Math-in-CTE Lesson Plan Template

Lesson Title: Electrode Diameter and Amperage		Lesson # 9		
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Occupational Area: Welding				
CTE Concept(s): Essentials of a good weld – Rod Diameter				
Math Concepts: Diameter, fraction to decimal conversions, estimation, Volume				
Lesson Objective:	Choosing the correct welding electrode.			
Supplies Needed:	worksheets, computers, welding electrodes, rulers, tape measures, round objects, calculators			

THE "7 ELEMENTS"	TEACHER NOTES (and answer key)
1. Introduce the CTE lesson.	
We want to choose the correct welding electrode for our job application.	note: We are assuming measurement and parts of an inch have been covered.
This welding electrode is trying to communicate with us, we just need	see handout 1(web based)
to know how to interpret its language.	* Give students a welding rod to look at and to touch.
We want to talk about the fact that welding electrodes come in different diameters and different alloys.	Show diagrams, pictures, and/or actual electrodes
The first thing is to define what a diameter is. A diameter is the distance across the end of metal electrode.	
In choosing the right electrode diameter there are several factors that we need to keep in mind. They are type and position of joint, metal type and thickness, and type of electrode.	
Why do you think we are concerned with the diameter of a electrode as a welder?	

2. Assess students' math awareness as it relates to the CTE lesson.		
Remember the fractions worksheet that we have done previously.	Worksheet 1	
Do you remember doing fraction to decimal conversions in your math classes.	Answers worksheet 1	
And who can show me an example of this conversion?	15 209375	
Lets convert these fractions on the board together.	325 4 125	
example: a = 2 $example: 3 = 375$	515625	
b 8	621875	
Lets practice a few conversions on your worksheet	7078125	
Now in your math classes you have defined diameter as a line that	ersions on your worksneet. 825	
crosses though the center of the circle and touches the outside circumference.	 at. at.	
Who can identify which line is the diameter of the following circle.	111875	
Now that you have identified the diameter of the circle measure its diameter with your ruler in inches.	12375 Show examples of lines on a circle from	
Lets practice measuring different diameter circles on the worksheets that you have been given.	www.mathgoodies.com/lessons/vol2/geometry/html	
Once you have determined the diameters of the circles, lets go ahead and convert the measurements to decimals.		
2 Work through the math evenues and added in the OTE larger		
3. Work through the math example <i>embedded</i> in the CTE lesson.		
Now that we are comfortable measuring diameters of circles lets		

measure the diameter of the welding rod that you have been given in fractions of an inch.	
Once you have measured the electrode diameter, convert that measurement to a decimals.	
Now with this conversion you have just determined the estimated welder amperage starting point.	ex: 1/8 = .125
Lets check out the accuracy of your conversion. For example, if you have a 1/8 inch electrode your decimal conversion should have been .125.	Estimate- An Approximation, or close to the real thing
Take your decimal that you converted and convert that to amperage by removing the decimal and adding the unit amperage to this number.	ex: .125 inch =125 amps
So if we take the .125 and change it amperage the welding amperage should be set a 125 amps to start.	
Because each type of electrode has a different amperage range this method is not necessarily accurate.	125 amps, + or amps
We need to remember this is our starting amperage, and that amperage can vary from machine to machine and day to day, plus or minus amperage.	
Keep in mind this does not tell us if the welder setting is AC/DC positive or negative. We will learn more about this later on.	

4. Work through related, contextual math-in-CTE examples.	
Now lets take these three different size electrodes, measure their diameters in fractions of an inch.	Have at least 3 different size electrodes, the more the better.
	Worksheet 3
Use the worksheet given to you to write your diameter measurements on.	Answers will vary depending on what electrodes you have.
5. Work through <i>traditional math</i> examples.	
There are other objects that we can find diameters of that are both 2-	examples of objects to measure:
dimensional, and 3 dimensional. Soda cans and ball barring are two example. See the examples on the worksheet.	Can, door knob, spray paint can, water bottle
In Geometry and Algebra class we often have to find the diameter a cylinder, which is the same shape as an electrode.	Worksheet 2
Find the diameter of 4 different cylinder objects in this classroom and convert their fractional inch measurements to decimals.	Answers will vary depending on objects measured
Use the worksheet given to you to record your measurements.	
On the second worksheet you are given circles with drawn diameters, and lines estimate these measurements without a measuring device.	
We also want to keep in mind that the length of cylinder(ie: electrode) is also important in finding its volume and how much weld is deposited in the fillet.	
	Volume of Cylinder=pi(r) ² (L)
	Volume of triangular prism=LWH/2
	Length of Weld= 2V/WH <u>note</u> : V = triangular prism
6. Students demonstrate their understanding.	
Return to the worksheet you wrote your electrode diameters on.	**Worksheet answers will depend on the size of electrodes
Take these three measurements and convert them to decimals, and then complete your conversions by finding the approximate starting amperage for the electrode diameters.	that you work have to work with. Continue on Worksheet 3

7. Formal assessment.	
With the rest of class and homework take this worksheet with given electrode diameter measurements and convert them to decimal and amperage equivalents.	Formal Assessment Worksheet
Also find the estimated diameters and lengths of the drawn figures.	
Have it ready first thing tomorrow as we will go over the answers then.	
Remember these are all common electrode diameters that we are going to want to recognize and memorize the size and conversions for.	
For a continuation of the math skills and a further stretch of the math use worksheet 4 as a conversion practice from decimals back to the fraction form.	
ex .35 = thirty five hundredths = 35/100= reduce fraction = 7/20	
ex225 = two-hundred-twenty-five thousandths = 225/1000 = 9/40	