

## Math-in-CTE Lesson Plan Template

Lesson Title:		Lesson #AT08	
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Occupational Area: Automotive Technology			
CTE Concept(s): Engine Performance			
Math Concepts: Ratios			
Lesson Objective:	Air needed for one gallon of gasoline		
Supplies Needed:	Notebook, Pen, Whiteboard		

THE "7 ELEMENTS"	TEACHER NOTES (and answer key)
<p><b>1. Introduce the CTE Lesson.</b></p> <p><b>Question: How much air is needed to completely burn one gallon of gasoline in a fuel ratio of 14.7 to 1?</b></p>	<p>Introduce as a question.</p> <p>Teacher Note: This is being kept to a minimal topic a sharp student may address the fact that air temperature and varying atmospheric pressure can effect this answer.</p> <p>Tell the students this would be in a perfect world or controlled environment.</p> <p>Ask this question to the group as the introduction and note any valid responses on the board. Also remind the students this is not the same as compression ratio, which represents only one cylinder of the engine.</p> <p>Also note to students we are going to use 15:1 to make are math easier.</p>

<b>2.Assess students' math awareness as it relates to the CTE lesson.</b>  <b>Question: What variables do we need to know in order to compute the answer to this question?</b>	Again an open chorus response should generate a varying amount of answers and maybe some mild controversy. You are looking for two answers.  1.Number of gallons of gas 2. Number of cubic feet of air
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3. Work through the math example embedded in the CTE lesson.

Introduce the two formulas for the students to work with.

Remind Students

To solve these problems we are going to use a proportion

A proportion is two ratios set equal to each other

Ratio=Ratio

$$\frac{1380 \text{ ft}^3 \text{ of air}}{1 \text{ gal of gasoline}} = \frac{x}{5 \text{ gal}}$$

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$$x \text{ gal} \cdot \text{ft}^3 = 1380(5) \text{ gal} \cdot$$

1380 cubic feet represents the value of air per one gallon of gasoline

X is the unknown amount of air in cubic ft

n is the number of gallons of fuel you are working with (this must be given)

We will use 5 gallons of gasoline for the example

We know that we must cross multiply in this example so 1 times X becomes just X

Then if we multiply 1380 times 5 the answer is 6900

X=6900 cubic feet

6900 is the amount of air in cubic feet needed to burn 5 gallons of gasoline.

That would be equivalent to a room that is approx. 23ft long, 30ft wide, and 10 ft high

<p><b>4. Work through related, contextual math-in-CTE examples.</b></p> <p>Now let's try a couple of known vehicles.</p> <p>A 2006 Chevrolet Silverado has a 36 gallon fuel tank, how much air is needed to burn a full tank of fuel?</p> <p>A 2008 Ford Focus has a 16 gallon fuel tank, how much air is needed to burn a full tank of fuel?</p>	<p><math>1380 \times 36 = 49,680</math> cubic feet of air</p> <p><math>1380 \times 16 = 22,080</math> cubic feet of air</p>
<p><b>5. Work through traditional math examples.</b></p> <p>Let's review a few other common conversions</p> <p>Teacher can add several more examples if needed</p>	<p>4 liters is x gallons      liters x .264=gallons   1.06 gallons</p> <p>15 lb. ft is X Newton Meters   Lb.Ft X 1.356=Newton Meter   20.34 Nm</p> <p>350      CID is X CCs   350 CID X 16.387=CCs   5735.45 CCs</p>
<p><b>6. Students demonstrate their understanding.</b></p> <p>Have students figure their own vehicle</p>	<p>Have each student figure the amount of air needed to burn a full tank of fuel in their vehicle or their parent's vehicle.</p>
<p><b>7. Formal assessment</b></p>	<p>Students that demonstrate their own vehicle will be a good final exam.</p>

NOTES: