Name: _____

Measures of Variability

One way to describe a data set is with its spread, or variability. This helps identify how similar the values are to one another. The three most common measures of variability are **range**, **interquartile range**, and **mean absolute deviation**.

Minutes Allie studied each day this week: 30, 0, 30, 40, 40, 20, 120

	What Is It?	**Limitations**

Range	**Range** tells the **total spread** of all data values.
	
	Step 1: Order the data values.
	Step 2: Subtract the smallest value from the largest.
	
	    (0), 20, 30, 30, 40, 40, (120)
	
	    120 − 0 = 120
	
	The range is 120.
		The range is greatly affected by outliers and skewed distributions. It also gives no indication of gaps or clusters.

Interquartile Range	**Interquartile range (IQR)** tells the **spread of the middle 50%** of data values.
	
	Step 1: Order the data values.
	Step 2: Find the quartiles, or values that divide the data into 4 equal segments.
	Step 3: Subtract Q1 from Q3.
	
	        Q1 Q2 Q3
	    0, (20), 30, (30), 40, (40), 120
	
	    40 − 20 = 20
	
	The IQR is 20.
		The IQR usually accounts for outliers and skews, but since it only considers the middle of the spread, it gives no information on what the tails of the distribution look like.

Mean Absolute Deviation	**Mean absolute deviation (MAD)** tells the **average distance from the mean** for all data values. **Step 1:** Find the mean. (Add all values then divide by the total number of values.) **Step 2:** Find the absolute deviations, or distance of each value from the mean. **Step 3:** Find the mean of the absolute deviations. **Mean** = (30 + 0 + 30 + 40 + 40 + 20 + 120) ÷ 7 = 40	Like any mean, the MAD can be affected by outliers. The information it provides is also limited since absolute values do not show the direction of skews.

value	30	0	30	40	40	20	120
AD	$\lvert 30-40\rvert$ = 10	$\lvert 0-40\rvert$ = 40	$\lvert 30-40\rvert$ = 10	$\lvert 40-40\rvert$ = 0	$\lvert 40-40\rvert$ = 0	$\lvert 20-40\rvert$ = 20	$\lvert 120-40\rvert$ = 80

MAD = (10 + 40 + 10 + 0 + 0 + 20 + 80) ÷ 7 = 22.86

The MAD is 22.86.

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