

# Automotive Service Fundamentals

EXAM INFORMATION	DESCRIPTION																				
<p><b>Exam Number</b> 505</p> <p><b>Items</b> 56</p> <p><b>Points</b> 73</p> <p><b>Prerequisites</b> NONE</p> <p><b>Recommended Course Length</b> ONE SEMESTER</p> <p><b>National Career Cluster</b> TRANSPORTATION, DISTRIBUTION, &amp; LOGISTICS</p> <p><b>Performance Standards</b> INCLUDED (OPTIONAL)</p> <p><b>Certificate Available</b> YES</p>	<p>This is an entry-level course in Automotive Service. Through demonstrations, lectures, research and practical experiences is designed to introduce the student to abroad experience in the use of: equipment, tools, materials, processes and techniques of automotive service. This is a one-semester course of instruction.</p> <p><b>EXAM BLUEPRINT</b></p> <table border="1"> <thead> <tr> <th>STANDARD</th> <th>PERCENTAGE OF EXAM</th> </tr> </thead> <tbody> <tr> <td>1- General Shop Safety</td> <td>18%</td> </tr> <tr> <td>2- Basic Hand Tools, Fasteners, Equipment</td> <td>13%</td> </tr> <tr> <td>3- Installation of Tires and Wheels</td> <td>12%</td> </tr> <tr> <td>4- Basic Services on a Vehicle</td> <td>40%</td> </tr> <tr> <td>5- Basic Emissions Components (Optional)</td> <td></td> </tr> <tr> <td>6- Mathematical Equations</td> <td>9%</td> </tr> <tr> <td>7- Vehicle Inspection (Optional)</td> <td></td> </tr> <tr> <td>8- Employability and Work Habits</td> <td>6%</td> </tr> <tr> <td>9- Professional Skills for the Workplace</td> <td>1%</td> </tr> </tbody> </table>	STANDARD	PERCENTAGE OF EXAM	1- General Shop Safety	18%	2- Basic Hand Tools, Fasteners, Equipment	13%	3- Installation of Tires and Wheels	12%	4- Basic Services on a Vehicle	40%	5- Basic Emissions Components (Optional)		6- Mathematical Equations	9%	7- Vehicle Inspection (Optional)		8- Employability and Work Habits	6%	9- Professional Skills for the Workplace	1%
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## STANDARD 1

*Students will be able to understand and demonstrate safety and environmental practices*

**Objective 1** Learn safe working habits and procedures. Pass a safety test with 100 percent.

1. Personal safety.
2. Tool and equipment safety.
3. Workplace safety.
4. Personal protective equipment (PPE).

**Objective 2** Comply with safety rules for working with automotive chemicals.

1. Identify the location of the safety data sheets (SDS).
2. Navigate through the SDS for critical information.
3. Store chemicals in properly labeled containers.

**Objective 3** Identify the gasses encountered in the automotive field and the hazards they present.

1. Water, oxygen, nitrogen, carbon dioxide (CO<sub>2</sub>), hydrocarbons (HC), oxides of nitrogen (NO<sub>x</sub>), and carbon monoxide (CO).
2. HC, NO<sub>x</sub>, and CO can pose health and environmental problems if they are not controlled.

**Objective 4** Identify the hazards and control of asbestos dust.

1. Asbestos is a carcinogen – a substance that causes cancer.
2. Never use compressed air to clean brake assemblies.
3. Use an approved brake vacuum or brake washer machine.

Standard 1 Performance Evaluation included below (Optional)

## STANDARD 2

*Students will be able to understand basic hand tools, fasteners, and shop equipment*

**Objective 1** Identify and measure metric and standard fasteners.

1. Machine screws, sheet metal screws, bolts, studs, nuts, washers.
2. Head markings, nominal size, thread pitch (TPI).

**Objective 2** Correctly identify and use basic hand tools.

1. Screwdrivers, wrench, sockets, drive handles, extensions, pliers, hammer, chisels, punches, files, hacksaw, taps, dies, basic pneumatic tools.
2. Describe the use of each of the above tools.

**Objective 3** Identify and demonstrate use of basic measuring tools (accurate to 1/32 or 1 mm).

1. Tire pressure gauges.
2. Tread depth gauge.
3. Feeler gauge.
4. Brake thickness gauge.

**Objective 4** Complete a repair order including cause, concern, and correction, use reference manuals or information systems to find service procedures and specifications.

1. Repair order.
2. Access service information.

**Objective 5** Properly raise and support vehicles using jack stands and a frame contact hoist.

1. Use a jack and jack stands to raise and support a vehicle.
2. Use a hoist to raise and support a vehicle and properly use safety locks to secure the vehicle.

Standard 2 Performance Evaluation included below (Optional)

### STANDARD 3

*Students will be able to understand the proper techniques in removal and installation of tires and wheels.*

**Objective 1** Inspect tires for abnormal wear.

1. Proper inflation
2. Mechanical problems (no specific angles)

**Objective 2** Remove a tire from a wheel.

1. Use the proper equipment.
2. Use the correct techniques and safety precautions.

**Objective 3** Properly rotate tires and reinstall using proper torque procedures.

1. Use either the conventional or radial tire rotation method.
2. Lug nuts should be tightened to the proper torque as indicated in the vehicle specifications and in a sequence of cross or star patterns depending on the number of lug nuts.

**Objective 4** Use a tire balancer to balance tires of a vehicle using proper procedures.

1. Static balance – equal distribution of weight around the wheel.

- Objective 5
2. Dynamic balance – equal distribution of weight on each side of the wheel.
- Locate a leak and identify proper repair procedure.
1. Buff the area slightly larger than the patch.
  2. Apply the cement with a brush.
  3. Apply the patch and firmly role the patch using a stitcher tool.

- Objective 6
- Interpret tire sidewall markings: size, inflation, and load.
1. Tire type
  2. Section width in millimeters
  3. Aspect ratio
  4. Speed rating
  5. Construction type
  6. Rim diameter

Standard 3 Performance Evaluation included below (Optional)

## STANDARD 4

*Students will be able to perform basic services on a vehicle.*

- Objective 1
- Locate and identify basic automotive parts.
1. Identify engine parts.
    1. Block, crankshaft, camshaft, piston, cylinder head, connecting rod, valve train, timing components
    2. Fuel systems: injector, filter, lines, pump, tank
    3. Ignition systems: spark plugs, coil(s)
    4. Cooling systems: radiator, pump, thermostat
  2. Identify drive train parts.
    1. Manual Transmission
    2. Automatic Transmission
    3. Drivelines
    4. Drive Axles
  3. Identify brake parts.
    1. Master cylinder, lines, caliper, rotor, drum, wheel cylinder, pads, shoes
  4. Identify steering and suspension parts.
    1. Steering gear: worm gear vs. rack and pinion
    2. Tie-rod

3. Shocks / Struts
4. Springs: leaf, coil, torsion bar, air
5. Identify electrical parts.
  1. Battery
  2. Alternator
  3. Starter
  4. Circuit protection: fuse, breaker

**Objective 2** Based on the manufacture's specifications, check and adjust all vehicle fluid levels.

1. Check belt tension and condition.
2. Check condition of hoses.
3. Check coolant strength and leaks.

**Objective 3** Change engine oil and filter on a vehicle. Use proper disposal methods for waste oil.

1. Lubricate chassis
2. Check air filter

**Objective 4** With a voltmeter, check battery voltage with the engine running and with the engine off.

1. Properly jump start a vehicle.

**Objective 5** Check shocks or struts.

1. Check for leakage.
2. Check for proper operation.

**Objective 6** Understand the four-stroke cycle.

1. Intake
2. Compression
3. Power
4. Exhaust

**Objective 7** Check brakes.

1. Lining thickness
2. Fluid leaks
3. Park brake function

**Objective 8** Check lights.

1. Replace light bulbs as needed.

Standard 4 Performance Evaluation included below (Optional)

## STANDARD 5 (Optional)

*Students will be able to identify basic emission components.*

Objective 1 Identify common emission components.

Objective 2 Run an emission test on a vehicle.

Standard 5 Performance Evaluation included below (Optional)

## STANDARD 6

*Students will be able to solve basic mathematical equations related to automotive.*

Objective 1 Solve whole number problems with two- and three-digits.

1. Addition
2. Subtraction
3. Multiplication
4. Division

Objective 2 Solve fraction problems.

1. Addition
2. Subtraction
3. Multiplication
4. Division

Objective 3 Solve decimal problems with two- and three-digits.

1. Addition
2. Subtraction
3. Multiplication
4. Division

Objective 4 Solve conversion problems.

1. Fraction-to-decimal
2. Decimal-to-fraction
3. Decimal-to-percent
4. Percent-to-decimal

Objective 5 Solve basic ratio-to-proportion problems.

Objective 6 Solve basic linear-measurement problems.

1. Measuring using the Imperial system.

2. Measuring using the Metric system.

Standard 6 Performance Evaluation included below (Optional)

## STANDARD 7 (Optional)

*Students will be able to identify and properly perform a vehicle inspection (optional) refer to your state vehicle safety inspection manual.*

- Objective 1** Inspect a vehicle's ownership, glass, lights, and accessories.
1. Check for vehicle registration.
  2. Inspect vehicle windshield and other glass for excessive damage, breakage, inadequate movement, and unsafe alterations.
  3. Inspect vehicle headlights and auxiliary lights for correct aiming; inspect headlights, auxiliary lights, tail lights, brake lights, turn signals, and other lights for malfunction, damage, or other unsafe conditions.
  4. Inspect vehicle windshield wipers, windshield washers, windshield defrosters, horn, speedometer, odometer, and automatic transmission/starter interlock for damage or malfunction.
- Objective 2** Inspect a vehicle's brakes, steering and suspension, and tires.
1. Inspect vehicle tires and wheels for excessive wear, damage, mismatched sizes, and improper mounting and illegal studs.
  2. Inspect vehicle steering and suspension assemblies for excessive wear, damage, missing parts, and improper functioning.
  3. Inspect altered vehicles to confirm that they conform to required tolerances for raised or lowered suspension and other changes.
  4. Using a brake plate or visual method, inspect vehicle brake systems for excessive wear, damage, missing parts, improper functioning, and other related safety hazards.
- Objective 3** Inspect a vehicle's exhaust and fuel systems.
1. Inspect vehicle exhaust systems for excessive wear, damage, malfunction, and illegal configuration.
  2. Inspect vehicle fuel systems for damage, malfunction, or leakage.
- Objective 4** Inspect a vehicle's body.
1. Inspect vehicle body, frame, motor mounts, fenders, bumpers, floor pan, doors, hood, seats, exterior mirrors, interior mirror, and seat belts for

excessive damage, illegal configuration, missing parts, and malfunction of mechanical assemblies.

2. Inspect "Sand" or "Dune" buggies to meet regular passenger car requirements.
3. Inspect street rods and other modified vehicles to meet minimum equipment and safety requirements for limited use on public highways.

Standard 7 Performance Evaluation included below (Optional)

### **STANDARD 8 (Optional)**

*Students will be able to understand the importance of employability and work habit.*

- Objective 1 Integrity
- Objective 2 Punctuality
- Objective 3 Staying on task
- Objective 4 Productive team worker
- Objective 5 Leadership

### **STANDARD 9 (Optional)**

*Students will gain an understanding of automotive service industry as a profession and will develop professional skills for the workplace.*

- Objective 1 As a participating member of the SkillsUSA student organization complete the SkillsUSA Level 1 Professional Development Program.
  1. Complete a self-assessment inventory and identify individual learning styles.
  2. Discover self-motivation techniques and establish short-term goals.
  3. Determine individual time-management skills.
  4. Define future occupations.
  5. Define awareness of cultural diversity and equity issues.
  6. Recognize the benefits of conducting a community service project.
  7. Demonstrate effective communication skills with others.
  8. Participate in a shadowing activity.
  9. Identify components of an employment portfolio.
  10. Demonstrate proficiency in program competencies.
  11. Explore what is ethical in the workplace or school.



12. Master a working knowledge of SkillsUSA.

1. State the SkillsUSA motto.
2. State the SkillsUSA creed.
3. Learn the SkillsUSA colors.
4. Describe the official SkillsUSA dress.
5. Describe the procedure for becoming a SkillsUSA officer.

**Objective 2** Understand how to use skills obtained in Automotive Service Fundamentals and how they relate to career opportunities.

**Objective 3** Display a professional attitude toward the instructor and peers.  
SkillsUSA PDP requirements - recommended

## Automotive Service Fundamentals

Performance assessments may be completed and evaluated at any time during the course. The following performance skills are to be used in connection with the associated standards and exam. To pass the performance standard the student must attain a performance standard average of 8 or higher on the rating scale. Students may be encouraged to repeat the objectives until they average 8 or higher.

Student's Name: \_\_\_\_\_

Class: \_\_\_\_\_

### PERFORMANCE STANDARDS RATING SCALE



#### STANDARD 1 – General Shop Safety

Score:

- Pass the safety test with a score of 100%
- Identify the hazard/control of asbestos dust
- Identify the gasses encountered in the automotive field and the hazards they present
- Comply with safety rules for working with automotive chemicals (MSDS)
- Identify the different types and hazards of solvents used in automotive

#### STANDARD 2 - Basic Hand Tools, Fasteners, and Shop Equipment

Score:

- Identify/measure metric/standard fasteners
- Correctly identify and use basic hand tools
- Identify and demonstrate use of basic measuring tools (accurate 1/32" or 1mm)
- Use reference manuals or information systems to find procedures and specifications
- Properly raise and support vehicles using jack stands and a frame contact hoist

#### STANDARD 3 - Installation of Tires and Wheels

Score:

- Locate a leak and demonstrate proper repair procedures
- Properly rotate and reinstall tires using proper torque procedures
- Use proper procedures with a tire balancer on a vehicle

- Inspect tires:
  - Abnormal wear
  - Proper inflation
  - Mechanical problems
- Interpret tire sidewall markings:
  - Size
  - Inflation
  - Load
- Remove a tire from a wheel:
  - Proper equipment
  - Techniques
  - Safety precautions

#### **STANDARD 4 - Basic Service on a Vehicle**

**Score:**

- Locate and identify basic automotive parts and functions
  - Engine
  - Brake
  - Drive train
  - Electrical parts
  - Steering suspension

#### **STANDARD 5 - Basic Emission Components**

**Score:**

- Identify common emission components
- Run an emission test on a vehicle

#### **STANDARD 6 - Mathematical Equations related to Automotive**

**Score:**

- Solve whole numbers with two- and three-digits:
  - Addition
  - Subtraction
  - Multiplication
  - Division
- Solve fraction problems:
  - Addition
  - Subtraction
  - Multiplication
  - Division

- Solve decimal problems with two- and three-digits:
  - Addition
  - Subtraction
  - Multiplication
  - Division
- Solve fraction-to-decimal- conversion problems, and vice versa
- Solve basic ratio-to-proportion problems
- Solve decimal-to-percent conversion problems, and vice versa
- Solve basic linear-measurement problems

### STANDARD 7 - Vehicle Inspection

Score:

- Check for registration
- Inspect vehicle tires and wheels:
  - Excessive wear
  - Damage
  - Mismatched sizes
  - Improper mounting
  - Illegal studs
- Inspect vehicle steering and suspension assemblies:
  - Excessive wear
  - Damage
  - Missing parts
  - Improper functioning
- Using a brake plate or visual method, inspect vehicle brake systems:
  - Excessive wear
  - Damage
  - Missing parts
  - Improper functioning
  - Related Safety hazards
- Inspect vehicle windshield and other glass:
  - Excessive damage
  - Breakage
  - Inadequate movement
  - Unsafe alterations
- Inspect vehicle headlights and auxiliary lights for correct aiming:
- Inspect each type of light for damage, malfunction, or other unsafe condition:

- Headlights
- Auxiliary lights
- Taillights
- Brake lights
- Turn signals
- Other misc. lights
- Inspect each of the following parts for damage or malfunction:
  - WS wipers
  - WS washer
  - WS defroster
  - Speedometer
  - Automatic transmission/starter interblock
  - Horn
  - Odometer
- Inspect each part for excessive damage, illegal configuration, missing parts, and/or malfunction of mechanical assemblies:
  - Vehicle body
  - Fenders
  - Hood
  - Interior mirrors
  - Frame
  - Bumpers
  - Seats
  - Motor mounts
  - Floor pan
  - Doors
  - Exterior mirrors
  - Seat belts
- Inspect vehicle exhaust systems:
  - Excessive wear
  - Damage
  - Malfunctions
  - Illegal configuration
- Inspect vehicle fuel systems:
  - Damage
  - Malfunctions

- Leakage
  - Inspect altered vehicles to confirm that they conform to required tolerances for raised and lowered suspension and other changes
  - Inspect “Sand” or “Dune” buggies to meet regular passenger car requirements
- Inspect street rods and other modified vehicles to meet minimum equipment and safety requirements for limited use on public highways

**PERFORMANCE STANDARD AVERAGE SCORE:**

Evaluator Name: \_\_\_\_\_

Evaluator Title: \_\_\_\_\_

Evaluator Signature: \_\_\_\_\_

Date: \_\_\_\_\_