OVERSIZED INCH

Student/Class Goal
Adults are often required to take measurements of various objects in their everyday lives to complete tasks with their families.

Outcome (*lesson objective)*
Students will read and accurately measure to the eighth of an inch with a ruler, yardstick or metal rule.

Time Frame
45 minutes

Standard *Use Math to Solve Problems and Communicate*

NRS EFL 2-4

COPS	**Activity Addresses Components of Performance**
Understand, interpret, and work with pictures, numbers, and symbolic information.	Students will learn the meaning of the various lines on a ruler.
Apply knowledge of mathematical concepts and procedures to figure out how to answer a question, solve a problem, make a prediction, or carry out a task that has a mathematical dimension.	Students will use basic knowledge of fractional parts to help understand what the lines on a ruler mean.
Define and select data to be used in solving the problem.	Students will determine which measurement tool should be used to measure an object and what lines are needed to determine the length of an object.
Determine the degree of precision required by the situation.	Students will decide how accurate their measurement needs to be.
Solve problem using appropriate quantitative procedures and verify that the results are reasonable.	Students will be able to accurately measure an object and decide of the measurements are reasonable.
Communicate results using a variety of mathematical representations, including graphs, chart, tables, and algebraic models.	Students will answer questions requiring measurements and communicate their results verbally and with illustrations.

Materials
Paper, fine tip markers/pencils in various colors
Small items (less than 12 inches) to measure
Diagram 1 & 2
Example of Student Work
Oversized Inch Learning Objects

Learner Prior Knowledge
Basic knowledge of fractional parts, basic understanding of a ruler (that it is a measuring device and divided into small units).

Instructional Activities
Step 1 – Introduce the activity by discussing situations when they are required to measure an object. Generate a list of situations and/or jobs where measurement skills are used. Small groups could brainstorm a list of situations to share with the class. Or instead of brainstorming, each question could be written on chart paper and placed around the room. Then the students could walk around the room marking their ideas on the papers. Questions might include: When do you use measurement in your personal life? When do you use measurement at work? What jobs do you know that require measurement skills?

Explain to the class that today they will be taking a close-up look at a commonly used unit of measurement - the inch. Remind students that the "inch" they will be looking at will have all the parts of an inch but will be much larger than a real inch.

Step 2 – Pass out a long skinny sheet of paper to each student. I like to use ½ of a legal sheet of paper (4 ¼ x 14) or half of a 12 x 18 sheet of paper (6 x 18).

TEACHER NOTE To help make this activity clear to the students, be sure to construct a sample along with the students or use an overhead projector to demonstrate what you are doing.

This activity requires students to fold their paper, step by step, and mark the lines and fractional values on the paper. Position the paper so the longest dimension is horizontal to the table.

First, use a narrow marker to mark the zero and one line on the ends of the "inch." Be sure to put these lines as close to the ends of the strip of paper as possible. Each line should extend from the top of the paper three-fourths of the way to the bottom of the strip. Remind the class that the distance from the 0 line to the 1 line is 1 "inch."

Next, fold the paper in half so the ends with the zero and one lines meet. Ask the students how many parts the paper is now divided into (2). Draw a line on the fold about half way to the bottom of the strip. See Diagram 1.

Now help the students see that if we start at the zero line we have 0/2 (zero parts out of two). At the fold line we have 1/2 (one part out of two) and at the 1 line we have 2/2 (two parts out of two. Label these lines.

Fold the paper in half (this is the fold you just made) and in half again. Open your paper and ask the students to identify the number of parts the "inch" is divided into (4). Trace over your new fold lines which have not been marked already with a marker (1/4 & 3/4). Make sure the lines are slightly shorter than the line at 1/2. Again, start at the zero point and identify each part or fraction of the inch (0/4, 1/4, 2/4, 3/4, 4/4).

Continue folding your "inch." Marking the "inch" at the 8^{th} lines and then the 16^{th} lines. Be sure to make the lines slightly shorter each time and be sure you mark all the lines with a fraction of the total number of spaces. This is an excellent time to reinforce or teach basic information on equivalent fractions. See Diagram 2.

TEACHER NOTE I go up to 16ths on this activity (it is impossible to fold the paper after that). I have had students that have neatly drawn lines to divide the inch into 32nds and 64ths. (See illustration of student work included with the lesson)

Step 3 – After completing their "inch" take time to discuss their observations and comments about the activity. Possible observations might include:

1) The lines with the shortest length will have odd numbers as their numerators.
2) Below each line is a list of equivalent fractions.

Step 4 - In order to gain practice with measurement, use your "inch" to measure small items around the classroom. Books, post-a-notes, etc. are small items that would measure less than their "inch." You may need to help the students determine which lines they will be using to measure the item. Discuss how they might measure a classroom item that is longer than their "inch." Practice measuring larger items such as tables, etc.

Step 5 - When students are comfortable with measuring with their "inch," get out rulers and yard sticks to measure with. Before using these measuring tools, be sure to spend time comparing how the spaces between the inch lines on a ruler compare to the lines on their "inch." Practice measuring items with a ruler and other measuring devices (tape measure, metal rule, yard stick, etc.). Have students compare the length of an item with their "inch" ruler and a real ruler.

Step 6 - Discuss with the students if they feel all items should be measured to the $1/16^{th}$ of an inch, the smallest unit on their "inch." Encourage the students to decide when their measurements would need to be very accurate and when they might not need to be as accurate.

After the discussion, the students could use the following writing prompt to practice GED writing skills:

Measurement is an important skill in everyday life. We measure many items in our everyday lives, both at home and on the job. Do all items we measure require the same level of accuracy? Does the degree of precision necessary when measuring an item vary depending on what is being measured? Why or why not? What items would require more or less precision?

In an essay answer express your ideas on measurement and the level of precision required when you measure items at home and work.

Step 7 - The culminating activity can be the completion of a teacher devised activity or worksheet listing various items around the classroom that the students will measure with both their "inch" and a ruler.

Assessment/Evidence (*based on outcome)*
Student responses from brainstorming or chart paper with student ideas (use colored markers so respondents can be determined)
Completed "inch" rulers

Observations of student comments
Essay on measurement
Classroom activity results

Teacher Reflection/Lesson Evaluation

My students really enjoyed this activity and felt more comfortable using a ruler as a result. Since the GED test uses fractions with halves, quarters, eighths and sixteenths this activity was especially useful. An unexpected result was the better understanding my students gained of equivalent fractions. Continue using rulers to practice calculating areas and perimeters of shapes.

Next Steps

Oversized Inch Learning Objects will give students additional practice with measurement concepts.

Technology Integration

Purposeful/Transparent

The activities all relate to the student goal of learning to measure accurately with a ruler. There is lots of practice so students can assess their learning as they go along.

Contextual

Since the students came up with real life uses for measurement the lesson is clearly related to their goals. The students are actively involved as each student constructs his or her own "inch" to measure with. Students then transfer this skill to rulers and other measuring devices.

Building Expertise

The lesson builds on the students' prior knowledge of fractions (starting with halves) to increase their knowledge of the divisions in the inch.

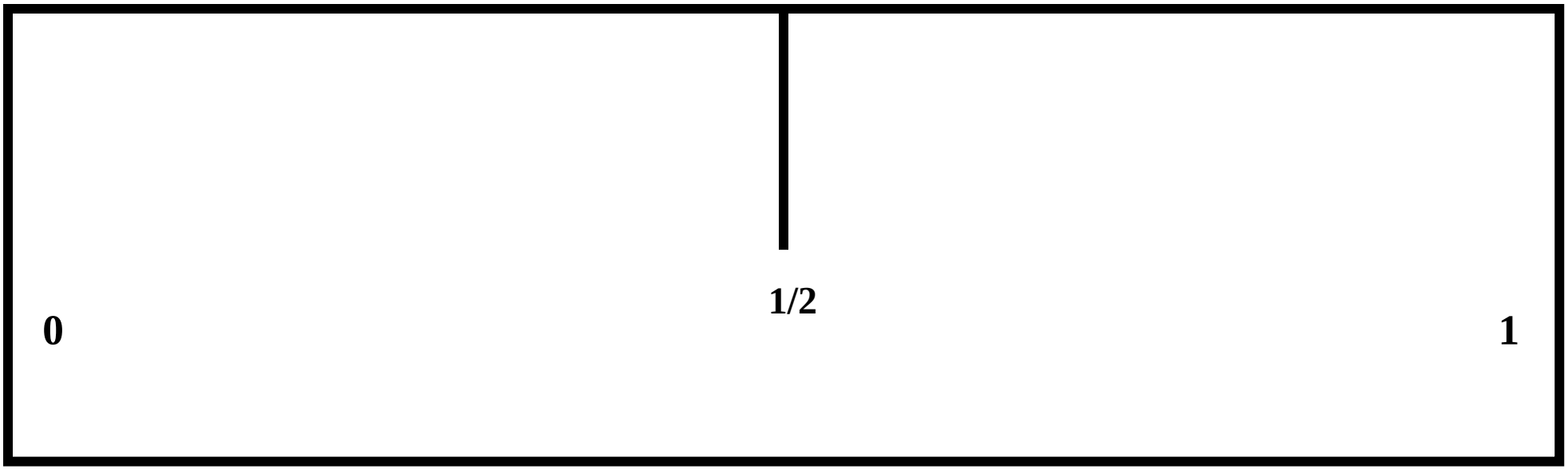


Diagram 1

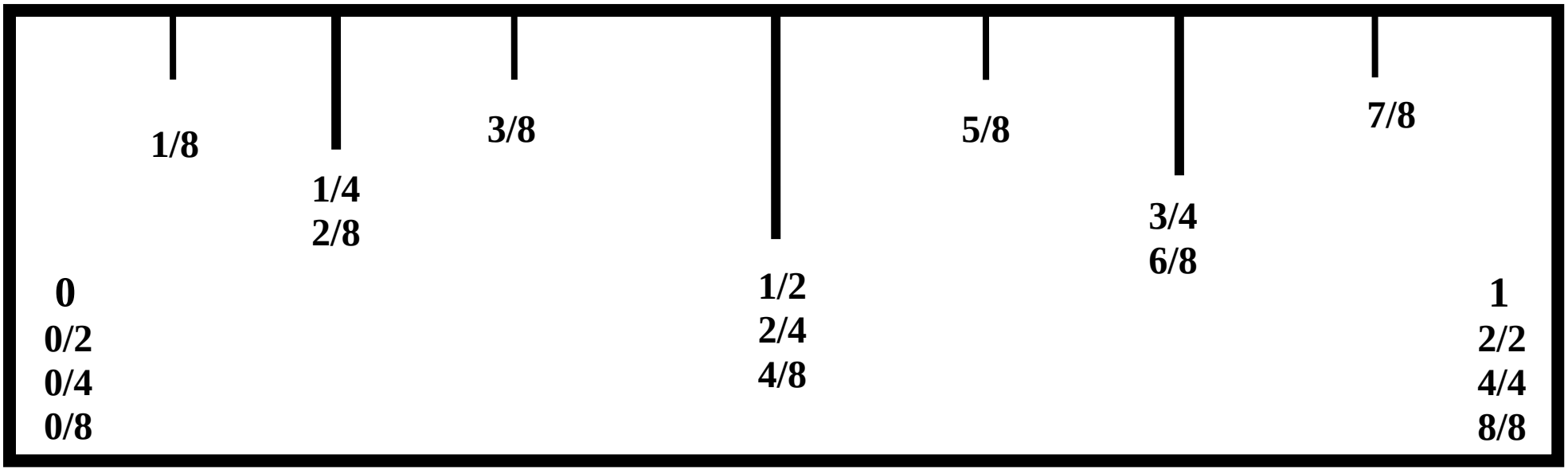
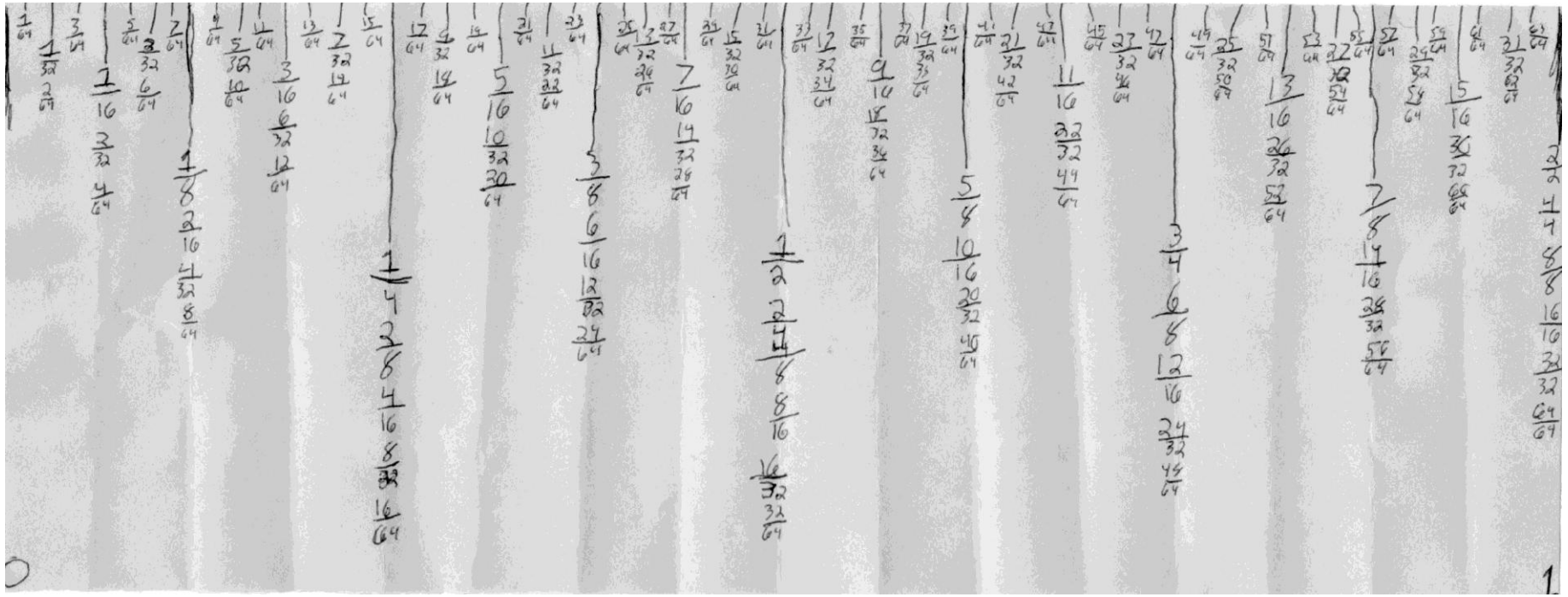


Diagram 2



Example of Student Work

http://www.wisconline.org

Everyone Knows How to Use a Ruler, Right?
Author: Barbara Anderegg
School: Madison Area Technical College **Date:** 9/10/2003
Description: Students review the best practices for using a ruler and answer five basic questions.
http://www.wisc-online.com/objects/index_tj.asp?objID=MSR3102

Units of Measurement
Author: Barbara Anderegg
School: Madison Area Technical College **Date:** 4/18/2002
Description The student reads through the learning object and then matches the units to the graph.
http://www.wisc-online.com/objects/index_tj.asp?objID=MSR401