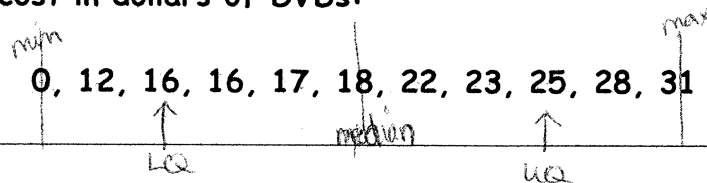


Measures of Variability

Measures of variability are used to describe how the data is "spread out" or "distributed." They are used to interpret and compare data. The measures of variability that we will be studying this year are: the range, quartiles, the interquartile range, outliers, and mean absolute deviation.

Example #1... The cost in dollars of DVDs:



RANGE

The range of a set of data is the difference between the greatest and the least values of the set. It describes whether the data are "spread out" or "clustered together."

$$\text{range } 31 - 0 = 31$$

QUARTILES

Last year you learned how to make box plots (aka "box-and-whisker plots"). You did this by first identifying five key values: the minimum, lower quartile, median, upper quartile, and the maximum value.

$$Q_1 (LQ) \rightarrow 16$$

$$Q_3 (UQ) \rightarrow 25$$

INTERQUARTILE RANGE

The interquartile range is the range of the middle half of a set of data. It is the difference between the third quartile and the first quartile. A small interquartile range means that the data in the middle of the set are close in value. A large interquartile range means the data in the middle are spread out.

$$\text{Interquartile Range } Q_3 - Q_1 = 25 - 16 = 9$$

OUTLIERS

The definition of outliers: data points that are more than 1.5 times the value of the interquartile range beyond the quartiles.

$$9(1.5) = 13.5$$

$$16 - 13.5 = 2.5 \text{ so "0" is an outlier.}$$

$$25 + 13.5 = 38.5 \text{ so no "upper" outliers.}$$

Example #2... Find the measures of variability and any outliers for the set of data.
The number of minutes spent bike riding are the following:

120, 80, 170, 100, 120, 110, 180, 35
 $\begin{array}{ccccccc} & & \text{LQ} & & & & \text{UQ} \\ 35, & 80, & \uparrow 100, & 120, & | & 120, & \uparrow 170, 180 \\ & & & & \text{median} & & \\ & & & & 115 & & \end{array}$

Range

$$180 - 35 = 145 \text{ wow!}$$

Quartiles

$$LQ = \frac{80 + 100}{2} = 90$$

see above ↑

$$UQ = \frac{120 + 170}{2} = \frac{290}{2} = 145$$

interquartile range

$$UQ - LQ = 145 - 90 = 55$$

Outliers

$$55(1.5) = 82.5$$

$$90 - 82.5 = 7.5 \text{ so no low outliers}$$

$$145 + 82.5 = 227.5 \text{ so no high outliers}$$