



# 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](#).

Send comments to: [craig@craiglincoln.com](mailto:craig@craiglincoln.com). Requirements revised: 2000, Workbook updated: February 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:

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

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and radial-belted tires.

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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. \_\_\_\_\_
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**7. Demonstrate your knowledge of a fuel system. Do the following:**

- a. Explain how the air and fuel system work together. \_\_\_\_\_
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- b. Explain how a carburetor works \_\_\_\_\_
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and how a fuel- injection system works. \_\_\_\_\_

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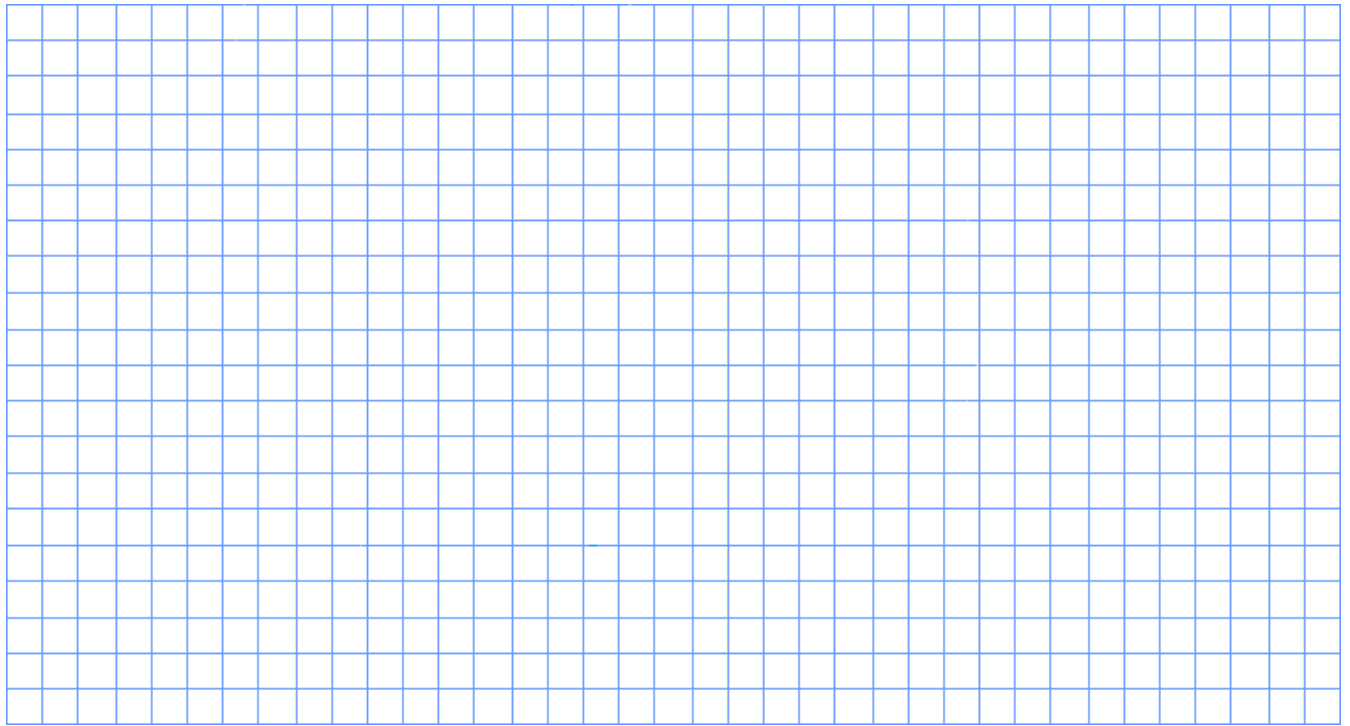
- c. Explain how an on-board computer works with the fuel injection system. Show where the computer is located. \_\_\_\_\_
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- d. Explain why it is necessary to have an air filter and a fuel filter. Locate them and change them according to the manufacturer's recommendations. \_\_\_\_\_
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- 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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**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.) \_\_\_\_\_

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**d.** Demonstrate how to connect jumper cables on your battery properly. Explain how to jump-start a vehicle. \_\_\_\_\_

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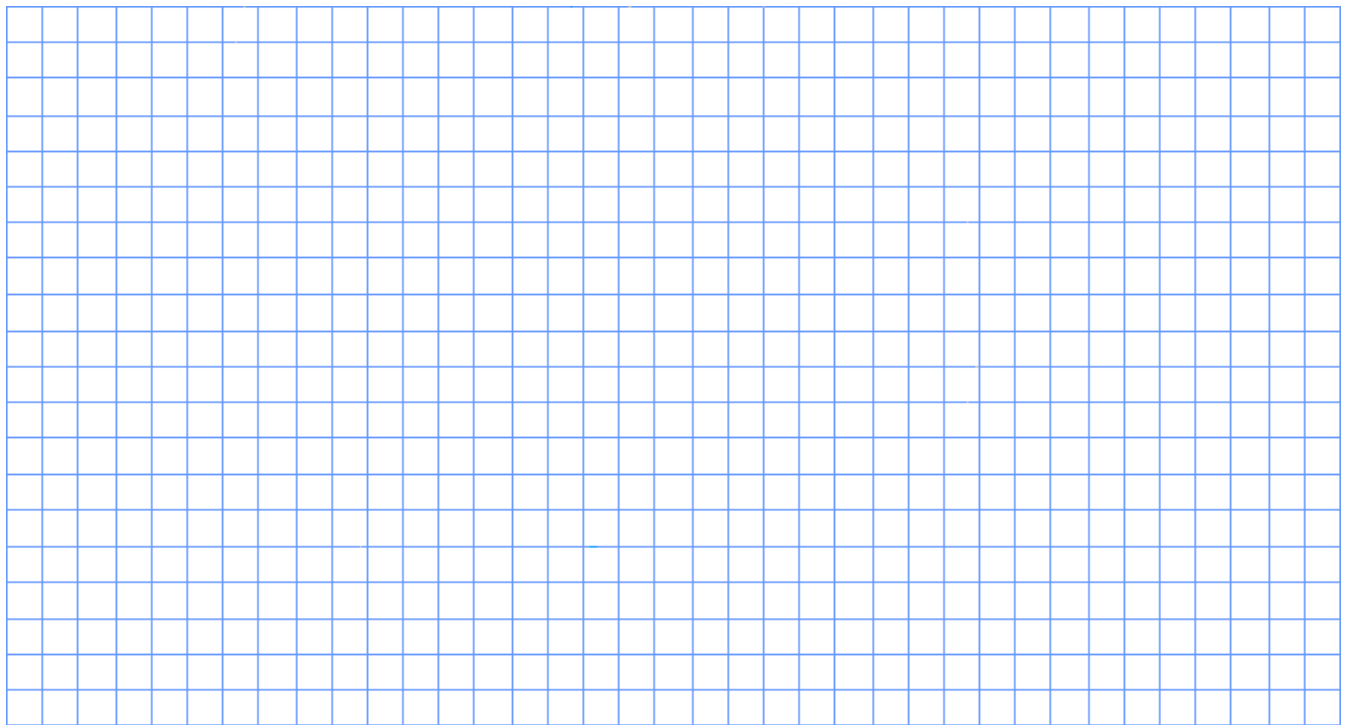
**e.** Explain the difference between electronic \_\_\_\_\_

and point ignition systems. \_\_\_\_\_

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**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. \_\_\_\_\_**

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\_\_\_\_\_

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

**Merit Badge Workbooks:** [usscouts.org](http://usscouts.org) -or- [meritbadge.org](http://meritbadge.org)

► **Merit Badge Books:** [www.scoutstuff.org](http://www.scoutstuff.org)

Boy Scouts of America: <http://www.scouting.org/>

► [Requirements](#)

► [Intro to Merit Badges](#)

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...](#)