Lesson Plan
The True Cost of Owning a Car

Objective
Thoroughly understand the true cost of purchasing and maintaining a car with an emphasis on smart budgeting to cover unexpected costs.

Students will be able to:

- Calculate their monthly payment based on a financing payment option
- Estimate vehicle registration costs, title fees, and sales tax
- Understand the need for and cost of car insurance
- Accurately determine and budget for common maintenance costs
- Estimate monthly fuel consumption and budget

Consumer Math Standards and Benchmarks
Common Core State Standards Initiative (CCSSI): The CCSSI was developed by the Federal Government in an attempt to standardize learning practices across states and to assist students in being better prepared for college and higher education.

CCSSI Mission Statement: The Common Core State Standards Initiative provide a consistent, clear understanding of what students are expected to learn, so teachers and parents know what they need to do to help them. The standards are designed to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers. With American students fully prepared for the future, our communities will be best positioned to compete successfully in the global economy.

This lesson corresponds with the eight Standards for Mathematical Practice as published by CCSSI:

Mathematical Practices
1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning

Teaching Materials

- Lesson plan with answer key for student exercise
- Lesson plan content document
- Assessment/evaluation exercise

Lesson Activity
Introduce "The True Costs of Owning a Car"

- Ask students to create a list of costs they think come with owning a car
- Write their responses on the board as a bulleted list
- Ask the class to rank them from most expensive to least expensive
- Ask which expenses are one-time costs and which are expenses that may not happen immediately, but need to be budgeted
- Ask for the crucial "must have" before buying a car

- Answer should be "a job"
- Ask how they will pay for a car without a job

Present "The True Cost of Owning a Car" (see attachment)

- Ask students to read the first page
- Compare the list on the board with the costs mentioned
  - Are any missing?
  - Did they mention any not included in the document?
- Discuss the *pros and cons* of paying cash for a car versus financing the car
  - The length of time they have to save for a full price purchase depends on the cost of the car and the amount they are able to save each month
  - Discuss what they should do if a good deal comes along before they've saved enough money
- Pages 2 and 3 discuss financing obstacles and opportunities
- Financing a private deal purchase will most likely be done by a credit union lender. Discuss the limitations of using credit union financing
  - Vehicles can't be too old
  - Cosigners
  - 20 percent down payment – how long would they have to save?
  - Car payment cannot exceed 40 percent of gross wages
- Point out that credit union financing offers much better interest rates than other forms of financing
- Pages 3 and 4 present the formula for calculating a monthly payment
  - Work through the presented example
  - Make sure students know how to do a calculation with negative exponents: $a^{-N} = \frac{1}{a^N}$
  - There are three additional examples on Page 4 for practice; answers are provided in the table.
  - Point out that a monthly car payment is an obligation and therefore must be budgeted and paid, every month, for the length of the loan

Registration Requirements

- Information presented is from the State of Florida
  - Most states follow same/similar procedures
  - Be sure students realize they should check with their Department of Motor Vehicles (DMV) for accurate, local values as their state may do things differently or use different values
  - Pages 4 and 5 address how to estimate for **tag, title, and taxes**
  - Out of these fees, only the annual registration tax needs to be accounted for in the monthly budget
  - All other fees are one-time costs and must be accounted for at the time of the purchase

Proof of Insurance/Insurance Calculation

- Pages 6 – 9 introduce the basics of car insurance
- Page 9 provides an example for students to complete
  - This example is for a 2006 Toyota. The solution to the example is:

    Base Cost = 20 percent of $7,800 = $1,560
    Subtract 10 percent of base cost since car is 5 years old:
    $1,560 – $156 = $1,404
    17-year-old driver increases the premium by 3 percent
    $1,404 + $42.12 = $1,446.12
    No surcharge added because driver is female.

***Note - very important for students to understand:** *Insurance companies use a complicated algorithm called the CRI calculation to determine the insurance premium for a particular vehicle owned by a particular driver. This algorithm can have more than 2,000 parameters. Each insurance company can set*

the weight of each parameter as it wishes. Therefore, it is not surprising that insurance premium quotes can vary greatly among insurance companies. ***For purposes of this lesson, we have simplified the calculation into a four-step process. This should not be assumed to be representative of actual insurance premium quotes.***

Repairs and Maintenance

- Pages 10 and 11 introduce routine maintenance
- Oil changes, tire rotations and replacements, and brakes are the most common
- Because car owners know these need to be done, they need to budget for them
    - A driver's habits can change the timeframe of routine replacements dramatically
        - If brakes, for example, last about 30,000 miles:
            - A driver that drives only 10,000 miles/year has a three-year timeframe to budget the cost
            - A driver that drives 15,000 miles/year has a two-year timeframe to budget the cost
- Actual mileage between tire changes will vary
    - Rotating tires with every oil change can prolong tire life
    - Highway driving can cause more mileage before tires require replacement than stop-and-go city traffic and rough, rural surfaces

Gas Mileage

- Gasoline costs have soared in recent years
- For purposes of this lesson, we fix the price of gas at $3.50/gallon
- Gas mileage estimates for a vehicle are calculated under *ideal* conditions
    - *Your results may vary,* and most likely will vary dramatically
- Budgeting gasoline costs is a straightforward calculation:
    - Take the annual mileage estimate (use 12,000 miles/year)
    - Divide by 12 to get monthly mileage
    - Divide by the car's mileage efficiency (use 22 mpg)
    - This gives you the number of gallons required each month
    - Multiply by $3.50 to arrive at the estimated monthly fuel cost

Car Purchase Analysis – Can I afford this Car?

- Word problems presented will assess if students can locate and use the pertinent data presented in the problem to solve a multi-step calculation with two results:
    - What are the initial costs needed to purchase the vehicle and get it on the road?
    - What are the on-going costs of owning the car that need to be accounted for when developing a car budget?
- Outright purchase versus financing the purchase
    - Financing:
        - 20 percent down payment calculation
        - 80 percent balance that will be financed
        - Determine the interest rate and length of loan
        - Monthly payment calculation formula:
        - $$MonthlyPayment = \frac{(P \times (I \div 12))}{(1-(1+(I \div 12))^{-N})}$$

P = Principal amount of the loan
I = Interest rate of the loan
N = Number of months in which you want to pay off the loan

Registration

- Mention that the registration fees presented in the lesson are based on the State of Florida and may differ in each state
- Initial registration includes annual registration fee (which occurs each year and must be included in the budget), and additional fees usually associated with the first-time car buyer
- Title, fees, and sales tax will also vary depending on location

Insurance Estimate

- Reiterate the formula used is only to be considered accurate for purposes of this lesson
    - 20 percent of purchase = base cost
    - Decrease base cost depending on vehicle age (see table)
    - Increase cost depending on driver's age
    - Increase cost if the driver is male
    - Typically, initial insurance premiums are paid for a six-month period, so the calculation result should be divided by two, and that figure used as an initial cost of purchase
- The six-month cost should be divided by six to arrive at the monthly cost to be included in the budget

Maintenance and Repairs

- Oil change, tire replacement, and brake pad replacement are typical upfront costs that can be calculated and added to the initial purchase cost
- Use the current mileage of the car to determine if there is an immediate need to replace tires and/or brake pads
- The annual mileage estimate will determine the length of time to budget for tire and brake pad replacements, and the estimated number of oil changes each year

Gas Mileage Budget Calculation

- Budgeting gasoline costs is a straightforward calculation:
    - Take the annual mileage estimate (use 12,000 miles/year)
    - Divide by 12 to get the monthly mileage
    - Divide by the car's mileage efficiency (use 22 mpg)
    - This gives you the number of gallons required each month
    - Multiply by $3.50 to get the estimated monthly fuel cost for your budget

Side-by-Side Cost Analysis Matrix

- The first analysis example has the figures pre-filled for the students
- Ask students to verify that they arrive at the same results for each line item
- Answer the question: Can I afford this car?
    - The "total" column on each side of the matrix should be examined
    - Does the person in the word problem have enough cash to cover the initial acquisition costs?
    - Does the person's income support the monthly budget estimate?
- The second analysis word problem gives students the side-by-side matrix, and asks them to fill in the figures to determine if Rebecca can afford this purchase. The results of the analysis are:

Analysis

Acquisition Costs		Monthly Costs	
Down payment	$3,900.00	Car payment	$378.94
Registration	$1,557.10	Annual registration renewal	$4.76
First six months of insurance	$1,958.78	Insurance renewal	$326.46
		Fuel	$185.61
Repairs/Replacements		Repairs/Replacements	
Oil change	$25.00	Oil changes (5/year)	$10.42
Brake pads	$200.00	Brake pads (2 years)	$8.33
Tires ($175 x4)	$700.00	Tires (2 years)	$29.17
Total Acquisition	**$8,340.88**	**Monthly Budget**	**$943.69**

It would appear Rebecca should continue to look for a more affordable car.

Assessment

- An assessment of the presented material
  - 10 question multiple choice assessment
  - Lesson document should be allowed as a resource, as the assessment utilizes formulas presented in the lesson
- Assessment answer key

Assessment Answer Key

1. C
2. B
3. A
4. C
5. A
6. E
7. D
8. A
9. D
10. B