Math-in-CTE Lesson Plan Template

Lesson Title: Basic Geometric Construction		Lesson #
Author(s):	**Phone Number(s):**	**E-mail Address(es):**
Melissa Fernandez	305-365-6278	melisssafernandez@dadeschools.net
Alejandro Carrasco	305-271-3311	acarrasco@dadeschools.net
Occupational Area: Engineering/ Drafting		
CTE Concept(s): Geometric Construction Drafting - need number Engineering – need number		
Math Concepts: Geometric construction Geometry 2.4 (MA.B. 1.4.1) 3.1 (MA.C. 2.4.1) 3.2 (MA.C. 3.4.1) 3.3 (MA.C. 2.4.2)		
Lesson Objective:	The student will understand and create basic geometric constructions	
Supplies Needed:	Pencil, 11x 17 paper, t-square or straightedge, text, compass	

THE "7 ELEMENTS"	TEACHER NOTES (and answer key)
1. Introduce the CTE lesson. Students will be given a small square of vellum (tracing paper) and a straight edge (not a ruler). They will then be asked to draw a line segment on the vellum (tracing paper). Using nothin but the vellum students will be asked to find the exact center of the line segment (the midpoint). Students will then be asked to repeat the activity but this time they will draw an angle before attempting to find the angle bisector using nothing but the vellum.	Students who successfully find the midpoint will do so by folding the paper so that the endpoints meet. The paper will then be creased and the crease will create a line perpendicular to the line segment at the midpoint. Students who successfully create the activity will fold the paper at the vertex so the two rays of the angle meet and the vertex is on the crease. The crease will become the angle bisector.
2. Assess students' math awareness as it relates to the CTE lesson. Given a line segment, how can you create an exact reproduction of it without using a ruler or	You can reproduce a line using only a compass and a straightedge.

scale?

What is an angle? What does it look like? How do we measure angles? What tools do we use to measure angles?	An angle is formed by two rays that share a common end point. Provided the two rays are non-colinear.
	A ray is similar to an arrow. On one end it has a specific start point and at the other end it continues on into infinity.
	An angle is created when two rays share a specific start point but travel in two different directions.
	We use a protractor to measure the smallest amount of rotation about the vertex from one ray to the other. That distance in measured in degrees.
	INSERT PICTURE OF AN ANGLE
How do you reproduce a given angle without using a protractor to measure the degree of the angle?	You can reproduce an angle using only a compass.
You're asked to divide a line segment or angle into two equal parts. You STILL haven't managed to find a ruler, scale or protractor. Will you be able to do it? How?	You can bisect a line or angle using a compass and straightedge.

3. **Work Through The Math Example** *Embedded* **In The CTE Lesson.**

In drafting is important to know several ways of precisely creating lines and angles.   It is equally important to understand how to accurately and precisely find the midpoint of a line segment or the bisectors of a line segment or angle.

We know how to create a line segment using a scale and straightedge. Today we'll be learning how to reproduce a line segment using only a compass.

<Demonstrate how to reproduce a line segement using a compass and straightedge. See video>

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Not only can we reproduce a line segment using only a compass and straightedge, we can reproduce an angle using the same tools.

<Demonstrate. See video>

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Precision is important when drafting. No method of finding the midpoint of a line segment is as accurate as using a compass.

<Demonstrate. See video>

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The same is true for finding the bisector of an angle.

<Demonstrate. See Video>

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Constructions Lesson

4. **Work through *related, contextual* math-in-CTE examples.**

You're responsible for designing the floor pattern for the school's new tiled hallway.   You've decided to create a diamong shaped insert using 1 rectangular tile. To do this, you must cut the tile in the following manner

<insert picture>

Each cut is made along the angle bisector. How could we make a pattern for cutting the tile?	
5. Work through *traditional math* examples. Using what we've learned about bisecting angles, how could we divide a given angle into four equal angles? <Demonstrate>	
6. Students demonstrate their understanding. How could we divide the angle into eight equal angles? Demonstrate on your worksheet.	
7. Formal assessment. Students will be asked to reproduce a line and angle which they will then bisect. The accuracy of the reproduction and bisection will be graded.	