Why do we need MAD?

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# Overview of lesson

Students will wonder why we need to have a value that describes the spread of the data beyond the range. If we give them three sets of data that have the same mean, median, and range and yet are clearly differently shaped then perhaps they will see that the MAD has some use.

# CCSS

CCSS.Math.Content.6.SP.A.3

CCSS.Math.Content.6.SP.B.4

# Prerequisites

Students should be able to plot a set of data in a dot plot or a histogram. Students should be able to calculate the mean and median for a set of data. Students should be able to find the absolute value of a number.

# Learning Targets

Students will be able to find the mean absolute deviation (MAD) for three different data sets and be able to discuss the relationship between the MAD and the shapes of the distributions.

# Time required

Approximately one class period.

# Materials Required

Paper, pencil and a calculator.

# Lesson Details

Students will be given the three data sets and asked to create dot plots or histograms for each set. Students should describe the data sets by their shape outlier center and spread (SOCS). For each data set they will get the same mean, median and range however the distributions look vastly different. They should be asked to describe the data by the shape and note the differences. Clearly the first set of data has much more variability. Ask the students, if you were to pick a number at random from each set of data, which data set is most likely to yield a number close to the mean and which is least likely to yield a number close to the mean? Now remind them how to find the absolute value of a number and what it means. For each element in the sets they will have to make a list of the absolute value of the deviation from the mean. So {xbar-x1} for each element. And then find the average of these absolute values. Now remind them of their choice of which set was most likely to give a number at random that was close to the mean. Compare the MADs for the three sets. What do they notice about the size of the MAD and their answers to the previous question? They should see the data set most likely to yield a number close to the mean has the smallest MAD and the data set least likely to yield a number close to the mean has the largest MAD.

# Student Handout

1. Given data A: {1,1,1,1,5,5,9,9,9,9}, create a histogram in the space below.



1. Calculate the mean, median and range for the distribution.

Mean: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Median:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Range:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Given data set B: {1,5,5,5,5,5,5,5,5,9}, create a histogram in the space below.



1. Calculate the mean, median and range for the distribution.

Mean: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Median:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Range:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Given data set C: {1,2,3,4,5,5,6,7,8,9}, create a histogram in the space below.



1. Calculate the mean, median and range for the distribution.

Mean: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Median:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Range:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. If you were to pick a number at random from each data set, which set is most likely to yield a number that is close to the mean? Which set is most likely to yield a number far from the mean? Which data set would yield a number not close but not far from the mean?
2. For each data set (A, B, and C) make a table  and find the average of the set. This average is called the MAD or mean absolute deviation from the mean. How does the size of the MAD compare to the rank order you put the data sets into in the last question.

Distribution 1

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Distribution 2

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Distribution 3

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1. Make up your own data set using 10 values from 1 through 10 similar to the numbers we used in the first exercises. Make the set have the largest possible M.A.D.

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| X Value |  |  |  |
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|  |  |  | Mean: |

1. Make up your own data set using 10 values from 1 through 10 similar to the numbers we used in the first exercises. Make the set have the smallest possible M.A.D.

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| X Value |  |  |  |
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|  |  |  | Mean: |

1. What is a “mean absolute deviation” in your own words and what does it tell us about a data set that other statistics do not? Explain in such a way that one of your students would understand.