

## KEY CONCEPT OVERVIEW

This topic focuses on data sets that are approximately symmetric (mound-shaped). The **mean** is the measure of center and the **mean absolute deviation (MAD)** is the measure of variability that describes these data sets. Students explore the “fair share” understanding of mean and also interpret mean as a balance point (see Terms), which helps students build a foundation for calculating the MAD. Students also use graphs (dot plots or histograms) as well as the numerical summaries (mean and MAD) to describe, compare, and answer questions regarding data sets.

You can expect to see homework that asks your child to do the following:

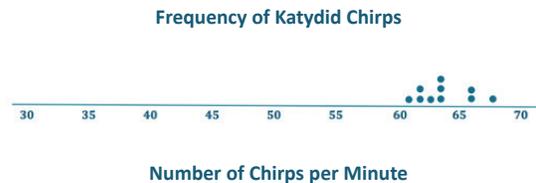
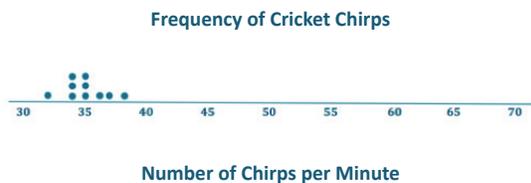
- Draw a representation of a data set by using cubes, where one cube represents one value.
- Use the fair share method to find the mean, shifting cubes between stacks to distribute them evenly.
- Draw and describe a dot plot that represents a particular data set.
- Find the mean by adding all the values and then dividing the sum by the number of values.
- Find the sum of the **absolute deviations**.
- After analyzing two data sets, recognize which mean is a better representation of the data set. Also, recognize which data set has the larger MAD and explain.
- Calculate the MAD of a data set.
- Given the mean and MAD, draw a dot plot.
- Given data and a real-world context, draw a dot plot, calculate the mean and MAD, describe the shape of the distribution, and answer questions.

## SAMPLE PROBLEM (From Lesson 11)

Insects chirp more as the air gets warmer. You want to answer the following question: Are field crickets better predictors of air temperature than katydids? The following data are the number of chirps per minute for 10 insects of each type. All the data were taken on the same evening at the same time.

Insect	1	2	3	4	5	6	7	8	9	10
Number of Cricket Chirps	35	32	35	37	34	34	38	35	36	34
Number of Katydid Chirps	66	62	61	64	63	62	68	64	66	64

- a. Draw a dot plot for each data set by using the same scale, ranging from 30 to 70. Visually, what conclusions can you draw from the data plots?



**Visually, you can see that the value for the mean number of chirps is higher for the katydids than for the crickets. The variability appears to be similar.**

**SAMPLE PROBLEM** (continued)

b. Calculate the mean and MAD for each distribution.

**Cricket:** The mean is 35 chirps per minute because the sum of the number of chirps is 350 and  $350 \div 10 = 35$ .

The sum of all the deviations (distances from the mean) is 12 because

$0 + 3 + 0 + 2 + 1 + 1 + 3 + 0 + 1 + 1 = 12$ . The MAD is 1.2 chirps per minute because  $\frac{12}{10} = 1.2$ .

**Katydid:** The mean is 64 chirps per minute because the sum of the number of chirps is 640 and  $640 \div 10 = 64$ .

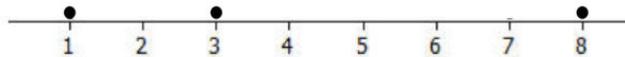
The sum of all the deviations is 16 because  $2 + 2 + 3 + 0 + 1 + 2 + 4 + 0 + 2 + 0 = 16$ . The MAD is 1.6 chirps per minute because  $\frac{16}{10} = 1.6$ .

**Conclusion:** Based on the data from the full problem in Lesson 11, field crickets are not better predictors of air temperature than katydids.

Additional sample problems with detailed answer steps are found in the *Eureka Math Homework Helpers* books. Learn more at [GreatMinds.org](http://GreatMinds.org).

**HOW YOU CAN HELP AT HOME**

You can help at home in many ways. Here are some tips to help you get started.



- With your child, discuss the point where the data balance on the dot plot above. (Answer: The balance point from the dot plot above must be 4 in order for the total of the distances on either side of the mean to be equal. At point 4, the sum of the absolute deviations to the right is 4 since 8 is 4 units away from 4, and the sum of the absolute deviations to the left is 4 since 3 is 1 unit away, 1 is 3 units away, and  $1 + 3 = 4$ .)
- The number of red cubes in six bags of cubes is as follows: 4, 4, 4, 4, 4, 4. Find the mean and MAD. (Mean: 4, MAD: 0. All data values are the same so there is no variability.) Various colored cubes are mixed up and the bags are filled again. Now, the number of red cubes in each bag is 1, 2, 4, 5, 6, 6. What happens to the mean? (The mean does not change.) Without doing any calculations, explain how the MAD is affected when the cubes are mixed up and the bags are refilled. Is the new MAD the same or larger? (The MAD is larger because now there is variability, so the MAD is greater than zero.)

**TERMS**

**Absolute deviation:** The distance of a data value from the mean of the data set.

**Mean:** The average of the values in a data set, also interpreted as a fair share (equal share of the total) or a balance point (where the sums of the distances, or absolute deviations, above and below the mean are equal). Mean is used as a measure of center in an approximately symmetric data distribution.

**Mean absolute deviation (MAD):** In a numerical data set, the MAD is the average of the distance (absolute deviation) each value is from the mean of the data set. It is found by determining the mean of the entire data set and the distance of each individual value from that mean and then calculating the mean of those distances. (See Sample Problems.)