WAMC Lab Template: Lamborghini Lab

Math Concept(s): Data Collection, Function Creation

Source / Text:

Developed by: Casey Lange, Keri Hampton, Catherine Ventura

E-Mail: langecq@puyallup.k12.wa.us, khampton@cloverpark.k12.wa.us, ventucn@puyallup.k12.wa.us

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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):

Students will be given a Hot Wheel car with a wind-up knob. They will then do a variety of torques to calculate the distance the car can travel per torque. Students will then need to graph their data points to create a linear regression formula for the data.

Lab Plan

Lab Title: Lamborghini Lab

Prerequisite skills: Plotting Data, Creating Equations, Linear Regression

Lab objective: Students will be able to create a function from data points.

Standards:

CCSS-M:

- **A-CED 1:** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
- **A-CED 2:** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **A-CED 3:** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
- **F-IF 4:** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
- **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:** Write a function that describes a relationship between two quantities.

Standards for Mathematical Practice:

- 1) Make sense of problems and persevere in solving them.
- 2) Reason abstractly and quantitatively.
- 4) Model with mathematics.
- 6) Attend to precision.
- 7) Look for and make use of structure.

State Standards addressed (2008 Washington State Mathematics Standards):

- **A1.1.A** Select and justify functions and equations to model and solve problems.
- **A1.2.D** Determine whether approximations or exact values of real numbers are appropriate, depending on the context, and justify the selection.
- **A1.3.B** Represent a function with a symbolic expression, as a graph, in a table, and using words, and make connections among these representations.
- **A1.6.A** Use and evaluate the accuracy of summary statistics to describe and compare data sets.
- **A1.6.B** Make valid inferences and draw conclusions based on data.
- **A1.6.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.

Reading:

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Writing:

- Students will write to respond to the key question "Why don't we have wind-up cars in real life?"

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
Creativity and Innovation
☒ Think Creatively
☒ Work Creatively with Others
☒ Implement Innovations
Critical Thinking and Problem Solving
☒ Reason Effectively
☐ Use Systems Thinking
☐ Make Judgments and Decisions
☒ Solve Problems
Communication and Collaboration
☒ Communicate Clearly
☒ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS
Information Literacy
☐ Access and Evaluate Information
☐ Use and manage Information
Media Literacy
☐ Analyze Media
☐ Create Media Products
Information, Communications and Technology (ICT Literacy)
☒ Apply Technology Effectively

LIFE & CAREER SKILLS
Flexibility and Adaptability
☐ Adapt to Change
☐ Be Flexible
Initiative and Self-Direction
☒ Manage Goals and Time
☐ Work Independently
☒ Be Self-Directed Learners
Social and Cross-Cultural
☒ Interact Effectively with Others
☐ Work Effectively in Diverse Teams

Productivity and Accountability
☒ Manage Projects
☒ Produce Results
Leadership and Responsibility
☐ Guide and Lead Others
☒ Be Responsible to Others

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

Materials

- Twist wind up cars, measuring tape, graph paper

Set-Up Required:

- Safe outside area or hallway/gymnasium

Lab Organization Strategies:

Grouping/Leadership/Presentation Opportunities:

- Groups of three - A data keeper, Torquer, Measurer
- Report their finding to the class at conclusion of lab

Cooperative Learning:

- Students are given the basic outline, key questions to answer and graph paper. They must work together to create a graph and determine the best way to represent their data

Expectations:

- Create a graph with variables of twist and distance
- Create an equation that reflects data collected
- Written response to "Why don't we have twist cars in the real world?"

Timeline:

- 60 min class period

Post Lab Follow-Up/conclusions:

Discuss real world application of learning from lab

- Key Questions
  - Why don't we drive wind-up cars in the real world?
  - Compare miles per gallon to inches per twist?
  - Which car was most economical? Inches per twist

Career Applications

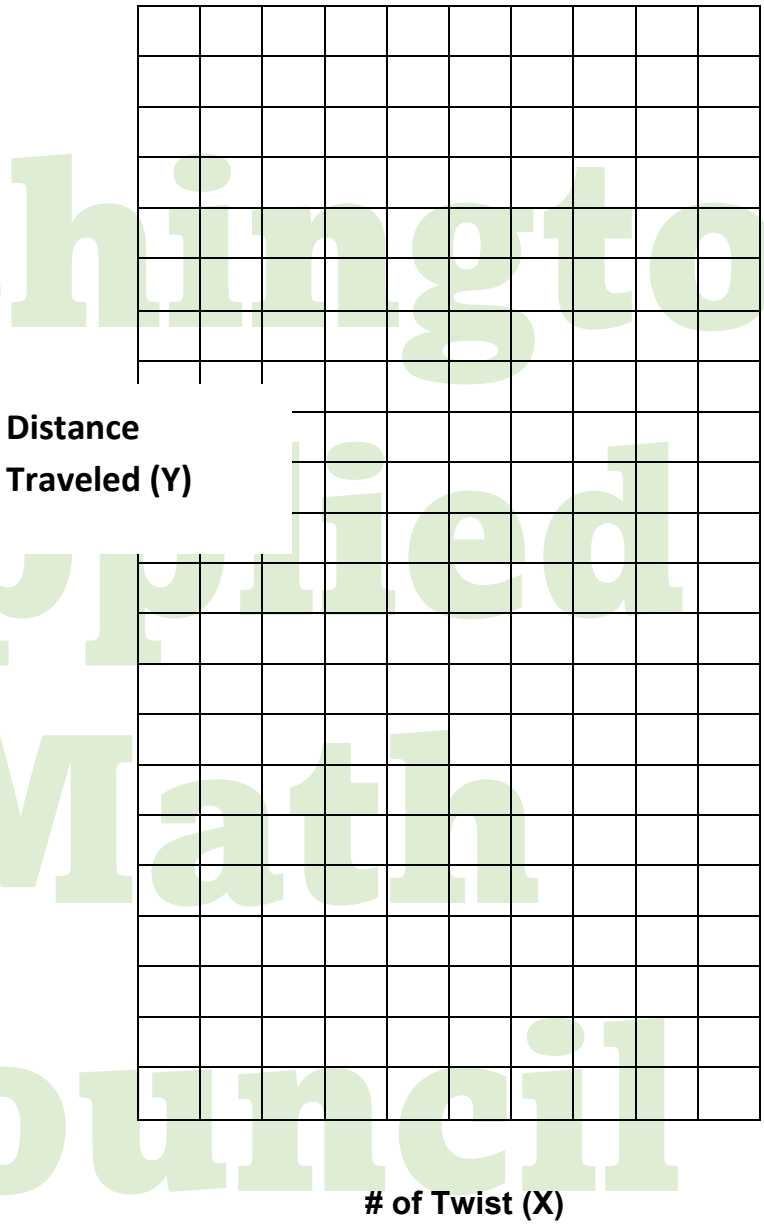
- Engineering
- Science (Data Collection)

Optional or Extension Activities

- Key Questions- Extension
  - Would it be possible for the wind up car to travel a ¼ mile?
  - What is the range? Is it infinite?
- Optional Supports
  - Prepared data collect/graph sheet

Data Collection Sheet

# of Twist (X)	Distance Traveled (Y)
1	
2	
3	
4	
5	
6	
7	
8	
9	



Key Question: Why don't we have wind-up cars in the real world?

_____

_____

_____

_____

What is the function of your data? (Enter your equation here)

Why don't we have twist cars in the real world?

_____

_____

_____

Compare miles per gallon to inches per twist?

_____

_____

_____

Which car was most economical? (Inches per twist) How do you know?

_____

_____

_____

Would it be possible for the wind up car to travel a ¼ mile? _____

What is the range? Is it infinite?

_____

_____

Bonus Extension:

How many twists are equivalent to a gallon of gas? (Let's use the example of a car that gets 25 miles per gallon.)

1st. Choose a data point from your graph.

2nd. Input your data into the proportion below.

$$\frac{8\ twists}{38\ inches} = \frac{?}{25mi\ x\ 5280ft\ x12in}$$

3rd. Solve for the missing value.