

How to Get the Wrinkles Out of Your Pathways?



Combining CTAE Courses with
Academic Courses
Providing **ALL** Students **Multiple**
Opportunities

ALL STUDENTS...



- Female Enrollment
- Free & Reduced Lunch
- Special Education & ELL
- All Abilities & Motives



FOUNDATIONAL TRUTHS

- We are for ALL kids, not just “Those Kids” -
- **Math is NOT watered down** -



We stopped solving math problems. Instead we teach solving problems using math.

Core Principles of the Math-in-CTE Model

Principle	Processes
<p>A. Develop and sustain a community of practice.</p>	<p>Cohorts of CTE-math teacher teams are formed around specific occupational foci or CTE content (e.g., business, auto technology, health).</p> <p>Administrators, school districts, or professional organizations provide structure and support to build and sustain communities of practice including:</p> <ul style="list-style-type: none"> • Regular professional development that brings the communities of practice together several times during the academic year. • External “stimuli” to keep teachers focused on the math interventions. • On-going support for CTE teachers for development and implementation of math-enhanced lessons.
<p>B. Begin with the CTE curriculum, not with the math curriculum.</p>	<p>CTE-math teacher teams <i>interrogate the curriculum</i> to identify the math embedded in the CTE curriculum.</p> <p>CTE-math teacher teams create curriculum maps that identify the intersection of occupational content and math constructs/concepts.</p> <p>CTE teachers use a scope and sequence to guide implementation of math-enhanced CTE lessons.</p>
<p>C. Address the math in CTE as an essential workplace skill.</p>	<p>CTE-math teams generate math examples in which students solve authentic workplace problems.</p> <p>CTE teachers introduce and reinforce math as a “tool” to use in the workplace.</p> <p>CTE teachers bridge CTE and math vocabulary as they develop and teach the lessons.</p>
<p>D. Maximize the math in CTE curricula.</p>	<p>CTE-math teacher teams continue to locate as much math as possible in the CTE curricula throughout the year.</p> <p>CTE teachers build on students’ prior math knowledge and skills.</p> <p>CTE teachers capitalize on teachable moments that follow the math enhanced lessons.</p>
<p>E. Support CTE teachers as “teachers of math-in-CTE,” not as math teachers.</p>	<p>CTE teachers participate in professional development activities that enable them to teach the math as it occurs in their CTE content, a process that involves:</p> <ul style="list-style-type: none"> • helping CTE teachers learn more about the math concepts in their CTE curricula. • helping CTE teachers learn math formulas and vocabulary. • providing opportunities for CTE teachers to practice teaching the math in their curricula.

Adapted from: National Research Center for Career and Technical Education

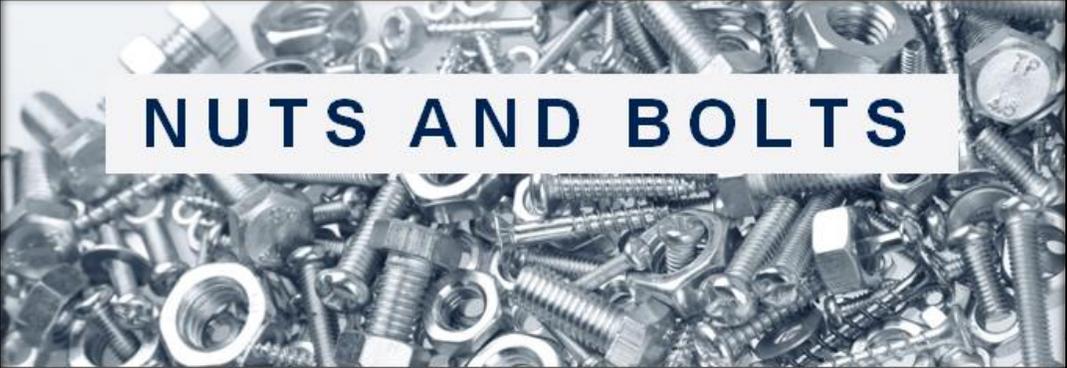
Website: <http://www.nrccte.org/professional-development/math-cte>

**Math-in-CTAE Curriculum Map:
Architecture and Construction**

CTAE Course/Unit	CTAE Concepts	Math Concepts	Middle School Math Standards	High School Math Standards
Safety	Tool usage; Shop safety	Statistics (Accidents in industry or schools); Reading and following flow charts	6.SP.4; 6.SP.5; 7.SP.2; 7.SP.3; 7.SP.4; 7.SP.5; 8.SP.1; 8.SP.3; 8.SP.4; 6.EE.2; 6.EE.3; 6.SP.4; 6.SP.5; 8.SP.3; 8.SP.4	S.ID.1; S.ID.2; S.ID.3; S.ID.5; S.ID.6; S.IC.1; S.IC.3; S.IC.4; S.IC.6; S.MD.1; S.CP.1; S.IC.1; S.IC.2; S.IC.5
Architectural design; Careers; Project design; Site layout; Types of drawings; Room planning & layout; Foundation types; Concrete foundations	Residential structure design types; Careers in construction and design; Layout of building site (solar angle); Room size requirements and layout; Different foundation types; Concrete foundation design and types	Symmetry; Earning potential; Trigonometric angle; Scale, ratio, and proportion; Area; Mathematical properties of concrete; Volume; Shear and compression ratios	7.G.5; 6.RP.1; 6.RP.2; 6.RP.3; 7.RP.1; 7.RP.2; 7.RP.3; 7.EE.3; 6.G.1; 6.G.2; 6.G.3; 7.G.1; 7.G.4; 7.G.6; 8.G.9; 6.EE.2	G.CO.9; G.CO.12; G.CO.13; G.SRT.6; G.SRT.8; F.TF.1; F.TF.2; F.TF.7; G.MG.3; G.GPE.7; G.MG.2; G.GMD.1; G.GMD.3
Methods of framing; Framing types; Live and dead loads; Plot plans; Contour and elevation data; Polar coordinates	Balloon framing and platform framing; Floor, wall, ceiling, and roof framing; Construction/framing; Stair layout and construction;	Measurement; Slope; Angle; Estimation; Tolerances; Load and data analysis; Proportions/ Ratios; Graph interpretation; Spatial -	8.G.6; 8.G.7; 8.G.8; 7.EE.3; 6.RP.1; 6.RP.2; 6.RP.3; 7.RP.1; 7.RP.2; 7.RP.3; 6.EE.2; 6.EE.3; 6.SP.4; 6.SP.5; 7.SP.2; 7.SP.3; 7.SP.4; 8.SP.3; 8.SP.4; 7.G.1; 7.G.2	G.SRT.6; G.SRT.8; F.IF.8; N.Q.3; G.MG.3; S.IC.1; S.IC.2; S.IC.3; S.IC.4; S.IC.5; S.IC.6; S.ID.1; G.CO.5; G.MG.1; G.MG.3; G.CO.12; G.CO.13;

	Calculating loads (beams); Scale; Interpret elevation data; Use polar coordinates to lay out a site/plot plan	conversion of 3D to 2D; Graphing/ plotting		G.GMD.4
Roofing materials and methods; Windows and doors; Door and window schedules; Floor plans	Application and different types of roof coverings; Types of doors and windows; Aesthetics; Generation of window and door schedule; Floor plan requirements and generation	Area and cost information; Symmetry, area usage; Charts; Area, square footage	6.EE.2; 6.EE.3; 6.SP.4; 6.SP.5; 7.SP.2; 7.SP.3; 7.SP.4; 8.SP.3; 8.SP.4; 6.G.1; 6.G.2; 6.G.3; 7.G.1; 7.G.4; 7.G.6; 7.G.5	S.IC.1; S.IC.2; S.IC.3; S.IC.4; S.IC.5; S.IC.6; S.ID.1; G.GPE.7; G.MG.2; G.CO.9; G.CO.12; G.CO.13
Material and cost estimation; Interior and exterior finishes Construction details; Section drawings	Residential building material and cost estimation; Building cost restraints; Detail drawings and section views	Linear, area, and volumetric calculation of materials; Scale, ratios, and proportion	6.G.2; 6.G.3; 7.G.6; 8.G.9; 6.EE.2; 7.G.1; 6.G.1; 6.RP.1; 6.RP.2; 6.RP.3; 7.RP.1; 7.RP.2; 7.RP.3; 7.EE.3	G.GMD.1; G.GMD.3; G.MG.2; G.GPE.7; G.MG.3
Exterior finishes; Residential electrical	Types and uses of exterior finishes; Residential electrical requirements; Electrical plans	Linear and area calculations; Power, resistance, and current equations and their relationships; Electrical material estimation	6.G.1; 6.G.2; 6.G.3; 7.G.1; 7.G.4; 7.G.6; 6.EE.2; 7.EE.1; 7.EE.2; 8.G.6; 8.G.7; 8.G.8	G.GPE.7; G.MG.2; A.REI.1; A.REI.2;

Residential plumbing	Residential plumbing requirements; Plumbing plans	Slope and volume; Water pressure; Plumbing material estimate	6.G.2; 6.G.3; 7.G.6; 8.G.9; 6.EE.2; 7.G.1	G.GMD.1; G.GMD.3; G.MG.2; G.SRT.6; G.SRT.8; F.IF.8
Residential HVAC and Mechanical	Residential HVAC requirements; HVAC/mechanical plans	Volume, cross-sectional area and flow ratios; HVAC materials estimate	6.G.2; 6.G.3; 7.G.6; 8.G.9; 6.EE.2; 7.G.1; 6.G.1	G.GMD.1; G.GMD.3; G.MG.2; G.GPE.7
Architectural modeling; Application of theory through drawing final project	Architecture model construction	Scale and proportions; Assessment of completed project	6.RP.1; 6.RP.2; 6.RP.3; 7.RP.1; 7.RP.2; 7.RP.3	



NUTS AND BOLTS

- Relevance for Math & academic rigor for CTAE -
- Team taught with CTAE; both teachers in class -
 - 40 to 50 students in class -
 - Classes are blocked back to back -
- Not a new class, but a new delivery method -
- Increased student engagement thru activities -
 - Authentic projects -



The Benefits of Combining CTAE Courses with Academic Courses

Increased Attendance
Higher Homework Completion Rates
Increased Enthusiasm (Student & Teacher)
Decreased Disciplinary Incidents
Cross-Curricular Allies
Keeping Kids in Math

Geometry in Construction Logo Design Problem of the Quarter

As with any business, good marketing of the product(s) produced is crucial to the financial success of the business. For this problem of the quarter you are asked to develop a marketing logo. This logo will be used on various items including t-shirts (we hope). The logo should not be offensive to any group.

Your tasks are:

1. Create a logo to use on a t-shirt that represents the essence of this class and the product being produced (house). The logo should not be offensive to any group.
2. Your original logo should be a pocket (small) size logo. It should be drawn neatly with attention given to details, colors, etc.
3. A short (half page to 1 page typed) should be included to explain each portion of the logo. An explanation of why you chose the shapes, figures, colors, etc. should be included. This explanation will answer the question "Why should this logo be used?".
4. Find the area of your design or the assigned pieces if a complicated design. Find the area mathematically. Reference #5
5. Show the dimensions, and the sub problems used to find areas. This page can be hand written but needs to be very clear with labels, words, drawings, to help explain how the area was found.
6. Draw or copy an enlarged logo to fit on the back of a t-shirt. Be sure to specify the scale factor.
7. Find the area of the large logo by using the same methods as #4/5 above. Be sure to show the sub problems.
8. Find the area of the large logo using what you learned about proportions and ratios. Note that #6 and #7 ask you to find the area but using the different ways specified.
9. The check list above is completed.

The class will vote on the logos. The top 2 in each class will be voted on by all Geometry in Construction classes. We hope to use the logo on a class t-shirt, web site, and/or DVD. It will be computerized to ease printing. You are limited to 3 colors plus the color of the t shirt.

Objective: Students will learn what similar triangles are and be able to calculate missing sides.

Opener: Octagon unit conversion puzzle Model how to fit 2 pieces together

(discuss finding the area as a function of triangles as an alternative to $.5 \times \text{apothem} \times \text{perimeter}$)

Check Homework: #68-82

CTE Problem: Given the truss in the room, find the supports needed at the spacings of 36" and 48" given the support at 24" is 6.375"

Input:

1. What are similar triangles?
Demonstrate using balsa wood truss model
Show photos of similar gables
2. Notation and corresponding parts discussion
3. How do you determine if triangles are similar?
 - a) same scale factors (dilation) for all sides
 - b) Angle-Angle
4. Guided practice...are they similar and how to find the missing side

Similar Triangles
Truss supports

Name _____

Goal:

Using the truss at the front of the room, what would be the lengths of the supports be if spaced every 16”.

a) What measurements do you need? Remember direct measurements are not practical when the truss is installed on top of the framed walls....climbing the ladder to get each measurement is not efficient.

b) Make a rough sketch of the truss below with the measurements.

c) Show work to calculate the lengths needed.

d) What is the pattern in the lengths?