# Math-in-CTE Lesson Plan Template

Lesson Title: 3/4/5 Rule		Lesson # M-23		
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Occupational Area: Welding Trades		Level : 11-12 and Post Sec.		
CTE Concept(s): Squaring of trailer using 3,4,5 rule Algebra I				
Math Concepts: Pythagorean Theory				
Lesson Objective:	Students will be able to layout or check 90 degree angles.			
Supplies Needed:	Measuring Tapes, Straight edge, masking tape, pencil, calculate			

THE "7 ELEMENTS"	TEACHER NOTES (and answer key)
<ul><li>1. Introduce the CTE lesson.</li><li>Today we are going to learn how to draw a perpendicular line.</li><li>Ask: What does the term perpendicular mean?</li><li>So, if the side of the table represents the back beam of our trailer frame, we are going to learn how to square the trailer so that all sides are perpendicular.</li><li>Ask: Why wouldn't you just use a carpenter's square?</li></ul>	Other terms for perpendicular are square, 90 degree, intersection at right angle Main reason is that the Pythagorean Theorem can be used on a much bigger scale!
<ul> <li>2. Assess students' math awareness as it relates to the CTE lesson.</li> <li>Show examples of objects that are cut both square and not square. Making sure they know the importance of getting the trailer squared properly from the beginning.</li> <li>Ask? Do any of you know how this would be accomplished on the job site?</li> <li>Ask? To what degree of accuracy are we striving</li> </ul>	Some of our second year students will know that we use the 3, 4, 5 method. a <sup>2</sup> +b <sup>2</sup> =c <sup>2</sup> 3 <sup>2</sup> +4 <sup>2</sup> =5 <sup>2</sup> Show area diagram.

for?	Depending on early of an inch can be	
Ideas for other uses?	Depending on scale, of an inch can be	
Ask? What problems you eliminating down the road by getting things square.	very close to accurate or several degrees off. It will eliminate floor decking problems.	
In what other situations might you use this?		
	Building a house, ice shack etc.	
3. Work through the math example <i>embedded</i> in the CTE lesson.	Using 4 as a multiplier.	
Lets say that we have a trailer that is 6' wide by 8' long, then the hypotenuse is 10'.	4x3=12, 4x4=16, 4x5= 20	
a <sup>2</sup> +b <sup>2</sup> =c <sup>2</sup>	12, 16, 20	
$6^2 + 8^2 = c^2$		
36+64=100	Using 12 as a multiplier,	
	12x3=36, 12x4=48, 12x5=60	
Talk through the multiplier of each to help accurately locate lines on a larger scale.	These 3 number combinations are sometimes	
Have each table come up with their own multiplier and numbers	reterred to as Pythagorean triples.	
4. Work through <i>related, contextual</i> math-in-CTE examples.		
Find the diagonal length of the stairway that has a 12" base (run) and is 9" high (rise).		
	The answer is 15".	
	The multiplier was 3.	
vvnat would be the hypotenuse of the house that		
measures 64' x 24' to the nearest of an inch!	68' 3/8"	
	.35 is closest to so the answer is	

5. Work through traditional math examples.	
What would be the base of a right triangle that has a hypotenuse of 10" with a height of 5"? Round answer to nearest 1/8"?	
	.66 is close to 5/8 of an inch so the answer would be 8 and 5/8".
On a standard baseball field, with bases 90' apart, what is the distance a catcher must throw to second base with his front foot on home? Round to the nearest foot.	
	To the nearest foot the answer is127 feet.
6 Students demonstrate their understanding	I will asses the students on a partner basis
With your table partner, draw a line perpendicular to the edge of your table using the 3,4,5 method.	checking technique and accuracy.
The students will apply the 3/4/5 rule to the squaring of the footings and basement walls.	
7. Formal assessment.	
The students will apply the Pythagorean Theorem work on this.	

Name \_\_\_\_\_

Pythagorean Theorem (3.1.A1b)

## Read each question below and circle the correct answer.

**1.** A field shaped like a trapezoid has the dimensions shown in the diagram below.

What length of fence, to the nearest tenth of a foot (ft), is needed to enclose the entire field?

A. 80.0 ft	B. 91.2 ft
C. 131.2 ft	D. 150.0 ft

**2.** A 12-foot (ft) ladder is leaning against a house, as shown below.



The top of the ladder touches the house 9 ft above the ground. **Approximately** how many feet from the base of the house is the base of the ladder?

A. 3 ft	B. 8 ft
C. 15 ft	D. 21 ft

**3.** Chris wants to glue ribbon diagonally across the cover of his rectangular scrapbook, as shown below.



How many centimeters (cm) of the ribbon will Chris need for **both** diagonals of the scrapbook cover?

A. 52 cm B. 68 cm C. 104 cm D. 136 cm

**4.** The drawing below shows a 29-foot (ft) warehouse ramp on level ground.



How far above the ground, to the nearest foot, is the ramp at its highest point?

A. 3 ft B. 9 ft C. 13 ft D. 39 ft

**5.** A 400-foot-tall utility pole and one of the guide wires is shown below.



The base of the guide wire is 300 feet from the base of the tower. What is the length of the guide wire?

A. 100 feet B. 500 feet

C. 700 feet D. 1200 feet

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## **Answer Key**

### **Teacher:**

#### M.HS.3.1.A1b

**1.** A field shaped like a trapezoid has the dimensions shown in the diagram below.

What length of fence, to the nearest tenth of a foot (ft), is needed to enclose the entire field?

**Correct Answer: B** 

**2.** A 12-foot (ft) ladder is leaning against a house, as shown below.



The top of the ladder touches the house 9 ft above the ground. **Approximately** how many feet from the base of the house is the base of the ladder?

**Correct Answer: B** 

**3.** Chris wants to glue ribbon diagonally across the cover of his rectangular scrapbook, as shown below.



How many centimeters (cm) of the ribbon will Chris need for **both** diagonals of the scrapbook cover?

**Correct Answer: C** 

**4.** The drawing below shows a 29-foot (ft) warehouse ramp on level ground.



How far above the ground, to the nearest foot, is the ramp at its highest point?

**Correct Answer: C** 

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**5.** A 400-foot-tall utility pole and one of the guide wires is shown below.



The base of the guide wire is 300 feet from the base of the tower. What is the length of the guide wire?

