

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

**Names of Group Members:**

**Brian Long, Jamie Smith, Patricia Wheeler, Catherine Tombasco**

**Topic/Theme:**

**Use scale to determine distance on a map.**

**Level: Grades 6-8**

**Time Element:**

**3 class periods consisting of 45 min. each.**

**NCTM Standards Addressed:**

**NCTM STANDARDS SETS: MEASUREMENTS  
STANDARDS => MATHEMATICS**

**Understand the measurable attributes of objects and the units, systems, and processes of measurement.**

1. Understand both metric and customary systems of measurement
2. Understand relationships among units and convert from one unit to another within the same system.

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

1. Discuss and understand the correspondence between data sets and their graphical representations, especially histograms, stem and leaf plot, box plots and scatter plots.

**PA Math Standards Addressed:**

- 2.8.3.A**      Develop formulas and procedures for determining measurements (e.g., area, volume, distance).
- 2.8.3.D**      Estimate, use and describe measures of distance, rate, perimeter, area, volume, weight, mass and angles.
- 2.8.3.F**      Use scale measurements to interpret maps or drawings.

**2.8.3.G** Create and use scale models.

**Math Assessment Anchors Addressed:**

**ASSESSMENT ANCHOR**

- M8.B.1** Demonstrate an understanding of measurable attributes of objects and figures, and the units, systems and processes of measurement.
- M8.B.1.1.1** Convert among all metric measurements (milli, centi, deci, deka, hecto, kilo using meter, liter and gram) (table of equivalency provided on the reference sheet).
- M8.B.2** Apply appropriate techniques, tools and formulas to determine measurements.
- M8.B.2.4.1** Interpret and/or apply scales shown on maps, blueprints, models, etc.
- M8.B.2.4.2** Determine and/or apply an appropriate scale for reduction or enlargement.
- M8.E.1** Formulate or answer questions that can be addressed with data and/or organize, display, interpret or analyze data.
- M8.E.1.1.1** Choose the correct representation for a set of data.
- M8.E.1.1.2** Display and/or interpret data shown in bar/double bar graphs, line/double line graphs, circle graphs and histograms.
- Use a title, appropriate scale, labels and key where appropriate.
  - Circle graphs for open-ended items must show a center point and tick marks (protractor not necessary to display data in a circle graph).

**Reading Assessment Anchors Addressed:**

**READING SET: ASSESSMENT ANCHOR**

- R8.A.2** Demonstrate the ability to understand and interpret nonfiction text, including informational, autobiography, biography, editorial and speeches appropriate to grade level.
- R8.A.2.7.1** Items may address information found in a text subsection, including graphics and charts.

## Objectives:

- 1 The students will demonstrate estimation skills and understanding of scale by locating their home on a map and determining the distance from their home to the school.
- 2 The students will generate bar graphs and double bar graphs utilizing estimated and actual measurements.
- 3 The students will demonstrate public speaking skills by orally presenting the results of their map reading project.

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

### DAY 1

- 1 Before class begins, the teacher will duplicate a large scale local map containing the location of the school and the homes of the students. The teacher will prepare a large bar graph form in the front of the classroom. The x-axis will be labeled “number of students;” the y axis will be labeled “distance from school.”
- 2 While the teacher is taking attendance, each student will write his name on a post-it note. He will then estimate the distance from his house to the school. The student will place his post-it note in the appropriate position on the bar graph to indicate the estimated distance from the school. This activity encompasses visual, tactile and kinesthetic learning styles.
- 3 Using the map on the overhead projector, the teacher and the students will identify and notate the location of the school and local landmarks. The teacher will model how to use the map key and scale to determine actual distance from the school to local landmarks.
- 4 Each student will use a copy of the local map to locate his own house with teacher assistance, if necessary.
- 5 The students will measure the distance from the school to the house on the map in inches using a string tied to a pen and a

- ruler. He will then determine the actual distance by converting the inches to miles.
- 6 Each student will write his name on another post-it note (different color). The child will place the post it note in the appropriate space on the large bar graph that shows actual distance. Do not place the new post-it notes in the same column as the estimation labels.
  - 7 Discuss the results of the activity.

## DAY 2

- 1 The students will now construct a double bar graph on paper comparing the estimated distance and the actual distance for each student in the class.
- 2 The students will complete a worksheet requiring them to find the actual distance to 5 local landmarks from the school.

## DAY 3

- 1 Finish projects from prior day. The students will now work in small groups, each with a copy of a national map. Each group will choose 1 city to visit, then randomly choose two additional cities from a group generated by the teacher. The group will then measure the distance in inches on the map to each city to determine the actual distance from their home city. They will present these results orally to the class.

## DAY 4

- 1 Present small group projects.

## Materials/Resources:

- ⇒ overhead projector
- ⇒ post-it notes (two different colors)
- ⇒ one local map per student
- ⇒ rulers(with both metric and standard measures)
- ⇒ pencil with string connected

- ⇒ one national map per small group
- ⇒ 'WHERE DO YOU LIVE PROJECT' with accompanying worksheet
- ⇒ 'ON THE ROAD AGAIN PROJECT' with accompanying worksheet

### **Interdisciplinary Connections:**

1. **Reading:** New vocabulary will be introduced including scale, actual distance, estimated distance, contiguous.
2. The students will evaluate text organization by reading the headings and graphics on the bar graph to derive meaning.
3. **Technology:** Local maps are constructed using the internet.
4. Graphing calculators may be used to determine the statistics. A bar graph may be displayed on the calculator.
5. **Other**
6. **Social Studies:** students practice map reading skills. Discussions of local and national geography are a logical consequence of this activity.

### **Assessment Strategies:**

1. **Formative Evaluation** (checking student understanding during the lesson):
  - a. Direct teacher observation and student response.
2. **Summative Evaluation** (how will it be determined that the objectives were achieved?)
3. **Rubric** (for project)

### **Correctives/Remediation:**

Review prior knowledge and vocabulary, using a ruler, working with fractions, and standard units.

### **Extensions/Enrichment:**

1. Convert from standard to metric units.
2. **Statistics;** calculate the range, mean, median, and mode of the data on the bar graph.
3. Display the data as a circle graph.

## **Special Accommodations (special needs students)**

**Description of the Special Needs Student Selected:** *Margaret is functioning three years below grade level. She is receiving learning support services for language arts and math and has difficulty following directions in all instructional areas. Margaret has difficulties in language comprehension, vocabulary, direction following, event-sequencing and working memory. She can answer literal comprehension questions in all content areas and usually answers 1 out of 5 inferential questions correctly. She tends to jump into reading tasks without previewing material but has success when instructions are broken down and accompanied by modeling. She has difficulty with basic math facts for multiplication and division as well as problems involving multiple steps.*

### **Accommodations to Use with this Student:**

- 1. Pair Margaret with another student for this activity.**
- 2. Give Margaret a map with the location of her house already marked.**
- 3. Allow Margaret to use a calculator for entire activity,**
- 4. Develop a print outline of the main points to be covered in the presentation with blanks to be filled in by the child as she discovers the information.**
- 5. Assign Margaret to a smaller group than the other students.**
- 6. Allow Margaret to hold the pencil while measuring the distance in the project.**