

**Pennsylvania Governor's Institute
for Mathematics Educators
2004**

Names of Group Members:

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Topic/Theme:

Data Collection and Scatter plots/Olympic Math Games

Level: Grades: 6-8

Time Element: 3 days

NCTM Standards Addressed:

MEASUREMENT:

- Understand both metric and customary systems of measurement.
- Select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision.

DATA ANALYSIS AND PROBABILITY:

- Formulate questions, design studies, and collect data about a characteristic shared by two populations or different characteristics within one population.
- Select, create, and use appropriate graphical representations of data, including histograms, box plots, and scatter plots.
- Find, use, and interpret measures of center and spread, including mean and interquartile range.
- Discuss and understand the correspondence between data sets and their graphical representations, especially histograms, stem-and-plots, and scatter plots.
- Use observations about differences between two or more samples to make conjectures about the populations from which the samples were taken.
- Use conjectures to formulate new questions and plan new studies to answer them.

PA Math Standards Addressed:

- 2.3.8.D.** Estimate, use and describe measures of distance, rate, perimeter, area, volume, weight, mass, and angles.
- 2.5.8.B.** Verify and interpret results using precise mathematical language, notation and representation, including numerical tables and equations, simple algebraic equations and formulas, charts, graphs, and diagrams.

- 2.6.5.B. Describe data sets using mean, median, range, and mode.
- 2.6.8.F. Use scientific and graphing calculators and computer spreadsheets to organize and analyze data.
- 2.7.8.B. Present the results of an experiment using visual representations (e.g. tables, charts, graphs, etc.)
- 2.11.8.A. Analyze graphs of related quantities for minimum and maximum values and justify the findings.

Math Assessment Anchors Addressed:

- M8.B.1 Demonstrate an understanding of measurable attributes of objects and figures, and the units, systems and processes of measurement.
- M8.E.1 Formulate or answer questions that can be addressed with data and/or organize, display, interpret or analyze data.
- M8.E.4 Develop and/or evaluate inferences and predictions or draw conclusions based on data or data displays.

Reading Assessment Anchors Addressed:

- R8.A.2 Demonstrate the ability to understand and interpret nonfiction text, including informational, autobiography, biography, editorial and speeches appropriate to grade level.

Objectives:

- The student will use a graphing calculator or computer spreadsheet to organize and analyze data.
- The student will fit a line to a scatter plot, describe the correlation of the plots of data that include the heights of the students and lengths of a standing broad jump in metric measure.

Instructional Strategies and Plan (include strategies used to help different types of learners, i.e. auditory, visual, etc.):

Plan for Day One:

- The teacher will conduct a brief overview of the Olympic Games – especially since this is a year for the Summer Games.
 - www.olympics.com
- There will also be a review of the metric system (specifically – meter, centimeter, millimeter) and measuring skills.
- The teacher will then discuss goals of the broad jump activity on Day Two.
- The height of each student and the length of his/her best jump out of 3 will be measured and recorded.
- Discuss the possible relationships between height and jump length and make predictions about how a student's height might affect the outcome of the broad jump.
- Finally, have students write their name on three Post-it notes; collect and keep for Day Two. Group students in pairs for Day Two activity.

- ▶ Auditory learning will be addressed by oral review of procedures and skills by the teacher.
- ▶ Visual learning will be addressed by using an overhead of the worksheet that will be distributed on Day Two.

Plan for Day Two:

- Each student will measure the height (to the nearest millimeter) of his/her partner. Record heights on worksheet.
- From a position marked with masking tape, each student will jump as far as he/she can. The student's partner will mark the jump with one of the Post-its. Each student will jump three times; the student's partner will measure the length of the best jump. Repeat this process for the partner. Record the jump lengths on the worksheet.
- The teacher will monitor the progress of the students, walking around the room.
- The teacher will help the students gather the results from the entire class; every student will have a complete set of data for use on Day Three.
 - ▶ Auditory learning will be addressed by the discussion between the student pairs. Teachers can also verbally check to see that the students are on task.
 - ▶ Visual learning will be addressed through the use of the meter sticks and the worksheets.

Plan for Day Three:

- Each student will create a scatter plot of the data, either with a computer spreadsheet, graphing calculator, or by hand, depending on the availability of technology.
- Students will draw a line of best fit through the data.
- Students will then work with their partners to answer the following questions.
 - Who jumped the farthest? How tall is this student?
 - Who jumped the shortest? How tall is this student?
 - What is the range of height between the tallest and shortest students? How does this compare to the range of the longest and shortest jump?
 - Is there a relationship between the height of a person and how far he/she can jump? What is the relationship? Were our predictions from Day One correct?
 - Suppose Shaquille O'Neal or "Mini-Me" joined the class for the day. What do you think would happen to the Measures of Central Tendency?

- End the activity by discussing the correlation (if there is one) of the scatter plot, confirming or rejecting the predictions that were made by the class on Day One.
 - ▶ Auditory learning will be addressed through the class discussion both before and after the graphing activity.
 - ▶ Visual learning will be addressed through the graphing activity itself.

Materials/Resources:

- Meter sticks
- Paper/pencil
- Masking tape
- Post-it notes
- Graphing calculator or spreadsheet software
- Guided worksheet
- Rubric
- Posterboard/markers

Interdisciplinary Connections:

- **Reading**
 - Research history of the modern Olympic games
 - Bring in articles related to the Olympics to share with the class
- **Technology**
 - Create a variety of graphs using a spreadsheet program to organize, display and evaluate the data
 - Research the technological advances used for scoring and timekeeping of Olympic events
- **Other**
 - Social Studies: Discussion of current events
 - Science: “Physics of Winning”
 - Geography: Locate Olympic participants

Assessment Strategies:

- **Formative Evaluation (checking student understanding during the lesson):**

The teacher will rotate through the room, checking to see that students are on task and understand their goals for the activity, during both the broad jump and the graphing activity.
- **Summative Evaluation (how will it be determined that the objectives were achieved?):**

Based on the presence of any extremes from the correlation of the scatter plot, the teacher will be able to determine if students measured correctly.

Correctives/Remediation:

- Graph the data of only 10 students
- Model the measurement process

Extensions/Enrichment:

- Students can develop their own Olympic events
- Write a persuasive letter to the USOC describing their new event and asking for consideration
- Convert metric units to customary units
- Brainstorm other positive/negative correlations
- Display data in different ways (ex: box and whisker plot, boys vs. girls, etc.)
- Calculate the equation for the line of best fit

Special Accommodations (special needs students)

- **Description of the Special Needs Student Selected:**
 - Jimmy is a student diagnosed with Asperger's syndrome. He is above grade level in decoding and fluency in reading. Jimmy loves to read anything that is fact based and quickly memorizes and recites the facts. He has great difficulty with problem solving and inferential thinking. Jimmy has poor fine motor skills and has trouble writing within boundaries and organization of his written work. He has strong rote math facts but has severe difficulty with the organization of multi-step sequences and problem solving. When he is presented with these types of math problems, he crawls under the desk and refuses to come out.
- **Accommodations to Use with this Student:**
 - List instructions for each task separately on overhead or LCD projector
 - Model/demonstrate tasks and procedures. Have Jimmy repeat instructions.
 - Have names recorded on template for Jimmy. Template can be pasted into Excel to enable him to input data directly to the computer.
 - Building on Jimmy's love of reading and facts, encourage him to research and report on Olympic events, news, or history. He can even role play news reporter and videotape the report for presentation.