

**Ms. Herron's Class Olympics**

**Angie Herron**

**Lab Partner: Chris Khedouri**

**South Carolina State Standards for Data Analysis:**

**II. Select and use appropriate statistical methods to analyze data.**

**A. Describe the shape and important features of a set of data and compare related data sets, with an emphasis on how the data are distributed.**

**1. Describe the features of a data set, including measures of center, range, and outliers.**

**B. Use measures of center, focusing on the median, understand what each does and does not indicate about the data set.**

**C. Compare different representations of the same data and evaluate how well each representation shows important aspects of the data.**

**1. Compare the different types of graphs (bar graph, line plot, line graph, and pictograph) to represent a given data set and explain the benefits of each.**

**III. Develop and evaluate inferences and predictions that are based on data.**

**A. Propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions of predictions.**

**1. Make and justify predictions based on data from a variety of applied situation.**

**2. Consider alternative explanations to the conjectures formed on the basis of presentations of data and then design further studies to test the conjectures.**

**Concepts:**

Mean, Median, Mode, Range, Outliers, Measuring with the metric system, graphing

**Background Information:**

Measures of Central Tendency

(Suppose we have a sample with 4 observations: 4,1,4,3)

**Mean** – The sum of a set of numbers divided by the number of observations.

Example:  $4+1+4+3= 12/4= 3$

**Median** – The middle point of a set of numbers (for odd numbered samples).

The mean of the middle two points (for even samples).

Example: 1,3, 4, 4=  $3+4=7/2= 3.5$

**Mode** – The most frequently occurring number.

Example: Mode= 4 (4 occurs the most).

### Measures of Variation

**Range** – The maximum value minus the minimum value in a set of numbers.

Example:  $4-1=3$

**Standard Deviation** – The average distance a data point is away from the mean.

### Hints for calculation:

1. Standard Deviation: compute the difference between each data point and the mean. Take the absolute value of each difference. Sum the absolute values.  
Divide this sum by the number of data points.
2. Median: first arrange the data points in increasing order.

### Metric System:

Meters, Centimeters, and Millimeters

1 Meter (m) = 100 Centimeters (cm) = 1,000 Millimeters (mm)

1 Meter is about the width of the classroom door

1 Centimeter (cm) = 1/100 of a Meter of .01 m

1 Centimeter is about the width of your pinky finger

1 Millimeter (mm) = 1/1,000 of a meter or .001 m

1 Millimeter is about the thickness of a dime

1 Kilometer (km) = 1000 m

1 Kilometer is about the distance of 6 city blocks

### History of Olympics:

The first Olympics were held in Olympia, Greece in the year 776 B.C. It was a running event called the stade, which was approximately 200 meters. The winner of the event was presented a crown of ivy to wear. Only men were allowed to compete, and they were naked.

More events were added as the years past. By 400 B.C. it became a festival of sports and entertainment. The Romans put a halt to this celebration, because they felt it was a pagan worship. Then, in 1896, athletes from 13 countries were sent to Athens to compete in the modern Olympics. Baron Pierre de Coubertin is the man known as “The Father of the Modern Olympic Games”.

Olympic games in the ancient times were held to worship and honor the Gods. Modern Olympics are held as a friendly competition between nations.

### **References:**

Math + Science: A Solution, 1987 Aims Education Foundation, page 21-23, 1987

Internet source: <http://infoplease.lycos.com>

Internet source: <http://www.nsa.gov/programs/mepp/ms/numthe03.pdf>

### **Materials Needed:**

**Tootsie Rolls, Marshmallows, Lifesavers, Chart Paper, Overhead Projector, Graph Paper, Metric Ruler and Metric Tape Measures, Masking Tape (for starting point), Student Resource Sheets (attached)**

### **Engage**

Introduce the lesson with a discussion of the history of the Olympics. Discuss where it occurred, when, and what kinds of events were held. Compare the Greek Olympics to the Olympics of today. Record the student’s answers on chart paper.

Explain to the students that we are going to hold our own Mini-Olympics. Each student will be competing in three events. The events that will be held are the lifesaver roll, the tootsie roll flick, and the marshmallow toss.

Discuss as a class how the Olympic events are measured using the metric system in order to determine a winner. The metric system is used today as the universal system of measurement. Have the students tell you everything they know about the metric system. Have them give you examples of where the metric system is used in every day life. Record this discussion on chart paper.

After the students have told you everything they know about the metric system, discuss the metric system more in depth. Talk about all of the metric units and their

appropriate uses. Practice using the metric system and making simple conversions within the metric system.

### **Exploration**

The students will be placed in groups of 5 students for the Olympic games. For each game the students must follow the same directions as follows:

- Each team member must first estimate the distance they think they will get on each event. This estimate should be shared with the group and recorded.
- Each team member must complete each event and measure their own distance to the nearest centimeter. This distance must be reported to their other team members and their result must also be recorded on their own recording sheet.

### **Each group will begin with the lifesaver roll event.**

1. Record all team members' names on the Olympic Trials Recording Sheet.
2. Have each team member estimate in centimeters how far they think their lifesaver will roll.
3. Have members of the team take a turn rolling their lifesaver, beginning at the starting point.
4. Team members will have to measure the distance from the starting point to where their lifesaver stopped. All results should be recorded on the group's sheet.

### **Explanation**

After each group has completed the lifesaver roll event, the class will meet to discuss the results. Review how to find the mean of the data. Give each group time to calculate the mean of the data. Each group will have to present their results and explain how they found the groups mean roll. This will be a good review of how to find the mean. As each group presents the teacher will collect and record the mean calculated by each team.

Ask the students how we could display the means of each group in a graph. Help lead them towards understanding that this information should be presented in a bar graph. Ask the students how we would set up a bar graph in order to display this information. After we have discussed the set up of the graph have each student create their own bar graph on graph paper to display the data.

As a class talk about what variables could have affected the results of the mean of each group. This is a good place to talk about outliers and how they affect a data set.

### **Exploration**

**The next event each group will participate in is the tootsie roll flick.**

1. Record all team members' names on the Olympic Trials Recording Sheet.
2. Have each team member estimate and record in centimeters how far they think their tootsie roll will travel.
3. Each team member will take turns placing the tootsie roll on end at the starting point. Hold the tootsie roll on its end with your index finger, and flick it with your other hand.
4. Each team member will measure from the starting point to where the tootsie roll stopped. Results for each team member must be recorded.

### **Explanation**

After each group has completed the tootsie roll flick event, the class will meet to discuss the results. Review how to find the mean and the mode of the data. Give each group time to calculate the mean and the mode from their Olympic Trial data. Have each group present their results. Make sure that each group explains how they found the mean and the mode of their data. Also ask each group to discuss variables that could have affected their results. They should be comfortable with the ideas of variables and outliers due to the previous class discussion.

Ask the students how would we be able to graph the mean and the mode as a double bar graph using the class results. Have students give you ideas about how you could graph this information. Remind the students that a double bar graph needs a key as well as labels. If the students are having a hard time with this concept the steps can be modeled with a random set of data. Have the students create a double bar graph on graph paper representing the mean and the mode of the class results of the tootsie roll flick.

### **Exploration**

**The third and finally event that the students will be participating in will be the marshmallow toss.**

1. Record all team members' names on the Olympic Trials Recording sheet.

2. Have each team member estimate in centimeters how far they think they will be able to throw the marshmallow. Estimates should be recorded.
3. Explain to the students that the marshmallow must be thrown like a shot put. The throwing arm must be bent back at the wrist. Then the students will thrust their arm upward to launch the marshmallow. All students must toss the marshmallow in the same manner.
4. Each team member will follow the directions given to toss the marshmallow.
5. Each team member will measure the distance from the starting point to where the marshmallow stopped. These measurements will be recorded.

### **Explanation**

After each group has completed the marshmallow toss event, the class will meet back together to discuss the results. Review how to find the mean, mode, median, and range of a set of data. Allow each group ample time to find those specific statistics from their data set. Have each group present their results. Results will be recorded on overhead. Make sure that each group explains how they found the mean, mode, median, and range of their data. Also have the groups discuss any variables that may have affected their results. At this point they should be using any new mathematical terms they have learned throughout the unit.

Have the students discuss in their groups how they could make a bar graph that displays the mean, median, and mode of the class results. They have had practice with creating bar graphs previously. Have each group create a triple bar graph representing the class data. After the groups have created their graphs talk about what steps were required in this task as a class.

### **Elaboration**

After the students have completed the three Olympic events have them discuss in their groups how the mean, median, mode, and range differ from each other. Also have them discuss how outliers can influence the mean. Have the students look at the graphs they have created throughout this unit in order to decide if one measure is more representative than another.

After students have been given enough time to meet and discuss in their groups the topics listed above hold a class discussion. During this discussion students will be

encouraged to use new mathematical vocabulary. Students will also be expected to provide reasoning and evidence in order to support their opinions.

### **Evaluation**

Students will be assessed daily on performance. Both measuring accurately with the metric ruler and using computational skills to calculate mean, median, and mode will be used to evaluate each student's progress. Students will also have to write in their math journals what they have learned about how to find the mean, median, mode, and range. They will also have to be able to explain how to choose the appropriate measure of central tendency when given a set of data.

Students will work in pairs in order to research a specific country that competes in the Olympics. They will be expected to collect data on how many Olympic medals their country has won. They will represent this information using the appropriate type of bar graph. They will also be expected to find the measures of central tendency, along with the range. An oral presentation can be requested to go along with this information.

### **Extensions**

- Students can be required to do a history report on the Olympics.
- They can also be asked to research the country that they are doing for their final evaluation and write an informative essay about that country.
- Students can also research a specific athlete that has competed in the Olympics in order to write about them.
- Olympic events can be researched and discussed. Students can then write an expository essay on which event they would like to someday compete in and why.
- Students can invent a new event for the Olympics.
- Students can investigate a specific event and research how to prepare in order to compete for that specific event. (e.g. what muscles are targeted when competing in a specific event)

Name:

Date:

### Measuring with Metric Units

1 meter (m) = 100 centimeter (cm) = 1,000 millimeters (mm)

1 meter is about the width of the classroom door

1 centimeter (cm) = 1/100 of a meter or .01 m

1 centimeter is about the width of your pinky finger

1 millimeter (mm) = 1/1,000 of a meter or .001 m

1 millimeter is about the thickness of a dime

1 kilometer (km) = 1000 m

1 kilometer is about the distance of 6 city blocks

**Estimate the length of each line to the nearest centimeter. Then measure each to the nearest centimeter. Finally, tell the length of each line to the nearest millimeter.**

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

Number	Estimate (cm)	Measure (cm)	Measure (mm)
1			
2			
3			
4			
5			

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Directions: Using your knowledge of the metric system make the following conversions.**

1. 0.3 cm = \_\_\_\_\_ mm

2. 2 cm = \_\_\_\_\_ mm

3. 4.5 cm = \_\_\_\_\_ mm

4. 2.5 cm = \_\_\_\_\_ mm

5. 80 mm = \_\_\_\_\_ cm

6. 85 mm = \_\_\_\_\_ cm

7. 1m = \_\_\_\_\_ cm

8. 5.5 m = \_\_\_\_\_ cm

9. 20 cm = \_\_\_\_\_ m

10. 350 cm = \_\_\_\_\_ m

11. 25 cm = \_\_\_\_\_ m

12. 6.5 m = \_\_\_\_\_ cm

13. 8 km = \_\_\_\_\_ m

14. 700 m = \_\_\_\_\_ km

15. 0.4 km = \_\_\_\_\_ cm

What would you use to measure the following items? Choose the appropriate unit. Use **kilometers (km), meters (m), centimeters (cm), or millimeters (mm)**.

16. Length of a relay baton \_\_\_\_\_

17. Thickness of a gold metal \_\_\_\_\_

18. Height of a bar for the high jump \_\_\_\_\_

19. Distance of a marathon runner \_\_\_\_\_

**20. In the classroom, use a ruler to measure in cm and mm the dimensions of your math textbook.**

**Height:** \_\_\_\_\_ (how tall the book is)

**Width:** \_\_\_\_\_ (how wide the book is)

**Thickness:** \_\_\_\_\_ (how thick the book is)

## Teacher Answer Sheet

**Directions: Using your knowledge of the metric system make the following conversions.**

1.  $0.3 \text{ cm} = 3 \text{ mm}$
2.  $2 \text{ cm} = 20 \text{ mm}$
3.  $4.5 \text{ cm} = 45 \text{ mm}$
4.  $2.5 \text{ cm} = 25 \text{ mm}$
5.  $80 \text{ mm} = 8 \text{ cm}$
6.  $85 \text{ mm} = 8.5 \text{ cm}$
7.  $1 \text{ m} = 100 \text{ cm}$
8.  $5.5 \text{ m} = 550 \text{ cm}$
9.  $20 \text{ cm} = 0.2 \text{ m}$
10.  $350 \text{ cm} = 3.5 \text{ m}$
11.  $25 \text{ cm} = 0.25 \text{ m}$
12.  $6.5 \text{ m} = 650 \text{ cm}$
13.  $8 \text{ km} = 8,000 \text{ m}$
14.  $700 \text{ m} = 0.7 \text{ km}$
15.  $0.4 \text{ km} = 40,000 \text{ cm}$

What would you use to measure the following items? Choose the appropriate unit. Use **kilometers (km)**, **meters (m)**, **centimeters (cm)**, or **millimeters (mm)**.

16. Length of a relay baton = cm

17. Thickness of a gold metal = mm

18. Height of a bar for the high jump = m

19. Distance of a marathon runner = km

20. In the classroom, use a ruler to measure in cm and mm the dimensions of your math textbook.

Height: \_\_\_\_\_ (how tall the book is)

Width: \_\_\_\_\_ (how wide the book is)

Thickness: \_\_\_\_\_ (how thick the book is)



### **Directions For Olympic Trials**

**Each team member must first estimate the distance they think they will get on each specific event. This estimate should be shared with the group and each team member must record the estimates of their teammates on their own recording sheet. Then each team member must complete the specific event and measure their own distance to the nearest centimeter (cm). The distance must be reported to the other team members and each member must record the result on their own recording sheet.**



### **Lifesaver Roll**

**Place the lifesaver on its edge at the starting point. Roll the lifesaver. Measure the distance from the starting point to where the cookie stopped. Record the result.**

### **Tootsie Roll Flick**

**Place the tootsie roll on end at the starting point. As you hold the tootsie roll on its end with your index finger, flick it with your other hand. Measure the distance from the starting point to where the tootsie roll stopped. Record the result.**

### **Marshmallow Toss**

**The marshmallow must be thrown like a shot put. The throwing arm must be bent back at the wrist. Thrust the arm upward to launch the marshmallow. Make sure all students toss the marshmallow in the same manner. Measure the distance from the starting point to where the marshmallow stopped. Record the result.**

**Olympic Trials Recording Sheet**

**Team** \_\_\_\_\_

**Lifesaver Roll**

**Team Members**

**Estimate**

**Actual Distance**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Group Mean:** \_\_\_\_\_

**Tootsie Roll Flick**

**Team Members**

**Estimate**

**Actual Distance**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Group Mean:** \_\_\_\_\_

**Group Median:** \_\_\_\_\_

## Marshmallow Toss

**Team Members**

**Estimate**

**Actual Distance**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Group Mean:** \_\_\_\_\_

**Group Mode:** \_\_\_\_\_

**Group Median:** \_\_\_\_\_