## Math-in-CTE Lesson 7 Plan Template

Lesson Title: Blueprint Scaling		Lesson # 7			
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Occupational Area: Pre-Engineering					
CTE Concept(s): Scaling and scale reading on blueprints					
Math Concepts: Scaling, adding/subtracting different units					
Lesson Objective:	Teach using a scale and correct choice of scales				
Supplies Needed:	Several building plans, architectural scales for each student, worksheets for each student, quarter inch graph paper, &photo reduction of several drawings containing graphic scale.				

THE "7 ELEMENTS"	TEACHER NOTES (and answer key)
1. Introduce the CTE lesson.	See prepared Powerpoint
Review Sketching and 3D modeling basics	Line types and usages, dimensions, orthographic projection, isometric, & prospective.
Vocabulary: Blueprint, Floor Plan, Views, Sections, Details, Units, Scale, Dimensions Slide 2	Show on board as bell work and have them look up definitions. Review definitions
	<b>Blueprint</b> : Document intended as guide on how to build something.
	<b>Floor Plan</b> : Drawing showing locations of parts of a building floor such as walls, doors, and window.
	<b>Views</b> : Individual ways to look at something, also called elevations.
	<b>Sections</b> : A representation of components utilized in construction if it could be viewed when cut open.

	<b>Details</b> : An expansion of a portion of a drawing at a higher resolution scale to show greater detail.
	<b>Units</b> : The measurements at which the part will be built to such as feet and inches or millimeters.
	<b>Scale</b> : Both the <b>ratio</b> used to represent parts of a drawing to the actual size of the completed part or the tool used to interpret the drawing.
	<b>Dimensions</b> : Lines on a drawing stating the size of the completed part.
Hand out Architectural Scales to each student. Powerpoint slide 3 Show different scales, demonstrate how to use the architects sca on the board, and explain why there are so many different archite	Show differences between an engineers <b>scale</b> , metric <b>scale</b> , machinist <b>scale</b> , and an architects <b>scal</b> e, where they are appropriate to use, and why they exist.
scales required. Equate scale to <b>ratios</b> . Show complete set of <b>blueprints</b> explain each ones use for a, house, show other prints are mechanical, electrical, and site. Discuss parts of prints and purpose. 1'=1/4" is a ratio of 1 to 48. Show on board how to get <b>ratio</b> . Show location and meaning of vocabulary words.	Review <b>scale</b> types as shown on complete house plan, expose to other types of plans with scales such as mechanical, welding, electrical, and site. Show where to find the <b>scale</b> markings on the drawings (note some items such as the legend, schedules, and some diagrams do not have scales), a <b>graphical scale</b> on the drawings for reproduction enlargement/reductions, and what the standard scales are for drawings. 1'=1/4" is the same as 12"=1/4" is the same as 48"=1" is the same as 1/48 scale or 1 to 48.
2. Assess students' math awareness as it relates to the CTE lesson.	Handout Worksheet 1 Scaling linear length worksheet, and hand out Architect Scale
Powerpoint slide 4	
Scaling linear length worksheet 1 do the first problem on the board with the students then ask them to finish the worksheet. Roam the room observing and assisting as necessary. If worksheet 1 too difficult for students back up and explain the use of the scale by doing another example or having a student who grasps the idea present it at the board.	Check how interpretation of marks mean on different scales, that the students use the right end for measuring inches, and that the whole feet are read from the correct end.

3. Work through the math example <i>embedded</i> in the CTE lesson.	Handout Chained Dimension Worksheet 2
Powerpoint Slide 5 Work with unit measurement chained dimensions worksheet.	Students do worksheet and check as a class. Note that the sum of chained dimensions may be different than the measured total due to accumulated errors and should be
Demonstrate an example on the board.	justified to eliminate the apparent errors.
4. Work through <i>related, contextual</i> math-in-CTE examples.	
Powerpoint Slide 6	
Pass out photo reductions of drawings containing graphic scale with each student taking a different drawing. Students utilize the graphic scale and ratio to demonstrate how scaling by enlargement/reduction can be accomplished. Calculate scaling ratio factor as already presented.	Demonstrate how the graphic scale can be sued and show a series of the same drawing at different reductions using the graphic scale to come up with the same lengths. Walk around class and assist as necessary. Call one student to present their solution at the board.
5. Work through <i>traditional math</i> examples.	Handout Scale Ratio Worksheet 3
Powerpoint Slide 7	
Work with <b>scale</b> , <b>ratio</b> , and <b>units</b> to answer the questions on the worksheet 3 Scale Ratio.	Have 4 students come up and each show one of the problem solutions that they correctly figured.
6. Students demonstrate their understanding.	
Provide quarter inch graph paper to each student.	Have the student draw on a sheet of quarter inch graph
Calculate the scale factor necessary to provide space to draw a 24' x 48' foundation on a landscape sheet that is 8 $\frac{1}{2}$ " x 11" with 1" minimum border around the outside of the foundation.	paper the scaled foundation.

7. Formal assessment.	
Powerpoint Slide 8	Quiz is worth 50 points or half of an exam. Correctly drawing the perimeter on the graph paper 10 points, having the correct ratio 10 points, and finding the correct value for the scales 5 points each. The trick is the riser
1. Evaluate perimeter foundation drawing for accuracy and correct ratio	
2. From set of plans determine scale required for the site plan, floor plan, typical wall section, front elevation, electrical plan, and plumbing riser diagram. Record your answers neatly on a sheet of notebook paper, using correct spelling, grammar, in the form of complete sentences, for each scale requested. Make sure to include your name at the top of the paper and the date.	diagram does not have a scale so the answer no scale would be correct.

NOTES: