

# Analyzing Product Price and Sales Data

**Grade Band:** 3-5

**Lesson Length:** Approximately 2 days

## **NCTM Standard and Expectation**

Data Analysis and Probability

1. Select and use appropriate statistical methods to analyze data

## **Learning Objectives**

1. The student will complete product analyses by calculating the mean, median, mode, and range for a given set of item retail prices.
2. The student will complete sales analyses by calculating mean, median, and range using daily sales data.
3. The student will understand how statistics are used to collect, organize, and interpret data.

## **Connection to Bloom's Taxonomy**

- ✓ Comprehension
- ✓ Application
- ✓ Analysis
- ✓ Synthesis

## **RG's Literary Connection**



*What Do You Mean by "Average"?* by Elizabeth James is basically a story about a young girl running for student council president who wants to prove to her fellow classmates that she is just an average person. Although this book is old, it is an excellent piece of juvenile literature that focuses on teaching kids how to calculating the mean, median, and mode. Students experience how to calculate the mean for student height and weight, median number of kids per family, and how modal averages are used in everyday life.

## Word Origin by Hannie



*Median* is from the Latin word *medianus* which means “of the middle” and comes from the word *medius* meaning “middle.” In mathematics it is known as the middle number in a series or set of numbers that are placed in order. It is also called the midpoint. The middle is known as point that divides something in half with basically two equal parts, one on each side. In the 1950’s the phrase *median strip* became known as the strip of land between the two lanes of a highway.

## Vocabulary Words



1. Mode – the most common value in a series of values
2. Median – the middle value in a series of values placed in numerical order
3. Mean – the average, calculated by adding values (data) and dividing by the number of values (sample)
4. Range – difference between the largest and smallest numbers in a sample
5. Sample – a group of numbers

## Learning Model Component

- ✓ Making Connections
- ✓ Exploring and Learning
- ✓ Extended Learning and Practice
- ✓ Assessment
- ✓ Closure

## Teaching Strategies

- ✓ Brainstorming
- ✓ Guided Practice
- ✓ Paired Learning

## Materials List

- ✓ Weather Data Worksheet
- ✓ Weather Data Worksheet – Key
- ✓ Geddes Kit List
- ✓ Weekly Sales Results Excel Spreadsheet
- ✓ Product Analysis Worksheet
- ✓ Product Analysis Worksheet – Key
- ✓ Sales Analysis Worksheet
- ✓ Sales Analysis Worksheet – Key
- ✓ Assessment of Student Progress
- ✓ Pencils
- ✓ Calculator
- ✓ Index Cards
- ✓ Crayons or colored pencils

## Analyzing Data

### Making Connections

Ask students to define the word statistics. As a class, brainstorm possible definitions. Then provide students with dictionaries or access to on-line dictionaries to develop one definition that describes the term accurately. In general, statistics is a mathematical or scientific term to describe the collecting, organizing, and interpreting of data. Statistics may include creating graphs, calculating averages, or determining probability.

We live in a world filled with statistics, yet we are often unaware of their usefulness in our daily lives. Have students think about statistics by asking them to identify and list when averages are used. Provide newspapers as one possible way to jump start the activity. Some possible responses may include the following:

- the average price of a gallon of gasoline
- baseball batting averages
- bowling averages
- average temperature
- average rainfall or snowfall
- average hospital stay for patients
- average income or age, collected as census data
- average wait time (on the telephone) when on-hold for customer service
- product price averages for dairy products
- average grade on a test
- the Dow Jones Industrial Average (stocks)
- average weight or height for a child of a certain age (used by pediatricians)

Students may be amazed at the role and frequency that statistics play in their daily lives.

## Exploring and Learning

1. Four common statistical terms used to analyze data are mean, median, mode, and range. Review the following definitions and how to calculate each:
  - The mean is the average. It is calculated by adding values (data) and dividing by the number of values (sample).
  - The median is the middle value in a series of values placed in numerical order. For odd sample sizes, simply use the middle value. For even sample sizes, take an average of the two middle values.
  - The mode is the most common value in a series of values. If no value occurs more than once, then there is no mode. If two values occur more than once and the same number of times, the sample is called bimodal.
  - The range is the difference between the largest and smallest values in a sample.
2. Pair students together and provide each pair with a copy of Weather Data Worksheet. Student will analyze a sample 5-day weather forecast to calculate the following statistics:
  - Average (Mean) High Temperature
  - Average (Mean) Low Temperature
  - Median High Temperature
  - Median Low Temperature
  - Mode High Temperature
  - Mode Low Temperature
  - Range for High Temperatures
  - Range for Low Temperatures
3. Together as a class review the calculations for each weather temperature statistic. It may be helpful to guide students through each of the calculations in order to reinforce the concept of how to calculate the mean, median, mode and range. Refer to the Weather Data Worksheet – Key for answers.
4. Based on the calculated weather temperature statistics, discuss the following questions:
  - Was the Average (Mean) High Temperature above 85 degrees? (no)
  - Was the Average (Mean) Low Temperature below 60 degrees? (yes)
  - What two values were exactly the same? (the Median High Temperature and the Mode High Temperature)
  - Which had a larger range over a 5-day period, high temperatures or low temperatures? (high temperatures ranged 21 degrees versus low temperatures that ranged 18 degrees)
  - Present students with the following scenario:



***RG and Hannie are working at the Raymond Geddes Elementary School Store. Sniffer has asked them to analyze their top 20 school store items. He would like to know the average (mean) retail price of those items, the median retail price, the mode, and the range. In addition, Sniffer would like RG and Hannie to analyze a week's worth of sales by calculating several statistics: average daily total sales amount, the median daily total sales amount, and the range for daily total sales amounts for the week. Can you help RG and Hannie calculate and analyze the statistics?***

***Challenge: If you run your own school store, or ran the school in a pervious Geddes lesson plan, update the sales spreadsheet with your own sales data.***

5. To help complete the scenario pair students together and provide each group with the following:
  - [Geddes Kit List](#)
  - [Weekly Sales Results Excel Spreadsheet](#)
  - [Product Analysis Worksheet](#)
  - [Sales Analysis Worksheet](#)
  - pencils and calculator
  
6. Explain and list on the board, or as a transparency, the following instructions to complete the scenario:
  - Place the items in the [Geddes Kit List](#) in order by retail price from lowest to highest. If students are familiar with using spreadsheet software, encourage them to input the list into a spreadsheet to complete the product analysis.
  - Calculate
    - average item retail price
    - median item retail price
    - mode
    - range.

- Record answers on the Product Analysis Worksheet.
  - Next, use the Weekly Sales Results Excel Spreadsheet to analyze sales results for one week.
    - Place the daily total sales amounts in order from lowest to highest.
    - Calculate the average daily total sales amount for this week
    - Calculate the median daily total sales amount
    - Calculate the range for the daily total sales amounts.
  - Record answers on the Sales Analysis Worksheet.
7. As a class, review the results. Refer to the Product Analysis Worksheet – Key and the Sales Analysis Worksheet – Key for answers.
8. Discuss the following sales analysis questions:
- Which day of the week generated the most sales? (Friday)
  - Which day of the week generated the least sales? (Monday)
  - What was the range between the highest sales day and the lowest sales day? (\$14.76)
  - Brainstorm some possible reasons to explain why sales on Friday were so much better than sales on Monday for this week. Some possible explanations include the following:
    - a. Students may not remember to bring in their money when returning back to school after the weekend
    - b. The school may be able to send out more reminders during the week advertising the school store and its products.
    - c. Teachers may have completed their lessons with students providing students more time at the end of the week to shop at the school store.
    - d. Students purchased more of the most expensive item (6-Color Pens) on Friday. This may have helped to boost sales for the day.
    - e. There may not be any particular reason since we have only one week's worth of sales. Students would need multiple weeks of sales results to determine if Friday always remained the best day of the week.
9. Review the definition of statistics -- collecting, organizing, and interpreting data. Do students feel they were successful using statistics to analyze product and sales data?

10. Lead a short discussion on some of the shortcomings of statistics. Statistics can be helpful to analyze data. However, statistics may also be misleading. As shown above, students cannot pinpoint the exact reasons why Friday generated the highest sales for the week. Statistics do not take into account the human factor- why people make the decisions they do. Averages, in particular, can be misleading. They may be affected by outliers, extreme high and low values. Often times, mathematicians will drop the highest and lowest values in a sample in order to arrive at a more representative average.

### **Extended Learning and Practice**

1. Spend more time analyzing the [Weekly Sales Results Excel Spreadsheet](#).
  - What was the average daily number of items sold for the week? ( $656/5 = 131$  items)
  - What was the median number of daily items sold? (134 items)
  - What was the range? ( $148 - 105 = 43$  items)
  - Examine and analyze individual items. For example, what was the average daily sales amount for Mini Fish Erasers ( $\$18.13/5 = \$3.63$ ).
2. Visit the PBS Kids ZOOM website at <http://pbskids.org/zoom/fromyou/backpack/index.shtml> for another in-class activity to calculate averages. How heavy are your students' backpacks? Collect, organize, and calculate data just like ZOOM did



## Assessment

The lesson objectives can be assessed by evaluating the Weather Data Worksheet, the Product Analysis Worksheet, and the Sales Analysis Worksheet with the Weather Data Worksheet - Key, the Product Analysis Worksheet - Key, and the Sales Analysis Worksheet – Key.

Use the Assessment of Student Progress to assess students' overall abilities to meet the lesson's learning objectives, which include analyzing product price and sales data by calculating mean, median, mode, and range; and understanding how statistics are used to collect, organize, and interpret data.

## Closure

Provide each student with an index card and have them answer the following questions on one side of the index card:

1. Describe two new things that you have learned.
2. What else would you like to learn about this topic?

On the back side of the index card, instruct the students to draw a picture of something they learned about during this lesson. The index cards can be whole punched and held together with a simple shower curtain ring



# Analyzing Product Price and Sales Data

## Weather Data Worksheet

Day	High Temperature	Low Temperature
Sunday	76	54
Monday	80	60
Tuesday	97	72
Wednesday	77	58
Thursday	77	54

Calculate the Following:

1. Average (Mean) High Temperature \_\_\_\_\_
2. Average (Mean) Low Temperature \_\_\_\_\_
3. Median High Temperature \_\_\_\_\_
4. Median Low Temperature \_\_\_\_\_
5. Mode High Temperature \_\_\_\_\_
6. Mode Low Temperature \_\_\_\_\_
7. Range for High Temperatures \_\_\_\_\_
8. Range for Low Temperatures \_\_\_\_\_

## Analyzing Product Price and Sales Data

### Weather Data Key

Day	High Temperature	Low Temperature
Sunday	76	55
Monday	80	60
Tuesday	97	72
Wednesday	77	58
Thursday	77	54

Calculate the Following:

1. Average (Mean) High Temperature      81.4
2. Average (Mean) Low Temperature      59.8
3. Median High Temperature      77
4. Median Low Temperature      58
5. Mode High Temperature      77
6. Mode Low Temperature      none
7. Range for High Temperatures      21 degrees
8. Range for Low Temperatures      18 degrees



## Analyzing Product Price and Sales Data

### Geddes Kit List

	<b>Item Name</b>	<b>RG Item #</b>	<b>Retail Price</b>
1	Retro Pencils	67176	.20
2	Pet Silhouettes Pencils	67175	.20
3	Astral Wonders Pencils	67124	.20
4	Munchin Mike Sharpener	67183	.50
5	Piranha Sharpener	67037	.50
6	Mouse Sharpener	65627	.50
7	Erasing Grip	67137	.35
8	Criss Cross Critters	67036	.15
9	Happy Cap Erasers	64259	.05
10	Dessert Erasers	66993	.15
11	Twister Erasers	67027	.35
12	Mini Fish Erasers	67099	.50
13	G Mechanical Pencils	67039	.35
14	Traction Mechanical Pencils	67013	.35
15	Cushion Click Mechanical Pencils	66315	.35
16	.7mm Value Lead	61152	.40
17	Study Buddy Inferno	66967	.50
18	6-Color Pens	66685	.75
19	Bracelet Pens	65581	.40
20	Twister Pens	66921	.35



# Analyzing Product Price and Sales Data

## Product Analysis Worksheet

Place the top 20 school store items in order by retail price from lowest to highest.

	Item Name	RG Item #	Retail Price
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

1. Calculate the average item retail price. Show your work.
2. Calculate the median item retail price.
3. What is the mode item retail price?
4. What is the range of item retail prices? Show your work.

## Analyzing Product Price and Sales Data

### Product Analysis Key

Place the top 20 school store items in order by retail price from lowest to highest.

	Item Name	RG Item #	Retail Price
1	Happy Cap Erasers	64259	\$.05
2	Criss Cross Critters	67036	\$.15
3	Dessert Erasers	66993	\$.15
4	Retro Pencils	67176	\$.20
5	Pet Silhouettes Pencils	67175	\$.20
6	Astral Wonders Pencils	67124	\$.20
7	Erasing Grip	67137	\$.35
8	Twister Erasers	67027	\$.35
9	G Mechanical Pencils	67039	\$.35
10	Traction Mechanical Pencils	67013	\$.35
11	Cushion Click Mechanical Pencils	66315	\$.35
12	Twister Pens	66927	\$.35
13	Bracelet Pens	65581	\$.40
14	.7mm Value Lead	61152	\$.40
15	Munchin Mike Sharpener	67183	\$.50
16	Piranha Sharpener	67037	\$.50
17	Mouse Sharpener	65627	\$.50
18	Mini Fish Erasers	67099	\$.50
19	Study Buddy Inferno	66967	\$.50
20	6-Color Pens	66685	\$.75

1. Calculate the average item retail price. Show your work.
  - a.  $\$7.10/20 \text{ items} = \$.355 \text{ or } \$.36$
2. Calculate the median item retail price.     \$.35  
       (.05, .15, .20, .35, .40, .50, .75)
3. What is the mode item retail price?     \$.35 (6 items for .35)
4. What is the range of item retail prices? Show your work.
  - a.  $\$.75 - \$.05 = \$.70$



# Analyzing Product Price and Sales Data

## Sales Analysis Worksheet

Use the sales data provided in the Weekly Sales Results Spreadsheet to complete this worksheet.

1. Fill in the daily total sales amounts and the total for the week.

	Daily Total Sales
<b>Monday</b>	
<b>Tuesday</b>	
<b>Wednesday</b>	
<b>Thursday</b>	
<b>Friday</b>	
<b>Total Weekly Sales</b>	

2. Put the daily total sales amounts in order from lowest to highest.

	Daily Total Sales
<b>Total Weekly Sales</b>	

3. Calculate the average daily total sales amount for this week.  
Show your work.
4. What is the median daily total sales amount for the week?
5. What is the range for the daily total sales amounts for the week?

## Analyzing Product Price and Sales Data

### Sales Analysis Key

Use the sales data provided in the Weekly Sales Results Spreadsheet to complete this worksheet.

1. Fill in the daily total sales amounts and the total for the week.

	Daily Total Sales
<b>Monday</b>	\$ 39.75
<b>Tuesday</b>	\$ 43.70
<b>Wednesday</b>	\$ 42.20
<b>Thursday</b>	\$ 46.90
<b>Friday</b>	\$ 54.25
<b>Total Weekly Sales</b>	\$226.80

2. Put the daily total sales amounts in order from lowest to highest.

	Daily Total Sales
<b>Monday</b>	\$ 39.75
<b>Wednesday</b>	\$ 42.20
<b>Tuesday</b>	\$ 43.70
<b>Thursday</b>	\$ 46.90
<b>Friday</b>	\$ 54.25
<b>Total Weekly Sales</b>	\$226.80

3. Calculate the average daily total sales amount for this week. Show your work.

$$\$226.80 / 5 \text{ days} = \$45.36$$

4. What is the median daily total sales amount for the week?

\$43.70

5. What is the range for the daily total sales amounts for the week?

$$\$54.25 - \$39.75 = \$14.50$$



## Analyzing Product Price and Sales Data Assessment

Use the following summary to assess a student's abilities and performance throughout the lesson. Share this assessment with students at the start of the lesson so that students will understand how they will be assessed prior to beginning the Exploring and Learning section. The tool can be used as a basis for providing feedback to the student. Use the scale below to score each of the following items:

### Making Connections:

\_\_\_\_\_ Student participates in discussion by offering answers to one or more of the questions asked by the teacher.

### Exploring and Learning

- \_\_\_\_\_ Student works with partner to calculate weather statistics.
- \_\_\_\_\_ The Weather Data Worksheet contains accurate calculations.
- \_\_\_\_\_ Student works with partner to complete product analysis by calculating average item retail price, the median item retail price, the mode, and the range for the top 20 school store items.
- \_\_\_\_\_ The Product Analysis Worksheet contains accurate calculations.
- \_\_\_\_\_ Student works with partner to complete sales analysis by calculating the average daily total sales amount, the median daily total sales amount, and the range for daily total sales amounts.
- \_\_\_\_\_ The Sales Analysis Worksheet contains accurate calculations.
- \_\_\_\_\_ Student participates in closing discussions by offering answers to one or more of the questions asked by the teacher.

### SCALE

#### 4 – Excellent

Student completes the activity, task or assignment with no errors and demonstrates mastery of concepts and/or lesson objectives.

#### 3 – Good

Student completes the activity, task, or assignment with few major errors and demonstrates an understanding of the concepts and/or lesson objectives.

#### 2 – Fair

Student completes the activity, task, or assignment with some major errors and demonstrates difficulty with the concepts and lesson objectives.

#### 1 – Poor

Student does not complete the activity, task, or assignment and demonstrates no understanding of the concepts and/or lesson objectives.