

WAMC Lab

Math Concept(s): Seeing Structure in Expressions

Source / Text: CORD Algebra I (Vol. 2, Ch. 1)

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

This is a group activity lab to reinforce appropriate formulas (Speed = Distance/Time, in this case) in a real-world application. Here, you have groups of students racing toy cars on a Point A-to-Point B track.

This can be a classroom lab or can be done outside on a flat surface or inside in the gym. A carpeted classroom may be tough, depending upon the cars.

Lab Plan

Lab Title: Racing Formulas

Prerequisite skills: Work in CORD Algebra I (Vol. 2, Ch. 1), teamwork, good communication skills

Lab objective: To reinforce formulas to predict which team's car will win in a race.

Standards: (Note SPECIFIC relationship to Science, Technology, and/or Engineering)

Mathematics K–12 Learning Standards:

- A-SSE 3 - Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
- A-SSE 4 - Derive the formula for the sum of a finite geometric series (when the common ratio is not 1) and use the formula to solve problems.

Standards for Mathematical Practice:

- 1. Make sense of problems and persevere in solving them.
- 5. Use appropriate tools strategically.
- 6. Attend to precision.

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):

- [CCSS.ELA-Literacy.RST.11-12.3](#)
Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

K-12 Science/Engineering Standards

- [HS-ETS1-2 Engineering Design](#)
Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Technology

- **HS-T1d.** Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.

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

Applied Math Council

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Racing Formulas

This is a group activity lab to help reinforce algebraic formulas in a real-world setting. This lab can be done in the classroom, in the gym, the school hallway or outside on a flat surface. A hard (not carpeted) surface works best.

You will need:

- Wind-up or battery-powered car
- Masking tape (blue tape is preferable)
- Stopwatch
- Tape Measure
- Handout (to record times)
- Calculator

Mark down a 5-yard straight line course – one line to start and one line to finish – around the room/gym. If there are more than one course, you can speed up the process and get everyone done in one period.

Split the class up by teams, at least four (five is better, depending on how many cars you have), and have them divide up into roles: driver (the one who handles the car), timer and scribe. You may have to assign the driver in case there are arguments over who wants to send off the car.

There will be five runs, so this is a chance for everyone on the team to change roles within the trials. After each run, the scribe will get the time from the timer and write it down on the handout. The handout will ask for speed, distance and time. Two of these three elements will be known to the group and it'll have to determine the third element.

After the group has five runs on the course, the group will determine the average speed and time of the runs. This will determine whether the group will be in the finals.

The top-three fastest teams will be in the finals. The trials will predict which team will win. Discuss with the class what factors will be in favor or against the prediction. Also, the groups should double check their work, preferably double checking another group's work, to make sure the right teams are in the finals.

Run the finals. Did the trials' results predict the winner? What other formulas could be used to determine who would win before the final?

If you run the finals on a longer straight-line course, say 7 yards (21 feet), would the results be the same? You can talk about probability as well. If the finals were run five times, which group would win the most?

Formative Assessment: Teamwork (is one person doing all of the work?), accuracy of data gathered during the trials, exit ticket (the handout with their work).

Summative Assessment: The work turned in, the results, an extra question or two on the end-of-chapter test.

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Racing Formulas (Scoring)

Team: _____

Members: _____

Speed	Distance	Time

Overall Average

Speed: _____

Time: _____

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

Materials

- Wind-up or battery-powered car
- Masking tape (blue tape is preferable)
- Stopwatch
- Tape Measure
- Handout (to record times)
- Calculator

Set-Up Required:

- You'll need to set up the courses. If there are more than four groups, it is best to have at least two courses in order to speed up the lab. This should be a one-period lab, but you can stretch it to two days if you want (add a longer course).

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected) and Cooperative Learning:

- Work Effectively with Others and in Diverse Teams: Everyone in the group will have a chance to be the leader (aka the driver) of the car during the trials. Also, everyone will have the chance to be the scribe and the timer. No one will get away with not doing anything.
- Guide and Lead Others/Be Responsible: When you take over all three jobs during the trials, you have to be responsible to get the work done correctly. A wrong answer could lead to a team not making the finals.

Expectations:

- Everyone has a bit of fun, learns about teamwork, formulas ($\text{speed} = \text{distance}/\text{time}$) and how unpredictable toy cars can be.

Timeline:

- 45-50 minutes (1 class period)

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- Trip planning: If you need to be somewhere by a certain time, you can use this main formula to determine how fast you have to drive and plan accordingly. Of course, you must obey traffic laws.

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Racing Formulas (Scoring)

Team: _____

Members: _____

Speed	Distance	Time

Overall Average

Speed: _____

Time: _____