

## INTRODUCING YOUR CHILD TO STEM

### VOCABULARY TO KNOW

#### MASS

The amount of matter in an object.

#### INERTIA

The tendency of an object to resist a change in its momentum

#### MOMENTUM

A measure of how hard it is to stop an object.

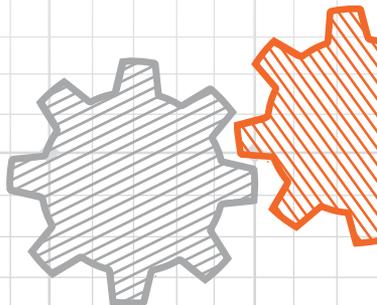
#### LAW OF CONSERVATION OF MOMENTUM

The total momentum of objects that collide is the same before and after a collision.

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 VEX Robotics® by Hexbug® toys help individuals learn more about **math, physics, 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® BATTLEBOTS® Bite Force provides a fun and interesting way for students to learn about **math, science, and engineering**.



### FORMULAS AND VARIABLES

$$\text{Speed (meters/second)} = \frac{\text{Distance (meters)}}{\text{Time (seconds)}}$$

$$\text{Momentum (kg m/s)} = \text{Mass (kilograms)} \times \text{Velocity (meters/second)}$$

$$\text{Final Momentum (kg m/s)} = (\text{Object 1 Momentum}) \times (\text{Object 2 Momentum})$$

$$\text{Final Velocity} = \frac{\text{Final Momentum}}{(\text{Mass Object 1 in kg}) + (\text{Mass Object 2 in kg})}$$

## EXTEND YOUR LEARNING

### DISCUSS

What type of robot would you design if you were competing on BattleBots? What kind of weapon do you think would be most effective?

### APPLY

Forensic investigations of car accidents and crime scenes often involve determining the momentum of an object. Math and physics are a big part of these investigations. How would knowing about final momentum and final velocity help determine which car was speeding at the time of an accident?

### EXPLORE

You can explore additional engaging hands-on activities with VEX and Hexbug toys at <https://www.vex.com/help/build-instructions>

# STEM STANDARDS ADDRESSED

# S T E M

## HS-PS-2-1

Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration

## MS-PS-2-1

Motion and Stability: Forces and Interactions. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects

## MS-PS-2-4

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

## HE-ETS1-2

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

## PS-PS-3-3

Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy

## ISTE1.1A

Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes

## ISTE1.1D

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

## ISTE3.3D

Students build knowledge by actively exploring real world issues and problems, developing ideas and theories while 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

## ISTE7.7C

Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal

## ETS1.A

Defining and delimiting engineering problems

## ETS1.B

Developing possible solutions

## ETS1.C

Optimizing the design solution

## CCSS.MATH.PRACTICE.MP1

Make sense of problems and persevere in solving them

## CCSS.MATH.PRACTICE.MP4

Model with mathematics

## CCSS.MATH.PRACTICE.MP7

Look for and make use of structure

## CCSS.MATH.CONTENT.HSA.REI.A.1

Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

## CCSS.MATH.CONTENT.HSA.REI.A.2

Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

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

Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.

## 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>