WAMC Lab Template

Math Concept(s): understanding conversion from English standard to metric system. Understand the stopping distance formula for a vehicle and formula for distance traveled and fuel economy over that distance.

Source / Text: Financial Algebra

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            Date: Summer In-service 2014

Attach the following documents:

Lab Instructions

Student Handout(s)

Rubric and/or Assessment Tool

Short Description (Be sure to include where in your instruction this lab takes place):

Lab Plan

Lab Title: "Road trip: Safety First"

Prerequisite skills: The students should have a working knowledge of the stopping distance formulas. Students should know how to solve for a given variable. Students should know how to do conversion between English standard and metric system. Students should know how to find average.

Lab objective: Write, interpret and use the distance formula. Use the formula for the relationship between distance, fuel economy, and gas usage. Calculate and use the total stopping distance formula in both the Standard English system and the metric system.

Standards:

CCSS-M:

- A-CED4, A-SSE1b, A-SSE3, A-RE12

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Reading:

- A-SSE3, A-CED4, A-REI1

Writing:

- A-SSE3, A-CED4, A-REI1

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)
☐ Global Awareness   ☐ Financial/Economic/Business/Entrepreneurial Literacy   ☐ Civic Literacy
☐ Health/Safety Literacy   ☐ Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION	INFORMATION, MEDIA & TECHNOLOGY SKILLS	LIFE & CAREER SKILLS	Productivity and Accountability
Creativity and Innovation		Flexibility and Adaptability	
☐ Think Creatively	Information Literacy	☐ Adapt to Change	☐ Manage Projects
☐ Work Creatively with Others	☐ Access and Evaluate Information	☐ Be Flexible	☐ Produce Results

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials

- Lab instructions. Scoring rubric, internet access, lab worksheet, Pencil or pen, and a calculator.

Set-Up Required:

- Chapter 5 section 5.7, 5.8, and 5.9 in the financial algebra text should be covered before the lab is started.

Lab Organization Strategies:

Grouping/Leadership/Presentation Opportunities:

- When all of the students are done with the lab you can offer an opportunity for students to present their findings. Considering that all students should have chose different vehicles with different fuel economies no lab should be identical to the other.

Cooperative Learning:

- I would allow students to work in groups of no more than 2. both students should each choose a different vehicle, so that the fuel economy will be different.

Expectations:

   Expectations are that each student chooses a different vehicle therefore fuel economy will be different.

Timeline:

- I would provide 3 days to do this lab and a 4th day for presentations.

Post Lab Follow-Up/conclusions:

Discuss real world application of learning from lab

- Real world applications are that the students gain an understanding of fuel economy. Instead of seeing that every car takes fuel at the same rate per gallon, over a long period of time i.e. trip, it cost a lot more money over the long run because of the mpg for that specific vehicle that they had chose to purchase. A monster truck that looks cool but only gets 10 mpg is totally different than a small size sedan that gets 40mpg. Furthermore the students can learn conversions of fuel and distance between the Standard English system and the metric system. Students will also learn that different weather or road conditions can affect your driving safety.

Career Applications

- Police officer, travel agent, insurance agent, accident investigator.

Optional or Extension Activities

- You could have the students put together power points for their presentations. Although not necessary time allowing it would be a nice piece to add.

Washington Applied Math Council

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"Road Trip: Safety First"
By Darren Sylte
Chapter 5 section 5.7-5.9

Name: _____.

Date: _____.

Lab objective: To collect safety and economic data.
  a. Determine safety factors in relation to changing road and weather conditions.
  b. Determine fuel economy in terms of miles per gallon.
  c. Convert English standard for of measurement to the metric system and visa versa.

For this activity you will be taking a trip with your family from your home in Marysville Washington to Calgary Canada where your grandparents live and you are in charge of figuring out fuel and road safety. Of course it is winter break and you are going on a holiday visit to your grandparents' house so you not only need to find mileage you also need to check weather conditions and road conditions.

Remember Canada uses the metric system so you will need to convert from the English standard system to the metric system as you compile you data.

1. The first thing that you need to do is go to the lab and find a vehicle to buy for the trip. Remember you need to locate a vehicle that the advertiser provides the MPG or miles per gallon that the vehicle is rated at. Furthermore we are looking for economy not coolness factor.

   a. Make of vehicle _____.

   b. Model of vehicle _____.

   c. MPG rating _____.

   d. Why did you choose this specific vehicle?
      _____
      _____
      _____

_____

_____

2. In order to plan for fuel consumption you will need to know the distance you will travel in both the English standard and metric systems. Go to the website, www.distancefromto.net

   a. What is the total distance from Marysville WA. To Calgary Canada?

   1. In Miles _____
   2. In Kilometers _____

3. Now that you know the total distance you will need to determine your fuel consumption both in the English standard and the metric system.

   a. Gallons of gas._____
   b. Liters of gas. _____

For this section your trip will be broken up into 6 different sections. In each section there will be a different speed for your vehicle and a different road condition. Use the following chart for drag factors for each road condition.

Road condition	Drag factor
Dry asphalt	0.78
Wet asphalt	0.70
Gravel	0.60
Snow	0.325
Ice	0.175

4. Between Marysville and Bellingham the speed limit is 70 MPH and the road conditions are dry asphalt.

   a. How long did it take to get between Marysville and Bellingham? _____

b. How much fuel did you go through? _____ .

c. Using the stopping distance formula, what is your total stopping distance?
_____.

d. How much fuel did you use?
Gallons_____

5. Between Bellingham and Langley the speed limit is also 70 mph but the roads are wet.

a. How long did it take to get between Marysville and Bellingham? _____

B. How much fuel did you go through? _____ .

C. Using the stopping distance formula, what is your total stopping distance?
_____.

D How much fuel did you use?
Gallons? _____

e. Was this a safe speed to travel? Why or why not?
_____
_____
_____

 Now that you are in Canada everything is in the metric system so you will need to do some conversions. Remember there are .62 miles in one Kilometer and 3.8 liters of fuel in every gallon.

6. Between Langley and Kamloops you find the roads are nice and dry and the speed limit is 120 KPH.

a. How many miles is it between Langley and Kamloops ?_____
Kilometers _____

b. How long did it take to get between Langley and Kamloops ?_____

c. How much fuel did you use?
Gallons _____
Liters_____

D. Using the stopping distance formula how long would it take for your vehicle to stop. _____

E. Was this a safe speed to travel? Why or why not?

_____
_____
_____
_____

7. Between Kamloops and Salmon Arm there is road construction so you are driving on gravel at 80 KPH.

A How many miles is it between Kamloops and Salmon Arm?_____
    Kilometers _____
B How long did it take to get between Kamloops and Salmon Arm?_____
C How much fuel did you use?
    Gallons _____
    Liters_____
D Using the stopping distance formula how long would it take for your vehicle to stop. _____
E Was this a safe speed to travel? Why or why not?

_____
_____
_____

8. Between Salmon Arm and Golden it begins to snow so you need to slow down to 60 KPH.

A How many miles is it between Salmon Arm and Golden?_____
    Kilometers _____
B How long did it take to get between Salmon Arm and Golden?_____
C How much fuel did you use?
    Gallons _____
    Liters_____
D Using the stopping distance formula how long would it take for your vehicle to stop. _____
E Was this a safe speed to travel? Why or why not?

_____
_____
_____

9. Between Golden and Calgary the roads turn to ice so you have to slow way down to 40 KPH.

A How many miles is it between Golden and Calgary?_____
    Kilometers _____
B How long did it take to get between Golden and Calgary?_____

C How much fuel did you use?

    Gallons _____

    Liters_____

D Using the stopping distance formula how long would it take for your vehicle to stop. _____.

E Was this a safe speed to travel? Why or why not?

_____

_____

_____

Now that you have arrived at your destination it is time to compile some data.

Distance

    Total miles _____

    Total Kilometers _____

Average speed

    MPH_____

    KMP_____

At the average speed in MPH how long did it take to complete the journey? _____

Fuel consumption

    Gallons _____

    Liters _____

For full credit show all your work on a separate sheet of paper.

Math - Problem Solving: Road trip, safety first

Teacher Name: **Mr. Sylte**

Student Name: _____

CATEGORY	4	3	2	1
Mathematical Concepts	Explanation shows complete understanding of the mathematical concepts used to solve the problem(s).	Explanation shows substantial understanding of the mathematical concepts used to solve the problem(s).	Explanation shows some understanding of the mathematical concepts needed to solve the problem(s).	Explanation shows very limited understanding of the underlying concepts needed to solve the problem(s) OR is not written.
Mathematical Reasoning	Uses complex and refined mathematical reasoning.	Uses effective mathematical reasoning	Some evidence of mathematical reasoning.	Little evidence of mathematical reasoning.
Mathematical Errors	90-100% of the steps and solutions have no mathematical errors.	Almost all (85-89%) of the steps and solutions have no mathematical errors.	Most (75-84%) of the steps and solutions have no mathematical errors.	More than 75% of the steps and solutions have mathematical errors.
Completion	All problems are completed.	All but one of the problems are completed.	All but two of the problems are completed.	Several of the problems are not completed.
Mathematical Terminology and Notation	Correct terminology and notation are always used, making it easy to understand what was done.	Correct terminology and notation are usually used, making it fairly easy to understand what was done.	Correct terminology and notation are used, but it is sometimes not easy to understand what was done.	There is little use, or a lot of inappropriate use, of terminology and notation.

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