

Automotive Technology 6th Edition

Chapter 14 Math, Charts, & Calculations

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This Automotive Technology 6th text provides complete coverage of automotive components, operation, design, and troubleshooting. It correlates material to task lists specified by ASE and ASEEducation (NATEF) and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Case Studies, Videos, Animations, and ASEEducation (NATEF) Task Sheets.
Motivate Learners	Explain how the knowledge of how something works translates into the ability to use that knowledge to figure why the engine does not work correctly and how this saves diagnosis time, which translates into more money.
State the learning objectives for the chapter or course you are about to cover and explain this is what they should be able to do as a result of attending this session or class.	Explain the chapter learning objectives to the students as listed: <ol style="list-style-type: none"> 1. Discuss the use of scientific methods and energy principles in solving problems. 2. Explain the relationship between torque, work, power, and horsepower. 3. Explain the importance of Newton's laws of motion, kinetic energy, inertia, and mechanical principles in brake design.
Establish the Mood or Climate	Provide a <i>WELCOME</i> , Avoid put downs and bad jokes.
Complete Essentials	Restrooms, breaks, registration, tests, etc.
Clarify and Establish Knowledge Base	Do a round robin of the class by going around the room and having each student give their backgrounds, years of experience, family, hobbies, career goals, or anything they want to share.

NOTE: This lesson plan is based on the 6th Edition Chapter Images found on Jim's web site @

www.jameshalderman.com

DOWNLOAD Chapter 14 Chapter Images: From

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[automotive_principles.html](http://www.jameshalderman.com/automotive_principles.html)NOTE: You can use Chapter Images or possibly Power Point files:

ICONS

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1. SLIDE 1 MATH, CHARTS, AND CALCULATIONS



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MATH ANIMATIONS

[Math Formula Circle Area \(View\) \(Download\)](#)

[Math Formula Eng-Metric Conversion, Area \(View\) \(Download\)](#)

[Math Formula, Eng-Metric Conversion - Volume \(View\) \(Download\)](#)

[Math Formula, English to Metric - Pressure \(View\) \(Download\)](#)

[Math Formula, Eng to Metric - Length \(View\) \(Download\)](#)

[Math Formula, lb ft to lb in - Torque \(View\) \(Download\)](#)

[Math Formula, Gear Ratio \(View\) \(Download\)](#)

[Math Formula, Metric-Eng Conversion - Temp \(View\) \(Download\)](#)

[Math Formula, Metric-Eng Conversion - Area \(View\) \(Download\)](#)

[Math Formula, Metric-Eng - Length \(View\) \(Download\)](#)

[Math Formula, Metric-Eng - Pressure \(View\) \(Download\)](#)

[Math Formula, Metric-Eng Conversion - Volume \(View\) \(Download\)](#)



DEMONSTRATION: Show example of scientific notation. If this week's lottery jackpot is \$250 million, how is this written in scientific notation?



2. SLIDE 2 **EXPLAIN** Figure 14-1 Valve clearance allows the metal parts to expand and maintain proper operation, both when the engine is cold or at normal operating temperature. Adjustment is achieved by changing the thickness of the adjusting shim

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Ch14 Math, Charts, & Calculations



DEMONSTRATION: Show examples of decimal system. How is it like metric system? Where are decimals used by automotive service technicians?

DISCUSS FREQUENTLY ASKED QUESTION:
How Is Metric Fuel Economy Measured?
In the United States, fuel economy is expressed in miles per gallon. Outside of the United States, fuel economy is measured in the number of liters of fuel needed to travel 100 kilometers (62 miles), abbreviated L/100 km. This means that as the number increases, the fuel economy decreases. For example:

MPG L/100 km

5 47.0

10 23.5

15 15.7

20 11.8

25 9.4

30 7.8

35 6.7

40 5.9

45 5.2

50 4.7











In metric system, fuel is measured; in the United States, the miles are measured.



HANDS-ON TASK: Have students determine how much to adjust the valve clearance when specification calls for a clearance of 0.013 inch and the actual clearance is 0.0149 inch.



HANDS-ON TASK: Have students calculate how much it will cost them to fill a 12-gallon tank that is one-eighth full when gas is priced at 3.899/ gallon.

ICONS	Ch14 Math, Charts, & Calculations
	<p>HANDS-ON TASK: Have students determine RPM for a car going 60 mph with a gear ratio of 0.84:1 and a tire diameter of 18 inches, using the formula found on page 116 of TEXT.</p>
 	<p>DEMONSTRATION: Show students how to work with percentages. What automotive applications require technicians to calculate percentages?</p>
	<p>DEMONSTRATION: Show students how to calculate fuel economy. What steps should they follow to get an accurate number?</p>
	<p>HANDS-ON TASK: Have students compute fuel economy when a car consumes 13.5 gallons of gas while driving a distance of 300 miles.</p>
	<ol style="list-style-type: none"> 3. SLIDE 3 EXPLAIN Figure 14-2 drive gear is attached or is closer to the power source and rotates or drives the driven gear. 4. SLIDE 4 EXPLAIN Figure 14-3 If driven gear is rotating faster than the drive gear, it is called an overdrive ratio.
 	<p>DEMONSTRATION: Show an example of gear reduction on an automotive engine. Have students determine the gear ratio. Is the example a low or high gear?</p>
 	<p>DISCUSSION: Have students discuss significance of gear ratios. How are gear ratios determined? What is a gear ratio of 1:1 called? Have students discuss concept of overdrive. What is impact on RPM? Torque? Fuel economy?</p>

ICONS

Ch14 Math, Charts, & Calculations



5. **SLIDE 5 EXPLAIN Figure 14-4** A graph showing horsepower and torque. Notice that the curves cross at 5252 RPM or a little bit to the right of the 50, which is expressed RPM is expressed as the graph number multiplied by 100. Example is 52 multiplied by 100 equals 5200 RPM. The torque and horsepower curves cross at 5252 RPM because torque is measured by a dynamometer and then horsepower is calculated using a formula which causes both values to be the same at that one engine speed.
6. **SLIDE 6 EXPLAIN Figure 14-5** A typical chart showing what is applied in what gear in an automatic transmission.
7. **SLIDE 7 EXPLAIN Figure 14-6** An exploded view showing how the thermostat is placed in the engine.



HANDS-ON TASK

Math Problem Exercise Task Sheet PAGE 23