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# eisco

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# GARAGE PHYSICS & MATH

The **Garage Physics™** line by Eisco Scientific is designed for students ages 7-13 interested in **STEM** concepts including **physics** and **engineering**. Each kit engages the young learner to **discover new ideas** about the physical world through assembly and play. Each kit is easy to assemble and includes a step-by-step instruction guide. Garage Physics™ kits are designed, sourced, and assembled in the USA.

[www.hbarsci.com](http://www.hbarsci.com)



# NEW GARAGE PHYSICS KITS

## GARAGE PHYSICS HIGH POWER CATAPULT KIT

GP00018

Launch the included ping pong ball up to 30 feet with the High Powered Catapult Kit! This NEW, high powered catapult allows students of any age to explore the concepts of force, acceleration, parabolic trajectory, center of mass, Hooke's law, vector components, and class 2 levers while also providing hours of fun. The kit includes adjustable parts to experiment with different initial conditions and you can also try launching various objects to provide additional variables. Correlates well with NGSS standards 3-PS2-1&2, MS-PS2-2, and HS-PS2-1 (Motion and Stability: Forces and Interactions).



## GARAGE PHYSICS PROJECTILE MOTION SLINGSHOT KIT

GP00014

Projectile motion is one of the most important topics in Newtonian mechanics. Possibly the next most important concept is Hooke's Law for springs. The Sling Shot Kit allows students to explore both in a very simple and robust setup. By recording the time-of-flight of the ping pong ball, students can calculate the initial velocity for various rubber band settings. This can be used to experimentally determine the spring constant of the common rubber band in a dynamic setting. By tipping the slingshot and breaking the initial velocity into its horizontal and vertical components, range can be predicted and measured. Range with 2 rubber bands is more than 30 ft. Additional rubber bands can launch the ping pong ball (or other projectiles) even farther.



## GARAGE PHYSICS MURLIN TREBUCHET KIT

GP00015

Who knew that the trebuchet, one of the most elegant of all medieval weapons ever invented, could be improved! By redirecting the pulling force of the counterweight with a pulley, the Multi-Radial Linear Node (MURLIN) Trebuchet is able to transfer much more energy to the projectile than the standard trebuchet. Assembled kit throws the included ping pong ball 30 feet or more. The MURLIN Trebuchet Kit allows students to explore how the use of a simple machine (pulley) efficiently redirects gravitational potential energy to throw objects farther than a traditional trebuchet. The instruction guide also includes pedagogy for exploring concepts of energy transfer using the scientific method.



## GARAGE PHYSICS BALL BEARING ROLLER COASTER KIT

GP00017

Roller-coasters are one of the best ways to experience the interplay between potential and kinetic energy. This Ball Bearing Roller Coaster Kit makes that exploration easy and FUN! Safely attach the included hooks to the wall and tie up your 20 feet of tubular track with ease. Send the steel ball bearing through the hoop to see potential energy convert to kinetic energy. Go even farther and work out the rotational kinetic energy. Surprise, surprise – rotational kinetic energy accounts for more than 20% of the total kinetic energy! Have student teams compete to design the fastest tube track, slowest tube track, or tube track with the most number of loop de loops. The interplay between potential and kinetic energy has never been more fun!



# BEST SELLING GARAGE PHYSICS KITS



## GARAGE PHYSICS LARGE TREBUCHET KIT

GP00009

The trebuchet is one of the most elegant of all medieval weapons ever invented. With a simple counterweight, beam arm, and sling, heavier projectiles can be launched much further than is possible with other siege engines. Think of it as a machine which transforms gravitational potential energy into kinetic energy – a lot of kinetic energy! A ping pong ball is included, but students can experiment with marshmallows, jelly beans, bouncy balls and other safe objects. Two release pin angles allow exploration into how release angle changes the trajectory. Pedagogy for exploring concepts of energy transfer via the scientific method are included in the instruction guide.



## GARAGE PHYSICS CATAPULT KIT

GP00007

The Eisco Garage Physics Catapult Kit allows students of any age to explore the concepts of force, acceleration, parabolic trajectory, center of mass, Hooke's law, vector components, and class 2 levers while also providing hours of fun. The kit is simple and quick to assemble, and includes adjustable parts to experiment with different initial conditions. The guide includes learning exercises as well as ideas for further exploration segmented by grade level. Correlates well with NGSS standards 3-PS2-1&2, MS-PS2-2, and HS-PS2-1 (Motion and Stability: Forces and Interactions).



## GARAGE PHYSICS STANDING (CATENARY) ARCH KIT

GP00001

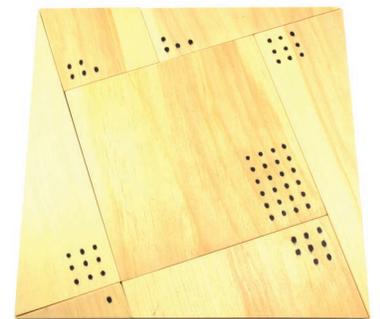
The Standing Arch Kit is composed of seven wooden blocks that, when properly assembled, produce the shape of the catenary arch. This kit engages students to learn engineering concepts such as force balancing and load transfer through assembly of the arch. The kit demonstrates how vaulted arches and types of bridges are constructed and how they are able to bear the weight of the buildings and roadways they hold up. By playing with the various blocks, young learners can understand the importance of the keystone in holding up the arch. The kit includes a hook for the attachment of a hanger and masses (not included) to demonstrate a live load. Alternatively, one can attach a force sensor (not included) to the hook to measure the amount of weight the arch can hold up. Instructions have been correlated to Next Generation Science Standards (NGSS).



## GARAGE PHYSICS PATHAGOREAN THEOREM PUZZLE KIT

GP00004

The Pathagorean Theorem Puzzle Kit encourages exploration for children of all ages. Young children can use the kit to explore basic shapes and similarity. Elementary-school children can engage in solving the central puzzle of the Pythagorean theorem - forming squares that represent the squares of the hypotenuse and shorter sides. Middle-school students can use the puzzle to work out three algebraic proofs of the Pythagorean theorem, including the proof put forward by President James A. Garfield. High-school students can use the kit to explore units of measure and reason out Einstein's proof of the Pythagorean theorem. The instruction guide has segmented sections for each grade level.



## GARAGE PHYSICS SODA BOTTLE CENTER OF MASS KIT

GP00008

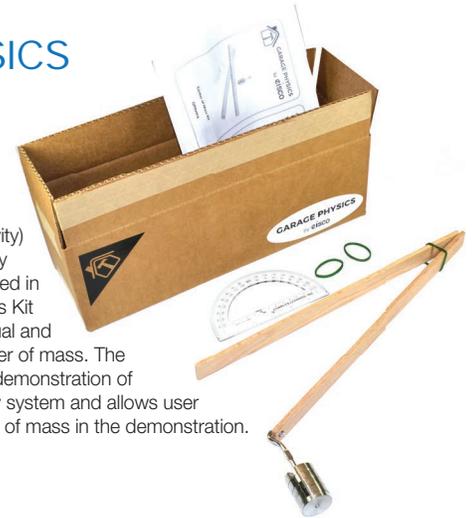
The Soda Bottle Center of Mass Kit offers a fun and simple way to learn about balance and the center of mass by using a common 2 liter soda bottle. The detailed instructions provide multiple activities for students of all age levels. Young children can use the kit to try and balance the board, and older students can use precise measurements of mass and distance to determine force vectors and the overall balance of the system. The minimalistic design allows students to explore balance the way they want to while still learning important mathematical, physical, and geometric concepts. This kit conforms well to NGSS standards 3-PS2-2, MS-PS2-2, and HS-PS2-2 (Motion and Stability: Forces and Interactions).



## GARAGE PHYSICS CENTER OF MASS KIT

GP00003

Center of mass (or center of gravity) is a single point on any solid body about which the weight is balanced in all directions. This Center of Mass Kit allows students to gain conceptual and mathematical knowledge of center of mass. The guided activity gives a dramatic demonstration of center of mass using a two-body system and allows user to calculate and move the center of mass in the demonstration.



## GARAGE PHYSICS SPIRAL OF THEODORUS KIT

GP00006

The Spiral of Theodorus Block Kit allows students of any age to experiment with square roots and irrational numbers in physical form. This kit provides a setting for age-appropriate discussions of the structure and behavior of a whole new type of number. Young children can use the kit to explore right triangles and ramps. Elementary school children can use the triangles to make their first foray into indirectly defined quantities. They can make Theodorus' spiral and other related shapes as well as explore the pythagorean theorem and square roots. Middle school students can use the triangles to test equivalencies with square roots and explore abstract concepts like a sequence of geometric shapes based on the Fibonacci numbers. High school students can use the kit to explore a proof of irrationality for non-square integer roots, a method for approximating square roots, and use the Spiral of Theodorus to approximate the number  $\pi$ .



## GARAGE PHYSICS MAGIC BLOCKS KIT

GP00005

The Magic Blocks Kit has been designed to enable exploration of basic mathematical operators by children of all ages. Young children can use the kit to explore the natural numbers. Elementary school children can use them to investigate addition, subtraction, multiplication, as well as units of measure, and the associative property. They can also try to solve simplified versions of the magic square puzzle by trying to make two stacks, three stacks, or five stacks of the same height. Middle school students can use the puzzle to explore the magic square in depth (in which all rows, columns and the two diagonals should stack to the same height), as well as arithmetic sequences (including the first few elements of the Fibonacci sequence). Beyond working out the complete solution to the magic square, high school students can use the kit to explore counting in binary up to 15, or ternary up to 26 by combining multiple class sets.



## GARAGE PHYSICS TORQUE DEMONSTRATION

GP00002

Torque is a measurement quantity that helps explain how well a force can cause a rotation. With this Torque Demonstration the user can experience significantly increasing torque by moving a mass set down a rod while trying to balance the main rod. It is a tricky and fun demonstration that will leave a lasting conceptual understanding with students of any age. The activity correlates well with the Next Generation Science Standards PS2, Motion and Stability: Forces and Interactions.



## GARAGE PHYSICS TRIGONOMETRY EXPLORATION KIT

GP000011

The trigonometric functions are some of the most important and useful tools within STEM fields. They show up from engineering to quantum mechanics and everything in between. This Trigonometry Exploration Kit gives physical intuition to the unit circle as well as 30-60-90 and 45-45-90 triangles. The instruction guide included walks students through the definition of all six trigonometric functions and uses the properties of similar triangles and the Pythagorean theorem to help students establish the critical relationships between them. 1 radian and 2 radian circular sectors are also included allowing students to explore the definition of the radian unit of angular measurement with their hands. They can then use these tools to come up with their very own approximation of Pi. Finally, Kepler's triangle (which is related to the Fibonacci sequence) provides a vehicle to test one's understanding; trig functions of its angles can all be expressed in terms of the golden ratio.



For more details, visit [hbarsci.com/collections/garage-physics](http://hbarsci.com/collections/garage-physics)