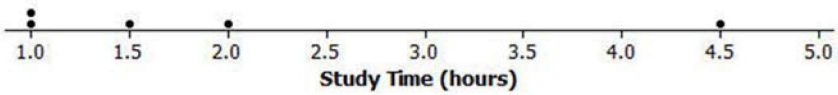
Name _____ Date_____

Describing Distributions Using the Mean and MAD

1. A dot plot of times that five students studied for a test is displayed below.



   a. Use the table to determine the mean number of hours that these five students studied. Then, complete the table.

Student	Aria	Ben	Chloe	Dellan	Emma
Number of study hours	1	1	1.5	2	4.5
Deviations				0	
Absolute deviations					

   b. Find and interpret the MAD for this data set.

2. The same five students are preparing to take a second test. Suppose that the data were the same except that Ben studied 2.5 hours for the second test (1.5 hours more) and Emma studied only 3 hours for the second test (1.5 hours less.)

   a. Without doing any calculations, is the mean for the second test the same, higher, or lower than the mean for the first test? Explain your reasoning.

   b. Without doing any calculations, is the MAD for the second test the same, higher, or lower than the MAD for the first test? Explain your reasoning.

1. Draw a dot plot of the times that five students studied for a test if the mean time they studied was two hours and the MAD was zero hours.

2. Suppose the times that five students studied for a test is as follows:

Student	Aria	Ben	Chloe	Dellan	Emma
Time (hrs.)	1.5	2	2	2.5	2

Michelle said that the MAD for this data set is 0 because the dot plot is balanced around 2. Without doing any calculation, do you agree with Michelle? Why or why not?

3. Suppose that the number of text messages eight students receive on a typical day is as follows:

Student	1	2	3	4	5	6	7	8
Number	42	56	35	70	56	50	65	50

a. Draw a dot plot for the number of text messages received on a typical day by these eight students.

b. Find the mean number of text messages these eight students receive on a typical day.

c. Find the MAD number of text messages and explain its meaning using the words of this problem.

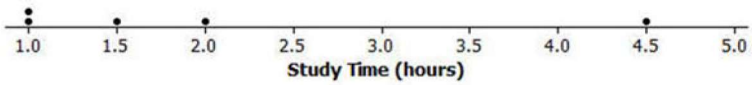
d. Describe the shape of this data distribution.

e. Suppose that in the original data set, Student 3 receives an additional five more text messages per day, and Student 4 receives five fewer messages per day.

   i. Without doing any calculation, does the mean for the new data set stay the same, increase, or decrease as compared to the original mean? Explain your reasoning.

   ii. Without doing any calculation, does the MAD for the new data set stay the same, increase, or decrease as compared to the original MAD? Explain your reasoning.

1. A dot plot of times that five students studied for a test is displayed below.



a. Use the table to determine the mean number or hours that these five students studied. Then, complete the table.

The mean is 2 hours since the deviation around 2 hours is 0.

Student	Aria	Ben	Chloe	Dellan	Emma
Number of study hours	1	1	1.5	2	4.5
Deviations	-1	-1	-1.5	0	2.5
Absolute deviations	1	1	-0.5	0	2.5

b. Find and interpret the MAD for this data set.

The MAD is $\frac{1+1+0.5+2.5}{5} = 1$ hour.

On average the students studied 1 hour away from the group mean of 2 hours.

2. The same five students are preparing to take a second test. Suppose that the data were the same, except that Ben studied 2.5 hours for the second test (1.5 hours more), and that Emma studied only 3 hours for the second test (1.5 hours less).

a. Without doing any calculations, is the mean for the second test the same, higher, or lower than the mean for the first test? Explain your reasoning.

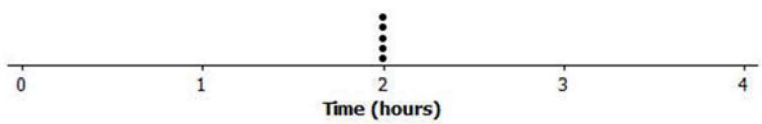
The mean would be the same since the distance that one data point moved to the right was matched by the distance another data point moved to the left. The distribution is balanced at the same place.

b. Without doing any calculations, is the MAD for the second test the same, higher, or lower than the MAD for the first test? Explain your reasoning.

The MAD would be smaller since the data points are clustered closer to the mean.

1. Draw a dot plot of the times that five students studied for a test if the mean time they studied was two hours and the MAD was zero hours.

Since the MAD is 0, all data points are the same and that would be the mean value.



2. Suppose the times that five students studied for a test is as follows:

Student	Aria	Ben	Chloe	Dellan	Emma
Time (hrs.)	1.5	2	2	2.5	2

Michelle said that the MAD for this data set is 0 because the dot plot is balanced around 2. Without doing any calculation, do you agree with Michelle? Why or why not?

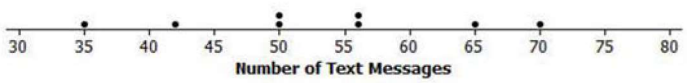
No, Michelle is wrong. There is variability within the data set, so the MAD is greater than zero.

Note: If students agree with Michelle, then they have not yet mastered that the MAD is measuring variability. They need to grasp that if data points differ in a distribution, whether the distribution is symmetric or not, then there is variability. Therefore, the MAD cannot be zero.

3. Suppose that the number of text messages eight students receive on a typical day is as follows:

Student	1	2	3	4	5	6	7	8
Number	42	56	35	70	56	50	65	50

a. Draw a dot plot for the number of text messages received on a typical day by these eight students.



b. Find the mean number of text messages these eight students receive on a typical day.

Since the distribution appears to be somewhat symmetrical around a value in the 50s, one could guess a value for the mean, such as 52 or 53, and then check sums of positive and negative deviations. Using the formula, the mean is $\frac{424}{8} = 53$ *text messages.*

c. Find the MAD number of text messages and explain its meaning using the words of this problem.

The sum of the positive deviations from 53 is: $2(56-53)+(65-53)+(70-53)=6+12+17=35$. *So,* $\frac{2(35)}{8}$ *yields a MAD of 8.75 text messages.*

This means that, on average, the number of text messages these eight students receive on a typical day is 8.75 messages away from the group mean of 53 messages.

d. Describe the shape of this data distribution.

The shape of this distribution is fairly symmetrical (balanced) around the mean of 53 messages.

e. Suppose that in the original data set, Student 3 receives an additional five more text messages per day, and Student 4 receives five fewer messages per day.

i. Without doing any calculation, does the mean for the new data set stay the same, increase, or decrease as compared to the original mean? Explain your reasoning.

The mean would remain at 53 messages because one data point moved the same number of units to the right as another data point moved to the left. So, the balance point of the distribution does not change.

ii. Without doing any calculation, does the MAD for the new data set stay the same, increase, or decrease as compared to the original MAD? Explain your reasoning.

Since the lowest data point moved closer to the mean and the highest data point moved closer to the mean, the variability in the resulting distribution would be more compact than the original distribution. So, the MAD would decrease.