

# Driving STEM

## APPLIED STEM CHALLENGES

### GRADES 3 - 6

#### THE MORE YOU KNOW, THE FASTER YOU GO!

Driving STEM Challenges introduce students to problem solving strategies based on math modeling through the excitement of racing. Students own a motorsports team that strives to engineer performance on track, in research & development (R&D) and in the team's "board room".

Driving STEM students apply concepts and practice skills required in their science and math curriculum including addition, subtraction, multiplication, division, data collection, graphing, problem solving, decimals, fractions, time, measurement, estimation and more!

#### Technology

Their team's technology is an electric, radio-controlled (RC) car that can be modified by small hands to be faster and more stable.

Students in grades 3 - 4 use a 1:16 scale RC car that generates reliable data without fine motor control.

Students in grades 5 - 6 use a 1:24 scale RC car with more performance variables to modify.

#### Available Formats

- Out-of-School clubs
- Summer camps
- Monthly Challenges for the formal classroom



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#### Problem-Solving Skills through Applied Math Modeling

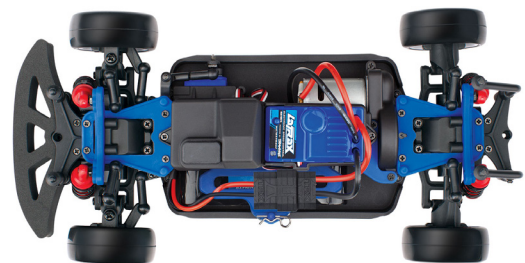


#### Creativity & Innovation



#### Engineering Design

Below: Driving STEM Grades 5-6 Competition Car



Solve problems by setting up experiments, identifying variables, & planning data collection. Use fractions, decimals, and basic computation to describe what you observe.

## DRIVING STEM CHALLENGE OVERVIEW FOR GRADES 3 - 4

CHALLENGE	DESCRIPTION	SKILLS & CONCEPTS
1 Tool Time	Unpack your toolbox.	<ul style="list-style-type: none"> <li>Practice measurement and units.</li> </ul>
2. How Fast is Fast?	What is the range of times required to walk, run and drive the track?	<ul style="list-style-type: none"> <li>Using information from multiple trials, compare, the distances that objects moving at different speeds travel in the same amount of time.</li> <li>Locate points on a number line and in a coordinate grid</li> <li>Rounding Numbers</li> <li>Determine start time, elapsed time, and end time</li> </ul>
3. Road Trip	How does driver skill affect time? How "steady" is your driving?	<ul style="list-style-type: none"> <li>Make use of and analyze models, such as tables and graphs to summarize and interpret data.</li> </ul>
4. Are We There Yet?	How does length of the track affect time & speed?	<ul style="list-style-type: none"> <li>Scientific Inquiry</li> <li>Using information from multiple trials, compare the distances that objects moving at different speeds travel in the same amount of time.</li> <li>Graphically define relationships</li> </ul>
5. Tell Your Story	Design a flag to market your race team and attach it to the car.	<ul style="list-style-type: none"> <li>Understand criteria in an engineering design problem</li> <li>Define engineering design problems and constraints</li> <li>Develop possible solutions, communicate ideas</li> <li>Test different solutions and present a final product</li> </ul>
6. What a Drag!	How does weight of the vehicle affect time and speed?	<ul style="list-style-type: none"> <li>Forces, motion, time and distance</li> <li>Mathematically define relationships</li> </ul>
7. Data-Driven Design (DDD) Project: Payload Carrier	Design a Payload Carrier that transports weights without touching tape to weight.	<ul style="list-style-type: none"> <li>Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.</li> <li>Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.</li> </ul>
9. Power Drag	Optimize work done with the car. Carry the most weight in the least amount of time.	<ul style="list-style-type: none"> <li>What is the difference in work and work done in some amount of time?</li> <li>Use patterns in data to solve problems</li> </ul>
10. DDD: Trailer	Design a payload carrier to carry weights and other items.	<ul style="list-style-type: none"> <li>Understand criteria in an engineering design problem</li> <li>Define engineering design problems and constraints</li> <li>Develop possible solutions, communicate ideas</li> <li>Test different solutions and present a final product</li> </ul>
11. DDD: Kites	Design a kite pulled by the car.	
12. DDD: Moving Targets	Design a catapult to toss pom poms into the car trailer or roof rack	
13. DDD: Paper Bridge	Using triangles and squares, build a bridge for the car.	

# DRIVING STEM CHALLENGE OVERVIEW FOR GRADES 4 - 6

CHALLENGE	DESCRIPTION	SKILLS & CONCEPTS
1 Tool Time	Unpack your toolbox.	<ul style="list-style-type: none"> <li>Practice measurement and units.</li> </ul>
2. How Fast is Fast?	Who is the fastest walker and RC car driver on each team? In the class?	<ul style="list-style-type: none"> <li>Using information from multiple trials, compare, the distances that objects moving at different speeds travel in the same amount of time.</li> <li>Locate points on a number line and in a coordinate grid</li> <li>Rounding Numbers</li> <li>Determine start time, elapsed time, and end time</li> </ul>
3. Are We There Yet?	How does length of the track affect time & speed?	<ul style="list-style-type: none"> <li>Use scientific Inquiry.</li> <li>Using information from multiple trials, compare the distances that objects moving at different speeds travel in the same amount of time.</li> <li>Graphically define relationships</li> </ul>
4. Tell Your Story	Design a flag to market your race team and attach it to the car.	<ul style="list-style-type: none"> <li>Understand criteria in an engineering design problem</li> <li>Define engineering design problems and constraints</li> <li>Develop possible solutions, communicate ideas</li> <li>Test different solutions and present a final product</li> </ul>
5. Weight Balance	How does weight balance affect speed and handling?	<ul style="list-style-type: none"> <li>Forces, motion, time and distance</li> <li>Mathematically define relationships</li> </ul>
6. Pit Stop, Tires & Traction	Investigate to choose the best traction compound for your tires. Change tires with a Pit Stop Challenge.	<ul style="list-style-type: none"> <li>Use scientific inquiry</li> <li>Understand the meaning of traction, or "grip"</li> <li>Use a tool to measure and compare forces</li> <li>Make use of and analyze models, such as tables and graphs to summarize and interpret data.</li> </ul>
7. It Works!	How does weight of the vehicle affect work?	<ul style="list-style-type: none"> <li>Define forces, motion , distance, work and scientific terms.</li> <li>Make Predictions (hypotheses) based on patterns in data and graphs.</li> <li>Determine equivalent expressions</li> <li>Compare, order, and describe decimals with or without using the symbols (&lt;, &gt;, or =)</li> </ul>
8. Power Drag	Optimize work done with the car. Carry the most weight in the least amount of time.	<ul style="list-style-type: none"> <li>Explain the difference in work and work done in some amount of time.</li> <li>Use patterns in data to solve problems</li> </ul>
9. Gears and Gear Ratios	How does changing gears change performance?	<ul style="list-style-type: none"> <li>Engineering design</li> <li>Make data-driven decisions</li> <li>Use machines, levers and understand trade-offs.</li> </ul>
10. Chassis Geometry	How does changing tire angles change performance?	<ul style="list-style-type: none"> <li>Engineer design solutions to problems.</li> <li>Make data-driven decisions.</li> </ul>
11. Suspension	How does changing the suspension angle change performance?	<ul style="list-style-type: none"> <li>Determine how angles change performance.</li> <li>Understand potential and kinetic energy in springs</li> </ul>
12. Final Race Day!	Optimize your car to race well	<ul style="list-style-type: none"> <li>Apply learning to make a final data-driven decision on how to setup the car for racing.</li> </ul>