

Calculating if a data value is an Outlier

It may be the case that a data value falls well outside the range of the other values in the set. Such data values are called **outliers** (as they "lie outside" the other values).

Outliers are defined as those data points that fall more than a specified distance from the first or third quartiles. That specified distance is $1.5 \cdot IQR$ (one and one-half times the IQR). Data points that fall to the far left, or far right, of an ordered data set should be tested as possible outliers.

Outliers are:
greater than $Q_3 + (1.5 \cdot IQR)$
(referred to as the **upper fence**)
or less than $Q_1 - (1.5 \cdot IQR)$
(referred to as the **lower fence**)

STAT 1: Edit to put #3
into L₁
STAT → CALC 1: 1-Var stats

to get Q_1, Q_3

Examples 1-3: Do the following data set have an outlier?

<p>1) Data Set: {1, 30, 40, 44, 44, 44, 45, 46, 47, 51, 54, 54, 55}</p> <p>$Q_1 = 42$ $Q_3 = 52.5$</p> <p>$IQR = Q_3 - Q_1 = 52.5 - 42 = 10.5$</p> <p>$Q_1 - (1.5 \cdot IQR) = 42 - (1.5 \cdot 10.5) = 42 - 15.75 = 26.25$</p> <p>$Q_3 + (1.5 \cdot IQR) = 52.5 + (1.5 \cdot 10.5) = 52.5 + 15.75 = 68.25$</p> <p style="text-align: center;">1 is an outlier</p>	<p>2) Data set: {-3, 5, 10, 12, 14, 18, 24, 26, 49, 60}</p> <p>$Q_1 = 10$ $Q_3 = 26$</p> <p>$IQR = Q_3 - Q_1 = 26 - 10 = 16$</p> <p>$Q_1 - (1.5 \cdot IQR) = 10 - (1.5 \cdot 16) = 10 - 24 = -14$</p> <p>$Q_3 + (1.5 \cdot IQR) = 26 + (1.5 \cdot 16) = 26 + 24 = 50$</p> <p style="text-align: center;">60 is an outlier</p>
<p>3) Data Set: {29, 19, 35, 27, 21, 48, 23, 12, 24, 26, 20, 28, 30, 22, 19, 32, 22}</p> <p>{12, 19, 19, 20, 21, 22, 22, 23, 24, 26, 27, 28, 29, 30, 32, 35, 48}</p> <p>$Q_1 = 20.5$ $Q_3 = 29.5$</p> <p>$IQR = Q_3 - Q_1 = 29.5 - 20.5 = 9$</p> <p>$Q_1 - (1.5 \cdot IQR) = 20.5 - (1.5 \cdot 9) = 20.5 - 13.5 = 7$</p> <p>$Q_3 + (1.5 \cdot IQR) = 29.5 + (1.5 \cdot 9) = 29.5 + 13.5 = 43$</p> <p style="text-align: center;">48 is an outlier</p>	<p>4) Given the box plot: IQR = Range of Box</p> <p>$Q_1 = 8$ $Q_3 = 16$</p> <p>$IQR = Q_3 - Q_1 = 16 - 8 = 8$</p> <p>$Q_1 - (1.5 \cdot IQR) = 8 - (1.5 \cdot 8) = 8 - 12 = -4$</p> <p>$Q_3 + (1.5 \cdot IQR) = 16 + (1.5 \cdot 8) = 16 + 12 = 28$</p> <p style="text-align: center;">28 is not an outlier</p>

* Can look at min & max on calc too after you put #3 into L₁ instead of