

# Math-in-CTE Lesson Plan

<i>Lesson Title:</i>	<b>Back to Basics</b>	<i>Lesson: 01</i>
<i>Occupational Area:</i>	Health Services Assistant	
<i>CTE Concept(s):</i>	Medical Math – unit conversions	
<i>Math Concepts:</i>	Unit conversions, ratios, proportions, exponents, basic operations (division, multiplication) metric prefixes	
<i>Lesson Objective:</i>	Students will be able to convert between metric, U.S. standard and apothecary measurements using ratios and proportions. Students will define and pronounce and spell all key terms.	
<i>Supplies Needed:</i>	Pretest as bell ringer for this class period List of Key terms, Conversion Reference Sheet, Metric Staircase Reference sheet with prefixes, Pre Test, Worksheet, Post Test <i>Lab visual aids:</i> medicine cup, graduated container, catheter bag, baby bottle, measuring cups and spoons, various drinking cups (Add later)	
<b>THE "7 ELEMENTS"</b>		<b>TEACHER NOTES (and answer key)</b>
<p><b>1. Introduce the CTE lesson.</b> Because the health care system extends over the entire world, it is important for the health care worker to understand the systems of measurement.</p> <p>Do any of you know what the apothecary system is? Give an example.</p> <p>What are two additional systems of measurement? Give an example.</p> <p>This lesson will focus on the two more common systems of measurements, the metric system and the household system and using ratios and proportions to convert between systems of measure.</p> <p>“Which of these if the preferred system of measurement in the health care setting?”</p> <p>It will be important for you to recognize the symbols and abbreviations of the metric and household systems and be able to</p>		<p>The apothecary system was the original system of weights and measures but is no longer commonly used.</p> <p>Metric and Household Systems of Measurement</p> <p>The metric system is the preferred system of measurement in health care settings at the present time. The household system is the one which you are probably the most familiar with and the one used when individuals take medications at home.</p>

<p>convert from one system to another. In this lesson, you will study these two systems of measurements as they relate to health occupations.</p>	
<p><b>2. Assess students' math awareness as it relates to the CTE lesson.</b></p> <p>Pretest given the day before the lesson is presented.</p>	<p>Hand back pretest and have students assess their results and identify any errors occurring consistently.</p> <p>Work any problems requested by students on the board.</p>
<p><b>3. Work through the math example embedded in the CTE lesson.</b></p> <p>The metric system is used in many health care fields. There are three basic units of measurement in the metric system.</p> <p>-Can anybody tell me what the three types are?</p> <p>The metric system is based on a power of 10. Units other than basic units are created by either multiplying or dividing the basic units of measurement by the correct power of 10.</p> <ul style="list-style-type: none"> <li>-kilo (k): thousands, or <math>10^3</math>, or 1,000 (multiply the base unit by 1,000)</li> <li>-hecto (h): hundreds, or <math>10^2</math>, or 100 (multiply the base unit by 1000)</li> <li>-deka (dk): tens, or <math>10^1</math>, or 10 (multiply the base unit by 10)</li> <li>-base unit of measurement (gram, liter, meter): ones or <math>10^0</math></li> <li>-deci (d): tenths, or <math>10^{-1}</math>, or 0.1 (divide the base unit by 10)</li> <li>-centi (c): hundredths, or <math>10^{-2}</math>, or 0.01 (divide the base unit by 100)</li> <li>-milli (m): thousandths, or <math>10^{-3}</math>, or 0.001 (divide the base unit by 1000)</li> </ul> <p>See the following conversion sheet.  <a href="http://becps.net/ConversionsMMNS.htm">http://becps.net/ConversionsMMNS.htm</a></p> <p>Metric measurements are easy to convert from unit to unit because the units represent multiples of 10. Placement of a</p>	<p>Grams, meter, liter</p>

number in relation to the decimal point represents the powers of 10, so metric measurements can be converted by moving the decimal point according to the power of 10 required.

-How many grams (g) are in 40 kilograms (kg)?

<http://becps.net/ConversionsLearningActivityMMNS.htm>

<http://www.studystack.com/flashcard-43359>

As you can see, the first step in converting metric measurements is to list the units in order from largest to smallest, using the prefixes along with the base unit of measurement. If movement is from left to right, the decimal point is moved the same number of places to the right. If movement is from right to left, the decimal point is moved the same number of places to the left.

-To move from a larger unit of measurement in the metric system to a smaller unit of measurement, move the decimal point to the correct number of places to the right.

-To move from a smaller unit of measurement in the metric system to a larger unit of measurement, move the decimal point the correct number of places to the left.

-There is also an interrelationship between units in the metric system. One important relationship is a cube that measures 1 centimeter on all sides will hold 1 milliliter

First, list the measurements in order from largest to smallest:

Kg hg dkg g dg cg mg

To go from kilograms to grams, movement is three places to the right. The decimal point should therefore be moved three places to the right.

If you write 40 as 40.000 and then move the decimal point.

$$40.000 = 40000$$

So your answer is that 40 kg equals 40000 grams.

How many deciliters (dkL) are in 14,500 milliliters?

Once again write the measurements in order from largest to smallest.

kL hL dkL L dL cL mL

To go from milliliters (mL) to deciliters (dkL), move four places to the left. The decimal point should therefore be moved four places to the left.

Write 14,500 as 14,500.0 and then move the decimal point to the left 4 places.

$$14,500.0 = 1.45000 \text{ dkL}$$

Examples of conversions:

$$\frac{12 \text{ in}}{1 \text{ ft}} = \frac{x \text{ in}}{4 \text{ ft}}$$

$$12(4) = 1(X)$$

<p>of water. So 1cc = 1mL. These measurements can be interchanged.</p> <p>The household systems of measurement are common in the United States, but the metric system is used in healthcare more commonly. Therefore it is necessary to convert from the household US system to metric.</p> <p>The household system of measurement uses many different units of measurement. See conversion sheet.</p>	$48 = x \text{ in}$ $\frac{16 \text{ OZ}}{1 \text{ LB}} = \frac{80 \text{ OZ}}{x \text{ lb}}$ $80 = 16x$ $\frac{80}{16} = \frac{16x}{16}$ $x = 5 \text{ lb}$
<p><b>4. Work through <i>related, contextual math-in-CTE</i> examples.</b></p> <p>Example 1.</p> <p>A food nutrition label says that it supplies 17% of the daily requirement for sugar. If the product contains 6 grams of sugar, what is the recommended daily allowance of sugar?</p> <p>Remind students that percents are per 100, so <math>17\% = \frac{17}{100}</math></p> $\frac{17}{100} = \frac{6}{x}$ $17x = 600$ $\frac{17x}{17} = \frac{600}{17}$ $X = 600/17$ $x = 35.3$	<p>Answer: 35.3 grams</p>
<p><b>5. Work through <i>traditional math</i> examples.</b></p> <p>A proportion is just an equation where two</p>	<p>To work with traditional math proportion problems the student needs to know how to work with fractions, set up ratios, cross multiply, and solve one step equations.</p>

<p>ratios are equal.</p> <p>We use the Cross Product Property to solve for the unknown in a proportion.</p> <p>Work the following proportions:</p> <p>Example 1.</p> $\frac{4}{5} = \frac{x}{9} \qquad 4 \cdot 9 = 5x \qquad \frac{36}{5} = x$ <p>x = 7.2</p> <p>Example 2.</p> $\frac{3.2}{x} = \frac{8}{9} \qquad 3.2 \cdot 9 = 8x \qquad \frac{28.8}{8} = x$ <p>x = 3.6</p> <p>Example 3.</p> <p>Susan can read 43 pages of a book in 25 minutes. How many pages can she read in an hour?</p> $\frac{43 \text{ pages}}{25 \text{ min}} = \frac{x}{60 \text{ min}}$ $\frac{43 \text{ pages} \cdot 60 \text{ min}}{25 \text{ min}} = 103.2 \text{ pages}$	<p>Here you <b>may</b> discuss the concepts of means and extremes in regard to proportions.</p> <p><b>Cross Product Property</b></p> <p>The product of the means will equal the product of the extremes.</p> $\frac{a}{b} = \frac{c}{d} \qquad ad = bc$ <p>“ad” are extremes      “bc” are means</p> <p>Answer to Examples</p> <ol style="list-style-type: none"> <li>1. 7.2</li> <li>2. 3.6</li> <li>3. 103.2 pages</li> </ol>
<p><b>6. Students demonstrate their understanding.</b></p> <p>We will be going to the lab. There will be various different containers set up with different amounts in each, and you will be asked to read the amount in each container and then calculate and convert the measurements.</p>	<p>Lab Demonstration Test</p> <p>(See attached Lab Demonstration Test: health_health_lab_01)</p>
<p><b>7. Formal assessment.</b></p>	<p>Health Science I &amp; II</p>

	Systems of Measurement Unit II Lesson 6 (See attached System of Measurement Assessment: health_health_assessment_01)
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NOTES:

Simmers, L., Simmers-Nartker, K, and Simmers-Kobelak, S. (2008). *Diversified Health Occupations*, 7<sup>th</sup> ed. Delmar Cengage Learning.

Nichols, E. D., and Schwartz, S. L. (1998). *Mathematics Dictionary and Handbook*. Nichols Schwartz Pub.