Roadside Survival

Description
For most people a roadside breakdown can be very frustrating and sometimes even scary to the point of feeling totally helpless. This Activity Plan will describe what to do in the three most frequent situations that cause a roadside breakdown and will help students learn a few basic skills to “get you home.”

Additional
Tasks that are shown to the students must be pre-tried by the teacher to ensure successful delivery.

Lesson Outcomes
The student will be able to:
• Establish a roadside safety perimeter
• Safely change a flat tire on the roadside
• Boost a car with a dead battery
• Perform a temporary repair of a burst radiator hose

Assumptions
• Students will have little or no prior experience of vehicle care or maintenance.
• The teacher will have a good working mechanical knowledge and skills appropriate to teaching the necessary lessons.

Terminology
Terminology used will be taught to students as required by the teacher.

Estimated Time
Each session 30 minutes (3 × 30 minutes)

Recommended Number of Students
20, based on the BC Technology Educators’ Best Practice Guide

Facilities
• Lessons may be taught indoors or outdoors, as preferred.
• To realistically demonstrate most of these skills it is recommended they be done outdoors.
• More than one vehicle would be an asset, depending on the class size.
Activity 1: Change a Flat Tire

Tools
- Lug nut wrench
- Vehicle jack and any attachments
- Wheel chocks

Materials
- 12" length of pipe to extend the vehicle’s own lug nut wrench
- Flares and/or warning triangles
- The spare wheel for the vehicle being used for the demonstration

Activity
1. Position the vehicle in a way to simulate traffic passing as if on a highway or road. Place the vehicle in park (if automatic) or 1st gear (standard) and apply the emergency parking brake.

   Remember, it is YOUR responsibility to protect yourself from passing cars. Many drivers have been killed while changing a flat tire because they didn’t protect themselves from traffic.

2. Ensure the vehicle is positioned in such a way as to block any traffic from hitting the person changing the tire. For example, park the car on an angle to keep the person changing the tire protected from passing vehicles.

   Figure 1—Positioning a vehicle with a flat tire to block any traffic from hitting the person changing the tire while changing it

3. Place the warning devices to give traffic sufficient warning of a traffic hazard (Figure 2). Discuss options of emergency flashers, etc., for nighttime safety concerns.
4. Demonstrate the use of the vehicle factory jack before installing it under the vehicle, and how to select the proper position to place the jack (usually a few inches inboard of the wheels). All vehicle owner’s manuals contain instructions on how to operate the vehicle jack.

5. Install wheel chocks (Figure 2) before removing lug nuts on a wheel, so as to stop the wheel from rocking while nuts are being removed.

6. Install the vehicle lug nut wrench as needed to begin the process of removing the lug nuts.

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Figure 2—Emergency warning triangles

Figure 3—Lugnut wrench

Figure 4—Cross lugnut wrench
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7. Set up the car jack as a fulcrum under the lug nut wrench, and add the pipe for additional leverage (Figure 5).

8. Install wheel chocks on any wheel not being raised.
9. Loosen the lug nuts.
10. Use the spare wheel as a safety device under the car should the jack fail.
11. Move the vehicle jack to the lifting position and raise the vehicle.
12. Change the flat tire, replace the lug nuts and tighten as required. Note: Students may benefit from a safety discussion pertaining to the use of tapered lug nuts and torque patterns. See Activity Plan 5: Nuts and Bolts for more detailed information.

**Information on Wheel Lug Nuts and Torque**

Wheel lug nuts need special consideration, as pulling wheels on and off is an everyday occurrence in an automotive shop. In order to avoid damage to the wheel or vehicle when replacing wheels, there are two things to be concerned about. Failure to follow the steps below could result in expensive replacement of wheels, repairs to the vehicle or injuries due to the wheel falling off while driving.

1. Most wheels are held on by tapered lug nuts. Ensure that the tapered side contacts the wheel first. If you look at the wheel you will see a corresponding taper to accept the tapered nut. The tapered side must point in toward the middle of the vehicle. This will ensure the wheel will be centred and the lug nuts stay tight.
2. Lug nuts must be torqued in sequence with a torque wrench or a torque stick, to the manufacturer’s specifications. This will ensure that the wheel or rim will not be damaged or warped due to incorrect tightening or overtightening. Figure 7 indicates the torque sequence, depending on the number of lug nuts. Simply tighten the lug nuts in the order indicated. A good practice for torquing is to snug all the nuts up first, then do the final tightening to the proper torque using the proper sequence.

![Wheel nut lug torque sequence](image)

**Figure 6**—Tapered lug nut

**Figure 7**—Regular flat nuts

**Figure 8**—Wheel nut lug torque sequence
Activity 2: Boost a Dead Battery

Tools

- Booster cables
- Safety goggles

Resources

What You Need to Know About Boosting a Car (Canadian Tire)
www.youtube.com/watch?v=7cMS9thXVNE

Activity

Open the vehicle hood. Using a discharged battery enhances the demonstration by adding realism. Safety protocols dictate that all students should be wearing safety glasses from this point forward.

If a second vehicle is used to boost the “dead” vehicle, it is wise to disconnect the negative cable of the boosting vehicle to avoid damage to its computer systems.

Make sure both vehicles have everything electrical turned off and the ignition keys are removed, driver’s window is open and doors are all closed (to put vehicle systems in sleep mode).

Install the booster cables in the following order:

1. First, the positive cable (red +) is connected to the dead vehicle battery positive post (red +).
2. The other end of the positive booster cable (red +) is connected to the good vehicle battery positive post.
3. The negative (black –) booster cable is connected to the good battery negative terminal.
4. The other end of the negative (black –) cable is connected to any clean solid metal (steel) component on the dead vehicle engine or engine mounts.

Never connect a booster cable to a dead vehicle battery negative terminal (hydrogen gas fumes are explosive and may be present around a recently discharged/charged battery). If a spark is initiated near a battery, a serious explosion could occur.

Remove the cables in the reverse order, taking care not to make contact when doing so.
Activity 3: Temporary Repair of a Burst Radiator Hose

Tools

- Several rolls of electrical tape (black tape)
- Scissors or a sharp knife
- Cleaning cloth and water to wash and dry the radiator hoses
- Heavy duty garbage bag (to demonstrate carrying water for radiator)

Activity

Always check first to see whether the cooling system is hot. If there is any heat coming from the radiator or the radiator hose, wait until the cooling system has cooled completely before making any repairs.

Never remove the cap if the system still has pressure.

1. Find a cloth or glove and slowly remove the radiator cap. Be careful of any hot water or steam that might be present. Allow the cooling system to cool slowly and vent any steam. DO NOT add water at this point.

2. Clean and dry the hose about 2" on either side of the burst section all around the hose. It’s important for it to be clean and dry or the tape will not stick (Figure 8).

3. Start a wrap of black electrical tape about 1–2" before the split section of the hose. Continue to wrap the tape around the hose, being sure to overlap each wrap about a half width over the last wrap (Figure 9). Do not stretch the tape when wrapping; just use the resistance of the roll of tape as it unwraps.

Figure 9—Clean and dry the hose about 2" on either side of the burst section
4. Continue about 1–2” past the opposite end of the split. Now return the same way back to the start of the split. Additional wraps can be done if extra strength is required. Use a sharp knife or scissors to cut the tape or the end will not stick and it will unravel (Figures 10 and 11). DO NOT pull the tape apart when finished.

5. Reinstall the hose if it was removed.

6. Fill the cooling system with water. If a jug is not available to carry water to refill the radiator, a small, strong garbage bag works well. A wheel hubcap, a baseball cap and many other things may also work.

7. Leave the radiator cap loose—turn the cap until it latches on the first click but is still not tight. This will prevent the cooling system from building up pressure. Excessive pressure is undesirable, as it will push the tape off the split section.