Prep my ride

GRADE 11

Buying a car is a huge milestone for many people but the unexpected costs of owning and operating one can be surprising. In this lesson, students explore both fixed and variable expenses associated with owning a car.

Subject

MBF3C – Foundations for College Mathematics

*This lesson could also be adapted and used in any automotive class

Suggested timing

70 minutes

Financial literacy objectives

At the end of this lesson, students will:

- create complex personal or family budgets for different life stages;
- analyze financial implications of car ownership;
- develop a personal budget based on current costs of goods and services.

Curriculum expectations

Mathematics, grades 11 and 12 (2007)
Foundations for College Mathematics (MBF3C)

Personal finance

- Interpret information about owning and operating a vehicle and solve problems involving the associated costs.
- Solve problems, using technology (e.g., calculator, spreadsheet), that involve the fixed costs (e.g., license fee, insurance) and variable costs (e.g., maintenance, fuel) of owning and operating a vehicle.

Assessment

Collect: Scavenger hunt car budget.

What you need

- Brown paper lunch bags or small boxes
- Sticky notes
- Catalogues and promotional materials from auto manufacturers
- Scissors and glue
- Access to a computer lab or internet for research

Minds on

Group work
In groups of 3 to 5, have students brainstorm the "obvious" and "hidden" costs of car ownership.

Give a brown paper lunch bag to each group. Using a glue stick and automotive magazines (or their own artistry), have students decorate the outside of the lunch bag with images of the obvious costs of car ownership. Examples might include photos of cars they like, a drawing of a gas pump and so on.

Next, instruct students to fill the inside of the lunch bag with magazine images and/or sticky notes that represent any less obvious costs of car ownership. Examples might include driver's licence, driving lessons, insurance, maintenance, etc.

Have the groups trade bags and compare their findings.

Context for learning
Bill Fold is a character who is constantly getting himself into financial scrapes. Use the scenario below to provide students with a context for learning.

Bill Fold is ready to get his hands on a car but he isn't prepared for the costs required to pay for and maintain it! Help Bill prep for his new ride.

Action

Instructions
Write the headings *Fixed Expenses* and *Variable Expenses* on the board and use examples to define each term.

Call students to the board and have them place their sticky notes and other materials from the lunch bags into the correct expense category.

Activity: Scavenger hunt
Explain that the next task will involve a scavenger hunt and the completion of a spreadsheet in order to budget for car-related expenses over a 5-year period. (You can decide whether this will be an individual or group activity.)

Present students with copies of the Scavenger hunt rubric (Appendix A).

If necessary, provide students with a brief refresher on the use of spreadsheets. (Note: If a spreadsheet computer program is available, this technology integration is recommended).

Distribute Scavenger hunt spreadsheet template (Appendix B) as a guide to help students complete their own spreadsheet. Involve students in noting what costs they predicted and which are new to them.

Action
(cont'd)

Research
Instruct students to research (using the Internet or other sources) the current local costs to fill in the spreadsheet. If using Excel (or another spreadsheet program), remind or show students where to insert formulas in order to calculate totals.

If students are unfamiliar with the concepts, or a computer lab is not available to research costs, distribute Tip sheets (Appendices C and D). These can be modified in order to provide students with an at-a-glance understanding of the frequency of maintenance and repairs. Use of the Tip sheets will also shorten the duration of the lesson, allowing it to be completed in one period.

Extension: Provide students with copies of Backgrounder: Common sense guidelines for maintenance costs (Appendix E) and Backgrounder: Factors affecting costs (Appendix F) to give students further insight into cost differentials and ways to effectively manage vehicle costs.

Consolidation/ debrief

Gallery walk and discussion
Display the finished spreadsheets on the board and encourage students to engage in a gallery walk to compare their findings.

Conduct a large-group discussion focused on the different findings. Include questions about differences in costs noted by the students.

Engage students with the questions identified below and ask that students record answers in reflective journals:

1. How do vehicles compare to other types of investments? Do they hold their value, increase or decrease in value?
2. Given the numerous and costly expenses required to operate a car, what are some alternatives to owning a car? Weigh the pros and cons of the alternatives you identify.
3. When researching insurance rates, you may have noted that boys often pay more than girls. Is this fair?

Scavenger hunt rubric

Student name: _____

Category	Level 1 (50%-59%)	Level 2 (60%-69%)	Level 3 (70%-79%)	Level 4 (80%-100%)
Knowledge/ understanding				
Fixed costs Includes all appropriate fixed costs (at correct amount) for each year (5 marks per year).	Calculates with many errors showing limited understanding.	Calculates with some errors showing some understanding.	Calculates with only minor errors showing considerable understanding of concepts.	Calculates accurately and efficiently demonstrating thorough understanding of concepts.
Thinking				
Comparisons Compares values to class and identifies / discusses differences.	Provides limited reasoning when discussing comparison of costs.	Provides some reasoning when discussing comparison of costs.	Discusses cost comparisons using some complexity and details.	Discusses cost comparisons considering many factors within the context of the problem, making complex discussion points.
Insurance, tires, fuel Investigates car-specific costs, determines appropriate costs and calculates accurately for each year required.	Calculates with many inappropriate costs and many errors showing limited understanding.	Calculates with some inappropriate costs and some errors showing some understanding.	Calculates with only a few inappropriate costs / minor errors showing considerable understanding of concepts.	Calculates accurately and efficiently with appropriate costs demonstrating thorough understanding of concepts.

Scavenger hunt rubric (cont'd)

Category	Level 1 (50%-59%)	Level 2 (60%-69%)	Level 3 (70%-79%)	Level 4 (80%-100%)
Communication				
Spreadsheet is formatted as instructed, organized, and has an effective layout. Labels and calculations are clear and free of errors.	Communicates with a limited degree of effectiveness. More than 4 errors in formatting, spelling, mathematics terminology. Summarizes information using limited organization and clarity.	Communicates with a moderate degree of effectiveness. Student makes 3 - 4 errors in formatting, spelling, mathematics terminology. Summarizes information using some organization and clarity.	Communicates with a considerable degree of effectiveness. Student makes 1 - 2 errors in formatting, spelling, mathematics terminology. Summarizes information with considerable organization / clarity.	Communicates with a high degree of effectiveness. Student makes no errors in formatting, spelling, mathematics terminology. Summarizes information using thorough organization and clarity.
Application				
Variable costs Calculates all appropriate costs (at correct amount) for each year.	Calculates with many inappropriate costs and many errors showing limited understanding.	Calculates with some inappropriate costs and some errors showing some understanding.	Calculates with only a few inappropriate costs / minor errors showing considerable understanding of concepts.	Calculates accurately and efficiently demonstrating thorough understanding of concepts.

Comments: _____

_____

_____

Mark: _____

Scavenger hunt spreadsheet template

Category	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Fixed costs						
Driver's license renewal						
Vehicle number plate(s)						
Emission test						
Vehicle safety inspection						
License plate validation sticker						
Insurance						
Financing						
Rustproofing						
Variable costs						
Gas						
Tire pressure						
Windshield fluid						
Oil						
Seasonal maintenance						
Seasonal tire purchase						
Tire rotation						
Tire balance						
Windshield wiper replacement						
Brake service						
Replace muffler						
Repair or replace exhaust pipes or gaskets						
Brakes – repair pads or rotors						
Engine diagnostic and tune-up						
Tire replacement						
Wheel alignment						
Timing belt replacement						
ANNUAL TOTAL						

Tip sheet for fixed costs

Fixed ownership costs

(Annual or monthly fees that do not change with usage of car)

Item	Cost + 13% HST	Frequency	Notes
Obtain G1 diver's license knowledge test, G1 road test, and five year license	**$ 125**	One time	• Renew license every 5 years. • No tests required until 80 years old or over, then every two years. • If you already have your license, don't include this cost in your calculations. If you don't have your license, you must get it before you can drive your car!
Driver's license renewal	**$ 75**	Every 5 years	Must pay any outstanding traffic tickets or other fines before renewal is allowed.
Vehicle number plate(s)	**$ 20**	One time	Number plates bought at time of car purchase; plates stay with car owner, not car.
Emission test	**$ 35**	Time of purchase for used cars only Every 2 years – if car > 7 years old	• Ontario Drive Clean program • Seller may include cost in sale price. • Failed emission test indicates - exhaust leak, failed catalytic converter or poorly running engine.
Vehicle safety inspection	**$75 - $125**	Time of purchase for used cars only	• Varies – depends on hourly rate for the mechanic. • Seller of used car may include in sale price.
License plate validation sticker Southern Ontario residents	**$37 - $74**	Annual fee	Allows you to drive anywhere in Ontario. Fee depends on your community.
Municipal vehicle tax	**$ 60**	Annual fee	• Not all municipalities have a vehicle tax. • Typically, larger cities might charge a vehicle tax to help cover cost of roads, etc.
Insurance	**Varies** **Call or check Internet-based quotes**	Annual fee (can pay once per year or smaller monthly amounts)	Insurance companies calculate your risk of getting into an accident or making a claim and charge each person a different annual fee based on the items below: • **Car:** value, age, make/model, frequency/ease of (or demand for) theft. • **Driver:** age, training, experience, record, gender. • **Other:** km driven per year, residential address of owner, frequency of prior claims, number of drivers, level of coverage (collision, fire/theft, other) and amount of deductible against any claim (higher deductible = cheaper rates).
Financing: interest on car loan or line of credit used to pay for your car Note: Financing cost will include interest plus cost of car	**Percentage interest rate outlined in your loan**	Interest paid as part of regular loan repayment – could be monthly, bi-weekly, or weekly	• Interest rates for car loans or a line of credit depend on the prime interest rate in effect at the time of the loan, credit rating, lender policies. • Interest is charged against the amount owing (principal) on your car loan. The more money owing, the more interest you pay.

Tip sheet for fixed costs (cont'd)

Item	Cost + 13% HST	Frequency	Notes
Rust proofing / prevention	**$75 - $120**	Annual treatment	• Special coating (fluid) sprayed onto the underside (and inside doors and other spaces) to prevent rust from forming.

Tip sheet for variable costs

Variable operating costs: Minor / routine maintenance

The expenses below are variable (depend on usage – km driven or time).

- Assuming an average distance per year of 20,000 km, the following costs are virtually certain for any car within the first 1 - 3 years of ownership.
- The costs are listed from most frequent (gas – add weekly) to least frequent (brake service every 1 to 3 years).
- Used cars will require greater costs sooner, while new cars should have fewer costs in the first years of ownership.
- Oil changes, tire maintenance and seasonal inspections are required for all cars – new or used.
- The items listed below are general guidelines only and represent the minimum costs required to keep your car safe and reliable. Performing more maintenance sooner will increase performance, extend the lifetime of parts and maintain the value of your car.
- These guidelines are not a substitute for the professional work of an automotive technician who can address specific needs and issues for your particular car (make and model), driving conditions, and driving habits. DIY (Do It Yourself) indicates procedures or actions that owners can perform themselves.

Items	Cost + 13% HST	What is required	Frequency	Varies with	Notes
Gas	**$1.15 - $1.20 per litre** (price in March 2012).	Purchase gas	As required. In winter, best not to let tank drop below half to avoid condensation, which can lead to frozen fuel lines	• Distance driven • Speed • Tire Inflation • Car type, condition and age	• Distance driven is the main factor for gas costs. • Driving faster burns more gas per km driven. • Car not tuned-up or in bad condition burns more gas. • Fuel efficiency by car and city vs. highway driving.
Air pressure in tires	**$0.50 - $1.00** for air pump use.	DIY - 4 tires checked with tire gauge, add air as needed	Check each time you buy gas, or every 2 weeks	Air temperature change +/- 5.5 ° C equals 1 PSI of tire pressure.	• Distance driven, age/type of tire affects air seal on tire. • Air in tire expands in warm weather, contracts in cool weather. • Properly inflated tire is safer and saves on gas. • Improperly inflated tire is unsafe and wears out quickly.
Windshield washer fluid	**$3.00 - $5.00 for 4L container**	DIY - Fill reservoir in engine area	As required, more frequently in winter	• Distance driven • Weather • Wiper blades	• Winter driving (dirty spray and salt) requires frequent windshield cleaning. Usage varies directly with frequency of use and weather conditions. • A minimum of 3 containers per year.

Tip sheet for variable costs (cont'd)

Items	Cost + 13% HST	What is required	Frequency	Varies with	Notes
Oil	**$30 - $50** Varies by mechanic or if part of service package.	Remove (and dispose of safely) old oil and add new oil. Change oil filter.	Min. 4 times per year OR twice in addition to 2 Seasonal maintenance packages.	• Time or distance driven • 3 months or 5000 km	• Less frequently for newer cars, higher quality (synthetic) oil and highway driving.
Seasonal maintenance package (includes oil change)	**$30 - $70** (Cost increases with more items checked).	Oil change and multi-point inspection and road test.	Minimum 2 per year - every fall and spring.	Season and distance driven	• Seasonal maintenance involves an oil change along with a multi-point safety and maintenance inspection (brakes, tires, exhaust, belts, hoses, filters, fluids, lights, horn, battery levels, heating/cooling, starter and a road test).
Seasonal tire purchase	**$100 – $175** (Cost depends on size and type of tire) Steel rims **approx. $45 - $60** Tire change approx. $50 per season	4 tires: should be same type, size, and condition – see codes on the side of the tire. 4 steel rims optional but recommended.	Once: before winter.	Distance driven (Rated for approx. 100 000 km of driving)	• Almost all cars come with only one set (all season) of tires. • Buying winter tires and steel rims is a significant upfront cost. • Storage and installation costs may add to fees. • Some provinces require snow tires in winter.
Tire rotation	**$10 - $15 per tire**	4 tires rotated: back/front and left/right.	Every 20,000 km or twice a year (assume 20,000 km annually).	Distance driven.	• Ensures even tire wear – rotate back to front/left to right. • It is possible to remove and rotate the tires yourself, although you need proper equipment and some skill.
Tire balance	**$10 - $15 per tire**	Spin tire and add weights to balance on rim.	Every 25,000 km or yearly / as required.	Distance driven.	• Prevents wheel from wobbling, car handles better, tire lasts longer, prevents damage to steering system.
Windshield wiper replacement	**$8 - $20 per blade**	DIY - Remove old blades and install new ones.	Every 1 – 3 years depending on usage.	Usage, weather, quality of blade.	• A clean windshield is an important safety feature. • Quality varies.
Brake service	**$100 - $150+** for front or back (brakes are serviced by location as both front brakes work together).	Inspect, lubricate, calibrate, brake fluid check/ replace other parts.	Min. every 1 – 3 years, very specific to car and car owner.	• Distance driven • Regular maintenance performed • Driving conditions and habits	• Brakes are the most important safety feature and should be carefully monitored. • Regular maintenance can extend brake life.

Tip sheet for variable costs (cont'd)

Variable operating costs: Common (periodic) repair expenses

The expenses below are variable (depend on usage – km driven or time).

- The following expenses should not be expected during the first year of ownership of a new or quality used car.
- For used cars, repair expenses depend on the age of the parts. If a used car comes equipped with a new exhaust system, then the repair time frame will be similar to that of a new car. If the exhaust system is 2-3 years old when the car is purchased, then repairs may be required within the first year of ownership.
- When purchasing a used car, request the service records, or at least ask the former owner to document when and what was replaced. This information allows the new owner to plan for recurring (periodic) repairs to the exhaust and brake systems.
- Additional preventative maintenance expenses that could be performed (e.g., coolant and other fluid system flush) depending on the make/model.
- Vehicles with an automatic transmission may begin to experience transmission problems as they age. Transmission repair/replacement is very costly and is related to the make/model of the car, driving habits, and seemingly random events.
- Vehicles with a standard transmission will require a new clutch at some point during the life of the car. This is a major expense and the status of the clutch depends greatly on make/model and driving habits. Depending on driving style, a clutch may last 15 years or only 5 years.
- Car owners should take a driver training course (especially for standard transmission cars), read the owner's manual, and read about car maintenance in order to extend the life of the car and to minimize repair costs over the lifetime of the car.

Items	Cost + 13% HST	What is required	Frequency	Varies with	Notes
Replace muffler	**$225 - $350**	Remove old (rusted or damaged) part and add new one	Approx. every 2 – 5 years depending on many factors.	• Distance driven • Driving habits • Quality of part	• Mufflers fail due to rust and holes or leaks – especially at connection points called gaskets. • Many factors can lead to muffler failure, ranging from the environment to driving habits.
Repair or replace exhaust pipes or gaskets	**$150 - $250**	Remove old (rusted or damaged) part	Approx. every 2 – 5 years depending on many factors.	• Distance driven • Driving habits • Quality of part	• Driving habits affect life of exhaust pipes and gaskets.
Brake – repair pads or rotors	**$150 - $350 per set (front set or back set)**	Remove old (rusted, worn or damaged) part	Approx. every 2 – 5 years depending on many factors.	• Distance driven • Driving habits • Quality of part	• Brakes also suffer from short drives or infrequent use.

Tip sheet for variable costs (cont'd)

Items	Cost + 13% HST	What is required	Frequency	Varies with	Notes
Engine diagnostic and tune up	**$100 - $250+** depending on parts and labour needed.	Inspect, clean, repair/replace parts, wires, spark plugs, filters, fuel injectors	If Check Engine Light is on, or if car is not running well. If spark plugs need to be replaced, 50 000 – 75 000 km or longer, every 2.5 – 4 years.	• Distance driven • Regular maintenance performed • Driving conditions and habits (fast, slow, wet, cold or hot weather)	• Read / follow the manufacturer's schedule for maintenance, especially if you have a warranty. • Modern spark plugs (with platinum tips) cost more but last a long time, some over 100 000 km.
Tire replacement	**$100 - $200** per tire – varies depending on size, car type, brand of tire.	Best to replace all tires at the same time, min. 2 replaced (so back or front always match)	Based on tire, many are rated for 100 000 km – approx. 4 – 5 years of continuous driving.	Driving conditions, habits and speed, use of brakes.	• Inspection each oil change (usually free). • Replace when tire tread is 2/32 of an inch or less, or if leaking or damaged. • Proper inflation and rotation can extend tire life.
Wheel alignment	**$90 - $120**	Align / adjust steering systems	Inspect every 25 000 km (with road test), and align at least every 3-4 years.	Distance driven or repairs	• Align when installing new tires or suspension parts.
Timing belt replacement	**$850 - $1200**	Replace main engine (timing) belt; replace water pump and other required parts in the area of the engine that is stripped down	Based on car design, often approx. 100 000 km. Approx. every 5 years.	• Distance driven • Car model • Parts required	• Timing belt replacement is very expensive due to the time (labour costs) required to remove and replace parts.

Backgrounder: Common sense guidelines for maintenance costs

1. **Shop around:** For major repairs, get several estimates.

2. **Caveat emptor:** *'Let the buyer beware'* – When something seems too good to be true – such as an extremely low price or a very good deal – it probably is! If you don't feel comfortable, you feel pressured, or if you just have a bad feeling about something, follow your instincts. Get a second opinion or simply walk away.

3. **References and ratings:** To find a reliable mechanic for your car, ask friends for references, check ratings online, or check the Better Business Bureau ratings. Award-winning technicians will proudly display newspaper stories or awards they have received for excellence.

4. **Certified:** Automotive repair is government regulated and certified automotive technicians must complete an apprenticeship and pass exams before being allowed to work on your car. Automotive technicians are highly skilled, and a *red seal automotive technician* will proudly display his or her certificate in the automotive shop or offices. If you don't see these certificates on display, ask to confirm that the person working on your car is a qualified automotive technician – what people commonly call a mechanic.

5. **Build relationships:** As a car owner, find and build a long-term relationship of trust and respect with an excellent mechanic. You and your car will benefit from having the same dependable person working on your car; someone who understands your particular concerns and needs.

6. **Ask questions:** You rely on your car for transportation and you expect safety for you and your family. Any reputable business should be happy to answer your questions, provide you with more information, explain what needs to be done and give you options/cost estimates. The Chilton Labour Guide provides baseline time estimates for doing repairs.

7. **Read/research/active car ownership:** As a car owner, you can save money and increase your satisfaction by learning more about your car:
   - Be attentive and informed about problems as they emerge. Listen/watch for strange noises/smells or warning lights as they appear.
   - Check periodically for recall notices from the manufacturer. Remind your mechanic to check for any recalls each time you bring in your car for service.
   - Buy a repair manual from the car dealer or automotive store and follow the recommended maintenance and repair procedures.
   - Read your ownership manual and follow the suggested practices and guidelines.

8. **An ounce of prevention is worth a pound of cure:** Performing small, proactive and inexpensive maintenance and monitoring of your car can prevent major problems from developing.

Backgrounder: Factors affecting costs (cont'd)

Automotive repair costs can vary widely for many different reasons.

- **Location:** The labour rate in a small town could be $50 - $70 per hour, while these costs could be doubled in a large city.

- **Dealer vs. independent:** Automotive dealerships such as Ford and Honda usually charge more for labour and parts. However, dealer-certified technicians may have more specialized training. In addition, dealer-certified parts are certified for your car brand and may have a longer warranty.

- **Domestic vs. imported car:** Cars manufactured in Canada (or North America) may be cheaper to service than imported cars (from Europe or Asia). However, this is only a guideline and depends on the type of car. For example, some Honda cars are made in Alliston, Ontario. Common or average costing cars (e.g., Honda Civic) are cheaper to repair (labour and parts) than expensive imported cars (e.g., SAAB or Volvo). Imported cars, particularly from Europe, are not as common and may require specialized parts. Technicians who are qualified to service imported cars may only work at automotive dealerships.

- **Quality of parts:** There are varying degrees of quality and cost when it comes to common and major car parts. There are low-cost/lower-quality and high-cost/higher-quality mufflers, exhaust pipes, brakes and tires. It is often said that you get what you pay for, and it is often true that more expensive parts will last longer. Ask your mechanic, read about warranties and choose the parts that make sense for your budget and needs. Saving money on brakes might seem like a good idea, but in terms of safety and peace of mind, you might consider installing a higher quality option. All car parts sold must meet minimum safety standards; however, higher quality parts will last longer, ensuring longer-term safety and ultimately saving you money.

- **Repairs for safety vs. repairs for reliability or preference:** Some repairs MUST be done and are not optional. Bald tires are unsafe and will cause an accident. An exhaust leak might result in the inhalation of toxic gases while driving. Other issues, such as a belt that makes noise or shocks that are old (resulting in a less comfortable ride) could be optional if they don't make you unsafe. A battery that is old is not unsafe but could make starting your car unreliable in the winter when it is cold outside. When taking your car to the garage, make sure to ask the technician to organize repairs by urgency. You must make safety repairs but you could save money or manage your expenses/budget if you decline or delay some optional service work. Eventually old parts wear out, and repairing them later might cost more money.
  Talk to your mechanic about the pros and cons of doing repair work later if the repair is considered optional.

- **Car life considerations:** There are always opportunities to spend more money on your car. However, a car is a bad investment. Its value declines significantly the moment you drive it off the lot (this is called depreciation). Cars always drop in value! You could spend $2,000 repairing your car without increasing its resale value. If you plan to own your car for only one more year, don't install the most expensive or long-lasting parts when cheaper parts will hold you over.