

INTRODUCING YOUR CHILD TO STEM

VOCABULARY TO KNOW

SPEED

The distance traveled divided by the time it takes to travel the distance.

FRICTION

The force that acts to resist sliding between two touching surfaces.

Science, Technology, Engineering and Mathematics (**STEM**) education provides young adults with the opportunity to participate in many themed **hands-on activities**, including those with connections to sports, history, and other subjects.

Activities involving the VEX Robotics Offroad Truck help individuals learn more about **math** and **engineering** by engaging in activities that are useful and enjoyable while providing them with hands-on experiences in those key areas.

This activity with the VEX Robotics Offroad Truck provides a fun and interesting way for students to apply math skills in a real-world scenario while having fun!

FORMULAS AND EQUATIONS

$$\text{Average Run Time} = \frac{\text{Run1Time} + \text{Run2Time} + \text{Run3Time}}{3 \text{ Runs}}$$

$$\text{Average Speed (m/s)} = \frac{3.0 \text{ meters}}{\text{Average Run Time}}$$

$$\text{Average Speed (mph)} = \text{Average Speed (m/s)} \times 2.24$$

TIPS AND TRICKS

A low battery warning may show up on your screen if the VEX Robotics Offroad Truck gets stuck or cannot gain traction. Keep in mind that the battery is not necessarily low, it just means that the truck's motors are using a lot of energy and triggering the battery warning. Simply press "OK" on the VEX Pilot App and continue to use the VEX Robotics Offroad Truck.

SAMPLE SOLUTIONS

	RUN 1	RUN 2	RUN 3	AVERAGE RUN TIME (SECONDS)	AVERAGE SPEED (M/S)	AVERAGE SPEED (MPH)
INDOOR FLOOR	3.38	3.78	3.51	3.56	0.84	1.88
CONCRETE/ ASPHALT	3.92	3.90	3.85	3.89	0.77	1.72
GRASS/ DIRT	6.39	6.39	6.30	6.36	0.47	1.05

EXTEND YOUR LEARNING

DISCUSS

Discuss how friction might change on bumpy, wet, muddy or icy surfaces. Also discuss how an uneven surface might affect friction as the wheels periodically may lose contact with the ground leading to a reduction in speed.

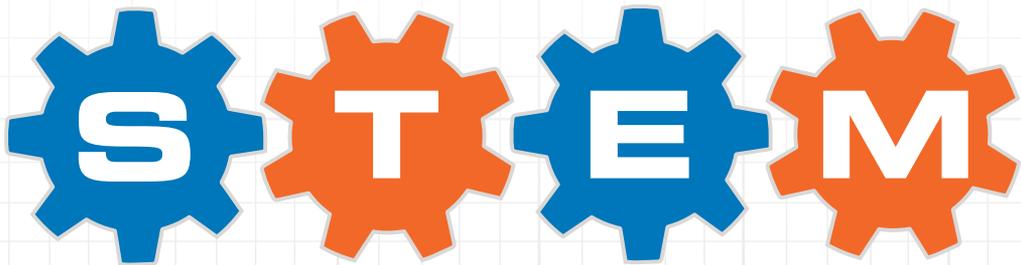
APPLY

Try driving the VEX Robotics Offroad Truck on additional surfaces in order to experiment with speeds on different levels of friction.

EXPLORE

You can explore additional VEX Hexbug products, builds and investigations here: <https://www.hexbug.com/vex>

STEM STANDARDS ADDRESSED



MS-ESS-1

Patterns can be used to identify cause and effect relationships.

3-PS2-1

Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

3-PS2-2

Make observations and / or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

MS-PS2-2

Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

HE-ETS-1-2

Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

MS-PS2-4

Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

STE3.3D

Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.

ISTE4.4C

Students develop, test and refine prototypes as part of a cyclical design process.

ISTE4.4D

Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.

ETS1.A

Defining and delimiting engineering problems.

ETS1.B

Developing possible solutions.

ETS1.C

Optimizing the design solution.

3-5-ETS1-1

Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.

MS-PS3-2

Develop a model to describe unobservable mechanisms.

MS-ETS1-4

Develop a model to generate data to test ideas about designed systems, including those representing inputs and output.

CCSS.MATH.PRACTICE.MP1

Make sense of problems and persevere in solving them.

CCSS.MATH.CONTENT.3.MD.B.4

Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch.

CCSS.MATH.CONTENT.6.SP.B.5

Summarize numerical data sets in relation to their context, such as by reporting the number of observations, describing the nature of the attribute under investigation, and giving quantitative measures of center.

STANDARDS REFERENCED

MATH

Common Core State Standards for Math
<http://www.corestandards.org/Math/>

SCIENCE & ENGINEERING

Next Generation Science Standards
<http://www.nextgenscience.org/>

TECHNOLOGY

International Society for Technology in Education
<http://www.iste.org/standards>