



2024 Edition

SCOUTMASTER BUCKY

Automotive Maintenance Merit Badge

SCOUTS PARTICIPATING IN A SCOUTMASTER BUCKY MERIT BADGE OPPORTUNITY (ONLINE OR IN PERSON), PLEASE CONSIDER ALSO USING THE AUTOMOTIVE MAINTENANCE MERIT BADGE CLASS PREPARATION PAGE FOR CLARIFICATIONS, INSIGHTS, AND EXPECTATIONS.

<https://scoutmasterbucky.com/merit-badges/automotive-maintenance/automotive-maintenance-cpp.pdf>

AUTOMOTIVE MAINTENANCE MERIT BADGE WORKBOOK

REQUIREMENT 1a: Explain to your counselor the hazards you are most likely to encounter during automotive maintenance activities, and what you should do to anticipate, help prevent, mitigate, or lessen these hazards.

HAZARD #1

Description:

Anticipate:

Help Prevent:

Mitigate:

Respond:



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HAZARD #2

Description:

Anticipate:

Help Prevent:

Mitigate:

Respond:



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HAZARD #3

Description:

Anticipate:

Help Prevent:

Mitigate:

Respond:



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HAZARD #4

Description:

Anticipate:

Help Prevent:

Mitigate:

Respond:



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HAZARD #5

Description:

Anticipate:

Help Prevent:

Mitigate:

Respond:



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HAZARD #6

Description:

Anticipate:

Help Prevent:

Mitigate:

Respond:



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REQUIREMENT 1b: 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.

Safety Equipment:

Tools:

Clothing:



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REQUIREMENT 1c: Describe the proper clothing and other precautions for safely making observations at night and in cold weather.

at night:

in cold weather:

REQUIREMENT 1d: Explain how to safely observe the Sun, objects near the Sun and solar eclipses.

Notes:



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REQUIREMENT 1c: Explain the different types of motors you may encounter.

ENGINE TYPE #1

Engine #1:

Notes:

ENGINE TYPE #2

Engine #2:

Notes:

ENGINE TYPE #3

Engine #3:

Notes:



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ENGINE TYPE #4

Engine #4:

Notes:

ENGINE TYPE #5

Engine #5:

Notes:

ENGINE TYPE #6

Engine #6:

Notes:



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ENGINE TYPE #7

Engine #7:

Notes:

ENGINE TYPE #8

Engine #8:

Notes:

REQUIREMENT 1d: Explain the safety considerations when performing maintenance on a vehicle equipped with a high-voltage electrical system.

Notes:



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REQUIREMENT 1e: Review the maintenance chart in the vehicle owner's manual. Explain the requirements and time limits.

Notes:

REQUIREMENT 1f: Explain the purpose, importance, and limitations of safety belts and passive restraints.

Purpose:

Importance:

Limitations:



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REQUIREMENT 1g: Find out the requirements for your state's emissions and safety inspections (as applicable), including how often a vehicle needs to be inspected.

Notes:

REQUIREMENT 1h: Explain the importance of registering a vehicle.

Notes:

REQUIREMENT 1h: Find out the annual registration fee for renewing your family car's registration.

Notes:



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A VEHICLE IS NEEDED FOR THIS REQUIREMENT COMPONENT AND OTHERS, IN-PERSON CLASSES WILL UTILIZE A VEHICLE OF THE COUNSELOR'S CHOICE AND MAY VARY FROM YOUR FAMILY'S VEHICLE.

REQUIREMENT 2: General Maintenance

REQUIREMENT 2a: Demonstrate how to check the following:

1. Brake fluid
2. Engine oil
3. Coolant
4. Power steering fluid
5. Windshield washer fluid
6. Transmission fluid
7. Battery fluid (if possible) and condition of the battery terminals.

Consider using the Automotive Maintenance merit badge pamphlet for preparation information on this component.

This requirement must be reviewed with your merit badge counselor.

BE PREPARED!

REQUIREMENT 2b: Locate the fuse boxes; determine the type and size of fuses. Demonstrate the proper replacement of burned-out fuses.

Consider using the Automotive Maintenance merit badge pamphlet for preparation information on this component.

This requirement must be reviewed with your merit badge counselor.

BE PREPARED!

REQUIREMENT 2c: Demonstrate how to check the condition and tension of belts and hoses.

Consider using the Automotive Maintenance merit badge pamphlet for preparation information on this component.

This requirement must be reviewed with your merit badge counselor.

BE PREPARED!

REQUIREMENT 2d: Check the vehicle for proper operation of its lights, including the interior overhead lights, instrument lights, warning lights, and exterior bulbs.

Consider using the Automotive Maintenance merit badge pamphlet for preparation information on this component.

This requirement must be reviewed with your merit badge counselor.

BE PREPARED!

REQUIREMENT 2e: Locate and check the air filter(s).

Consider using the Automotive Maintenance merit badge pamphlet for preparation information on this component.

This requirement must be reviewed with your merit badge counselor.

BE PREPARED!



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REQUIREMENT 3: Dashboard/Driver Information Center

REQUIREMENT 3a: Explain the function of the fuel gauge, speedometer, tachometer, oil pressure, and engine temperature gauge. Point each one out on the instrument cluster.

Fuel Gauge:

Speedometer:

Tachometer:

Oil Pressure Gauge:

Engine Temperature Gauge:



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REQUIREMENT 3b: Explain the symbols that light up on the dashboard and the difference between the yellow and red symbols. Explain each of the indicators on the dashboard, using the owner's manual if necessary.



- | | | |
|---------------------------------------|---|------------------------------------|
| 1. Front Fog Lights On | 23. Headlight / Taillight / Signal Bulb Problem | 45. Check Air Filter |
| 2. Power Steering System Problem | 24. Brake Light Problem | 46. ECO Mode |
| 3. Rear Fog Lights On | 25. Particulate Filter Problem | 47. Downhill Assist On |
| 4. Windshield Wash Indicator | 26. Trailer Connection Error | 48. Cooling System Problem |
| 5. Check Brakes Warning | 27. Air Suspension Problem | 49. ABS Problem |
| 6. Cruise Control Indicator | 28. Anti Sleep System / Lane Assist Warning | 50. Fuel Filter Problem |
| 7. Turn Signal Indicator | 29. Catalytic Converter Problem | 51. Door Open |
| 8. Light Sensor / Rain Sensor Warning | 30. Seat Belt Warning | 52. Hood Open |
| 9. Winter Mode | 31. Parking Light Warning | 53. Fuel Warning |
| 10. Information Indicator | 32. Alternator / Battery Problem | 54. Transmission Problem |
| 11. Diesel Auxiliary Heater | 33. Parking Sensors On | 55. Cruise Control on |
| 12. Ice Warning | 34. Service Warning Light | 56. Suspension Problem |
| 13. Starting System Problem | 35. Adaptive Headlights On | 57. Check Oil |
| 14. Key Not in Car | 36. Headlight Angle | 58. Front Window Defroster |
| 15. Key Low Battery | 37. Rear Spoiler Problem | 59. Open Trunk |
| 16. Warning Distance to Another Car | 38. Sunroof Error | 60. Electronic Stability |
| 17. Push Clutch Indicator | 39. Front Airbag Off | 61. Rain Sensor |
| 18. Push Brake Pedal Indicator | 40. Parking Brake On | 62. Check Engine |
| 19. Steering-Wheel Locked | 41. Water in Fuel Filter | 63. Rear Window Defroster |
| 20. High Beam On | 42. Airbag Off | 64. Windshield Wipers on Automatic |
| 21. Tire Pressure Warning | 43. Mechanical Problem / Electrical Error | |
| 22. Low Beam On | 44. Low Beam On | |



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REQUIREMENT 3c: Explain the messages and alerts that may be displayed on the dashboard/driver information center including maintenance-related reminders.

Notes:

REQUIREMENT 4: Tires

REQUIREMENT 4a: Explain the difference between tire manufacturer's and vehicle manufacturer's specifications and show where to find them.

Notes:

Consider using the Automotive Maintenance merit badge pamphlet for preparation information on this component.

This requirement must be reviewed with your merit badge counselor.

BE PREPARED!

REQUIREMENT 4b: Demonstrate how to check tire pressure and properly inflate a tire. Check the spare tire and make sure it is ready for use.

Consider using the Automotive Maintenance merit badge pamphlet for preparation information on this component.

This requirement must be reviewed with your merit badge counselor.

BE PREPARED!

REQUIREMENT 4c: Explain why wheel alignment is important to the life of a tire. Explain caster, camber, and toe-in adjustments on wheel alignment.

Notes:



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REQUIREMENT 4d: Explain the purpose of the lateral-wear bar indicator.

Notes:

REQUIREMENT 4e: Explain how to dispose of old tires in accordance with local laws and regulations.

Notes:

REQUIREMENT 5: Engine

REQUIREMENT 5a: Explain how an internal combustion engine operates.

Notes:



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REQUIREMENT 5a: Tell the differences between gasoline and diesel engines.

Notes:

REQUIREMENT 5a: Explain how a gasoline-electric hybrid vehicle is powered.

Notes:



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REQUIREMENT 5b: Discuss the purpose of engine oil.

Notes:

REQUIREMENT 5b: Explain the API service code.

Notes:

REQUIREMENT 5b: Explain the SAE number.

Notes:

REQUIREMENT 5b: Explain the viscosity rating.

Notes:

REQUIREMENT 5c: Explain where to find the recommended oil type and the amount of oil to be used in the vehicle engine.

Notes:



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REQUIREMENT 6: Cooling System

REQUIREMENT 6a: Explain the need for coolant in the cooling system.

Notes:

REQUIREMENT 6a: Explain the importance of selecting the correct coolant type for a given vehicle.

Notes:

REQUIREMENT 6b: Explain how to flush and change the engine coolant.

Notes:

REQUIREMENT 6b: Explain how to properly dispose of the used coolant.

Notes:



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REQUIREMENT 7: Fuel System

REQUIREMENT 7a: Explain how the air and fuel systems work together.

Notes:

REQUIREMENT 7a: Explain why it is necessary to have an air filter and fuel filter.

Notes:

REQUIREMENT 7b: Explain how a fuel injection system works.

Notes:

REQUIREMENT 7b: Explain how an onboard computer works with the fuel injection system.

Notes:



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REQUIREMENT 8: Ignition and Electrical Systems

REQUIREMENT 8a: Diagram and explain the parts of one of the following electrical systems.

1. Starting/charging system
2. Hybrid or electric vehicle inverter
3. Lighting system.

Notes:

REQUIREMENT 8b: Explain the engine's firing order.

Notes:

REQUIREMENT 8c: Explain the purpose of the spark gap.

Notes:



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REQUIREMENT 8d: Demonstrate how to safely connect jumper cables to your car battery.

Consider using the Automotive Maintenance merit badge pamphlet for preparation information on this component.

This requirement must be reviewed with your merit badge counselor.

BE PREPARED!

REQUIREMENT 8e: Discuss with your counselor what factors can affect range on an electrified vehicle.

Notes:

REQUIREMENT 8e: Explain the procedure for recharging an electric or plug-in hybrid vehicle.

Notes:

REQUIREMENT 8f: Explain what other vehicle systems are dependent on a reliable electrical system.

Notes:



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REQUIREMENT 9: Drive Train

REQUIREMENT 9a: Diagram the drive train and explain the different parts.

Notes:

REQUIREMENT 9b: Explain the difference between automatic and standard transmissions.

Notes:

REQUIREMENT 9c: Explain the types of automatic transmission fluid.

Notes:



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REQUIREMENT 9d: Explain the types of lubricants used in a standard transmission, and in the differential and transfer case.

Notes:

REQUIREMENT 9e: Explain the difference between front-wheel, rear-wheel, and four-wheel drive.

Front-Wheel Drive:

Rear-Wheel Drive:

Four-Wheel Drive:



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REQUIREMENT 10: Brake System

REQUIREMENT 10a: Explain the brake system (including antilock systems) and how it operates.

Notes:

REQUIREMENT 10b: Explain the differences between disc and drum systems.

Disc System:

Drum System:

REQUIREMENT 10c: Demonstrate how to check the condition of a vehicle's brake system. After checking, make recommendations for repairs (if necessary).

Consider using the Automotive Maintenance merit badge pamphlet for preparation information on this component.

This requirement must be reviewed with your merit badge counselor.

BE PREPARED!



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DO TWO OF THE FOLLOWING (11A, 11B, 11C, or 11D) FOR REQUIREMENT 11

REQUIREMENT 11a: Determine the value of three different vehicles you are interested in purchasing. One must be new, and one must be used; the third vehicle can be new or used. For each vehicle, find out the requirements and cost of automobile insurance to include basic liability and options for collision, comprehensive, towing, and rental car. Using the three vehicles you chose and with your merit badge counselor's assistance, complete the operation/maintenance chart provided in the merit badge pamphlet. Use this information to determine the operating cost per mile for each vehicle, and discuss what you learn with your counselor.

VEHICLE #1 (NEW VEHICLE)

Make

Model

Year

Value

Automobile Insurance costs: (itemize the costs to include basic liability, collision, comprehensive, towing, and rental car):

<i>Expenses</i>	<i>Cost</i>
Operating Costs	
Cost of gas per 10,000 miles driven (cost per gallon of gas ÷ miles per gallon X 10,000)	
Maintenance	
Oil changes	
Air, fuel filters	
Tune-ups	
Other	
Tires	
Rotation and balance	
Wheel alignment	
Ownership Costs	
Insurance (Basic liability, collision, comprehensive, towing, rental car)	
License, registration, taxes	
Miscellaneous Costs	
Car washes, cleaning supplies	
Accessories	
Total Driving Costs (Add all rows)	
Divide total driving costs by total miles driven	
Yearly Cost per Mile	



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VEHICLE #2 (USED VEHICLE)

Make

Model

Year

Value

Automobile Insurance costs: (itemize the costs to include basic liability, collision, comprehensive, towing, and rental car):

<i>Expenses</i>	<i>Cost</i>
Operating Costs	
Cost of gas per 10,000 miles driven	
(cost per gallon of gas ÷ miles per gallon X 10,000)	
Maintenance	
Oil changes	
Air, fuel filters	
Tune-ups	
Other	
Tires	
Rotation and balance	
Wheel alignment	
Ownership Costs	
Insurance (Basic liability, collision, comprehensive, towing, rental car)	
License, registration, taxes	
Miscellaneous Costs	
Car washes, cleaning supplies	
Accessories	
Total Driving Costs (Add all rows)	
Divide total driving costs by total miles driven	
Yearly Cost per Mile	



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VEHICLE #3 (NEW or USED VEHICLE)

Make

Model

Year

Value

Automobile Insurance costs: (itemize the costs to include basic liability, collision, comprehensive, towing, and rental car):

<i>Expenses</i>	<i>Cost</i>
Operating Costs	
Cost of gas per 10,000 miles driven	
(cost per gallon of gas ÷ miles per gallon X 10,000)	
Maintenance	
Oil changes	
Air, fuel filters	
Tune-ups	
Other	
Tires	
Rotation and balance	
Wheel alignment	
Ownership Costs	
Insurance (Basic liability, collision, comprehensive, towing, rental car)	
License, registration, taxes	
Miscellaneous Costs	
Car washes, cleaning supplies	
Accessories	
Total Driving Costs (Add all rows)	
Divide total driving costs by total miles driven	
Yearly Cost per Mile	



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REQUIREMENT 11b: Choose a car cleaner and wax product for a vehicle you want to clean. Explain clear-coat paint and the precautions necessary for care.

Notes:

REQUIREMENT 11b: Clean the vehicle, both inside and out, and wax the exterior. Use a vinyl and rubber protectant (on vinyl tops, rubber door seals, sidewalls, etc.).

THIS REQUIREMENT COMPONENT WILL NOT BE DONE AS A PART OF THE CLASS.

REQUIREMENT 11b: Explain the importance of this protectant.

Notes:

REQUIREMENT 11c: Locate the manufacturer's jack. Use the jack to demonstrate how to engage the jack correctly on the vehicle, then change a tire correctly.

Consider using the Automotive Maintenance merit badge pamphlet for preparation information on this component.

This requirement must be reviewed with your merit badge counselor.

BE PREPARED!

REQUIREMENT 11d Perform an oil filter and oil change on a vehicle.

THIS REQUIREMENT COMPONENT WILL NOT BE DONE AS A PART OF THE CLASS.

REQUIREMENT 11d Explain how to properly dispose of the used oil and filter.

Notes:



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REQUIREMENT 12: Find out about three career opportunities in the automotive industry.

Career Opportunity #1:

Career Opportunity #2:

Career Opportunity #3:

REQUIREMENT 12: Pick one and find out the education, training, and experience required for this profession. Discuss this with your counselor.

Selected Career Opportunity:

Educational Requirements:

Training Requirements:

Experience Requirements:

REQUIREMENT 12: Explain why this profession might interest you.

Notes: