14-3

Study Guide

Measures of Variability

If a set of data has been arranged in order and the median is found, the set of data is divided into two groups. If the median of each group is found, the data is divided into four groups. Each of these groups is called a **quartile,** and the quartile points Q_1, Q_2, and Q_3 denote the breaks for each quartile. The **interquartile range** is the difference between the first quartile point and the third quartile point.

Month	Temperature (°F)
Jan.	58.0
Feb.	57.9
March	61.6
April	62.5
May	68.7
June	67.4
July	69.3
Aug.	72.9
Sept.	75.5
Oct.	68.7
Nov.	64.0
Dec.	57.4

Source: National Climatic Data Center

Example 1 **The table shows the average monthly temperatures for San Diego in 1997.**

a. Find the interquartile range of the temperatures and state what it represents.

First, order the data from least to greatest and identify Q_1, Q_2, and Q_3.

57.4 57.9 58.0 61.6 62.5 64.0
67.4 68.7 68.7 69.3 72.9 75.5

For this set of data, the quartile points Q_1, Q_2, and Q_3 are not members of the set. Instead, Q_2 is the mean of the middle values of the set. Thus, $Q_1 = 59.8$, $Q_2 = 65.7$, and $Q_3 = 69.0$. The interquartile range is $69.0 - 59.8$, or 9.2. This means that half the average monthly temperatures are within 9.2°F of each other.

b. Find the semi-interquartile range of the temperatures.

The semi-interquartile range is $\frac{9.2}{2}$, or 4.6.

Example 2 **Find the mean deviation of the temperatures in Example 1.**

There are 12 temperatures listed, and the mean is $\frac{1}{12}\sum X_i$, or 65.325.

$$MD = \frac{1}{12}\sum |X_i - 65.325| \qquad MD = \frac{1}{n}\sum |X_i - \overline{X}|$$

$$MD = \frac{1}{12}\left(|75.5 - 65.325| + |72.9 - 65.325| + \cdots + |57.4 - 65.325|\right)$$

$$MD = \frac{1}{12}\left(|10.175| + |7.575| + \cdots + |-7.925|\right) \text{ or about } 5.092$$

The mean deviation of the temperatures is about 5.092. This means that the temperatures are an average of about 5.092°F above or below the mean temperature of 65.325°F.