



AUTO MECHANICS

Merit Badge Requirements

**NOTE: Access to an automobile or truck (with an owners manual) is needed to meet some of the requirements for this merit badge.*

- 1) Discuss with your counselor the safety equipment, tools, and clothing used while checking or repairing a motor vehicle. Use this equipment, tools, and/or clothing (when needed or called for) in meeting the requirements for this badge.
- 2) Explain how an internal combustion engine operates and the differences between gasoline and diesel engines.
- 3) Demonstrate your knowledge of general maintenance. Do the following:
 - A) Demonstrate how to check the fluid level of the following:
 - * Brake fluid
 - * Engine Oil
 - * Coolant
 - * Power steering fluid
 - * Windshield washer fluid
 - * Transmission fluid (automatic & standard)
 - B) Check battery fluid, if possible, and the condition of battery terminals.
 - C) Show the location of fuse boxes and the size of fuses, and demonstrate the proper replacement of burned-out fuses.
 - D) Review the maintenance chart in the owner's manual. Explain the requirements and time limits.
 - E)
 - 1) Choose a car cleaner and wax product for the vehicle. Explain clear-coat paint and the precautions necessary for care. Clean and wax the vehicle, both inside and out.
 - 2) Use a vinyl and rubber protectant (on vinyl tops, rubber door seals, sidewalls, etc.) and explain the importance of this protectant.
 - F) Demonstrate how to check the condition and tension of belts and hoses.
 - G) Demonstrate the following:
 - 1) Check the lighting in the vehicle, including instrument, warning, and exterior bulbs.
 - 2) Check headlight alignment.
 - H) Demonstrate how to check the vehicle exhaust system.
- 4) Demonstrate your knowledge of tires. Do the following:
 - A)
 - 1) Explain the difference between tire and vehicle manufacturer's information specifications and demonstrate where to find those specifications.
 - 2) Demonstrate how to check pressure and properly inflate a tire.
 - 3) Using the manufacturer's jack supplied with the vehicle:
 - * Demonstrate how to engage the jack correctly on the vehicle.
 - * Demonstrate how to change a tire correctly.
 - B)
 - 1) Explain the difference between bias-belted tires and radial-belted tires.
 - 2) Diagram and explain in writing how to rotate bias-belted and radial-belted tires.
 - 3) Using the manufacturer's guidelines, rotate the tires on the vehicle.
 - C)
 - 1) Explain the caster, camber, and toe-in adjustments on wheel alignment.
 - 2) Explain why wheel alignment is important to the life of a tire.
 - D) Explain the purpose of the lateral-wear bar indicator.
 - E) Explain how to dispose of old tires properly.
- 5) Demonstrate your knowledge of engine lubrication. Do the following:
 - A) Explain the purpose of motor oil.
 - B) Explain where to find the recommended type and amount of oil to be used in the vehicle engine.
 - C) Explain the difference in viscosity (10W/30 versus SAE 30).
 - D) Perform an oil change and oil filter change on the vehicle.
 - E) Explain how to dispose of the used oil and filter properly.
- 6) Cooling system. Do the following:
 - A) Explain the need for coolant in the cooling system.
 - B) Flush and change the engine coolant in the vehicle according to the manufacturer's instructions.
 - C) Explain how to dispose of used coolant properly.

Requirements continued on next page

- 7) Demonstrate your knowledge of a fuel system. Do the following:
- A) Explain how the air and fuel system work together.
 - B) Explain how a carburetor works and how a fuel-injection system works.
 - C) Explain how an on-board computer works with the fuel injection system. Show where the computer is located.
 - D) Explain why it is necessary to have an air filter and a fuel filter. Locate them and change them according to the manufacturer's recommendations.
 - E) Explain what fuel additives are, for both the carburetor and the fuel injection systems.
- 8) Demonstrate your knowledge of ignition and electrical systems. Do the following:
- A) Diagram and explain the parts of the electrical system.
 - B) Explain the cylinder engine sequence.
 - C) Explain the spark plug gap and, if practical, change the spark plug. (Use an engine with spark plugs that can be reached without tilting the engine.)
 - D) Demonstrate how to connect jumper cables on your battery properly. Explain how to jump-start a vehicle.
 - E) Explain the difference between electronic and points ignition systems.
- 9) Demonstrate your knowledge of a drive train. Do the following:
- A) Diagram the drive train and explain the different parts.
 - B) Explain the difference between automatic and standard transmissions.
 - C) Explain the types of automatic transmission fluid.
 - D) Explain the types of lubricants used in a standard transmission and in the differential.
 - E) Explain the difference between front-wheel, rear-wheel, and four-wheel drive.
 - F) Explain the gear ratio of the differential.
- 10) Demonstrate your knowledge of a brake system. Do the following:
- A) Explain the brake system (including anti-lock systems) and how it operates.
 - B) Explain the differences between disc and drum systems.
 - C) Demonstrate checking conditions of a vehicle brake system. After checking the brake system, make recommendations for repairs (if necessary).
- 11) Explain the purpose, importance, and limitations of passive restraints.

Requirement 1

What kind of safety equipment is used while checking or repairing a motor vehicle? _____

What kinds of tools are used while checking or repairing a motor vehicle? _____

What kind of clothing is used/worn while checking or repairing a motor vehicle? _____

___ Use this equipment, tools, and clothing when completing the other requirements for this badge

Requirement 2

Explain how an internal combustion engine operates: _____

What are the differences between gasoline and diesel engines? _____

Requirement 3

Do the following with your counselor (or qualified adult) present. Have them initial each task when it has been properly completed.

Check the fluid level of the following:

___ Brake Fluid

___ Engine Oil

___ Coolant

___ Power steering Fluid

___ Transmission Fluid

___ Check the battery fluid, if possible, and the condition of battery terminals.

___ Show the location of the fuse boxes and the size of the fuses.

___ Demonstrate the proper replacement of burned-out fuses.

___ After reviewing the maintenance requirements in the owners manual, use this area to explain the requirements and time limits: ___

Scout Name: _____ Unit #: _____ Date: _____

Choose a car cleaner and wax product for the vehicle. What did you choose? _____

Why? _____

Explain clear-coat paint and the precautions necessary for care: _____

___ Clean and wax the vehicle, both inside and out.

___ Use a vinyl and rubber protectant.

___ Explain the importance of the vinyl and rubber protectant: _____

___ Demonstrate how to check the condition and tension of belts and hoses.

___ Check the lighting in the vehicle, including instrument, warning, and exterior bulbs.

___ Check headlight alignment.

___ Demonstrate how to check the vehicle exhaust system.

Requirement 4

Explain the difference between tire and vehicle manufacturer's information specifications: _____

Where do you find these specifications? _____

___ Demonstrate how to check pressure and properly inflate a tire.

___ Using the manufacturer's jack supplied with the vehicle, demonstrate how to engage the jack correctly on the vehicle.

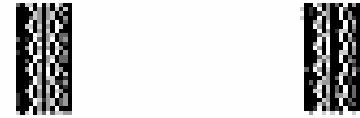
___ Using the manufacture's jack supplied with the vehicle, demonstrate how to change a tire correctly.

Explain the difference between bias-belted tires and radial-belted tires: _____

Using the space provided on the following page, diagram and explain in writing how to rotate bias-belted and radial-belted tires.



Bias-Belted



Radial-Belted

___ Using the manufacturer's guidelines, rotate the tires on the vehicle.

Explain the caster adjustment on wheel alignment: _____

Explain the camber adjustment on wheel alignment: _____

Explain the toe-in adjustment on wheel alignment: _____

Why is wheel alignment important to the life of a tire? _____

What is the purpose of the lateral-wear bar indicator? _____

Scout Name: _____ Unit #: _____ Date: _____

Explain how to dispose of old tires properly: _____

Requirement 5

What is the purpose of motor oil? _____

Where do you find the recommended type and amount of oil to be used in the vehicle engine? _____

Explain the difference in viscosity (10W/30 versus SAE 30): _____

___ Perform an oil change and oil filter change on the vehicle.

How do you properly dispose of the used oil and filter? _____

Requirement 6

Why do you need coolant in the cooling system? _____

___ Flush and change the engine coolant in the vehicle according to the manufacturer's instructions.

Explain how to dispose of used coolant properly: _____

Requirement 7

Explain how the air and fuel system work together: _____

Explain how a carburetor works: _____

Explain how a fuel-injection system works: _____

Scout Name: _____ Unit #: _____ Date: _____

Explain how an on-board computer works: _____

___ Show where the on-board computer is located.

Explain why it is necessary to have an air filter: _____

Explain why it is necessary to have a fuel filter: _____

___ Locate the air filter and change it according to the manufacturer's recommendations.

___ Locate the fuel filter and change it according to the manufacturer's recommendations.

Explain what fuel additives are for the carburetor: _____

Explain what fuel additives are for the fuel injection system: _____

Requirement 8

Use the area below to diagram (draw & label) and explain the parts of the electrical system.

Scout Name: _____ Unit #: _____ Date: _____

Explain the cylinder engine sequence: _____

Explain the spark plug gap: _____

___ If practical, change the spark plug.

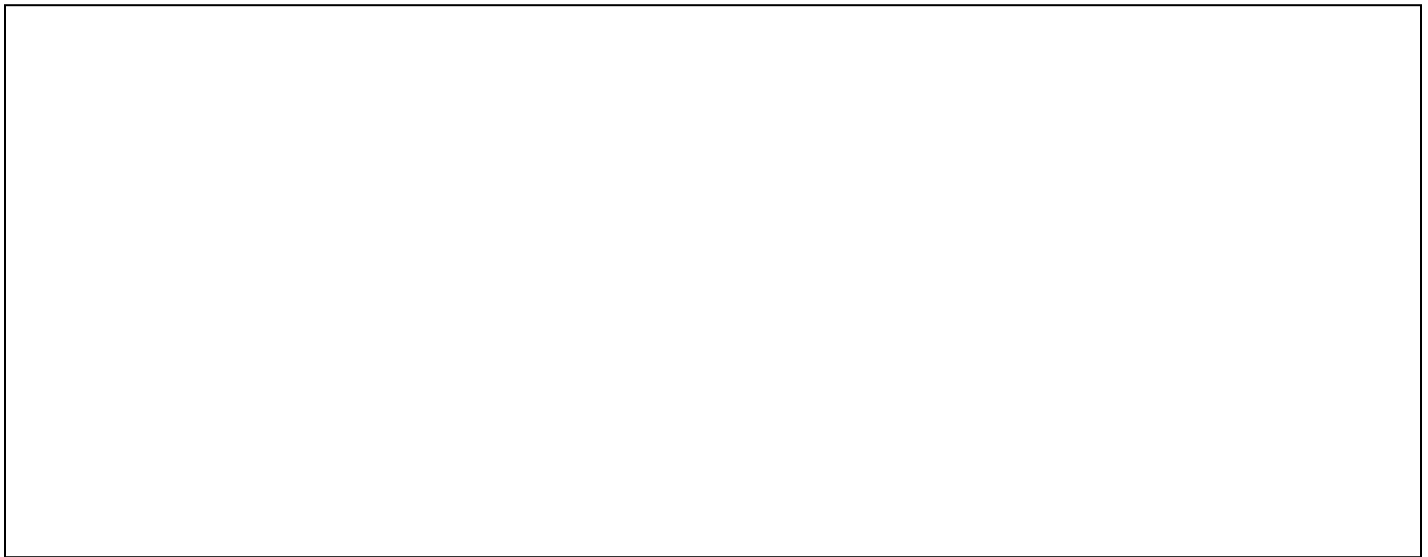
___ Demonstrate how to connect jumper cables on your battery properly.

Explain how to jump-start a vehicle: _____

Explain the difference between electronic and points ignition systems: _____

Requirement 9

Use the area below to diagram (draw & label) and explain the drive train.



Scout Name: _____ Unit #: _____ Date: _____

Explain the difference between automatic and standard transmissions: _____

Explain the types of automatic transmission fluid: _____

Explain the types of lubricants used in a standard transmission and in the differential: _____

Explain the difference between front-wheel, rear-wheel, and four-wheel drive: _____

Explain the gear ratio of the differential: _____

Requirement 10

Explain the brake system (including anti-lock systems) and how it operates: _____

Explain the difference between disc and drum systems: _____

___ Demonstrate checking conditions of a vehicle brake system.

After checking the brake system, make recommendations for repairs (if necessary): _____

Scout Name: _____ Unit #: _____ Date: _____

Requirement 11

Explain the purpose of passive restraints: _____

Explain the importance of passive restraints: _____

Explain the limitations of passive restraints: _____
