WHICH CAR SHOULD I BUY?

Student/Class Goal
To make an informed decision on the positive and negative points of a variety of cars, thereby being able to decide which the "best" car is for them.

Outcome (*lesson objective)*
The students will use the gas mileage of various vehicles to construct T-charts, write algebraic equations, and plot the equations on a graph. Students will use their graph to evaluate which car would be the best buy for them.

Time Frame
Two 60 or three 40 minute classes

Standard *Use Math to Solve Problems and Communicate*

NRS EFL 4-6

Number Sense	Benchmarks	Geometry & Measurement	Benchmarks	Processes	Benchmarks
Words to numbers connection		Geometric figures		Word problems	4.25, 5.25, 6.26
Calculation	4.2, 5.1, 6.1	Coordinate system	4.8, 5.7, 6.7	Problem solving strategies	4.26, 5.26, 6.27
Order of operations		Perimeter/area/volume formulas		Solutions analysis	4.27, 5.27, 6.28
Compare/order numbers		Graphing two-dimensional figures		Calculator	4.28, 5.28, 6.29
Estimation	4.5, 5.4, 6.4	Measurement relationships		Mathematical terminology/symbols	
Exponents/radical expressions		Pythagorean theorem		Logical progression	4.30, 5.30, 6.31
Algebra & Patterns	**Benchmarks**	Measurement applications		Contextual situations	
Patterns/sequences	4.15, 5.15,	Measurement conversions		Mathematical material	
Equations/expressions	4.16, 5.16, 6.16	Rounding		Logical terms	4.32, 5.33, 6.34
Linear/nonlinear representations	4.17, 5.17, 6.17	**Data Analysis & Probability**	**Benchmarks**	Accuracy/precision	
Graphing	4.18, 5.18, 6.18	Data interpretation		Real-life applications	4.34, 5.35, 6.36
Linear equations	4.19	Data displays construction		Independence/range/fluency	4.35, 5.36, 6.37
Quadratic equations		Central tendency			
		Probabilities			
		Contextual probability			

Materials
Car Ads from local newspapers or Craig's List
Car Facts Information Sheet
T-Chart Sample
How to Graph a Linear Equation in 5 Quick Steps Student Resource
Colored pencils (if available)
Calculators
Rulers
Graph paper (30 x 40 grid)

Learner Prior Knowledge
Students will have completed the *How Much Will I Spend on Gas?* lesson, providing a basic understanding gas prices and what is meant by miles per gallon (mpg).

Instructional Activities
Step 1 - Discuss with the class the high gas prices. Do they think their vehicle gets good or bad gas mileage? Be sure all students are clear on what gas mileage means (the number of miles a car can travel on one gallon of gasoline). Ask the class if any of them wish they could purchase a different vehicle to drive because the monthly gas cost would be less. In this exercise each member of the

class will have the opportunity to research yearly driving costs on several different vehicles. They will compare the gas costs of a small car, midsize car, large car or van, and a large SUV or truck.

Step 2 **-** Using car ads from the newspaper, each student will select an ad for one vehicle in each of the 4 categories. Using the information in the ad, the students will record the car facts on the *Car Facts* Information Sheet. The mileage of the vehicles can be found at Fuel Economy. Discuss with the students how they can figure out how many gallons of gas they would use in one month if they drive 1,000 miles (1000 ÷ mpg = gallons of gas used). Students will calculate the monthly gas consumption of each car on the *Car Facts* Information Sheet.

Step 3 – Using the monthly fuel consumption for each car, construct a T-chart showing the total fuel consumption for additional time spans for each vehicle. *T-Chart Sample* provides a chart to calculate months and usage. Ask the students to write an equation to represent the relationship between x and y on each chart.

Step 4 - Distribute graph paper. The students will graph the data for all 4 vehicles on one graph. Be sure to review how to plan the intervals on a graph. The student resource, *How to Graph a Linear Equation in 5 Quick Steps,* may be useful to review. Be sure to label the lines or construct a key to use with colored pencils.

Step 5 - Discuss the various graphs with the class. Questions can include some or all of the following:

- Which vehicle has the lowest gas consumption? What is the difference in monthly/yearly gas consumption between the vehicles with the lowest and highest gas usage?
- If gasoline averages $4.00 per gallon, how much will it cost to operate each car for a year? A month? What if the price of gas is $5.00 per gallon? Develop a T-chart where x = months and y = total gas cost. Write an equation and graph this data if time allows. How much money would be saved on gas in a month/year by purchasing one car over another?
- If differences in the initial prices of the vehicles are taken into consideration, how many months would it take to offset the difference by savings on gasoline?

Step 6 **-** Evaluate the students' work. Ask each student to write about which car they would select of the four they researched.

Assessment/Evidence (*based on outcome)*
Students will give a written explanation with specific reasons how they decided which car would be best. Skill with graphing, equations and T-charts will be assessed by examining student work.

Teacher Reflection/Lesson Evaluation
Not yet completed.

Next Steps
Compare gas costs of their current vehicle with gas costs of the car they would like to buy in this lesson.

Technology Integration
Cars and mpg 1985-2009 http://www.fueleconomy.gov/Feg/findacar.htm
Fuel Economy http://www.fueleconomy.gov/Feg/findacar.htm

Purposeful/Transparent
All the activities help the students to evaluate positive and negative points about a car.

Contextual
The lesson topic is very important to today's consumer, as gas is a huge expense.

Building Expertise
Students gain practice expressing data in four modes: equations, graphs, charts and writing.

Compact Car Information Sheet

Brand _____ **Year** _____

Model_____ **Price** _____

Engine size_____

Details about the car_____

_____

_____

Mileage: City_____ **Highway**_____

Your mileage estimate_____

Gallons of gas used in 1 month (1,000 miles)_____

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Mid-Size Car Information Sheet

Brand _____ **Year** _____

Model_____ **Price** _____

Engine size_____

Details about the car_____

_____

_____

Mileage: City_____ **Highway**_____

Your mileage estimate_____

Gallons of gas used in 1 month (1,000 miles)_____

Large Car or Mini-Van Information Sheet

Brand _____ **Year** _____

Model_____ **Price** _____

Engine size_____

Details about the car_____

_____

_____

Mileage: City_____ **Highway**_____

Your mileage estimate_____

Gallons of gas used in 1 month (1,000 miles)_____

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Large SUV or Truck Information Sheet

Brand _____ **Year** _____

Model_____ **Price** _____

Engine size_____

Details about the car_____

_____

_____

Mileage: City_____ **Highway**_____

Your mileage estimate_____

Gallons of gas used in 1 month (1,000 miles)_____

T-CHART SAMPLE

Months (x)	Total Gallons of Gas Used (y)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

30 x 40 grid

How to Graph a Linear Equation in 5 Quick Steps

Step 1 – Construct a T-chart of Values
Using your equation, construct a T-chart of values if one has not been done already. Substitute some simple numbers into the equation for x or y. If x=1, what is y? If x=10, what is y? If y=0, what is x? Each pair of values in your T-chart will become a point on the graph. (See illustration 1 for an example of a T-chart)

Step 2 – Decide on the interval for each axis
Before starting the graph, look at the T-chart to determine the highest value for y found on the chart. Look at the values needed for x. Using graph paper, count the number of lines on the x and y axes. Use these numbers to determine the intervals on each axis. (If you use the graph paper at the end of this lesson there are 30 spaces on the x axis and 40 spaces on the y axis.) If the largest total cost/y value that needs to be graphed is $80 and there are 40 lines on the y axis, let each line on the y axis represent $2. The number of gallons of gas/x value that goes with $80 is 20. There are 30 lines, so to make it simple one line will equal one gallon. Be sure the students realize they do not need to put a number next to every line. For example, the x might be labeled on every 5^{th} line (five gallons) and the y axis might also be labeled on every 5^{th} line (or $10). This is a good step to do in pencil. That way if the interval you selected did not work out, the numbers can be erased any you can start over.

Step 3 – Label each Axis
Decide what labels need to be added to the x and y axis. What do the numbers on the x-axis represent? What do the numbers on the y-axis represent? Usually the labels will match the descriptions/labels of x and y on the T-chart. (Note: When graphing equations involving elapsed time, time is traditionally represented by x)

Step 4 – Plot the points
Using each pair of points from the T-chart, plot the points on the graph. Every point does not need to be plotted. Just be sure you have at least 3. Using a ruler, draw a line through the points you have plotted. Write your equation next to the line.

Step 5 – Give the graph a title
Decide on a title for the graph. Make sure it accurately represents what is being shown on the graph. Does it explain the relationship between x and y?