Lab Framework

Text: CORD

Unit number and title: Unit 15 Using Formulas to Solve Problems

   Short Description: Students measure the time required for a battery-powered car to travel a measured distance. Students calculate the speed of their car and compare the speed of their car to the speed of other groups' cars. Based on the comparison each student will predict a winner of a race. A race will determine the results of the predictions.

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Lab Title
Rate + Distance

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

- **Lab Objective**

   Calculate speed of car.

   Compare speed of car to other students' cars.

   Predict the winner based on calculations and comparisons.

   Test the validity of predictions through a race of cars.

- **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)

   Estimating Answers

   Problem Solving Techniques

   Measuring speed and distance

   Timing using a Stop Watch

- **Vocabulary**

   Formula

   Distance

   Rate – Units of feet per second

   Average Speed

- **Materials List**

   Battery or Remote control car – Enough for one for each group of four

   Timer

   Tape Measure

   Masking tape

   White Board

   Calculator

- **GLEs (State Standards) addressed**

   Math: 1.1.6 Complete multi-step computations with combinations of rational numbers using order of operations and addition, subtraction, multiplication, division, powers, and square roots. W

   1.2.3 Apply unit conversions within measurement systems, U.S. or metric, to maintain an appropriate level of precision. W

1.5.4 Use variables to write expressions, linear equations, and inequalities that represent situations involving rational numbers, whole number powers, and square roots. W

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. W

1.2.2 Apply strategies to comprehend words and ideas.

Writing: 2.2.1 Demonstrates understanding of different purposes for writing.

Leadership Skills

1.1 Analyze, refine and apply decision-making skills through classroom, family, community, business, and industry standards.

1.4 Be involved in activities that require applying theory, problem solving and using critical thinking skills while understanding the outcomes of related decisions.

2.1 Communicate, participate and advocate effectively in pairs, small groups, teams, and large groups in order to reach common goals.

- **SCAN Skills/Workplace Skills**

   Basic Skills: C. Identifies relevant details, facts and specifications

   Writing: B. Records information completely and accurately

   Arithmetic: A. Performs basic computations

   Mathematics: A. Approaches practical problems by choosing appropriately from a variety of mathematical techniques.

   B. Uses quantitative data to construct logical explanations for real world situations

   C. Expresses mathematical ideas and concepts orally and in writing

- **Set-up information**

   Students are divided into groups of four and given one car for each group. Students will measure off start and finish line. Student will calculate the speed of each trial run (5 trial runs) using an appropriate formula in units of feet per second. Calculate the average speed of the car for the 5 trial runs. When all groups have finished, compare the average speeds and predict which car will win a race. Race the cars and write the conclusion.

- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -**Timeline required**)

   1 Class period

   Four students to a group

   Each student should do calculations and record data for one trial run. Each student should make their own predication based on data.

- **Teacher Assessment of student learning** (scoring guide, rubric)

   Teacher and student questions and answers.

   Accurate calculations with trial runs.

   Accurately completed student lab worksheet.

- **Summary of learning** (to be finished after student completes lab)

   -discuss real world application of learning from lab

   -opportunity for students to share/present learning

- **Optional activities**

- **Career Applications**

Speed and distance are used in a variety of ways in career settings. Automobile manufacturing, Airline manufacturing, Space Exploration and science.

Washington Applied Math Council

https://wa-appliedmath.org/

Name(s): _____   Period: _____   Date: _____

Unit 15 - Car Race

Directions: You will measure the time it takes for your race car to travel a certain distance and then calculate the speed of your car. Then you will compare it to the speed or other groups in your class. Use this data to predict the winner of a race between the cars. Test your prediction!

Setup: Measure off an exact distance (at least 10 feet or at least 4 meters) and mark the start and finish lines with tape.

How long is your course? _____

Time Trials: Send your car down the track timing it with a stopwatch. Do this 5 times.

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Time					
Speed ft/s					
Speed m/s					

What formula can you use to calculate the speed? _____

Calculations: Calculate the speed for each trial and enter it in the appropriate row in the table above. (Convert between m/s and ft/s. Complete both rows.)

Use the mean to find the average time for the car: _____

Use the mean to find the average speed for the car: _____

Predictions: Using the speeds you calculated and that of the other groups, which car should win the race? _____

Why? _____

In what order should the cars finish?

1st _____   4th _____   7th _____
2nd _____   5th _____   8th _____
3rd _____   6th _____   9th _____

Will length of the track matter in determining which car wins? Why or why not?
_____
_____
_____

Test: Race the cars on the course set by the teacher.
Did the cars finish in the order predicted? _____
What might account for any differences? _____
_____
_____