

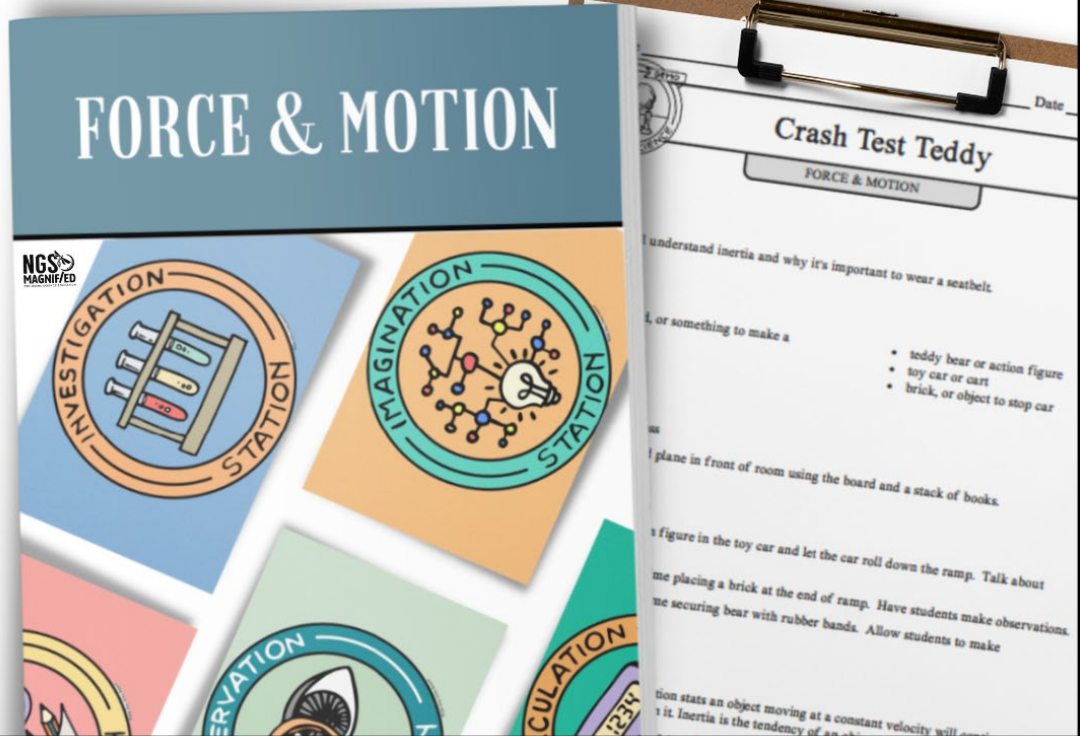


Demos, Labs, & Science Stations Feature:

- Hands-on Investigations
- STEM Challenge
- Scientific Literacy
- Inquiry Process Skills

PHYSICAL SCIENCE - 5E

NGSS · TEKS



DEMOS, LABS, & SCIENCE STATIONS

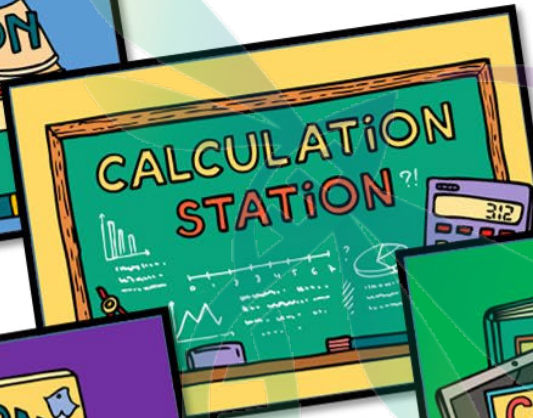
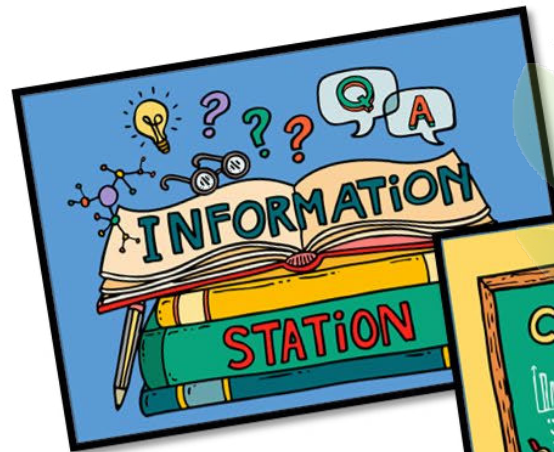
HANDS-ON · STEM · CRITICAL THINKING

**ENGAGING
READING!**

**GRAPHING,
WORD
PROBLEMS &
MEASUREMENT!**

**INQUIRY
SKILLS &
PROCESSES!**

**HANDS-ON
INVESTIGATIONS!**



STEM CHALLENGES!

ALL Station Signage Included!!

Color & Black and White



Teacher guide and answer key
offered for every lab!

Easy-to-get materials!



Crash Test Teddy

Students will understand inertia and why it's important to wear a seatbelt.

Materials:

- leaves or something to make a ramp
- books
- teddy bear or action figure
- toy car or cart
- brick or object to stop car

Demos:

Part A: Before class

- Build an inclined plane in front of room using the leaves and a stack of books.

Part B: During class

- Place bear or action figure in the toy car and let the car roll down the ramp. Talk about Newton's 1st Law.
- Repeat step 1, this time placing a brick at the end of ramp. Have students make observations.
- Repeat step 2, this time securing bear with rubber bands. Allow students to make observations.

What is Happening?

Newton's first law of motion states an object moving at a constant velocity will continue moving until another force acts on it. Inertia is the tendency of an object to resist change in its motion.

When a car travels at a certain speed and collides with a solid object, the car will stop, but the passengers will continue to move forward until their seatbelts stop them. If that passenger is not wearing a seatbelt, they will not be stopped by the seat. (Side note, writing is usually the last science teacher's word.)

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Discussion questions and
teacher set-up included!

Newton's Racers

Overview: Newton's first law of motion states an object will move when a force acts on it. Newton's second law states that the object will accelerate in the direction of the force, but the rate at which the object accelerates depends on its mass and the amount of force acting on it. Newton's third law states that for every action force, there is an equal and opposite reaction force.

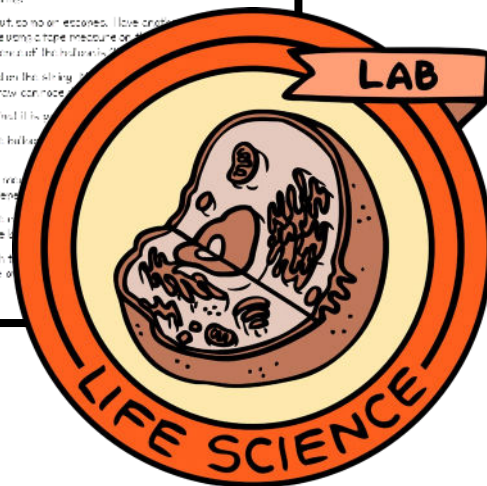
Materials:

- balloon
- string (2.0 feet)
- straw
- tape measure (cloth)
- book
- stopwatch

Procedure:

Part A: Speed

- Tie one end of the string to a stationary object in the room. Be careful not to block walkways or make any tripping hazards.
- Thread the straw onto the loose end of the string.
- Blow up the balloon and hold the end tightly shut so no air escapes. Have one member measure the balloon's circumference using a tape measure or string. Add air to the balloon until the circumference of the balloon is 30 cm.
- Tap the balloon so that the straw end is the end where the string is. The balloon is facing outward so the balloon and straw can move.
- Have a group member pull the string tight so that it is taut.
- On the count of three, release the straw and the balloon.
- Mark the place where the balloon stopped and record time and distance in your data table. Repeat steps 3-7 for two more sets for the circumference of 30 cm. For the final set, the circumference of 30 cm.
- Using data in table, calculate speed (m) for each of the three. Once done, calculate the average time of the three.





Group members will read a passage and then complete a task to help increase science literacy and deepen their understanding of the science concept.



A Floating Runway

Typically, airplanes require long runways of about 2,500 feet to gather enough speed to take off successfully. So, when do you do it? you're a pilot on an aircraft carrier with only about 300 to 500 feet of runway in front of you and nothing but the Pacific Ocean below you? There is a typical situation around the aircraft carriers of the United States Navy in which engineers have had to design off-vehicle launching and landing systems for planes aboard.

Taking Off

Technical engineers have designed a takeoff mechanism that uses massive steam-powered catapults. The catapults require a two-system operation - one system is above deck, the other below.

Above deck, the flight deck crew positions the plane at the rear of the catapult and hook the aircraft's nose gear (front wheel) to the catapult using a towbar. The towbar is attached to the catapult during the launch. At this time, the pilot puts the plane doesn't move forward once a holdback bar is in place.

Below the deck, steam is building up pressure into a catapult on a pulley system. When ready, the shooter, or for one the holdback bar to release the plane while the catapult is in two seconds. Now the easy part is over. The first

Landing

Planes come in for a landing using a light system to help them line up with the moving runway. This is especially true during night landings. Before touchdown, the pilot lowers the tailhook, which is exactly that - an extended hook attached to the plane's tail. The goal of the tailhook is to snag one of the arrestor cables that are stretched across the deck. The arrestor cables are a sturdy cables on a pulley system that are set to a specific setting depending on the aircraft so it can be caught and slowed down.

A

What is the major challenge of a runway on an aircraft carrier?

B

What system is in place to give airplanes the speed they need for takeoff?

D

What do you think engineers could look at in terms of new designs for more efficient launching and catching systems?

A

A

B

C

Name: _____
Date: _____

A1. _____

A2. _____

B1. _____

B2. _____

C1. _____

C2. _____

1. In the picture above, identify and describe the force that allows riders on this roller coaster to complete this loop without falling.

2. Knowing what you know about roller coasters, and centripetal force, would you swing a large bucket of water above your head? Why or why not?

Group members will have images, illustrations, or actual samples at this station that show applications or processes of the science topic.



Group members will work with one another to explore the concept through hands-on activities, so they may practice specific inquiry process skills as they learn.

Effects of Air Resistance

Problem: Does the shape of paper make a difference when it comes to air resistance?

Materials:

- tap water (2)
- sheets of scrap paper (2)
- masking tape

Procedures:

Part A:

- Measure a height of 1.5 m.
- Have one group member stand with another uses ten steps to the ground. Record data in table.
- Do two more trials.
- Repeat steps 2-3 with two different shapes.

Part B:

- Have a group member stand 1.5 m. Have two members use the two sheets of paper and measure the time it takes to fall.
- Do two more trials.
- Place a flat sheet of paper in the air and use the book with flat paper to measure the time it takes to fall.

Analyze and Conclude:

- In Part A, which piece of paper fell faster?
- In Part B, describe your observations.
- How did using the book in Part B affect the results?

Name _____
Date _____

Data and Observations:

Part I: A					
Paper Shape	Trial 1	Trial 2	Trial 3	Time	Observations
Flat					
Crumpled					

Part I: B					
Paper Shape	Trial 1	Trial 2	Trial 3	Time	Observations
Sheet 1 (one book)					
Sheet 2 (with book)					

Analyze and Conclude:

- _____
- _____
- _____

A

Define gravity and identify two things that the gravitational force between two objects depend on?

B

State Newton's Laws of Motion.

C

Gravity is a force that every object in the universe exerts on every other object.

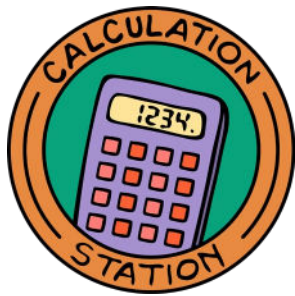
D

1st: Objects in motion stay in motion, objects at rest stay at rest until acted upon by a force; 2nd: Objects move in the direction of the net force; 3rd: For every action there is an equal and opposite reaction.

Name _____
Date _____



There are three different options for this station: interviews, videos, or group essay. Depending on the option you choose, group members will communicate what they know by answering questions in creative ways.



Group members use their math skills to complete the station challenge. Skills may include graphing, analyzing data, using models, measurement, and calculating formulas or word problems.

Domino Derby

Materials:

- Dominoes (30)
- Meterstick
- Stopwatch

Procedure:

- Set up all 30 dominoes in a straight line.
- Use the meterstick to measure five feet.
- Have one group member knock down the dominoes.
- Repeat steps 1-3, except the dominoes are now standing on their sides.
- Repeat steps 1-3 again.
- Calculate the average speed for the three trials by the average time in back for the table.
- Answer any questions found on your answer sheet.

Set-Up 1		
Time	Distance (cm)	Avg Speed (cm/s)
1		
2		
3		
Average		

Set-Up 2		
Time	Distance (cm)	Avg Speed (cm/s)
1		
2		
3		
Average		

Set-Up 3		
Time	Distance (cm)	Avg Speed (cm/s)
1		
2		
3		
Average		

How did the distance of the dominoes affect the average speed?



Design a Tire Tread Pattern

Challenge: Design a tire tread pattern that will reduce hydroplaning by forcing water out the sides of tread when driving while raining.

Materials (per group):

- Playdough
- Cardboard (4x6)
- Carving tools
 - plastic knife
 - plastic spoon
 - various art sculpting tools
- Water

System requirements:

Part A:

- As a group, use the planning sheet to create a new one. The objective is to make more of the tire surface touches the surface of the road and the tire on the road.

- No more than 50% of play
- Design must include a point in center for water to be

Part B:

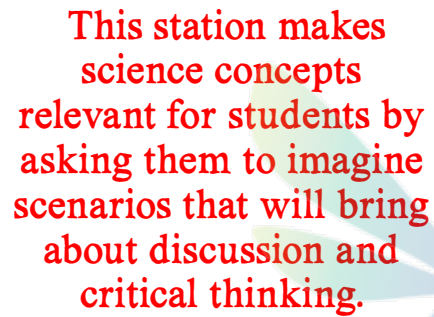
- Shave dough into a 4"x6" rectangular block. Place playdough on top of the
- Carefully cut out the design using card and spoon as possible to ensure accuracy.
- Wait for the teacher's instructions to take on your answer sheet and

Testing:

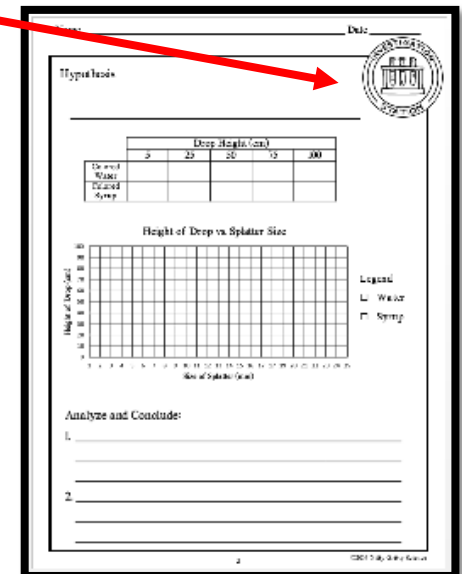
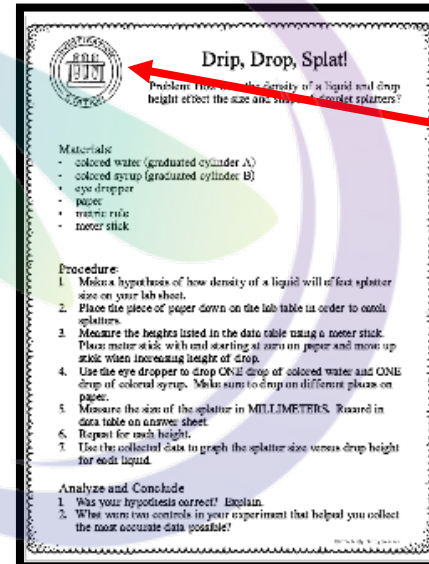
When time allows, test the tread pattern (prototypes). Pour two cups of water in a pan, and continuously pour. Measure the amount of water that is collected in the

Tire tread patterns to inspire your design!

Group members will work together to solve a STEM (Science, Technology, Engineering, Math) challenge by creating models or designs that demonstrate their understanding of the science topic being taught.



Students easily recognize which answer sheet to use at each station by matching station icons located on each page!



**Laminate station pages and reuse
for each class and for years to
follow!**

Inquiry and Process Skills

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 Demo

 Guided Inquiry Lab

 Science Stations

Inquiry-Based Science Unit:	Classifying	Communicating	Compare & Contrast	Creating Models	Gather/Organize Data	Generalizing	Identifying Variables	Inferring	Interpreting Data and Graphs	Making Decisions	Manipulating Materials	Measuring / Calculating	Observing	Predicting
Force and Motion														
Crash Test Teddy	X	X	X			X		X		X	X		X	
Force and Momentum		X	X			X	X			X		X		
Newton's Racers		X	X	X	X		X		X		X	X		X
Information Station: A Floating Runway					X	X		X						
Observation Station: Images & Questions	X		X		X	X		X					X	
Investigation Station: Effects of Air Resistance	X		X		X		X		X		X	X	X	
Calculation Station: Domino Derby					X		X			X		X		
Communication Station: Questions	X	X				X				X				
Creation Station: Tire Tread Patterns		X		X	X				X	X	X	X	X	X
Imagination Station: Nervous Newton		X		X						X				X

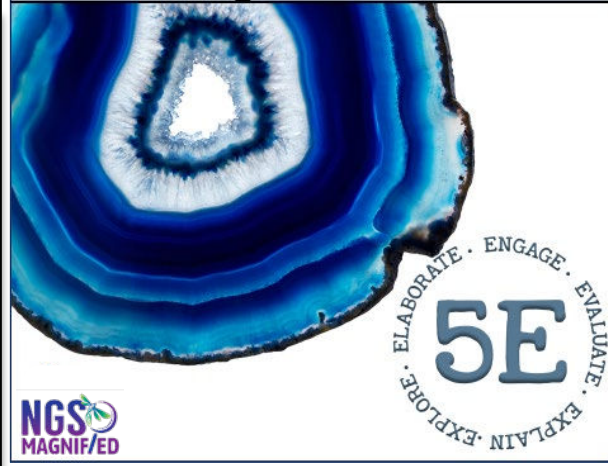
NGS Magnified promotes scientific inquiry throughout the curriculum. Students become more confident and effective learners while developing problem-solving and critical thinking skills. Process skills, such as planning, organizing, and evaluating, help students to complete projects and assignments. These skills allow students to independently gather information, analyze it, and draw their own conclusions.

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