State Fair Community College

BSA Merit Badge Camp

Automotive Maintenance

These steps will need to be completed prior to Saturday September 24th in conjunction with the instruction and hands-on SFCC camp to obtain the merit badge that day.

You may utilize any resources you deem necessary to accomplish this on your own, or you may use the instructional portion of our camp to ask questions and gather information to complete the tasks.

However, if you take that route, it is likely you will not earn your badge that Saturday but can earn it later once the tasks have been completed and confirmed.

1. You will first need to pick a vehicle, it can be your car, your parents or any car you may have access too, preferably a 1996 model or newer, due to the merit badge requirements. You need to locate the owner's manual for the vehicle, typically located in the glove compartment or center console.
2. You will need to identify any hazards you may encounter during automotive maintenance activities, and what you should do to anticipate, help prevent, mitigate, or lessen these hazards. Be prepared to discuss these and how to remedy or avoid them. For example, safety glasses to protest your eyes, gloves to protect your hands, and electrical cords out of the walk way to prevent tripping hazards.
3. 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. Proper use of PPE and things you should not wear while servicing a vehicle, and correct usage of tools.
4. Review the maintenance chart in the owner's manual. Explain the requirements and time limits and why this information is important. For example, why is the oil changed at certain mileage intervals.
5. Identify the location of the fuse box on the vehicle while using the owner's manual
6. Explain the purpose, importance, and limitations of safety belts and passive restraints(airbags).

7. Find out the requirements for your state's emissions and safety inspections (as applicable), including how often a vehicle needs to be inspected. https://dor.mo.gov/motor-vehicle/additional-help-resources.html#safety
8. Explain the importance of registering a vehicle and find out the annual registration fee for renewing your family car's registration.
9. Explain the function of the fuel gauge, speedometer, tachometer, oil pressure, and engine temperature gauge. Point each one out on the instrument cluster (resources; owner's manual and Google, https://www.torque.com.sg/features/how-does-the-fuel-gauge-work/, this website has a search feature that may allow you to find other gauges).
10. 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.
11. Explain the difference between tire manufacturer's and vehicle manufacturer's specifications and show where to find them. (Why does the tire have a higher pressure then the manufacture recommends)
12. Explain why wheel alignment is important to the life of a tire. Explain caster, camber, and toe-in adjustments on wheel alignment. (https://www.moogparts.com/parts-matter/five-ways-bad-alignment-wrecks-tires.html)
13. Explain the purpose of the lateral-wear bar indicator. (https://www.prioritytire.com/blog/tire-wearbars/#:~:text=Wear%20indicator%20bars%20are%20placed,tires%20need%20to%20be%20replaced.)
14. Explain how to dispose of old tires in accordance with local laws and regulations. (https://dnr.mo.gov/waste-recycling/reduce-reuse-recycle/what-to-do-with-specific/scrap-tires)
15. Explain how an internal combustion engine operates. (https://www.youtube.com/watch?v=ZQvfHyfgBtA&t=330s)
16. Tell the differences between gasoline and diesel engines. Explain how a gasoline-electric hybrid vehicle is powered. (https://www.google.com/search?q=how+a+hybrid+engine+works+drive.com.au&rlz=1C1GCEB_enUS927US927&oq=how+a+hybrid+engine+works+drive.com.au&aqs=chrome..69i57j33i160j33i22i29i30.17934j0j15&sourceid=chrome&ie=UTF-8#kpvalbx=_OrGfYob3JsSDwbkP0-uxyAc19)
17. Discuss the purpose of engine oil. Explain the API service code, the SAE number, and the viscosity rating. (https://www.castrol.com/en_us/united-states/home/motor-oil-and-fluids/engine-oils/oil-viscosity-explained.html)
18. Explain where to find the recommended oil type and the amount of oil to be used in the vehicle engine. (hint reference in glovebox or center console)

19. Explain the need for coolant in the cooling system, and the importance of selecting the correct coolant type for a given vehicle. (https://www.popularmechanics.com/cars/how-to/a91/1272436/#:~:text=These%20functions%20keep%20the%20engine,can%20damage%20the%20cooling%20system.)
20. Explain how to flush and change the engine coolant in the vehicle, and how to properly dispose of the used coolant. (https://www.youtube.com/watch?v=XdyZDw7jOP0&list=PLVpN23N8UVgQ1bbQduxIBqhghMuka95pv , https://knowhow.napaonline.com/how-to-dispose-of-antifreeze/)
21. Explain how the air and fuel systems work together and why it is necessary to have an air filter and fuel filter. (https://en.wikipedia.org/wiki/Air%E2%80%93fuel_ratio#:~:text=The%20stoichiometric%20mixture%20for%20a,grams%20of%20air%20are%20required , https://www.championautoparts.com/Parts-Matter/automotive-repair-and-maintenance/signs-of-a-dirty-engine-air-filter.html)
22. Explain how a fuel injection system works and how an onboard computer works with the fuel injection system. (https://www.aa1car.com/library/fuel_injection_basics.htm)
23. Diagram and explain the parts of the electrical system. (http://www.micro-tronik.com/learning/technical-information/automotive/repair-basics/electronic-basics/electrical-circuits/)
24. Explain the engine's firing order. (https://www.engineeringchoice.com/firing-order/#:~:text=Firing%20order%20in%20an%20engine,as%20it%20is%20very%20less.)
25. Explain the purpose of the spark gap. (https://ngksparkplugs.com/en/resources/gapping-and-indexing)
26. Diagram the drive train and explain the different parts. (https://www.artofmanliness.com/skills/manly-know-how/gearhead-101-the-drivetrain/ watch video in the article for better explanation of how a differential works)
27. Explain the difference between automatic and standard transmissions. (https://www.youtube.com/watch?v=auQgOtveQi0)
28. Explain the types of automatic transmission fluid. (https://www.cartechbooks.com/blogs/techtips/autotransfluid)
29. Explain the types of lubricants used in a standard transmission, and in the differential and transfer case. (https://www.wolflubes.com/EN_EU/Blog/2017/the-basics-of-lubricants-the-guide-to-understanding-transmission-fluids-gear-oil.aspx)
30. Explain the difference between front-wheel, rear-wheel, and four-wheel drive. (https://www.newroads.ca/blog/understanding-drivetrain-rwd-fwd-awd/#:~:text=The%20four%20different%20types%20of,4WD%20(4%20wheel%20drive))
31. Explain the brake system (including antilock systems) and how it operates. (https://www.youtube.com/watch?v=KJ0koDXk6PY , https://www.wagnerbrake.com/technical/parts-matter/automotive-repair-and-maintenance/guide-to-abs-brakes.html)

32. Explain the differences between disc and drum systems. (https://www.carparts.com/blog/drum-brakes-vs-disc-brakes-learn-their-difference/#:~:text=The%20primary%20difference%20between%20disc,more%20to%20it%20than%20that.)
33. Find out about three career opportunities in the automotive industry. Pick one and find out the education, training, and experience required for this profession. Discuss this with your counselor, and explain why this profession might interest you.

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While attending this camp on campus at State Fair Community College, some of the areas from the prework section will be explained will be in a classroom sitting.

Along with the pre-work completed before the camp the hands-on portion may be completed during the camp.

For the hands-on portion the scouts will be shown and demonstrate knowledge in the following areas:

1. Demonstrate how to check the following:
   A. (1) Brake fluid
   B. (2) Engine oil
   C. (3) Coolant
   D. (4) Power steering fluid
   E. (5) Windshield washer fluid
   F. (6) Transmission fluid
   G. (7) Battery fluid (if possible) and condition of the
   H. battery terminals
2. Locate the fuse boxes; determine the type and size of fuses. Demonstrate the proper replacement of burned out fuses.
3. Demonstrate how to check the condition and tension of belts and hoses.
4. Check the vehicle for proper operation of its lights, including the interior overhead lights, instrument lights, warning lights, and exterior bulbs.
5. Locate and check the air filter(s).
6. Demonstrate how to check tire pressure and properly inflate a tire. Check the spare tire and make sure it is ready for use.
7. Demonstrate how to safely connect jumper cables to your car battery.
8. Demonstrate how to check the condition of a vehicle's brake system. After checking, make recommendations for repairs (if necessary).