Auto Mechanics
Merit Badge Workbook

This workbook can help you but you still need to read the merit badge pamphlet (book). No one can add or subtract from the Boy Scout Requirements #33215. Merit Badge Workbooks and much more are below: Online Resources. Workbook developer: craig@craiglincoln.com. Requirements revised: 2000, Workbook updated: April 2008.

Scout's Name: ___________________________ Unit: ___________________________
Counselor’s Name: ___________________________ Counselor’s Ph #: ___________________________

NOTE: Access to an automobile or truck (with 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 merit 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:
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Scout’s Name: ___________________

☐ Brake Fluid

☐ Engine Oil

☐ Coolant

☐ Power steering fluid

☐ Windshield washer fluid

☐ Transmission fluid (automatic and 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 the following:

   a. 1. Explain the difference between tire and vehicle manufacturer's information specifications and demonstrate where to find these 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
3. Using the manufacturer's guidelines, rotate the tires on the vehicle.

c. 1. Explain the camber, ____________________________
caster, ____________________________
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 a 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. ________________________________________

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. ________________________________

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b. Explain the cylinder engine sequence. __________________________________________
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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.) __________________________________________
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Demonstrate how to connect jumper cables on your battery properly. Explain how to jump-start a vehicle. ________________
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e. Explain the difference between electronic _______________________________________
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____________________________________
____________________________________
and point 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 on a vehicle brake system. After checking make recommendations for repairs (if necessary). ___________________________________________

11. Explain the purpose, importance, ___________________________________________

and limitations of passive restraints. ___________________________________________

Online Resources  (Use any Internet resource with caution and only with your parent's or guardian's permission.)

  ► Scout  ► Tenderfoot  ► Second Class  ► First Class  ► Rank Videos  ► Safety Afloat

Boy Scout Merit Badge Workbooks: usscouts.org  or- meritbadge.org  Merit Badge Books: www.scoutstuff.org

Online Videos: http://www.expertvillage.com/

Car Inspection Videos:  ■ Tire Pressure  ■ Tread Wear  ■ Transmission Fluid  ■ Wiper Blades  ■ Lights  ■ other fluids...

Car Maintenance Videos:  ■ Check Oil  ■ Change Oil  ■ Inspect Belts  ■ Air Filter  ■ Detailing  ■ more...