North Penn School District

Elementary Math Parent Letter

Grade 6

Unit 5 – Chapter 13: Variability and Data Distributions

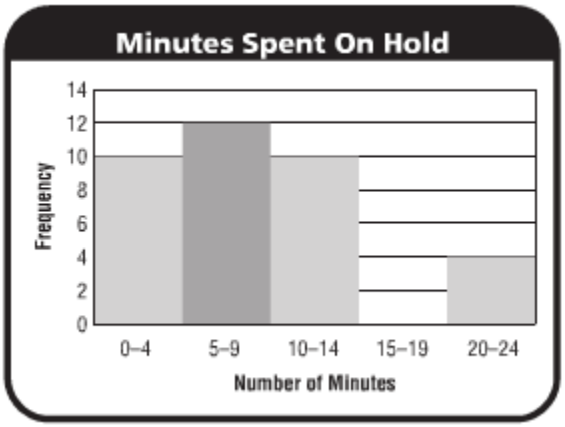
Examples for each lesson:

Lesson 13.1

Patterns in Data

The histogram shows the number of minutes a caller had to be placed on hold before talking to a representative.

According to the graph, there were 10 people who were on hold for 0 to 4 minutes.



Does the graph contain any clusters or gaps? If so, where? Does the graph have symmetry?	
Step 1 Look for a group of data points that lie within a small interval. These are clusters.	The bars for 0–4, 5–9, and 10–14 are in a group. This is a cluster of data.
Step 2 Look for an interval that contains no data. These are gaps.	There is no bar above the interval 15–19. This is a gap in the data. This means there were no people who were on hold for 15 to 19 minutes.
Step 3 Look for symmetry. If you draw a vertical line in the graph, the bars on the left and right sides will match if the graph has symmetry.	A line cannot be drawn anywhere on the graph and have the bars on either side match. There is no symmetry.

More information on this strategy is available on Animated Math Model #38.

Lesson 13.2

Box Plots

The weights in ounces of 12 kittens are 20, 18, 22, 15, 17, 25, 25, 23, 13, 18, 16, and 22.

A **box plot** for the data would show how the values are spread out.

Make a box plot for the data.

Step 1 Write the numbers in order from least to greatest. Find the median and the least and greatest values.

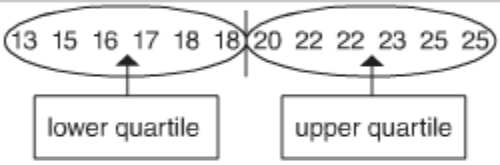
13 15 16 17 18 18 20 22 22 23 25 25

Since there is an even number of values, the median is the mean of the two middle values. The median is 19. The least value is 13, and the greatest value is 25.

Step 2 Find the lower and upper quartiles.

The **lower quartile** is the median of the lower half of the data.

The **upper quartile** is the median of the upper half of the data.



Draw a line where the median should be. Now the data set has been split into halves. (If there were an odd number of values in the data set, the median would be one of the data values, but you would not include it in the upper or lower half.) The lower quartile is 16.5, and the upper quartile is 22.5.

Step 3 Plot the five points on a number line, and construct the box and whiskers. Use an appropriate scale.

Weights of Kittens (ounces)

Lesson 13.3

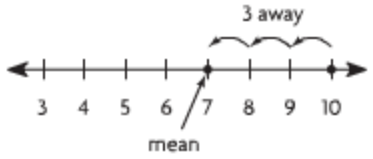
Mean Absolute Deviation

The **mean absolute deviation** tells how far away the data values are from the mean. A small mean absolute deviation means that most values are close to the mean. A large mean absolute deviation means that the data values are more spread out.

The prices of 8 lunches are $10, $8, $3, $5, $9, $6, $7, and $8. The mean is $7. Find the mean absolute deviation.

Step 1 Determine how far each data value is from the mean. You can use a number line.

Plot a value on the number line. Then count how many spaces you must move to reach the mean, 7.



Step 2 Make a list of all of the distances.

Data values:	10	8	3	5	9	6	7	8
Distance from mean:	3	1	4	2	2	1	0	1

Step 3 Find the mean of the distances by finding the sum and dividing by 8. The quotient is the mean absolute deviation.

$$\frac{3+1+4+2+2+1+0+1}{8} = \frac{14}{8} = 1.75$$

So, on average, each data value is 1.75 away from the mean.

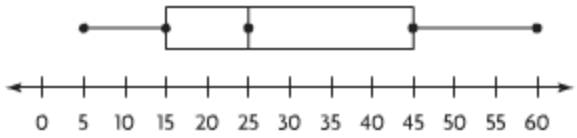
More information on this strategy is available on Animated Math Model #37.

Lesson 13.4

Measures of Variability

A **measure of variability** is a single number that describes how far apart the numbers are in a data set. **Range, interquartile range**, and mean absolute deviation are all measures of variability.

The box plot shows the cost of various concert tickets. Find the range and interquartile range of the data in the box plot.



Step 1 To find the range, subtract the least value from the greatest value.

60 (greatest) − 5 (least) = 55 (range)

Step 2 To find the interquartile range, subtract the lower quartile from the upper quartile.

45 (upper quartile) − 15 (lower quartile) = 30 (interquartile range)

More information on this strategy is available on Animated Math Model #37.

Lesson 13.5

Choose Appropriate Measures of Center and Variability

Sometimes one measure of center or variability represents the data better than another measure of variability. For example, the median might be a better representation than the mean.

Cheeseburger prices at several different restaurants are $5, $3, $2, $6, $4, and $14. Should the mean, median, or mode be used to describe the data? Should the range or interquartile range be used?

Measure of Center	Measure of Variability
Step 1 Find the mean, median, and mode. Mean: $\frac{5 + 3 + 2 + 6 + 4 + 14}{6} \approx \$5.67$ Median: $2 \quad 3 \quad 4 \mid 5 \quad 6 \quad 14 \quad \frac{4 + 5}{2} = \$4.50$ Mode = none	**Step 1** Find the range and interquartile range. Range: $14 - 2 = \$12$ Interquartile range: $6 - 3 = \$3$ $2 \quad (3) \quad 4 \mid 5 \quad (6) \quad 14$
Step 2 Compare. There are six data values, and the mean is greater than four of them. The outlier of $14 is causing this. So, the median is a better measure of center.	**Step 2** Compare. All of the data values except one are between $2 and $6. The interquartile range is a better measure.

More information on this strategy is available on Animated Math Models #36, 37.

Lesson 13.6

Apply Measures of Center and Variability

You can use measures of center and variability to compare sets of data.

Two math groups were given the same test.

Test Scores		
	Mean	Interquartile range
Group A	76.9	30
Group B	81.1	8

Compare the data.

Step 1 Compare the means. — Group B's scores are higher on average than Group A's scores because it has a greater mean.

Step 2 Compare the interquartile ranges. — Group B has a smaller interquartile range, which means their scores do not vary as much as Group A's scores.

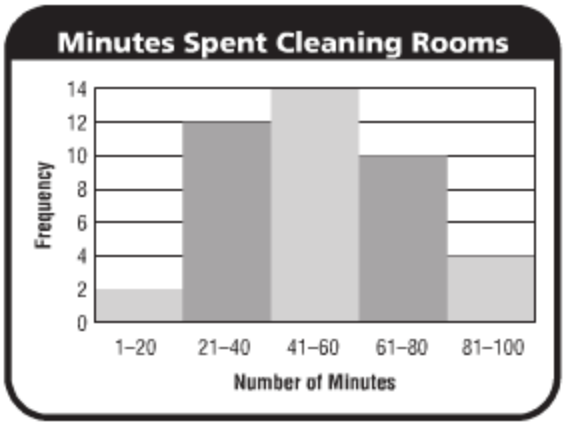
More information on this strategy is available on Animated Math Models #36, 37.

Lesson 13.7

Describe Distributions

When interpreting data, it helps to make a graph and then analyze the distribution of data.

Mr. Chen asked all of his students how long it takes them to clean their rooms. He displayed the information in a histogram. Describe the data distribution.



Step 1 Look for clusters.	There are no groups of data that are separated from the rest, so there are no clusters of data.
Step 2 Look for gaps.	There are no intervals that contain no data, so there are no gaps in the data.
Step 3 Look for peaks.	There is one peak, at the interval 41–60.
Step 4 Look for symmetry.	Imagine folding the graph in half vertically, along the interval 41–60. The halves are not identical, but they are close. The graph has symmetry.

More information on this strategy is available on Animated Math Model #38.

Lesson 13.8

Problem Solving • Misleading Statistics

Zaire wants to move to a town where the annual snowfall is no more than 5 inches. A real estate agent tells her that the mean annual snowfall in a certain town is 4.5 inches. Other statistics about the town are given in the table. Does this location match what Zaire wants? Why or why not?

Town Statistics for Annual Snowfall (in.)	
Minimum	0.5
Maximum	12
Median	8
Mean	4.5

Read the Problem

What do I need to find?	What information do I need to use?	How will I use the information?
I need to decide if the annual snowfall in the town is _____.	I need the _____ in the table.	I will work backward from the statistics to draw conclusions about the _____.

Solve the Problem

The minimum annual snowfall is _____

The maximum annual snowfall is _____

The median annual snowfall is _____

The mean annual snowfall is _____

Think: The median is _____, which means that half of the data is equal to or greater than _____.

So, the annual snowfall is usually _____ than 5 inches because at least half of the annual snowfall values are _____ than 5 inches. This location does not match what Zaire wants.

Vocabulary

Box plot – a type of graph that shows how data are distributed by using the least value, the lower quartile, the median, the upper quartile, and the greatest value in the data set

Distribution – the overall shape of the graph of a data set

Interquartile range – the difference between the upper quartile and the lower quartile of a data set

Lower quartile – the median of the lower half of a data set

Mean absolute deviation – the mean of the distance between the values of a data set and the mean of the data set

Measure of variability – a single value used to describe how spread out a set of data values are

Range – the difference between the greatest value and the least value in a data set

Upper quartile – the median of the upper half of a data set