

## **WAMC Lab Template**

Math Concept(s):

- Interpreting functions that arise in applications in terms of the content.
- Build a function that models a relationship between two quantities.
- Construct and compare linear, quadratic, and exponential models and solve problems.
- Interpret expressions for functions in terms of the situation they model.

Source / Text: CORD

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### **Attach the following documents:**

Lab Instructions/Student Handout(s)

Assessment Tool

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

#### **Lab Plan**

Lab Title: Cars: Life is a Highway

Prerequisite skills:

Construct and create a graph

Calculate Slope

Convert minutes to hours

Build a function based on given data

Collect and record data

Solve for an unknown  $x$  value when given the value of  $y$

Lab objective:

- Through this activity, students will;
  - Be able to calculate slope at various intervals.
  - Find missing information to solve problems.
  - Construct the function of both their data and the given data.
  - Use a data table to plot points on a graph and determine the trend line.

Student understanding will be assessed with a rubric upon completion of the student handout.

Summative assessment will follow with use of State COE Task, Connor's Touchdown.

#### **Standards:**

CCSS-M:

- F-IF.6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval.
- Estimate the rate of change from a graph. ★

- F-BF.1.C: Write a function that describes a relationship between two quantities. ★

- (+) Compose functions. For example, if  $T(y)$  is the temperature in the atmosphere as a function of height, and  $h(t)$  is the height of a weather balloon as a function of time, then  $T(h(t))$  is the temperature at the location of the weather balloon as a function of time.

- F-LE. 1.B: Distinguish between situations that can be modeled with linear functions and with exponential functions.
- Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

- F-LE. 2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

- F-LE.5: Interpret the parameters in a linear or exponential function in terms of a context.

Standards for Mathematical Practice:

- MP.1: Makes sense of problems and persevere in solving them.
- MP.2: Reason abstractly and quantitatively.
- MP.3: Construct viable arguments and critique the reasoning of others.
- MP.4: Model with mathematics.
- MP.5: Use appropriate tools strategically.
- MP.6: Attend to precision.
- MP.8: Look for and express regularity in repeated reasoning.

State Standards addressed (2008 Washington State Mathematics Standards):

- A.1.6.D: Find the equation of a linear function that best fits bivariate data that are linearly related, interpret the slope and y-intercept of the line, and use the equation to make predictions.
- A.1.8.G: Synthesize information to draw conclusions, and evaluate the arguments and conclusions of others.

Reading:

- 1.3.2: Understand and apply content/academic vocabulary critical to the meaning of the text, including vocabularies relevant to different contexts, cultures, and communities.

Writing:

- 3.2.1: Analyzes audience and purpose and uses appropriate voice.
- 3.2.2: Analyzes and selects language appropriate for specific audiences and purposes.
- 3.3.1: Uses legible handwriting.

Leadership/21st Century Skills:

<u>21st Century Interdisciplinary themes</u> (Check those that apply to the above activity.)			
<input type="checkbox"/> Global Awareness	<input type="checkbox"/> Financial/Economic/Business/Entrepreneurial Literacy	<input type="checkbox"/> Civic Literacy	
<input type="checkbox"/> Health/Safety Literacy	<input type="checkbox"/> Environmental Literacy		
<u>21st Century Skills</u> (Check those that students will demonstrate in the above activity.)			
<b>LEARNING AND INNOVATION</b>	<b>INFORMATION, MEDIA &amp; TECHNOLOGY SKILLS</b>	<b>LIFE &amp; CAREER SKILLS</b>	<b>Productivity and Accountability</b>
<u>Creativity and Innovation</u>	<u>Information Literacy</u>	<u>Flexibility and Adaptability</u>	<u>Accountability</u>
<input checked="" type="checkbox"/> Think Creatively	<input checked="" type="checkbox"/> Access and Evaluate Information	<input checked="" type="checkbox"/> Adapt to Change	<input checked="" type="checkbox"/> Manage Projects
<input type="checkbox"/> Work Creatively with Others	<input checked="" type="checkbox"/> Use and manage Information	<input checked="" type="checkbox"/> Be Flexible	<input checked="" type="checkbox"/> Produce Results
<input checked="" type="checkbox"/> Implement Innovations	<u>Media Literacy</u>	<u>Initiative and Self-Direction</u>	<u>Leadership and Responsibility</u>
<u>Critical Thinking and Problem Solving</u>	<input type="checkbox"/> Analyze Media	<input type="checkbox"/> Manage Goals and Time	<input type="checkbox"/> Guide and Lead
<input checked="" type="checkbox"/> Reason Effectively	<input type="checkbox"/> Create Media Products	<input checked="" type="checkbox"/> Work Independently	<input type="checkbox"/> Others
<input type="checkbox"/> Use Systems Thinking		<input checked="" type="checkbox"/> Be Self-Directed Learners	

- |   |  |  |  |
|---|--|--|--|
| <input type="checkbox"/> Make Judgments and Decisions       | <u>Information, Communications and Technology (ICT Literacy)</u> | <u>Social and Cross-Cultural</u>                                     | <input checked="" type="checkbox"/> Be Responsible to Others |
| <input checked="" type="checkbox"/> Solve Problems          | <input checked="" type="checkbox"/> Apply Technology Effectively | <input checked="" type="checkbox"/> Interact Effectively with Others |  |
| <u>Communication and Collaboration</u>                      |  | <input type="checkbox"/> Work Effectively in Diverse Teams           |  |
| <input checked="" type="checkbox"/> Communicate Clearly     |  |  |  |
| <input checked="" type="checkbox"/> Collaborate with Others |  |  |  |

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

### **Materials**

- Automobile or Pedometer (if modified)
- Watch/ Clock
- Handout
- Pencil
- Calculator
- Straight edge
- Driver/Recorder

### **Set-Up Required:**

- Copies of handouts and rubrics.

### **Lab Organization Strategies:**

#### **Grouping/Leadership/Presentation Opportunities:**

- Students will be grouped in groups of 3-4 to collaborate and share the data they have collected.
- Students will work individually to complete the student handout.

#### **Cooperative Learning:**

- Students will collaborate in small groups at the beginning and end of the activity to discuss their data and reflect on their understanding.
- Students will work with a family member or friend to collect their data while taking a 20 minute or longer drive.

#### **Expectations:**

- Students will be expected to complete the graphs using the collected and given data.
- Calculate rate at each interval of collected data.
- Construct a function for the given data by plotting points, creating a trend line, and calculating slope, and using either point slope or another method to find b.
- Solve for an unknown variable using technology appropriately.

#### **Timeline:**

- Two class periods or approximately 90 minutes.

### **Post Lab Follow-Up/conclusions:**

Discuss real world application of learning from lab

- Police Officers determining your speed
- Calculating gas mileage
- Stats for sports and athletes

### Career Applications

- Police Officer
- Sporting Scouts
- Sales Projections
- Travel Agents
- Stock Market

### Alternative Strategies

- Peer tutor/ Driving partner (ELL)
- Modified for health by walking and calculating steps per second and convert to miles per hour.
- Advanced students will find the area below the curve on the graph they created and compare it to their mileage.
- Struggling students will be given additional instruction and time to make modifications on the formative assessment (Student Handout).

### Optional or Extension Activities

- Calculating cost of a road trip based on miles per hour.
- Calculate area below the curve.

# Washington Applied Math Council

<https://wa-appliedmath.org/>