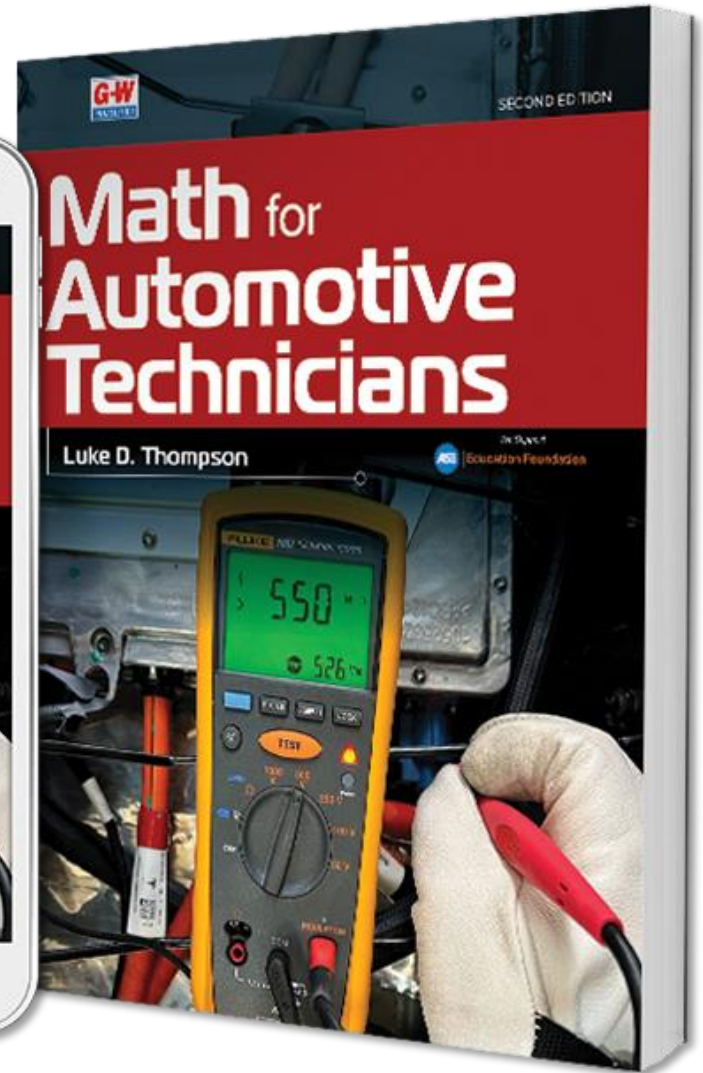
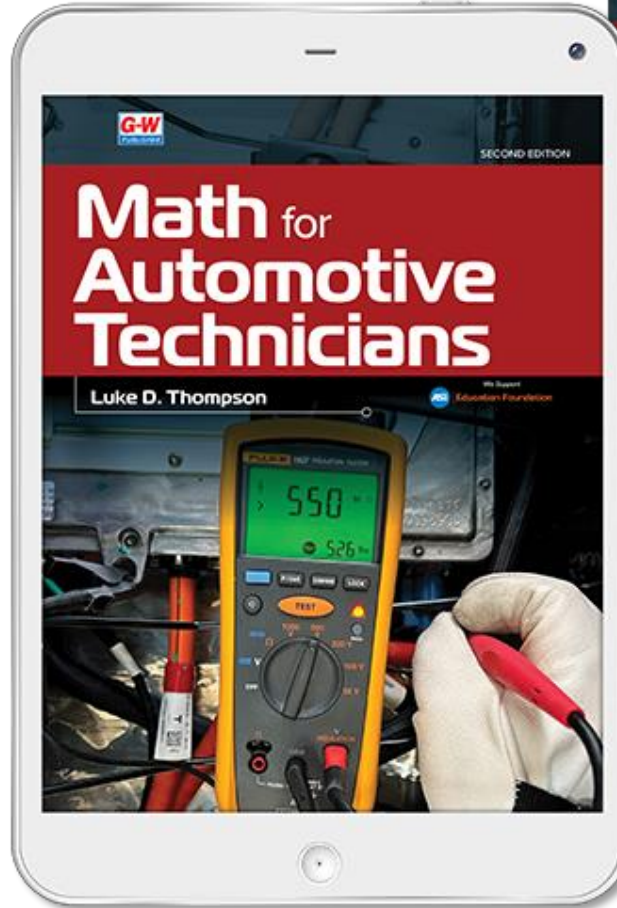


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***Math for Automotive Technicians***



## Math for Automotive Technicians: Lesson Plan

Instructor:

Date:

Course:

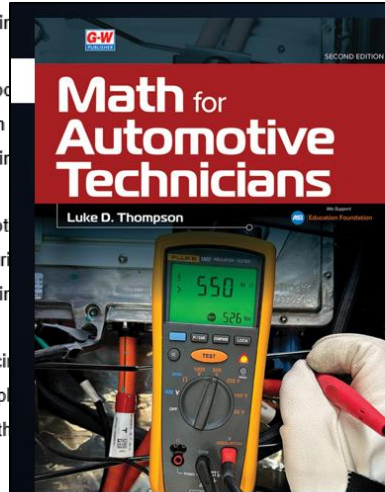
Unit:



### Unit 1: Basic Math Skills

#### Unit Objectives

- Lesson 1—Addition
  - 1.1.1 Identify the addend and sum of components of a basic addition problem.
  - 1.1.2 Compute addition problems with a variety of addends.
  - 1.1.3 Analyze and solve word problems using addition.
- Lesson 2—Subtraction
  - 1.2.1 Identify the minuend, subtrahend, and the difference components of a basic subtraction problem.
  - 1.2.2 Compute subtraction problems with a variety of minuends and subtrahends.
  - 1.2.3 Analyze and solve word problems using subtraction.
- Lesson 3—Multiplication
  - 1.3.1 Identify the factors and product components of a basic multiplication problem.
  - 1.3.2 Compute multiplication problems with a variety of factors.
  - 1.3.3 Analyze and solve word problems using multiplication.
- Lesson 4—Division
  - 1.4.1 Identify the dividend, divisor, and quotient components of a basic division problem.
  - 1.4.2 Compute division problems with a variety of dividends and divisors.
  - 1.4.3 Analyze and solve word problems using division.
- Lesson 5—Decimal Arithmetic
  - 1.5.1 Identify place value of whole and decimal numbers.
  - 1.5.2 Calculate addition, subtraction, multiplication, and division of decimal numbers.
  - 1.5.3 Analyze and solve word problems with decimal numbers.
- Lesson 6—Greater Than and Less Than
  - 1.6.1 Identify greater than, less than, and equal symbols.
  - 1.6.2 Compare whole numbers, decimal numbers, and fractions.
  - 1.6.3 Analyze and solve word problems by comparing numbers.
- Lesson 7—Fractions
  - 1.7.1 Identify the numerator and denominator of a fraction.
  - 1.7.2 Calculate addition, subtraction, multiplication, and division of fractions.
  - 1.7.3 Analyze and solve word problems using fractions.



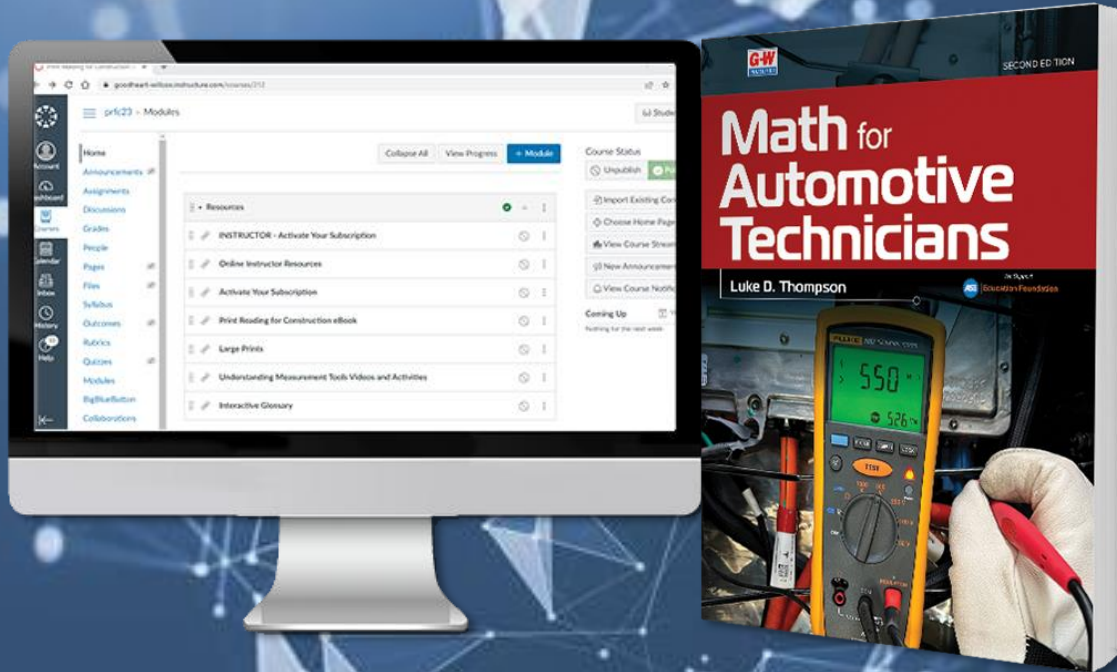
*Presentations for PowerPoint*

## Math for Automotive Technicians

**Lesson Plans, PowerPoint Presentations, and Answer Keys**



# Print • Digital • Bundle Options Available



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**BRIGHTSPACE**  canvas

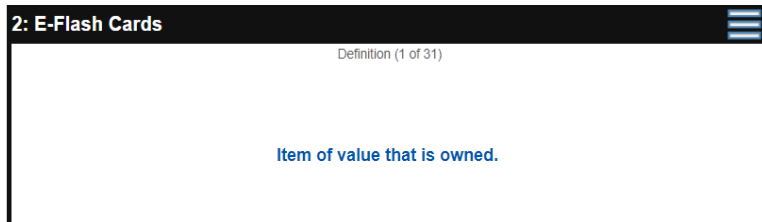
 moodle  schoolology<sup>®</sup>  Additional  
LTI-Compliant  
Platforms

**Clever**   
ClassLink

  
1EDTECH  
CERTIFIED

  
Google Classroom

## LMS and CMS Integration Easy Navigation



## E-Flash Cards & Vocabulary Practice

### 2: Vocabulary Game

Select a point value. Choose the term that matches the definition.

Score: 800

<input checked="" type="radio"/> 100	100	100	100
200	200	200	200
300	<input checked="" type="radio"/> 300	300	300
400	400	400	<input checked="" type="radio"/> 400

**Definition:** Act of giving money, goods, or services to meet the needs of others and support causes that are important to an individual.

- pay yourself first
- variable expense
- recordkeeping
- philanthropy

[Check Answer](#)

## Interactive Activities

### Unit 1: Basic Math Skills

#### Lesson 11: Measurement

##### Measurement Activity

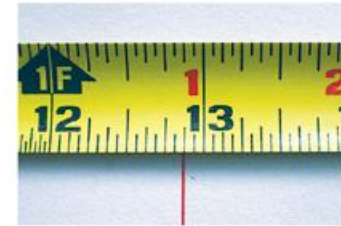
Complete the following activity.

- Working in groups of two, find the following measurement tools in your automotive shop: steel ruler, dial caliper, micrometer, dial indicator, tire gauge, digital dial caliper, and feeler gauges. One student should hold up a measurement tool while the other student identifies it and what it is used for in the automotive shop. Take turns identifying measurement tools until you and your partner are familiar with and can correctly identify all of them. (If you do not have a tool in your shop, you can use a picture.) (1.11.1)

Answer:

##### Measurement Practice Problems 11A

Record the measurements shown on the following tape measures and steel rulers. (1.11.2)



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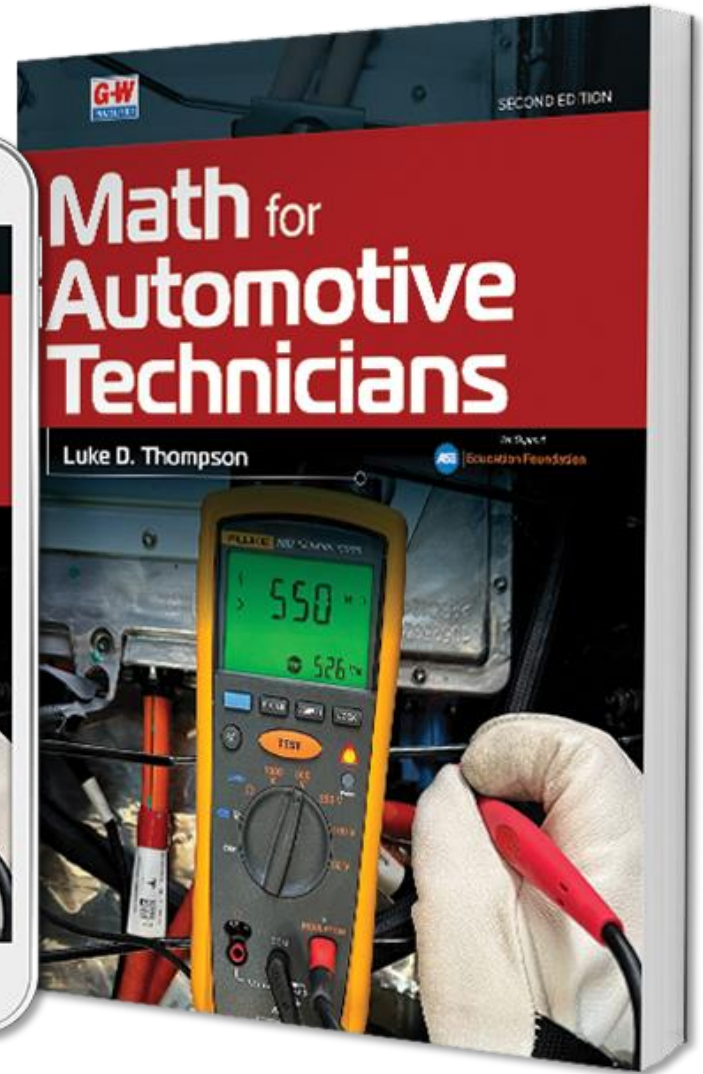
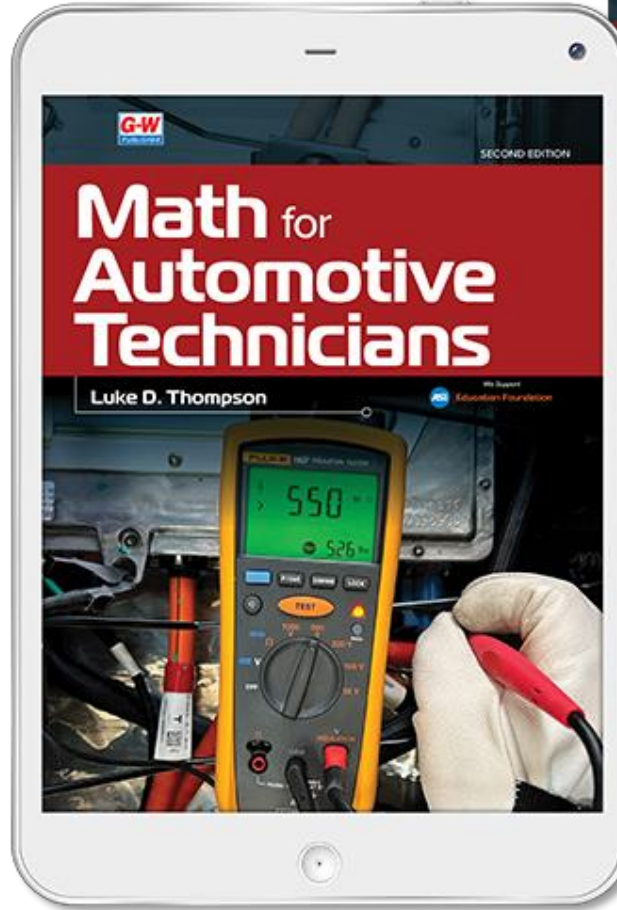
A. \_\_\_\_\_ (1.11.2)

Answer:

## Unit Review Materials

# Integrate G-W Digital Student Resources

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By Luke D. Thompson

**Unit 1–Basic Math Skills**

**Unit 2–Around the Shop**

**Unit 3–Vehicle Maintenance**

**Unit 4–Chassis**

**Unit 5–Engine Mechanical**

**Unit 6–Electrical**

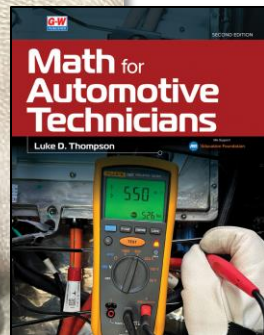
**Unit 7–Engine Performance**

**Unit 8–Driveline**

**Unit 9–Thermal Systems**

**Unit 10–High-Voltage & Electric Vehicles**

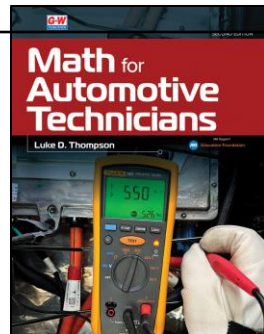
**Student Textbook**



# UNIT 9

# Thermal Systems

- Case Study 85 **Air Conditioning System Oil—Addition**
- Case Study 86 **Compressor Clutch Air Gap—Subtraction**
- Case Study 87 **High-Voltage Battery Pressure Testing—Multiplication**
- Case Study 88 **Radiator Fan Speed Circuit Controls—Division**
- Case Study 89 **Cooling System Boiling Point—Decimal Arithmetic**
- Case Study 90 **Electrolysis of Coolant—Greater Than and Less Than**
- Case Study 91 **Evaporator and Condenser Area—Fractions**
- Case Study 92 **Refrigerant Weight—Conversions**
- Case Study 93 **Air Conditioning System Pressures —Graphs and Tables**
- Case Study 94 **Electric Coolant Pumps—Formulas**
- Case Study 95 **Air Conditioning Gauge Reading—Measurement**
- Case Study 96 **Enthalpy Charts—Analyzing Specifications**



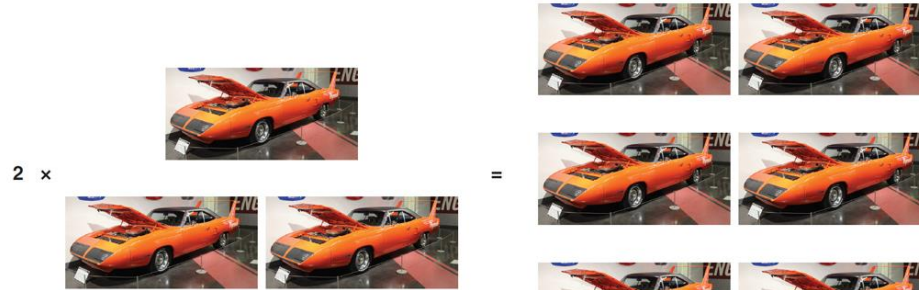
### 1.3.1 Components of Multiplication

Multiplication is the process of combining sets of a value into a total, or *product*, where one *factor* is the quantity in each set and the other factor is the number of sets.

$$\text{Factor} \times \text{Factor} = \text{Product}$$

$$\begin{array}{r} \text{Factor} \\ \times \text{Factor} \\ \hline \text{Product} \end{array}$$

Multiplication can be expressed as a visual representation and expressed with values in a table. A visual representation of the multiplication operation follows:



two  
of three

1															
1/2				1/2											
1/4		1/4		1/4		1/4		1/4		1/4		1/4		1/4	
1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8
1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16

$$\frac{3}{8} + \frac{1}{8} = \frac{4}{8} = \frac{1}{2}$$

$$\frac{7}{16} + \frac{13}{16} = \frac{20}{16} = 1 \frac{1}{4}$$

$$\frac{11}{16} - \frac{3}{16} = \frac{8}{16} = \frac{1}{2}$$

**Description**  
Complete fractions practice problems 7D.

$$\frac{1}{4} + \frac{3}{8} = \frac{1}{4} \times \frac{2}{2} + \frac{3}{8} = \frac{2}{8} + \frac{3}{8} = \frac{5}{8}$$

$$\frac{3}{8} \times \frac{4}{4} = \frac{12}{32}$$

$$\frac{8}{32} + \frac{12}{32} = \frac{20}{32} = \frac{5}{8}$$

$$\frac{5}{6} + \frac{5}{8} = \frac{5}{6} \times \frac{4}{4} + \frac{5}{8} = \frac{20}{24} + \frac{15}{24} = \frac{35}{24} = 1 \frac{11}{24}$$

$$\frac{5}{8} \times \frac{3}{3} = \frac{15}{24}$$

$$\frac{20}{24} + \frac{15}{24} = \frac{35}{24} = 1 \frac{11}{24}$$



## What's New to the Edition



## CASE STUDY 22

### Torque

#### LEARNING OUTCOMES

After studying this case study, you will be able to:

- 3.22.1 Identify the components of the formula for torque and calculate torque values.

#### TECHNICAL TERM

torque

#### MATH SKILLS

- Calculate values based on a formula.
- Analyze job skill problems related to the torque formula.

#### 3.22.1 Calculating Torque Values

**Torque** is the measurement of rotational force. The simplest example of torque is placing a wrench on a bolt head and pulling on the wrench to rotate the bolt. If enough force is exerted on the wrench, the bolt will rotate. The rotation is measured as *torque*.

The formula for torque is:

$$\tau = \text{force} \times \text{length}$$

The force value is the amount of force, typically indicated as pound or Newton, applied to a pivot arm, such as a wrench.

The length value is the length of the pivot arm, from the point of rotation to the point where the force is applied. This value is typically indicated as inches, feet, or meters.

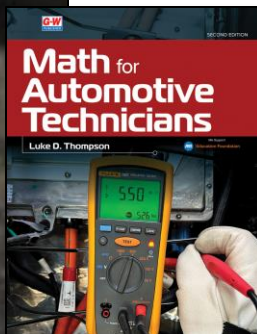
**Example:** If a wrench is 2 feet long and 25 pounds of force are applied to the end of the wrench, calculate the amount of torque at the other end of the wrench.

$$2 \text{ ft} \times 25 \text{ lb.} = 50 \text{ ft lb.}$$

The torque is 50 foot-pounds.



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## CASE STUDY 15

### Maintenance Parts

#### LEARNING OUTCOMES

After studying this case study, you will be able to:

- 3.15.1 Identify common maintenance items that require multiple quantities and calculate price and quantities needed for multiple parts and vehicles.

#### MATH SKILLS

- Multiplication of whole and decimal numbers.
- Analyze and solve word problems related to multiplication.

#### 3.15.1 Changing Components in Light Repair

Vehicle maintenance and light repair often include changing many common parts, such as filters, spark plugs, belts, hoses, tires, light bulbs, and wiper blades. Some of these items, such as spark plugs, require more than one part when service is being performed. Calculating price and parts needed when performing vehicle maintenance requires multiplication.



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**Example:** A dealership technician is changing the spark plugs on four identical vehicles that are equipped with gasoline powered V6 engines. Calculate the number of spark plugs needed to complete all four vehicles.

$$4 \times 6 = 24$$

24 spark plugs are needed to complete the vehicles.

# Opening Materials

Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_



Tread Depth Gauge



Tire Pressure Gauge

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The **lug spacing gauge** is designed to identify the exact size of lug nut spacing. This information is required when replacing stock wheels with custom wheels. The gauge is placed into the wheel holes or on the wheel studs and the scale indicates the measurement value.

Review the following examples.



A six lug wheel has 5.0" lug spacing.



A four lug wheel has 108 mm lug spacing.

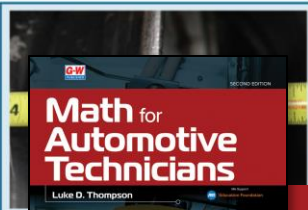
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A tape measure is used to measure the width of a wheel, from bead seat to bead seat. This measurement is required if wider or narrower wheels are being considered for performance or aesthetic purposes. The tape measure is read to the closest 1/16".

Review the following examples.



Wheel width: 5"



Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_

## Module Pinout Diagrams Job Skill Practice Problems

Use the following diagram and table to complete practice problems 72.1 through 72.3.



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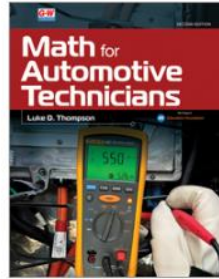
Pin	Wire Color	Circuit Number	Function	Pin	Wire Color	Circuit Number	Function
1	-	-	Not Used	17	-	-	Not Used
2	-	-	Not Used	18	GRY	435	EGR Control
3	BRN/WHT	633	CMP Signal	19	PPL/WHT	1660	HO2S High B1 S1
4	PNK	539	Ignition Feed	20	PPL	1665	HO2S High B1 S2
5	YEL/BLK	846	Injector #6 Control	21	PPL	1670	HO2S High B2 S1
6	-	-	Not Used	22	PPL/WHT	1668	HO2S High B2 S2
7	TAN	1667	HO2S B2 S1	23	-	-	Not Used
8	PNK/BLK	632	CMP Low	24	TAN	1671	Brake Signal
9	-	-	Not Used	25	TAN/WHT	1653	Shift Control Lamp
10	TAN/BLK	422	TCC Solenoid	26	BRN	441	Fuel Pump Relay
11	-	-	Not Used	27	-	-	Not Used
12	GRN/WHT	426	EVAP Purge Control	28	PPL	574	CKP Low
13	WHT	687	3-2 Control	29	GRN/BLK	822	VSS Low
14	BRN	436	AIR Relay Control	30	PPL/WHT	821	VSS Signal
15	WHT	696	VSS Output Signal	31	YEL	573	CKP Signal
16	-	-	Not Used	32	-	-	Not Used

7

72.1. Identify the function of pin 8. (7.2.1)

72.2. Identify the wire color for the fuel pump relay circuit. (7.2.1)

72.3. Identify the wire color, circuit number, and function of the blue-shaded pin. (7.2.1)



**Interactive Glossary**

**1 Basic Math Skills** ▼

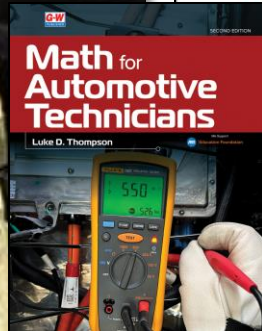
- E-Flash Cards
- Matching Activity
- Vocabulary Game
- Unit Review Materials (ZIP, 5,325 KB)

**2 Around the Shop** ▼

- E-Flash Cards
- Matching Activity
- Vocabulary Game
- Unit Review Materials (ZIP, 433 KB)

**3 Vehicle Maintenance** ▼

- E-Flash Cards
- Matching Activity
- Vocabulary Game
- Unit Review Materials (ZIP, 7,282 KB)



**Unit 1: Basic Math Skills**

**Lesson 12: Analyzing Specifications**

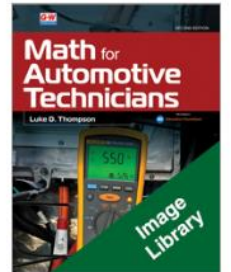
**Analyzing Specifications Activity**

Use the table below to answer questions A through D of the analyzing specifications activity.

**A/C Compressor**

Category	Specification
Model	Calsonic Kansei V-6
Type	V-6 Variable Displacement
Displacement cm <sup>3</sup> (cu in) / rev	Min 14.5 (0.885)
Displacement cm <sup>3</sup> (cu in) / rev	Max 184 (11.228)
Cylinder Bore * Stroke mm (in)	37 (1.46) × [2.3–26.6 (0.091–1.126)]
Direction of Rotation	Clockwise (viewed from front)
Drive Belt	Poly V

- A. Identify the minimum cu in displacement of the A/C compressor. (1.12.1)  
Answer:
  
- B. Identify the bore in mm. (1.12.1)  
Answer:
  
- C. Identify the direction of rotation. (1.12.1)  
Answer:



Math for Automotive Technicians 2e, Image Library



INTERACTIVE VIDEOS



Engine



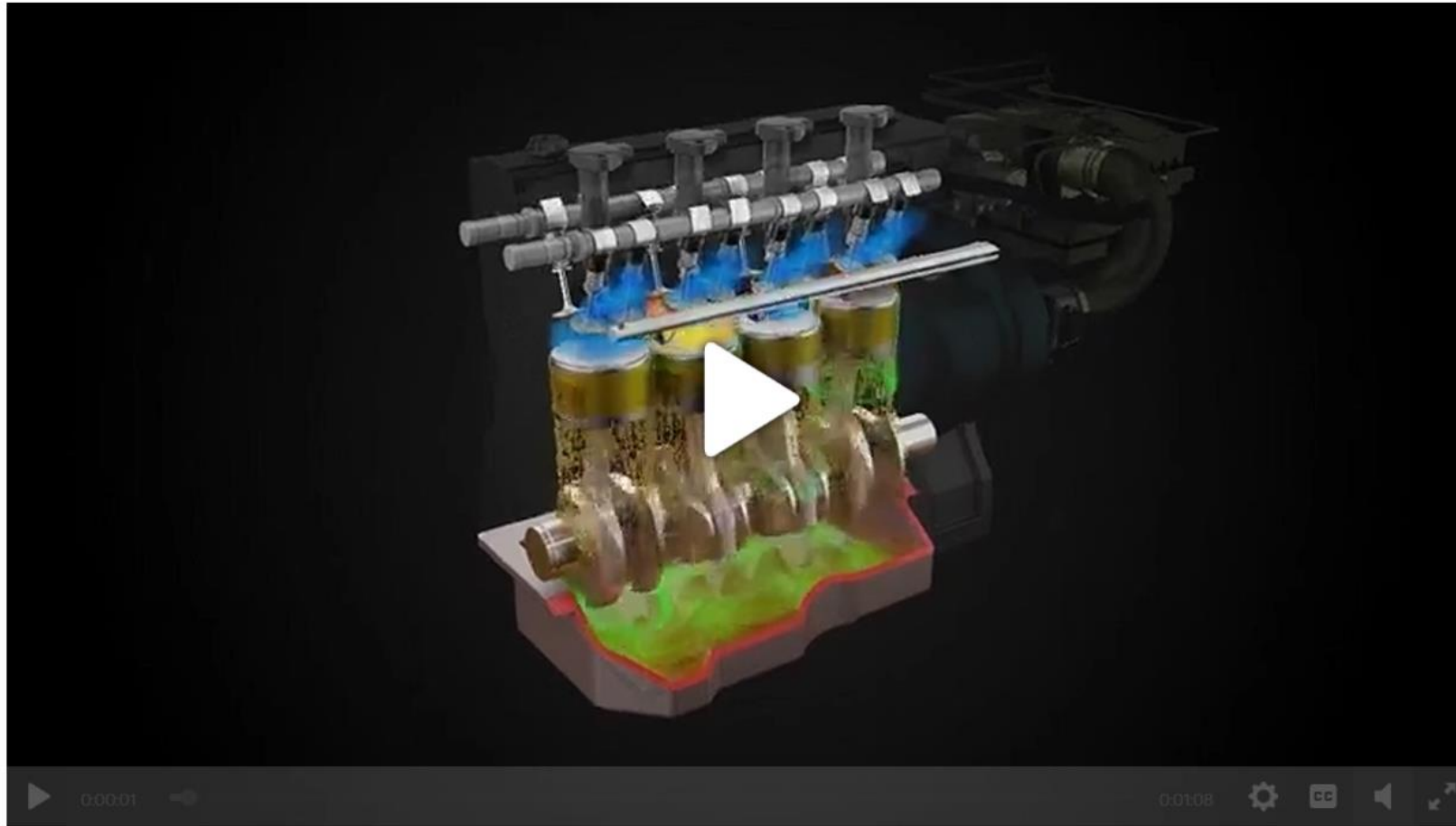
Engine Oil System



Timing Belt



Timing Chain



## Engine

### Basic Description

Internal combustion engines consist of pistons, a crankshaft, and valves.

NARRATED VIDEOS



Engine Oil S...

01:54



Timing Belt

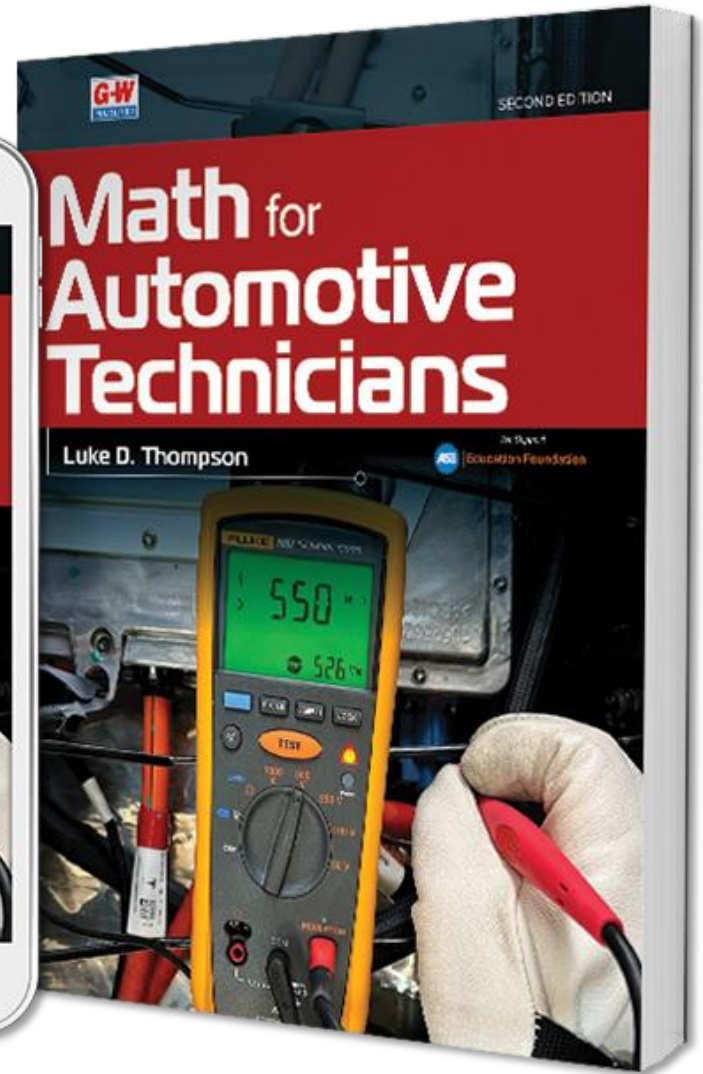
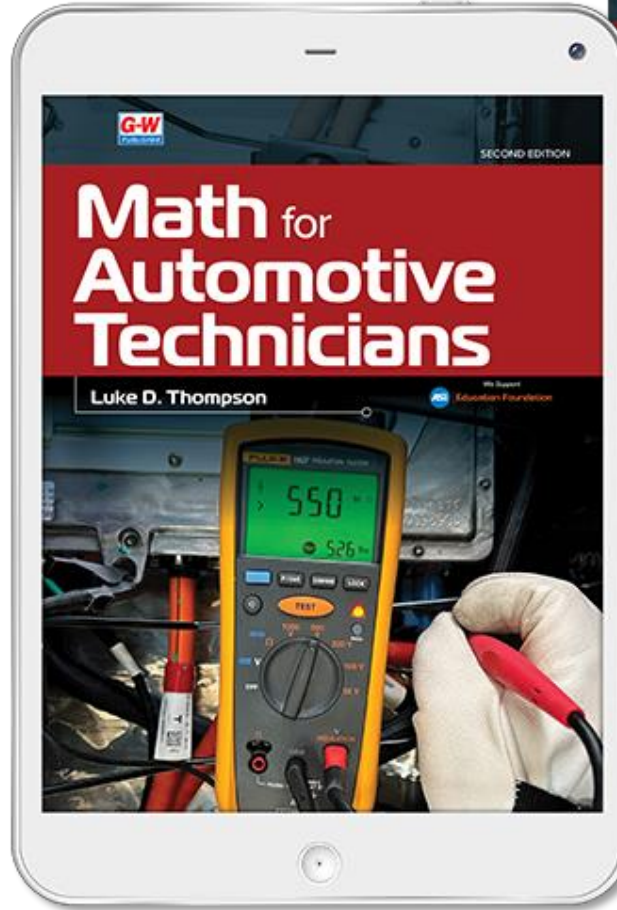


Timing Chain



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