Math-in-CTE Lesson Plan Template

Lesson Title: Material Prep. & Layout		Lesson # M19		
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Occupational Area: Welding				
CTE Concept(s): Material Prep. & Layout				
Math Concepts: fractions, estimation, visualization, measurement, area, volume, percentages				
Lesson Objective:				
	Being able to visualize a certain shape and lay it out next to other possible shapes to get the			
	most efficient and economical way to layout your materials with the least amount of waste.			
Supplies Needed:	worksheets, computers, ruler	s, tape measures, layout tools, calculators		

THE "7 ELEMENTS"	TEACHER NOTES (and answer key)
1. Introduce the CTE lesson.	
We want to choose the best and most effective way to layout the materials needed with the least amount of waste.	note: We are assuming scale measurement, parts of an inch, and calculating area have been covered.
Either refer to the handout or go to the noted website to see an example of a dog house layout.	see handout 1(web based) http://www.woodworkingplans.tv/patterns/dog-house- plan-blueprint-for-building-dog-houses-projects
Can anyone identify this as a good example or a bad example of a material layout?	

This is a poor example of a material layout, now who can give us reasons why?	Give students example layout to look at
Let me start by saying the edges of the material are not utilized very well.	This website shows an example of a poor dog house material layout
Does anyone notice anything else?	Show diagrams, pictures, and/or actual materials layouts.
Now lets draw out what we think would be a more efficient and economical layout.	More efficient drawing could vary between students.
2. Assess students' math awareness as it relates to the CTE lesson.	
Lets look over the area and volume worksheet that we have done.	Area worksheet 1
Do you remember doing area and volume in your math classes?	Answers Area worksheet 1
Who can give us an example of an area formula that we would have to use in the previous layout?	
Answer: rectangle area= length * width	
triangle area = 1/2* base*height or base*height / 2	
What are other common area formulas to possible consider for layout?	
circle= pi * radius ²	
trapezoid = ½ * height * (base1 + base2)	
parallelogram= base * height	
Lets work out an example of a couple of these formulas.	
Given: A rectangle, width = $4 \frac{1}{2}$ inches, length = 8 inches.	
step 1: A = L * W	
step 2: A = 8 in * 4 ½ in	
step 3: A = 36 in ²	
Now go to the worksheet and work through the 8 area examples.	
Now in your math classes you have gone over area. This exercise will	

help you to put into practice and reinforce those skills that you will need to layout materials on a sheet of metal.	
3. Work through the math example <i>embedded</i> in the CTE lesson. Now that we are comfortable calculating area. Identify and label the 6 pieces of our layout. For example front, back, right side, left side, right roof, left roof and their dimensions, in inches. Now calculate the area of the 6 pieces from the layout using the same 3 line method we used on the worksheet.	We are talking about the 6 pieces of the dog house or the object you are using. Talk the students through breaking the pieces into two recognizable shapes. example: The end piece of the doghouse can be two shapes a rectangle and a triangle.
4. Work through related, contextual math-in-CTE examples.	
Now we have the area of our 6 pieces of the dog house. What is the total amount of material used to construct the dog house?	
In math class we refer to this value as the Total Surface Area of the dog house.	
What is the Total Surface Area of the Dog House?	
Now what was the size of the sheet of material we started with?	
How much of the material are we not using? Do we know?	
Lets see if we can find this.	
Start by finding the area of the original sheet, and then subtract our TSA from the original sheet value. This value is the area of the left over material.	
This is our left over and/or waste material.	
Now in math or science we would calculate a percent waste value.	

% waste = (original sheet size – Project TSA) /original sheet size * 100	
Now lets calculate our % waste for our layout.	
5. Work through <i>traditional math</i> examples.	
Given this package layout from the geometry text find the needed measurements shapes and label them.	Worksheet from Geometry Packaging Unit.
Calculate the individual shape areas and then the total surface area of the package.	
Once that is complete calculate the percentage of wasted paper given an 8.5 by 11 inch sheet of paper.	
6. Students demonstrate their understanding.	
Given a 3D object, layout the object in true size, and then cut out the pieces and determine the best layout on a given sheet of paper.	Have different 3D object ready to hand out to students.
Calculate the area of each piece, the Total Surface Area, and the percentage of waste	
7. Formal assessment.	
In our next welding project your going to demonstrate the layout of your project in real measurements or scale. Calculate the TSA of the project and percent of wasted material.	

NOTES: