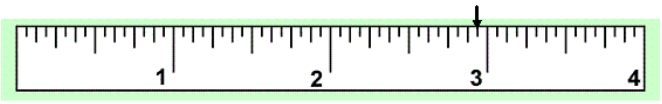
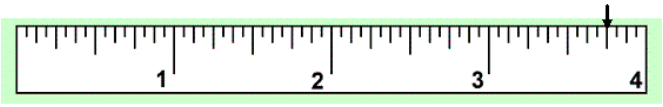
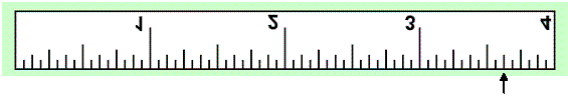
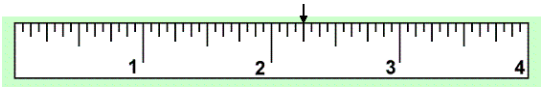
Math-in-CTE Lesson Plan

Technical Mathematics

Lesson Title: Reading a Ruler **Writers:** Adam Yakush: Minooka Community High School Kim O'Malley: Morris Community High School	Lesson # 2 **Vocabulary** Ruler Fractions Numerator Denominator Common denominator Reduce Greatest common factor

Technical Area: Woods 1
CTE Concept(s): Reading a ruler, accurate measurement
Math Concept(s): Fraction operations, measurement
CCSS Math Practices & Standards: G.CO.1 G.CO.12 MP 4

Lesson Objectives:	1. Read a 16^{th}-inch scale ruler 2. Measure within a 16^{th} of an inch 3. Add fractions 4. Subtract fractions 5. Multiply fractions 6. Divide fractions
Supplies Needed:	1. Pencil 2. Tape measure- 16^{th}-inch scale 3. Various shop objects 4. Dry erase board

THE "7 ELEMENTS"	TEACHER NOTES (Plus Answer Key)
1. Introduce the CTE lesson. **How important is measurement?** Measurement is necessary for everything that is produced.	Show students different objects to compare how important measurement is. **Examples:** Space shuttle, pencil
2. Assess students' *math awareness* as it relates to the CTE lesson. A. Give students Pre-test on different measurements such as the following examples:     B. Pretest will also include simple addition and subtraction of fractions. 5½ – ¾ = ¾ – 1/8 = 4-3/8 – 2¼ = 5/8 – ½ = 2- 5/16 – 1- 1/8 = ¼ + 1/8 = ¾ + 5/8 = 1½ + 1/16 = 5- 3/8 + ½ = 3/8 + 7/16 = C. Provide students answers to the pre-test to self-assess how well they have done.	Create a worksheet that includes the ruler, addition, and subtraction problems shown. • 2- 15/16 • 3- 3/4 • 3- 5/8 • 2-1/4 • 4¾ • 5/8 • 2-1/8 • 1/8 • 1- 3/16 • 3/8 • 1-3/8 • 1-9/16 • 5- 7/8 • 13/16

3. Work through the math example *embedded* in the CTE lesson.	
Parts of a tape measure: A. 16th-inch scale B. Foot marks C. Inch marks	Tape measures are handed to students.
Students are given blank inch to fill in. (See attached file) **Parts of an inch:** A. Inch Marks: Longest line and marks were an inch starts and stops B. ½″ mark: 2nd Longest line in an inch. Have students fill in the blank inch. C. ¼″ marks: 3rd longest line in an inch. Have students fill in 1/4″ and 3/4″ marks D. 1/8″ marks: 4th longest line in an inch. Have students fill in 1/8″, 3/8″, 5/8″, and 7/8″ marks E. 1/16″ marks: 5th longest and shortest line. Have students fill in 1/16″, 3/16″, 5/16″, 7/16″, 9/16″, 11/16″, 13/16″, and 15/16″ marks.	Students fill out the worksheet as it is simultaneously being filled in on the dry erase board. Once filled out, students can keep it for reference.

4. Work through *related, contextual* math-in-CTE examples. Examples of different line lengths/segments for students to measure. 1. _____ 2. ___ 3. _____ 4. _____ 5. _____ 6. _ 7. _____ 8. ____ 9. _____ 10. _____ Complete the following task with each line. 11. Add lines 2 and 9 12. Subtract line 6 from line 8 13. Multiply lines 1 and 10 14. Divide line 4 from 5	Give each student a tape measure to find the length of the different lines. They will find it the length to the nearest 16^{th} of an inch. Students use the individual line/segment measurements, from lines 1 through 10, to answer questions 11 through 14.

5. Work through the *traditional math* examples. Addition: 1. 3/16 + 5/8= 2. 1/2 + 3/8 +1/16= 3. 5/16 + 1/2 + 1+ 3/4= Subtraction: 4. 7/8 – 5/16= 5. 15/16 – 1/2= 6. 3/4 – 3/8= Multiplication: 7. 3/16 x 7/8= 8. 5/16 x 1/8= 9. 3/8 x 3/8=	Following are typical math problems. Addition HINT: Common Denominator Subtraction HINT: Common Denominator Multiplication HINT: Straight Across

Division: 10. 3/4 ÷ 3/8= 11. 1/8 ÷1/16= 12. 1/2 ÷ 1/8=	Division HINT: Flip and multiply
6. Students *demonstrate* their understanding. Students complete the following "**Measurement Activity"** assessment individually. They use tape measures and must find sizes of different objects around the classroom and shop. 1. Book thickness = _____ 2. Drain diameter = _____ 3. Screwdriver length = _____ 4. Elec. Box Opening Diameter = _____ 5. T- Square Width = _____ 6. Whiteboard marker length = _____ 7. Desk thickness = _____ 8. Broom handle diameter = _____ 9. Wall clock diameter = _____ 10. An item of your choosing = _____	Print and distribute the "Measurement Activity" assessment. Make a key before giving the assessment.
7. Formal assessment. Students complete a post-test assessment on reading a ruler. The test contains several different rulers and markings to test the students. ***Source of Formal Assessment Items:*** *Sample release and retired items from ACT, ACT COMPASS (including Joliet Junior College (JJC) Sample Release Items), ACT Explore, ACT WorkKeys, Illustrative Mathematics, JJC CAD Dual Credit proprietary test items, Career Cruising, National Automotive Technicians Education Foundation (NATEF), National Assessment of Educational Progress (NAEP), Partnership for Assessment of Readiness for College and Careers (PARCC), Trends in International Mathematics and Science Study (TIMSS), and teacher-constructed test items.*	Print and distribute the post-test assessment. Make a test key before giving the assessment.