the day class

The interquartile range is the difference between the third quartile **Q3** and the first quartile **Q1**.

$$IQR_{\text{Day}} = Q_3 - Q_1$$

$$IQR_{\text{Day}} = 82.5 - 56$$

$$IQR_{\text{Day}} = 26.5$$

Step 2: Calculate the interquartile range (IQR) for the night class

$$IQR_{\text{Night}} = Q_3 - Q_1$$

$$IQR_{\text{Night}} = 89 - 78$$

$$IQR_{\text{Night}} = 11$$

Step 3: Compare the interquartile ranges

The interquartile range for the day class (26.5) is larger than the interquartile range for the night class (11). This indicates that the middle 50% of scores for the day class are more spread out (have greater variability) than those for the night class.

Answer:

The interquartile range for the day class is **26.5** and for the night class is **11**. The day class has a larger interquartile range, meaning its middle data is more dispersed.

b. Any outliers in either set.

Step 1: Define the range for potential outliers

An outlier is typically defined as a data point that falls below.

$$Q_1 - 1.5 \times IQR \text{ or above } Q_3 + 1.5 \times IQR$$

Step 2: Check for outliers in the day class

Lower bound:

$$\text{Lower}_{\text{Day}} = Q1 - 1.5 \times \text{IQR}_{\text{Day}}$$

$$\text{Lower}_{\text{Day}} = 56 - 1.5 \times 26.5$$

$$\text{Lower}_{\text{Day}} = 56 - 39.75 = 16.25$$

Upper bound:

$$\text{Upper}_{\text{Day}} = Q3 + 1.5 \times \text{IQR}_{\text{Day}}$$

$$\text{Upper}_{\text{Day}} = 82.5 + 1.5 \times 26.5$$

$$\text{Upper}_{\text{Day}} = 82.5 + 39.75 = 122.25$$

The minimum (32) and maximum (99) values are within the range of 16.25 to 122.25. There are no outliers in the day class.

Step 3: Check for outliers in the night class

Lower bound:

$$\text{Lower}_{\text{Night}} = Q1 - 1.5 \times \text{IQR}_{\text{Night}}$$

$$\text{Lower}_{\text{Night}} = 78 - 1.5 \times 11$$

$$\text{Lower}_{\text{Night}} = 78 - 16.5$$

$$\text{Lower}_{\text{Night}} = \mathbf{61.5}$$

Upper bound:

$$\text{Upper}_{\text{Night}} = Q3 + 1.5 \times \text{IQR}_{\text{Night}}$$

$$\text{Upper}_{\text{Night}} = 89 + 1.5 \times 11$$

$$\text{Upper}_{\text{Night}} = 89 + 16.5$$

$$\text{Upper}_{\text{Night}} = \mathbf{105.5}$$

The minimum (25.5) value is below the lower bound of 61.5. The maximum (98) value is within the range. The minimum value is an outlier.

Answer:

There are **no outliers** in the day class.

There is **one outlier** in the night class: the minimum value of **25.5**