

## **Title: School Store Simulation**

### **Brief Overview:**

This learning unit is designed to allow students to apply and improve the concept of scale in diagrams and models. In addition, the concepts of measurement and spatial relationships will be applied to real world situations. Students will make decisions concerning stock based on consumer wants, allocated space, and allotted money to create a model of a school supply store.

### **Links to NCTM 2000 Standards:**

- **Standard 1: Number and Operation**

Mathematics instructional programs should foster the development of number and operation sense so that all students understand numbers, ways of representing numbers, relationships among numbers, and number systems; and understand the meaning of operations and how they relate to each other.

- **Standard 3: Geometry and Spatial Sense**

Mathematics instructional programs should include attention to geometry and spatial sense so that all students analyze characteristics and properties of two- and three-dimensional geometric objects; and use visualization and spatial reasoning to solve problems both within and outside of mathematics.

- **Standard 4: Measurement**

Mathematics instructional programs should include attention to measurement so that all students understand attributes, units, and systems of measurement; and apply a variety of techniques, tools, and formulas for determining measurements.

- **Standard 5: Data Analysis, Statistics, and Probability**

Mathematics instructional programs should include attention to data analysis, statistics, and probability so that all students pose questions and collect, organize, and represent data to answer those questions; interpret data using methods of exploratory data analysis; and develop and evaluate inferences, predictions, and arguments that are based on data.

- **Standard 6: Problem Solving**

Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students build new mathematical knowledge through their work with problems; develop a disposition to formulate, represent, abstract, and generalize in situations within and outside mathematics; apply a wide variety of strategies to solve problems and adapt the strategies to new situation; and monitor and reflect on their mathematical thinking in solving problems.

- **Standard 7: Reasoning and Proof**

Mathematics instructional programs should focus on learning to reason and construct proofs as part of understanding mathematics so that all students make and investigate mathematical conjectures; and select and use various types of reasoning and methods of proof as appropriate.

- **Standard 8: Communication**

Mathematics instructional programs should use communication to foster an understanding of mathematics so that all students organize and consolidate their mathematical thinking to communicate with others; express mathematical ideas coherently and clearly to peers, teachers, and others; extend their mathematical knowledge by considering the thinking and strategies of others; and use the language of mathematics as a precise means of mathematical expression.

- **Standard 9: Connections**

Mathematics instructional programs should emphasize connections to foster an understanding of mathematics so that all students recognize and use connections among different mathematical ideas; understand how mathematical ideas build on one another to produce a coherent whole; and recognize, use, and learn about mathematics in contexts outside of mathematics.

- **Standard 10: Representation**

Mathematics instructional programs should emphasize mathematical representations to foster an understanding of mathematics so that all students create and use representations to organize, record, and communicate mathematical ideas.

**Grade/Level:**

Grades 4-5

**Duration/Length:**

Approximately 4 class periods, 45 minutes to 1 hour length

**Prerequisite Knowledge:**

Students should have working knowledge of the following skills:

- Constructing a circle graph
- Use of a compass
- Constructing and conducting a survey
- Basic operations of money
- Area and perimeter
- Use of a percent protractor, graph-making technology, or knowledge of constructing circle graphs from basic data

## **Student Outcomes:**

Students will:

- utilize visual memory to sketch items to scale.
- construct and conduct a survey.
- analyze data to construct a circle graph.
- use problem solving skills.
- construct and label a model to scale.

## **Materials/Resources/Printed Materials:**

### **Day 1:**

- Visualization items (see Helpful Hints Day 1)
- 17" x 11" paper for each student
- 1" grid paper for each student (Student Resource Sheet #5)
- ¼" grid paper for each student (Student Resource #6)
- Transparencies of both grids for instruction
- Student Resource Sheet #1, one per group

### **Day 2:**

- Student Resource Sheet #2, one per student
- Compasses, percent protractors, or access to graph making technology for each student
- Markers, coloring pencils, or crayons
- Teacher Resource Sheet #1

### **Day 3:**

- Various sized boxes
- Masking tape
- Grid transparencies
- Transparency of ¼" grid for each student
- Overhead pens for each pair of students

### **Day 4:**

- Student Resource Sheet #3-4, one per student
- 1" grid paper, 2-3 per student
- ¼" grid paper, 1 per student
- Glue sticks
- Scissors
- Teacher Resource Sheet #1

## **Development/Procedures:**

### **Day 1:**

- Warm-up: Give students 17" x 11" paper. Ask the students to visualize the items listed below in Helpful Hints and draw each in its actual size on their papers. Allow 5 -10 minutes and then supply these items for comparison with students' drawings. Explain that we will be talking about and working with the sizes of these items in this task.
- Discuss prior knowledge of a school store.
- Brainstorm and record a list of possible items sold in a school store. Discuss the reasons for these choices.
- Distribute Student Resource Sheet #1. Discuss the directions, and assign groups.
- Allow 30 minutes for Task 1. In Task 1, students will construct and conduct a survey to find out what merchandise will be in demand by the consumers or students.

### **Helpful Hints for Teachers:**

- List for visualization activity: unsharpened pencil, glue stick, scissors, pencil top eraser, two-pocket folder, and notebook paper
- Pre-assign students to groups of 4 or 5.
- Model sample survey questions during discussion of directions.
- Direct students to use "choice type" questions instead of open-ended questions on the survey.
- Prior to the task, decide if the survey will be for the class, grade, or entire school.
- Be prepared to photocopy the survey and distribute it to survey group. You may want to attach a brief note to other teachers explaining the activity if you are including other classes or grades in the survey.

### **Day 2:**

- Distribute Student Resource Sheet #2 and discuss directions.
- Student groups will sort and analyze collected data.
- Each student will create a tally chart to organize the data.
- Each student will construct a circle graph displaying this data.
- Each student will write a descriptive paragraph to accompany their graph.

### **Helpful Hints for Teachers:**

- Decide in advance if students will use a percent protractor, technology, or a compass and computational skills to construct the graph.
- Review correct use of tools that students will use.
- The writing assignment may be used for homework.

### **Day 3:**

- Warm-up: Give each student the one-inch squared grid paper and the quarter-inch grid paper (Student Resource Sheets #5-6). Ask students to compare and contrast the papers. Prompt the students to discover the ratio of 16 small squares to 1 large square if no one shares this.
- Introduce the term scale and ask where they have seen or used this word before. Explore their prior knowledge of this concept. Discuss the reasons for needing scale in situations outside mathematics.
- Use overhead grid sheets to demonstrate drawing to scale. Show students various sized boxes and demonstrate how to calculate scale.
- Next, have pairs of students move about the room measuring various figures outlined on the floor with masking tape. Instruct students to draw these items to scale on their transparency grid paper. Allow 20 minutes for these explorations. Have students share their results with the class and discuss techniques used.

### **Helpful Hints for Teachers:**

- Make various quadrilateral shapes on the floor using masking tape. Be sure that all of the figures can be drawn to scale on the given grid paper.
- Prepare transparency sheets and pens for students ahead of time.
- Layer the student drawings for each figure to check for and demonstrate accuracy.

### **Performance Assessment:**

On Day 4, students will complete Student Resource Sheets #3-4 by drawing a scaled model of a school store display case. The scoring rubrics are found on Teacher Resource #1.

### **Extension/Follow Up:**

- Design a sign with a geometric symbol for the new school store. Use a compass to design chords, arcs, and circles. Lettering should be centered and names should be creative.
- Calculate the area and perimeter of the display case.
- Prepare a presentation for your school's PTA to persuade them to fund a school store.
- Write an editorial for your school paper expressing your opinion about the need for a school store. Support your position with facts.

### **Authors:**

Lynn Beauchamp  
Church Hill Elementary School  
Queen Anne's County, MD

Jennifer Davis  
Pinehurst Elementary School  
Wicomico County, MD

Group Members \_\_\_\_\_

**School Store Simulations**  
**Task 1**

You are on a committee to open a school store in your school. You must buy all of the items for the store. What will you purchase? How do you know what items will sell? Construct a survey that will help you find out what goods you need for your consumers.

Think Abouts:

- what types of items
- what items will be the most popular
- consumers, demand

Directions: In the space below, construct your survey. Be sure to include choices and not open ended questions.

---

Name \_\_\_\_\_

**School Store Simulations**  
**Task 2**

You now have feedback from a survey group to analyze. Sort and organize the data so that you can display it in graph form. You will need to create a tally chart for the data and then create a circle graph. Make sure that your graph has a title and is labeled. Your work should be neat and accurate. Complete your tally chart and circle graph on this sheet.

Name \_\_\_\_\_

**School Store Simulations****Performance Assessment**

You have collected data that will help you decide what items to stock in your store. You have other factors to consider. You have been given a budget of \$125.00 and one display case to hold your merchandise. There are two shelves in the display case and each shelf measures 6 ft. X 2 ft. You must make your decision based on all of these factors. The table below lists the items available, the quantities, sizes of packages, and prices. Decide what you will buy for the school store. Be prepared to explain why you made those choices.

<i>Item</i>	<i>Quantity</i>	<i>Size (LxW)</i>	<i>Price</i>
pencils	box of 100	9 x 6	\$11.75
tablets	box of 25	12 x 9	\$15.25
folders	box of 50	18 x 15	\$7.75
erasers	box of 100	9 x 15	\$5.65
book covers	box of 100	24 x 18	\$10.00
rulers	box of 10	15 x 9	\$5.35
glue sticks	box of 15	9 x 6	\$8.75
scissors	box of 5	6 x 9	\$12.35

Student Resource Sheet #4

Make a list of the supplies you will purchase on the back of this paper. Include prices, quantities, and a total amount for your purchases. There is no tax on these items. How much change will you have from the \$125.00?

Draw a scaled model of the shelves in the display case. Use the checklist.

1. Draw the shelves to scale on the large grid paper. \_\_\_\_\_
2. Draw the supplies you chose to scale on the small grid paper. \_\_\_\_\_
3. Label each item neatly. \_\_\_\_\_
4. Cut these models out and organize them on the shelf diagram. \_\_\_\_\_
5. When you have made a final decision on the placement of the items on the shelves, glue them into place. \_\_\_\_\_
6. Make sure your diagram has a title. \_\_\_\_\_

Writing in Mathematics:

Write a paragraph on another sheet of paper explaining why you purchased those particular items.

Think Abouts:

- Be sure to include support based on all of the factors. (consumer demand, cost, and size of items)
- Correct paragraph format
- C.U.P.S. (Capitalization, Usage, Punctuation, Spelling)

**Scoring Rubric for Circle Graph- Task 2**

- 3     Outlining circle was constructed with a compass  
      Accurate display of data in tally chart  
      Portions are accurately drawn  
      Key or legend is included  
      Portions are color coordinated with legend  
      Appropriate title  
      Completed neatly
- 2     Completed four of the above requirements
- 1     Completed three or two of the above requirements
- 0     Completed one or none of the above requirements

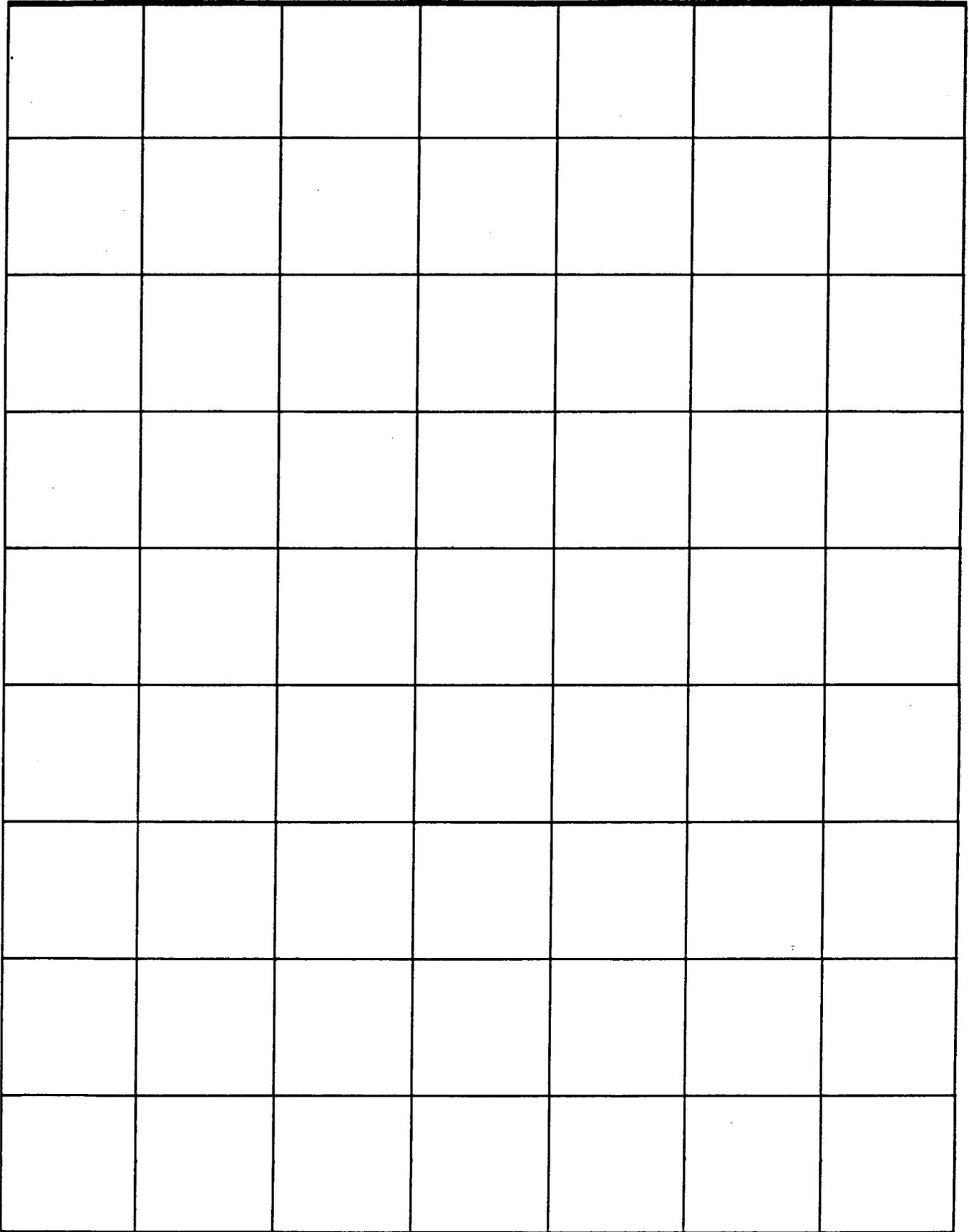
**Scoring Rubric for Scaled Diagram- Task 3**

- 3     Shelf is drawn on 1" grid paper  
      Shelf is drawn correctly to scale  
      Scaled items placed without overlap  
      All items labeled  
      Items made to scale correctly  
      Cut out and glued neatly  
      Title on diagram
- 2     Completed 4 of the above requirements
- 1     Completed 3 or 2 of the above requirements
- 0     Completed one or none of the above requirements

**Scoring Rubric for Mathematics Writing Prompt- Task 3**

- 3 Identified all items purchased  
Gave support based on consumer needs  
Gave support based on money/prices  
Gave support based on size of items/placement  
Used correct paragraph format  
Correct capitalization, usage, punctuation, spelling
- 2 Completed 4 of the above requirements
- 1 Completed 3 or 2 of the above requirements
- 0 Completed 1 or 0 of the above requirements

One Inch Grid Paper



Quarter Inch Grid Paper

