# Sixth Grade Math Assignment

This assignment is strongly aligned to the standards.

*Assignment Page 1

Lesson 10: Describing Distributions Using the Mean and MAD
Student written: DLT I can describe the center, spread, and shape of a distribution set of data.

An example of this work that students filled in together is given. Then there are 4 exercises.

1. Suppose that the weights of seven middle school students' backpacks are given below.
a. Fill in the following table.  Each student's backpack weighed 18 pounds. Students have to fill in the deviation and absolute deviation, and this student filled in zero for all.

b. Draw a dot plot for these data, and calculate the mean and MAD.  Student drew a line with labels 16, 17, 18, 19, 20 with 7 dots placed vertically on 18 and wrote "Mean is 18, MAD is 0".* Assignment Page 2

c. Describe the distribution of weights of backpacks by discussing the center, spread, and shape.
Student wrote: "18 was the center. The spread was the M.A.D.=0. The shape is straight because it only has 1 value."

2. Suppose that the weight of Elisha's backpack is 17 points rather than 18 pounds.
a. Draw a dot plot for the new distribution.
b. Without doing any calculations, how is the mean affected by the lighter weight? Would the new mean be the same, smaller, or larger? Student wrote "it would be smaller."
c. Without doing an calculations, how is the MAD affected by the lighter weight? Would the new MAD be the same, smaller, or larger? Student wrote "The average would be smaller."

3. Supposed that in addition to Elisha's backpack weigh having changed from 18 to 17 pounds, Fred's backpack is changed from 18 to 19 points.
a. Draw a dot plot for the new distribution.

Assignment Page 3

(Continuing the problem from page 2)
b. Without doing any calculations, how would the new mean compare to the original mean? Student wrote "The mean would be the same"
c. Without doing any calculations, would the MAD for the new distribution be the same as, smaller than, or larger than the original MAD? Student wrote "It would be larger because of the spread."
d. Without doing any calculations, how would the MAD for the new distribution compare to the one in Exercise 2? Student wrote "The mad in this one is bigger because it has a larger spread."

4. Suppose that seven second graders' backpack weights were as follows: (Chart shows all students have backpacks that weigh 5 pounds).
a. How is the distribution of backpack weights for the second graders similar to the original distribution for the middle school students given in Exercise 1?
b. How are the distributions different? Assignment Page 4

1. Draw a dot plot of the times that five students studied for a test if the mean time they studied was 2 hours and the MAD was 0 hours.

2. Suppose the times that five students studied for a test are as follows (1.5, 2, 2, 2.5, 2)
Michelle said that the MAD for this data set is 0 hours because the dot plot is balanced around 2. Without doing any calculations, 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: (42, 56, 35, 70, 56, 59, 65, 50).
a. Draw a dot plot.
b. Find the mean.
c. Find the MAD 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 text messages per day and Student 4 receives five fewer text messages per day. Without doing any calculations, does the mean for the new data set stay the same, increase or decrease compared to the original mean? Explain your reasoning.
Without doing any calculations, does the MAD for the new data set stay the same, increase, or decrease as compared to the original MAD? Explain your reasoning.

Overview

Sixth-grade students draw dot plots to represent data sets, calculate the mean and mean absolute deviation, and explain how the values of the mean and mean absolute deviation would change if at least one value in the data set changed. This assignment is strong because it not only builds students’ skill in calculating these measures, but also builds their conceptual understanding of the measures by asking students to describe and explain them.

Related Standards

We looked at how well the assignment aligned to the following standards:

KY.6.SP.4 Display the distribution of numerical data in plots on a number line, including dot plots, histograms and box plots.

KY.6.SP.5 Summarize numerical data sets in relation to their context, such as by:

a. Reporting the number of observations.

b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

c. Determining quantitative measures of center (median and/or mean) to describe distribution of numerical data.

d. Describing distributions of numerical data qualitatively relating to shape (using terms such as cluster, mode(s), gap, symmetric, uniform, skewed-left, skewed-right and the presence of outliers) and quantitatively relating to spread/variability (using terms such as range and interquartile range).

e. Relating the choice of measures of center and variability to the shape of the data distribution.

Why is this assignment strongly aligned?

This assignment aligns with two sixth-grade standards:

* KY.6.SP.4 requires students to display data graphically in a variety of ways on a number line, and this assignment prompts students to represent three data sets on a dot plot—a format referenced in the standard.
* KY.6.SP.5 (parts b-e) requires students to calculate measures of center (median and mean) and measures of variability  (interquartile range), and also describe these measures within the context of the data set. For this assignment, students had to calculate the mean and mean absolute deviation for three data sets. They also had to describe the data distributions (problem 1c), explain the meaning of the values of the mean and mean absolute deviation (problem 3c), and explain how the values of the mean and mean absolute deviation would change if one or more values in the data set changed (problems 2b-c). (interquartile range), and also describe these measures within the context of the data set. For this assignment, students had to calculate the mean and mean absolute deviation for three data sets. They also had to describe the data distributions (problem 1c), explain the meaning of the values of the mean and mean absolute deviation (problem 3c), and explain how the values of the mean and mean absolute deviation would change if one or more values in the data set changed (problems 2b-c).

This assignment focuses on both conceptual understanding and procedural skill, both of which are targeted in standards KY.6.SP.4 and KY.6.SP.5. Drawing dot plots and calculating mean and mean absolute deviation allows students to build procedural skill. Students build their conceptual understanding by providing descriptions and explanations of the measures of center and variability. For example, in the problems that ask students to explain how the value of the mean would change if a value in the data set changed, students are asked to not calculate the value of the new mean. Asking students to explain without doing actual calculations is a good way to get them to articulate their understanding of what the mean represents and how individual data points affect it. Drawing dot plots and calculating mean and mean absolute deviation allows students to build procedural skill. Students build their conceptual understanding by providing descriptions and explanations of the measures of center and variability. For example, in the problems that ask students to explain how the value of the mean would change if a value in the data set changed, students are asked to not calculate the value of the new mean. Asking students to explain without doing actual calculations is a good way to get them to articulate their understanding of what the mean represents and how individual data points affect it.

[**Practice Standards**](https://tntp.org/student-work-library/view/strongly-aligned-6th-grade-math-assignment)  
This assignment allows students to engage with multiple mathematical practice standards. Students engage with Mathematical Practice Standard #4 ("Model with mathematics") by mathematically representing real-world topics—like backpack weights—with dot plots. They engage with Mathematical Practice Standard #3 (“Construct viable arguments and critique the reasoning of others”) and Mathematical Practice Standard #6 (“Attend to precision”) by explaining how the values of the mean and mean absolute deviation would change given a new data point and agreeing or disagreeing with another student’s reasoning (problem 2).