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Preschool Basics on Motion and Forces:
Newton's Laws of Motion

Presented by
Dr. Theresa Vadala

Inertia

Force and Acceleration

Action-Reaction

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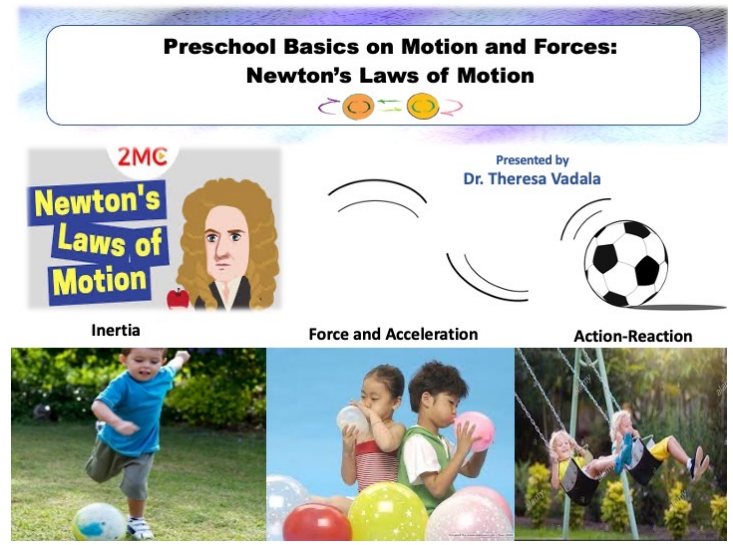
Preschool Basics on Motion and Forces: Newton's Laws of Motion

by

Theresa Vadala, Ed. D

Child Care Training Consultants, LLC

Las Vegas, Nevada 89139



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Applying New Knowledge:
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PRESCHOOL Module 2 **CDA Subject Area 1: Children's Physical and Intellectual Development** **Title: CDA PHY.INT 2.G Preschool Basics on Motion & Forces: Newton's Law of Motion**	**2 Hours**	**0.2 CEUs**

THE NEVADA REGISTRY TRAINING APPROVED

Dr. Theresa Vadala

(Instructor & Curriculum Designer)

AUTHORIZED IACET PROVIDER

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Learning Assessment

Read the material provided, take the 5-10 quiz questions and

complete the training evaluation at the end of the course.

Participants must receive 100% on individual courses to obtain a certificate of completion.

Questions?
We are happy to help.

Support Services:

Please contact us 24/7 at

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Child Care Training Consultants LLC., Goal

The goal is to empower educators as they take Child Development Associate (CDA) courses to make a powerful difference in the lives of young children!

Mission Statement

"Child Care Training Consultants, LLC's is committed to provide research-based professional growth and development training courses primarily focused on the Child Development Associate. The CDA is the nation's premier credential that is transferable, valid, competency-based and nationally recognized in all 50 states, territories, the District of Columbia, community colleges and the United State Military.

Vision

Child Care Training Consultants, LLC's vision is to provide the early childhood community with courses based on CDA competency standards to obtain their CDA Credential and assist in reaching their goal as an exceptional early childhood educator to ultimately achieve higher child outcomes.

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About the Instructor

Theresa has over 30 years experience in the field of Early Childhood Education. During that time, she served as a Preschool Teacher, Disabilities Coordinator, Program Facilitator, and Director of an Early Childcare Program. She has a Doctoral Degree in Educational Leadership with Specialization in Curriculum and Instructional Design. Theresa is a Professional Growth & Development Trainer and Curriculum Designer and offers web-based courses internationally. She is the Executive Director/Owner of of the training organization Child Care Training Consultants, LLC., (CCTC).

Business Description

Child Care Training Consultants, LLC. (CCTC) is an accredited provider (AP) with the International Association for Continuing Education and Training (IACET) that provides Continuing Education Units (CEU) for adult education nationally. The business is also a recognized training organization with the Council for Professional Recognition, Child Development Associate Council (CDA), National Credentialing Program.

Research

Physics is one of the sciences that in the learning process emphasizes conceptual understanding. When learning about physics, it will not be separated from the essential concepts that exist in every material. So that understanding of the concept becomes very important to be able to study physics in its entirety and be scientifically correct. One important concept in physics is Newton's laws which is a fundamental concept of the motion of objects related to force and mass. This law was formulated by Isaac Newton into three basic laws. Seemingly sophisticated science concepts are often deceptively simple enough to bring down to a child's level. Subjects such as physics are fair game for a child's learning if you explain terms and ideas in a kid-friendly way. If you're trying to teach a young student Newton's Laws of Motion, use age-appropriate vocabulary, illustrative examples and hands-on techniques.

Needs Analysis

Young children enjoy solving problems and exploring the world through science, technology, engineering, and math (STEM). STEM learning can support children's early math development and many other important skills. Students may have been exposed to basic concepts in math and science, but they did not develop a level of mastery necessary to progress to higher levels needed for school readiness.

Purpose

The purpose of this training is to provide educators with ideas for STEM based activities to prepare students for kindergarten readiness. Research shows that incorporating STEM education at a young age can increase academic achievement, persistence and critical thinking.

Goal and Objectives

Goal:

The goal is to identify Newtons Three Laws of Motion to provide students with purposeful, age-appropriate "motion" activities in daily teaching practices.

Objectives: Participants will be able to…

1) Apply inertia-based activities to teach students during daily teaching opportunities.
2) Demonstrate how force moves an object through distance to teach students during daily teaching practices.
3) Experiment with action - reaction activities to teach students in daily teaching practices.

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Learning Outcomes

Participants will be able to…

1) List 3 inertia-based activities to teach students during daily teaching opportunities.
2) Describe 2 ways on how force moves an object through distance to teach students during daily teaching practices.
3) List 2-5 activities on action - reaction to teach students in daily teaching practices.

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Agenda

Goals & Learning Objectives and Outcomes

Part 1: Newton's Laws of Motion Introduction, Activities & Review

Part 2: 2nd Law of Motion: Forces Introduction, Activities & Review

Part 3: 3rd Law of Motion: Action – Reaction Introduction, Activities & Review

Overview

References

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Part 1: First Law of Motion – Inertia

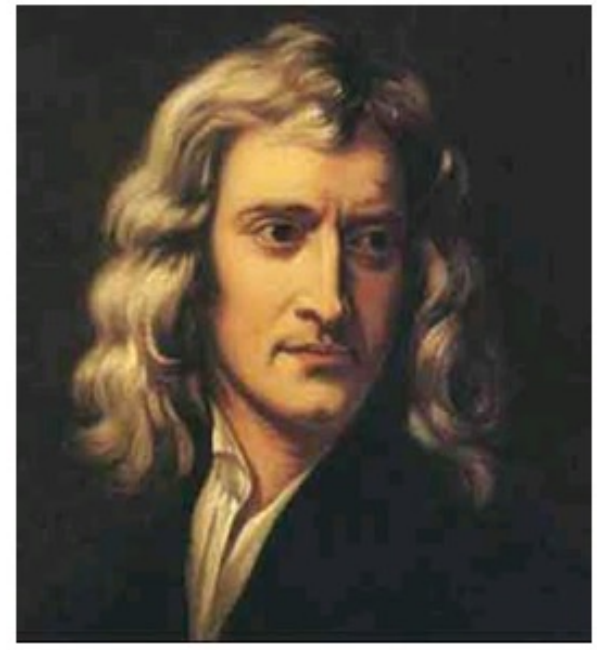
Objective: Apply inertia-based activities to teach students during daily teaching opportunities.

How does this apply to preschool?
What is Motion?
Newton's First Las of Motion

Newton's Laws of Motion

Physical motion is governed by Newton's three laws of motion:

1. Principle of Inertia
2. Force = Mass x Acceleration
3. Action & Reaction



Sir Isaac Newton
(1643 – 1727)

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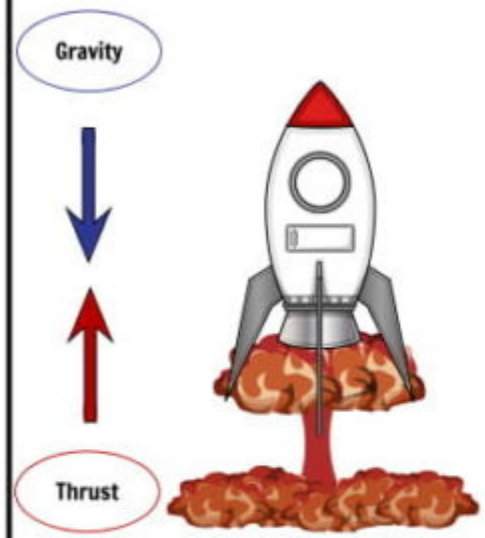
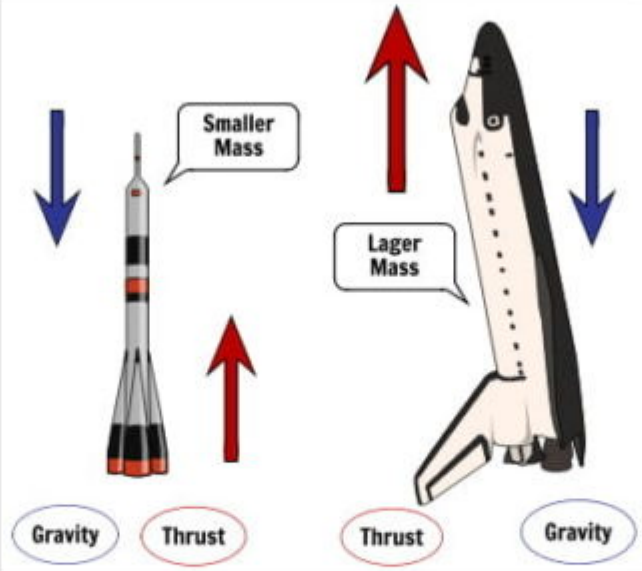
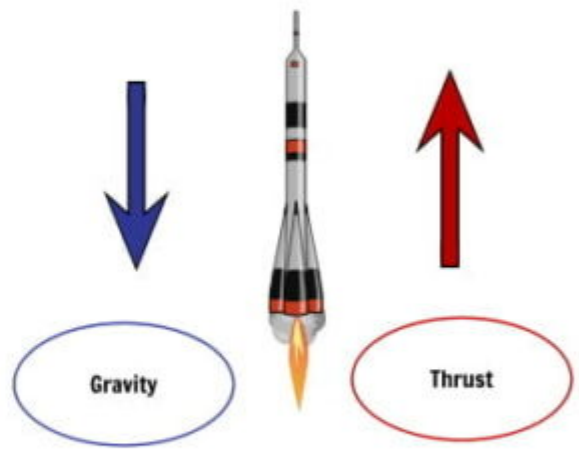
Newton's Laws of Motion

Rocket Launch

1st Law / Law of Inertia	2nd Law / Law of Force and Acceleration	3rd Law / Law of Action and Reaction
		
A stationary object remains at rest until you apply a force to it.The force is the explosion happening in the rocket that forces the rocket into the air. The motion is the rocket pushing itself into the air.	The smaller and thinner the object is the easier and faster acceleration than a larger and wider object. If the thrust is the same.	The action is gravity pushing down and always pushing down on the rocket. The reaction is the force that is being applied to the grown, that thrusts the rocket into the air pushing against the gravity.

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Newton's Laws of Motion
How does this apply to preschool?

Physics in preschool contributes to children's cognitive, language, social and emotional development. Studies show that physics is necessary for preschoolers as they are highly involved in purposeful movement activities throughout daily teaching practices.

Inertia

Force and Acceleration

Action-Reaction

How does this apply to preschool?

Physics and preschool are two concepts not generally used in the same context; physics is an issue of importance in the preschool period. Physics activities stimulate children's inquiry and problem-solving skills and supports children's social and language skills. While preschool children cannot define physics, they can make discoveries about matter and energy. For instance, activities with balls and ramps offer children experiences with their physical world, upon which they can later build more abstract physics knowledge (Woodard and Davitt, 1987). Through such manipulation, children learn how their movements affect the movement of other objects in different ways. It is important for educators to choose physics topics that preschool children face in their daily lives. Additionally, helping children grasp the basic principles of physics, learn by living and incorporating physics in their daily lives.

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What is Motion?

Motion is movement in any direction. You can move up, down, forwards, backwards, and sideways. You can move in circles. You can wiggle, wave, twist, turn, roll, flip, sway, bend, pivot, shake, and spin.

Newton’s First Law of Motion

Stop and Start. Newton's first law of motion states that an object won't move by itself and that, once in motion, it won't stop unless some force acts upon it. This shows the child that the force of his/her hand will stop the ball's motion.

Newton's 1st Law of Motion

First Law of Motion

- Law of Inertia
- An object not moving (at Rest) will stay at Rest
- An object moving, will keep moving until another force stops it

Which of the following has more inertia? And why?

or

or

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Newton's 1st Law of Motion

Which of the following has more inertia? And why?

or

or

The bowling ball has more inertia because it is heavier.
The hammer has more inertia because it is heavier.
Heavier objects consist of more "mass" and are more difficult to move and stop. That is why heavier objects have more inertia.

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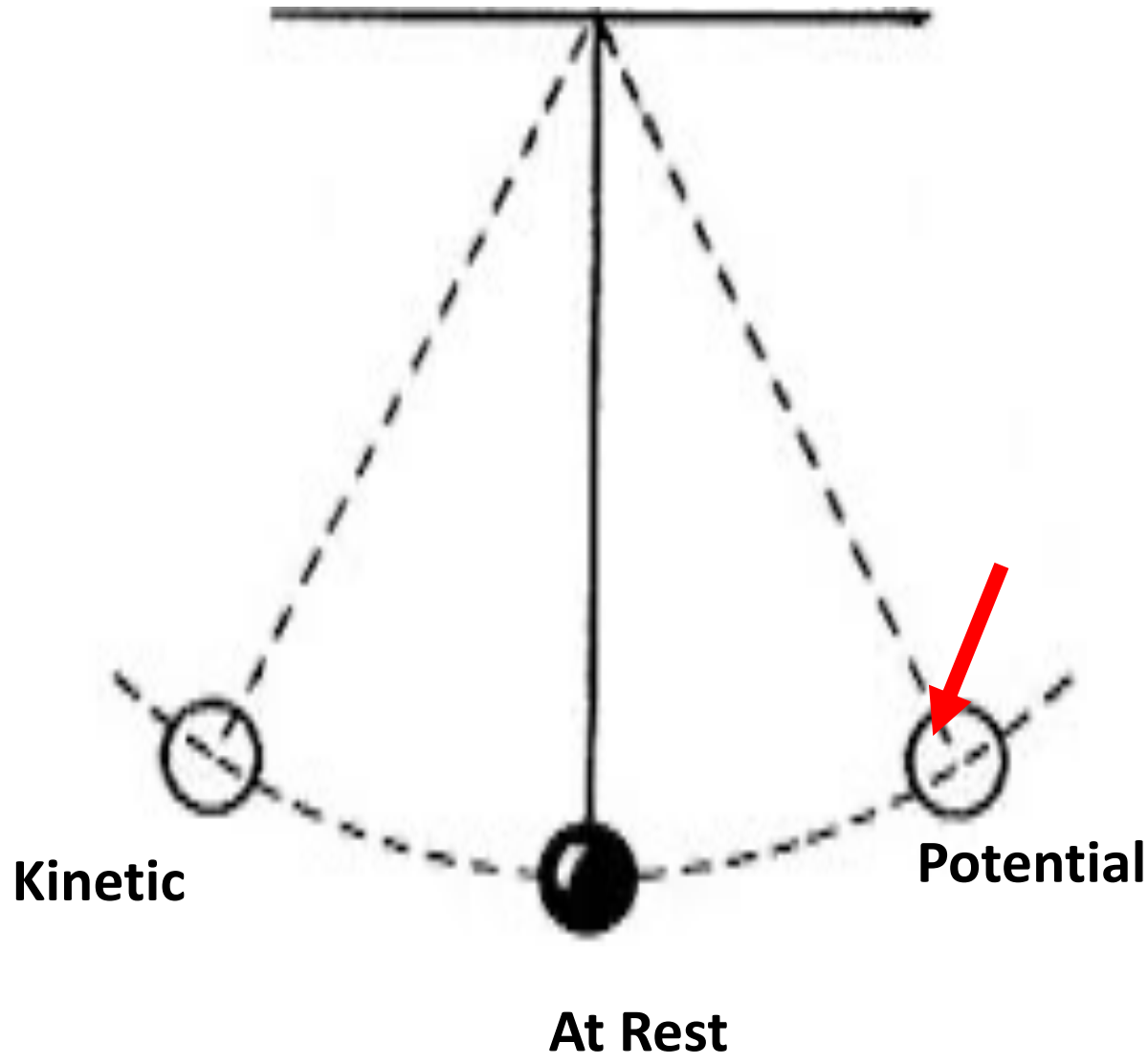
Pendulum: Kinetic versus Potential

(Energy caused by being in motion)

Energy stored in an object due to its position is Potential Energy. Energy that a moving object has due to its motion is Kinetic Energy. Explaining how energy is stored and transferred and how that relates to the movement and momentum of objects in motion involves understanding potential and kinetic energy. This is an area of science were getting hands-on with the storage, transfer, and release of energy really helps students connect with what is happening.



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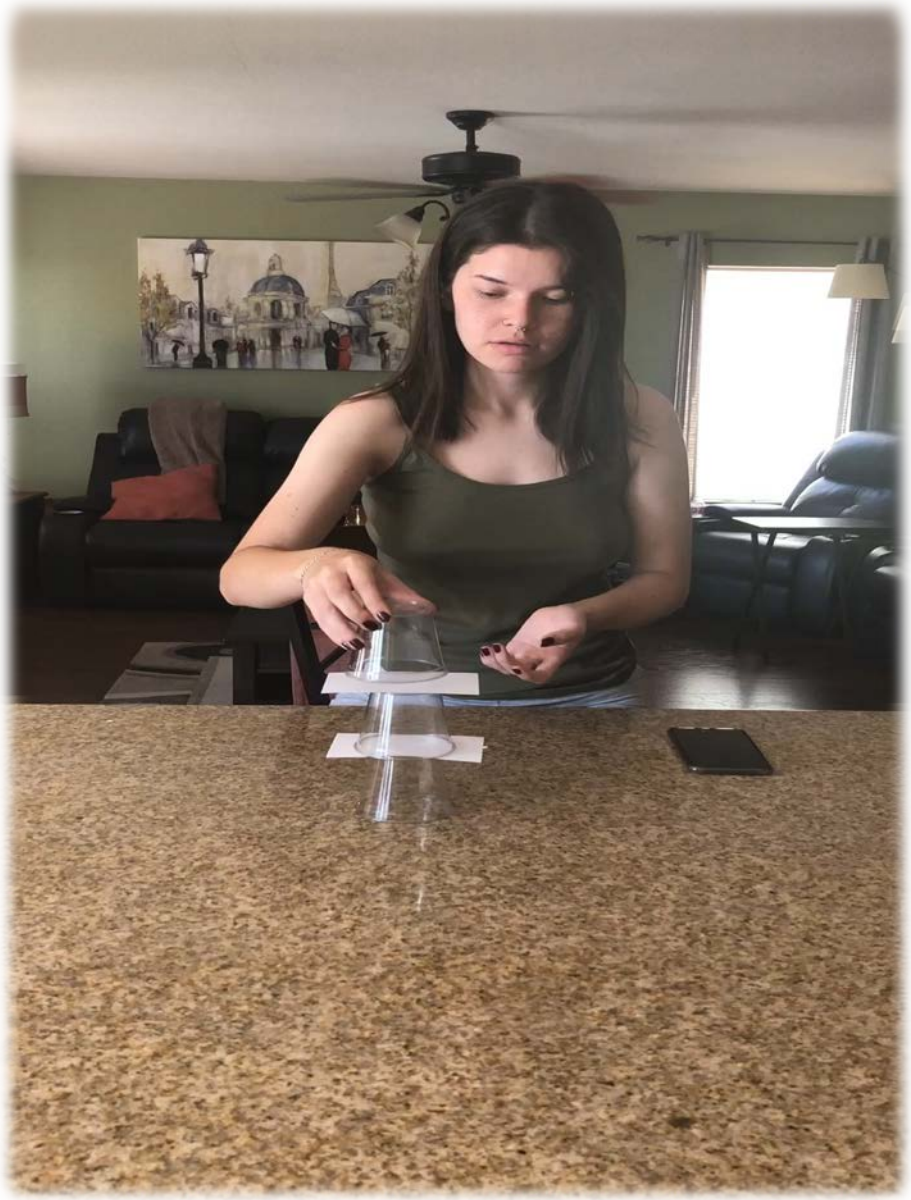
Domino Drop

When the domino falls, much of its potential energy is converted to kinetic energy, or energy of motion. Falling dominoes slide against one another, and their bottoms slip against the surface causing them all to fall. This kind of motion is called potential energy, when it is standing still, and kinetic energy when it moving.

Cup Tower Pull



Tower of Cups is a fun activity that can help your students start to understand the idea of perseverance, allow you to observe how they face challenges, and promote unity and collaboration in your classroom.

Egg Drop

Egg drop projects help students explore basic concepts such as gravity, force and acceleration. In an egg drop project, the specific details and rules may vary. The general idea is to have students design a container that will allow an egg to safely fall into a container with water from without breaking.

Inertia says an object, the egg in this case, will stay at rest, unless an outside force acts upon it, your hand in this case. When you move the pie pan with your hand, gravity takes over and pulls the egg straight down into the glass of water.

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Newton's First Law Experiment

1. The Law of Inertia / cup of water/card/penny

Why does the coin fall into the water?

Explanation:

The coin has inertia, meaning it really wants to stay in one place. If you move the card slowly, it isn't fast enough to overcome that force. If you flick it quickly, the coin stays in one place and then drops into the cup.

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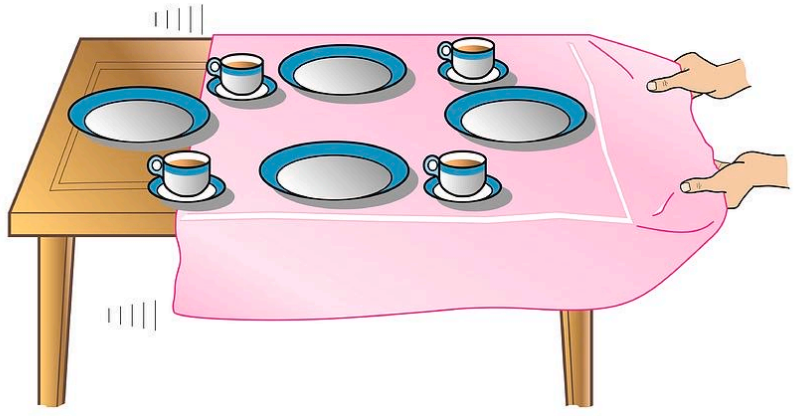
Newton's First Law Experiment

1. The Law of Inertia: Tablecloth Pull

Try this with students using plastic dishes or blocks. Discuss what happens when the tablecloth is pulled out slowly. What happens when the tablecloth is pulled out fast. The principle of inertia states that an object at rest (one that isn't moving, like the plates) stays at rest unless another force acts on that object. In this case, the plates stay at rest because the force of you pulling down on the tablecloth isn't enough to move them.



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Part 1: First Law of Motion – Inertia Review

1. Motion is movement in any direction.
2. Newton's first law of motion states that an object won't move by itself and that, once in motion, it won't stop unless some force acts upon it.
3. Heavier objects consist of more “mass” and are more difficult to move and stop. That is why heavier objects have more inertia.
4. Energy stored in an object due to its position is Potential Energy.
5. When domino fall, much of its potential energy is converted to kinetic energy, or energy of motion.
6. Inertia and the Egg Drop & Coin Drop: When you move the pie pan with your hand, gravity takes over and pulls the egg straight down into the glass of water.
7. Inertia and the Tablecloth Pull: The plates stay at rest because the force of you pulling down on the tablecloth isn't enough to move them.

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Part 2:
Second Law of Motion – Force and Acceleration

Objective: Demonstrate how force moves an object through distance to teach students during daily teaching practices.

Newton's Second Law of Motion

2. Acceleration F=ma Force motion acceleration

F=Force m = Mass a = Acceleration

Law of Acceleration and Force

- When greater force is applied, the greater the acceleration
- The lesser the force applied, the lesser the acceleration

Newton's 2nd Law of Motion

The second law states that the greater the mass of an object, the more force it will take to accelerate the object.

There is even an equation that says Force = mass x acceleration or F=ma. This also means that the harder you kick a ball the farther it will go.

A "Force" is a push or pull.

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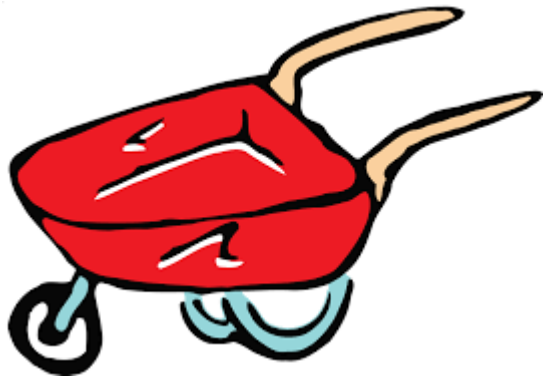
Examples of Force: Push and Pull

Push

Push and Pull

Pull



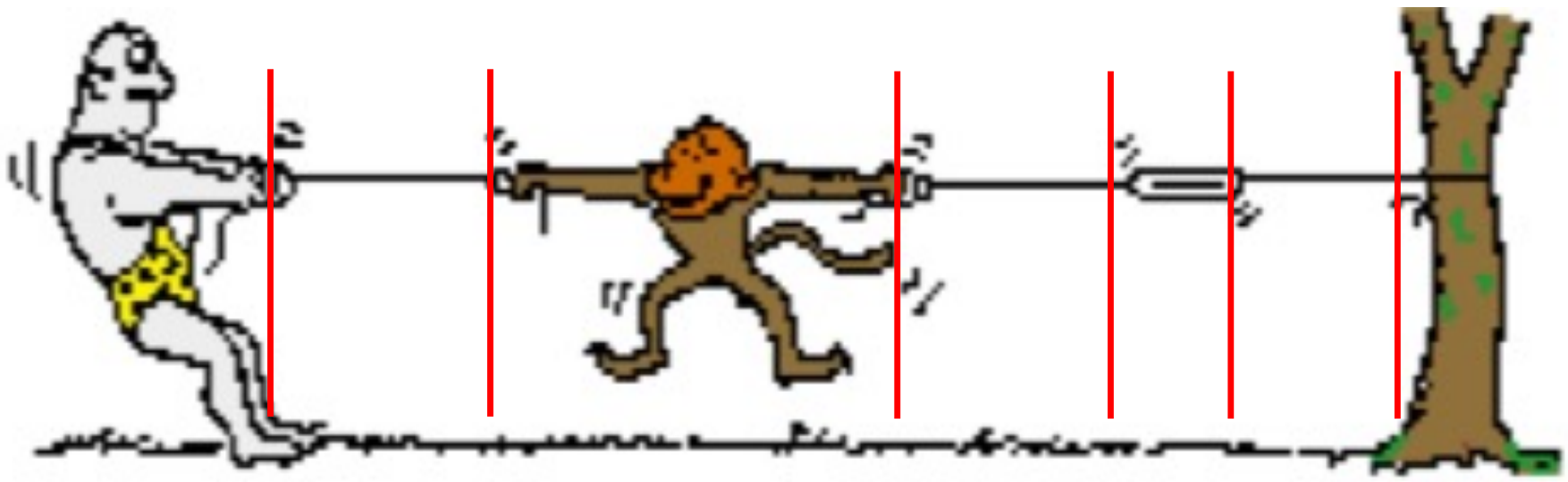
Newton's Law of Motion (2nd)

On the drawing below, how many points of "force" can you identify.

Newton's Law of Motion (2nd)

On the drawing below, how many points of "force" can you identify.

A force is a push or pull. There are 6 points of force.



Newton's 2nd Law of Motion

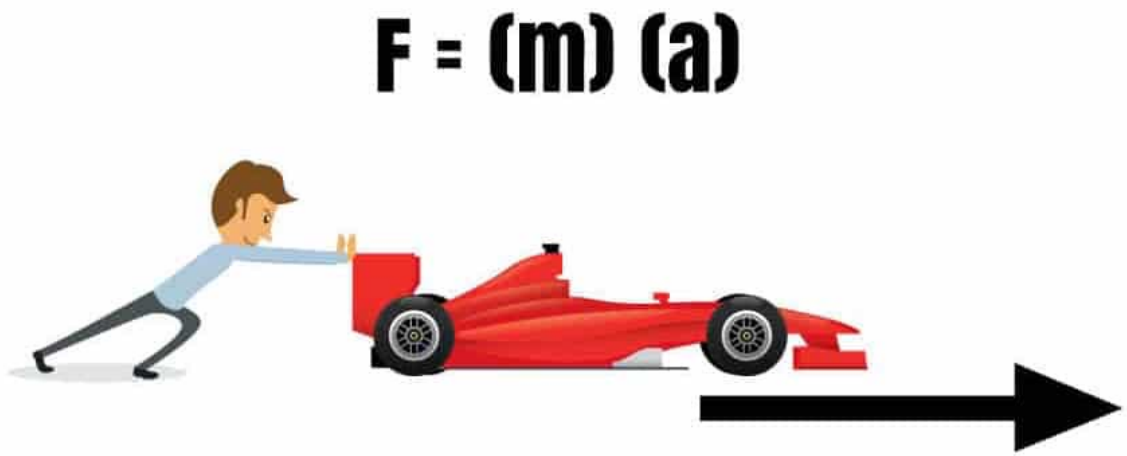
"Force"

2. Acceleration F=ma Force motion acceleration

F=Force m = Mass a = Acceleration

Law of Acceleration

- When greater force is applied, the greater the acceleration
- The lesser the force applied, the lesser the acceleration



What is Force?

- Force is strength or energy
- Physical action or movement
- Power
- Pressure
- Weight
- Might

Newton's Second Law of Motion

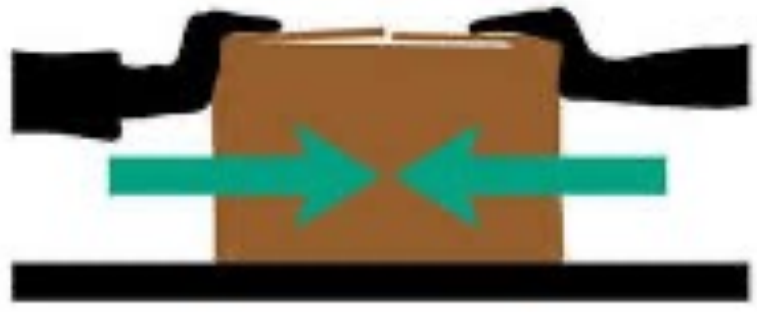
2. Acceleration F=ma Force motion acceleration

F=Force m = Mass a = Acceleration

Law of Acceleration

- When greater force is applied, the greater the acceleration
- The lesser the force applied, the lesser the acceleration

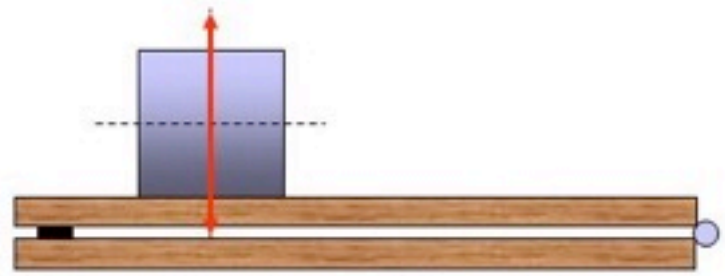
Balanced forces = no acceleration



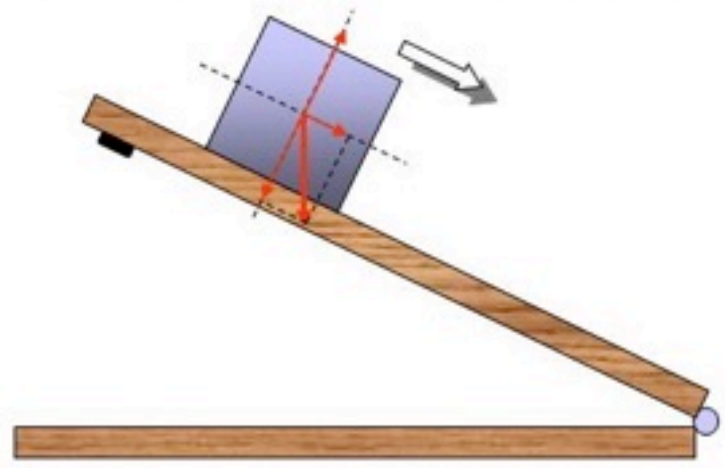
Newton's Second Law of Motion

2. Acceleration F=ma Force motion acceleration

We already learned that when all forces balance there is no motion



Unbalanced forces induce acceleration



Skating - Acceleration

Acceleration is the name we give to any process where the velocity changes. Since velocity is a speed and a direction, there are only two ways for you to accelerate: change your speed or change your direction—or change both.

Light & Heavy Cylinder Roll (Weight)

For a rolling object, kinetic energy is split into two types: translational (motion in a straight line) and rotational (spinning). When you roll a ball down a ramp, it has the most potential energy when it is at the top, and this potential energy is converted to both translational and rotational kinetic energy as it rolls down.

Will all rolling objects accelerate down the ramp at the same rate?

If two cylinders have the same mass (weight) but different diameters, the one with a bigger diameter will have a bigger moment of inertia. This is because its mass is more spread out.

Try it!

Squeeze Bottle Activity

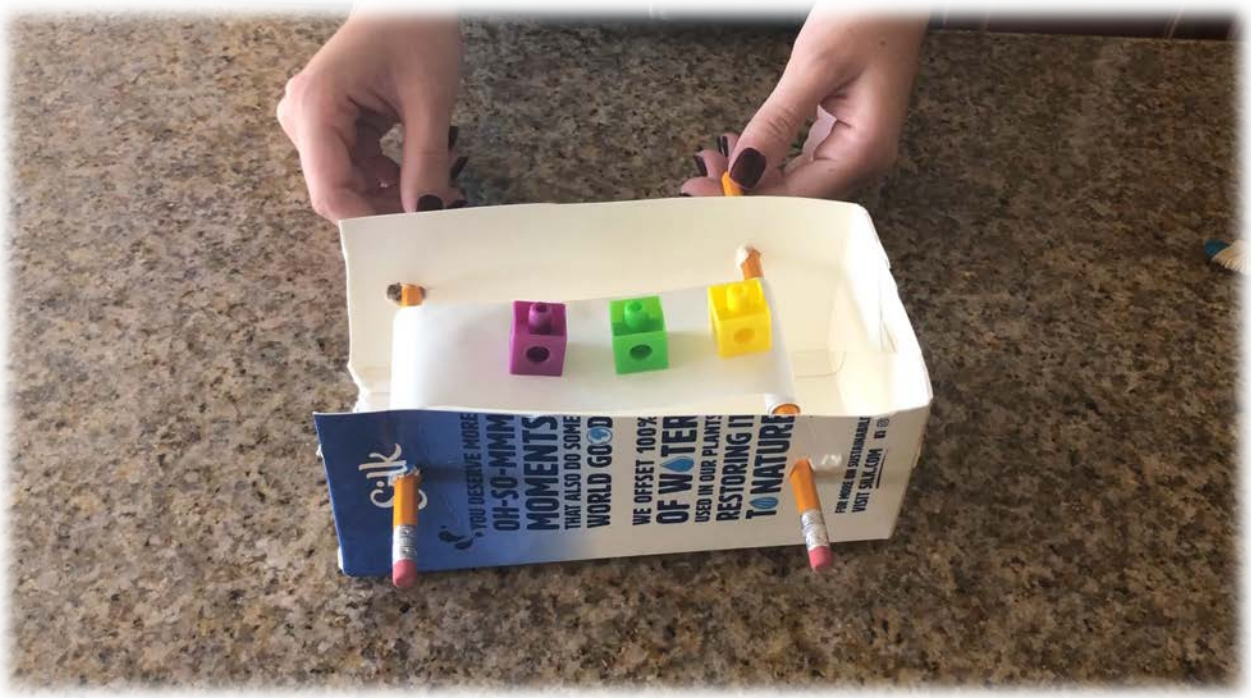
The more force or pressure you apply to the water bottle, the more water comes out. Use a KWL chart and ask students what they think will happen if you squeeze the bottle with water softly.

F=Force m = Mass a = Acceleration

Law of Acceleration

- When greater force is applied, the greater the acceleration
- The lesser the force applied, the lesser the acceleration

Conveyer Belt Activity



F=Force m = Mass a = Acceleration

Examples of Law of Acceleration

- When greater force is applied, the greater the acceleration
- The lesser the force applied, the lesser the acceleration

Zip Line

Newton's Second Law states that the force of an object is equal to its mass times its acceleration. ... The rider will continue in motion along the zip line until a braking force is applied to stop the rider.

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Part 3: Third Law of Motion: Action – Reaction

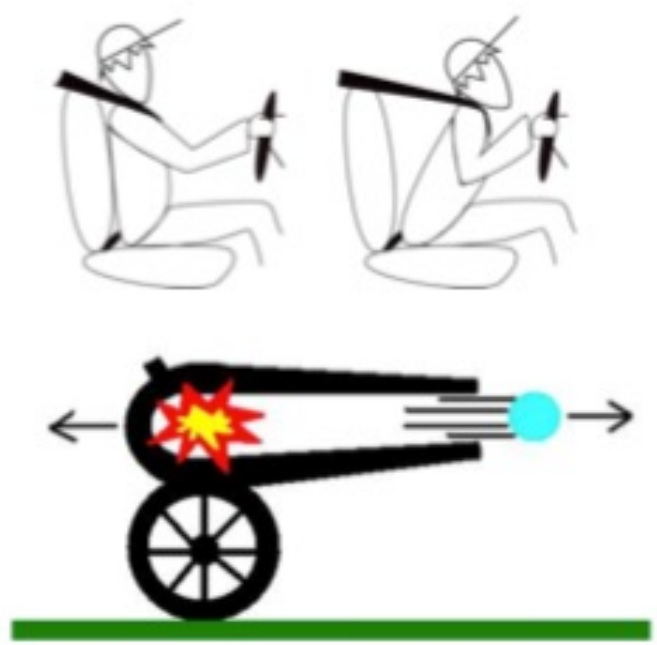
Objective: Experiment with action - reaction activities to teach students in daily teaching practices.

Newton's Third Law of Motion

3. Force -Action - Reaction (Balloon Racers)rockets

- Action – Reaction
- Equal in size and acts in the opposite direction
- Always occurs in pairs

Example: A bat hitting a baseball: Baseball hitting the bat

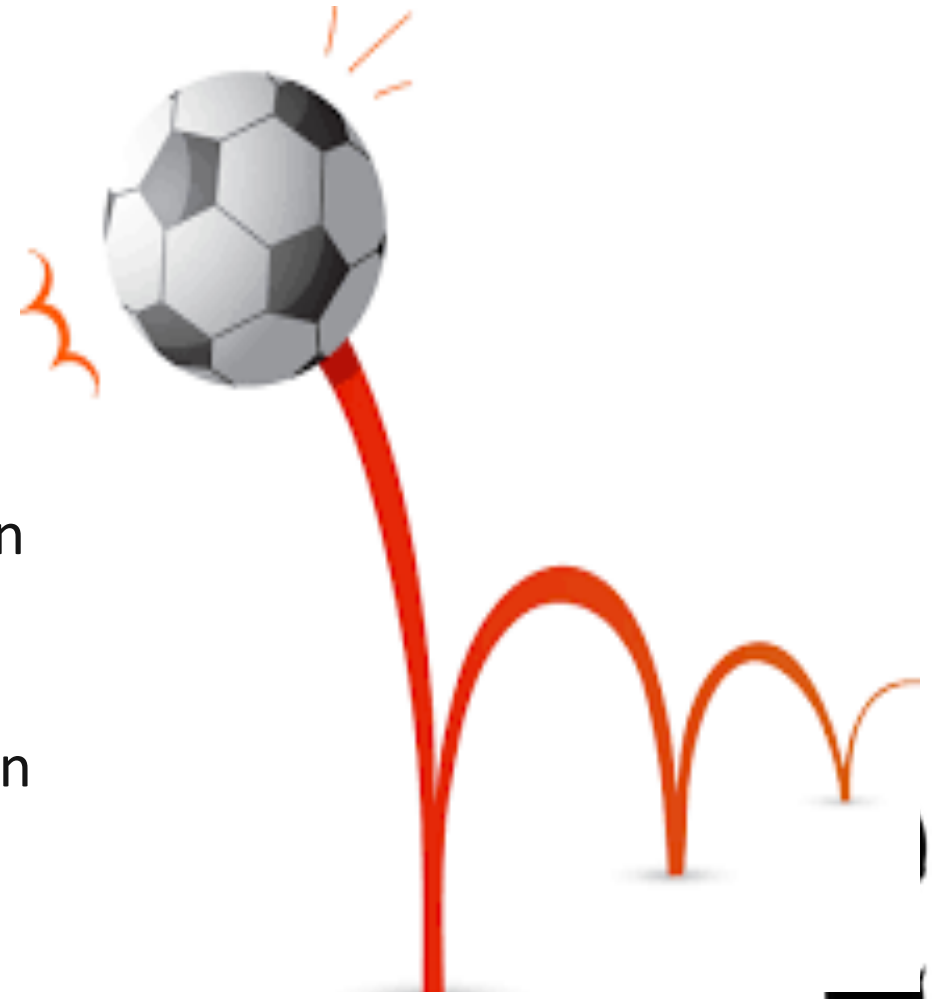


Newton's 3rd Law of Motion

Newton's Third Law. A force is a push or a pull that acts upon an object as a results of its interaction with another object. ... These two forces are called action and reaction forces and are the subject of Newton's third law of motion.

Bouncing a Ball

Balls are rather unassuming objects; they serve as an interesting springboard into learning about many interesting physics phenomena.



Acceleration, velocity, energy; you can learn it all when you start looking at the physics behind bouncing balls.
In any ball bounce, the action can be broken into during its motion, before, during, and after impact is examined.

Throw Ball Against Wall

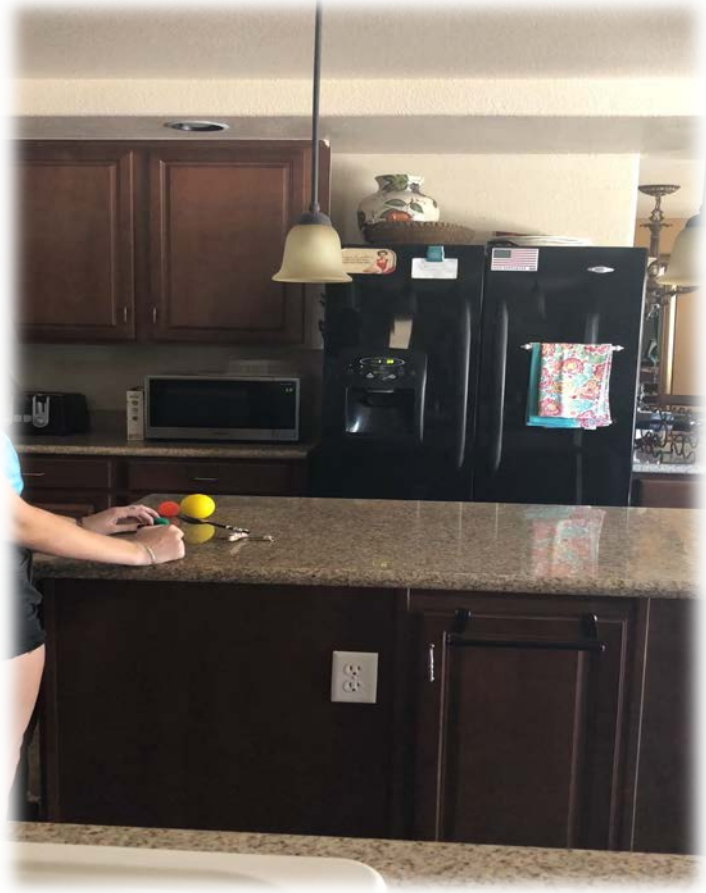
According to Sir Isaac Newtons third law of motion, "For every action force, there is an equal reaction force in the opposite direction." What this means is when you exert a force upon the wall, as the ball does when it strikes it, the wall exerts an equal force back upon the ball, causing the ball to bounce back.

Boxing

Physics occurs in punching because of energy, momentum and work, power, and velocity. Before a boxer punches, he has potential energy which is stored energy. Once, the boxer begins to punch potential energy turns into kinetic energy.

Catapult

Newton's Third-law of motion states that for every action force, there is a reaction force that is equal in strength and opposite in direction. ... The catapult arm is pushing up on my hand with a lot of force, but my hand is pushing back, in the opposite direction, making the catapult arm move downwards.



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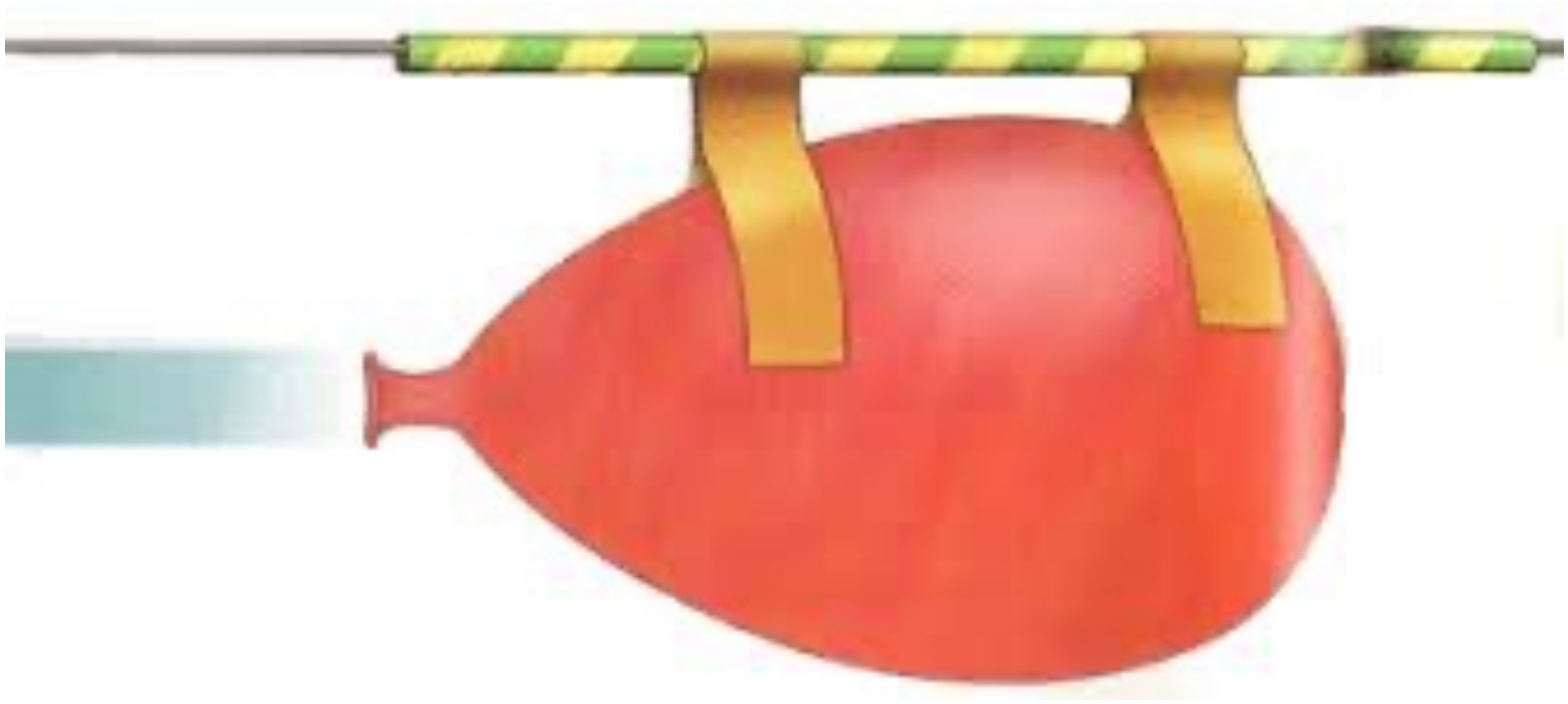
Balloon Rocket Launcher



This experiment is all about the air and thrust! Once you let out the air inside of your balloon, it creates a forward motion called THRUST! Thrust is a pushing force created by energy that pushes your balloon all the way across your string!

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Part 3: Third Law of Motion – Action – Reaction Review

Every action has an equal and opposite reaction: As an object creates a force on another object, it will move slightly (or a lot) in the opposite direction

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Overview

Isaac Newton is known as the scientist that studied gravity, but he also produced three important laws of motion. There's a reason things move the way they do, and it all has to do with force, or any push or pull on an object.

The three laws are:
1.Law of inertia: An object at rest will stay at rest and an object in motion will stay in motion until a force makes it move or stop moving

2.Force equals mass times acceleration: The force an object can create can be calculated by multiplying its mass by how fast it is speeding up or slowing down

3.Every action has an equal and opposite reaction: As an object creates a force on another object, it will move slightly (or a lot) in the opposite direction.

Subjects such as physics can be incorporated into child's learning if you explain terms and ideas in a kid-friendly way. If you're trying to teach a young student Newton's Laws of Motion, use age-appropriate vocabulary, illustrative examples and hands-on techniques.

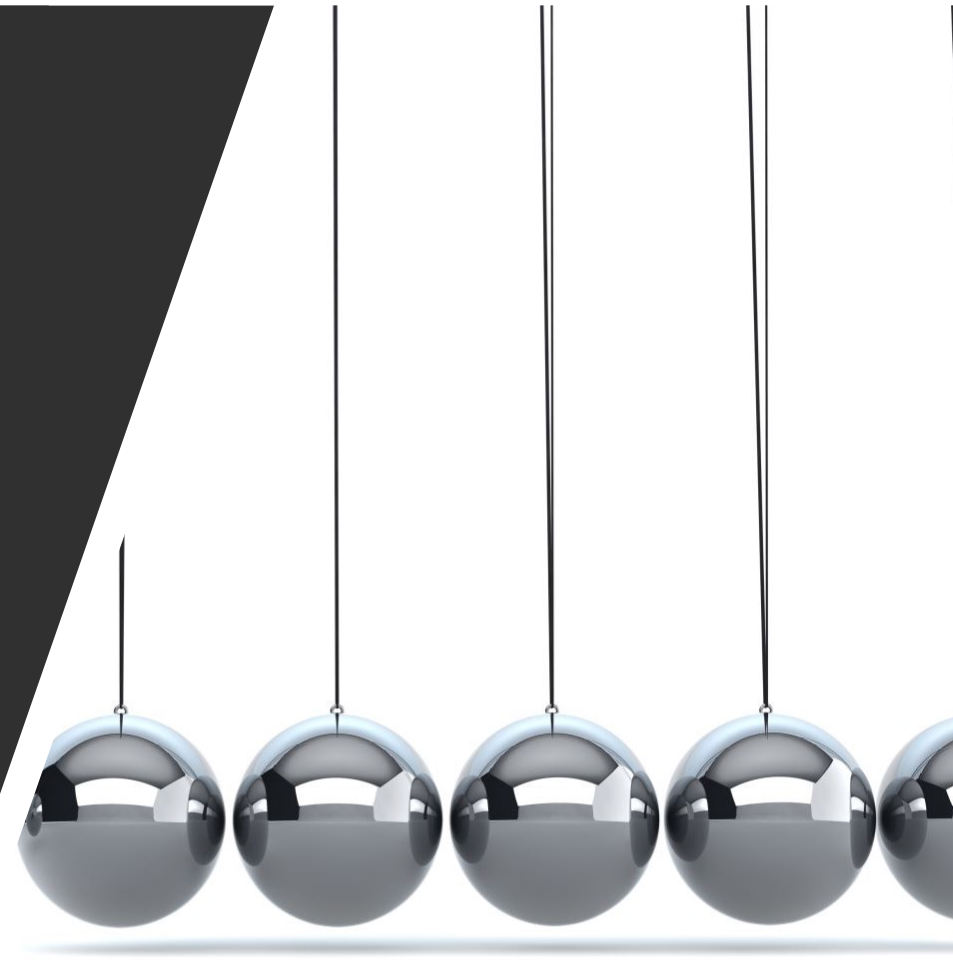
Newton's Laws of Motion

The next slide provides activities under each of the "Laws of Motion" that you can incorporate during daily learning practices.

First Law of Motion - Inertia

Second Law of Motion – Force & Acceleration

Third Law of Motion – Action - Reaction



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Newton's Laws of Motion Activities

Inertia	Force and Acceleration	Action - Reaction
Pendulum	Bowling	Launch a Balloon
Domino Drop	Car Ramps	Skating
Coin Drop	Spinner	Throw Ball
Egg Drop	Squeeze Bottle	Against Wall
Tablecloth Pull	Swinging	Bounce a Ball
	Riding a Bike	Boxing
	Kicking a Ball	Walking
	Pulling a Wagon	
	Pushing a Stroller	
	Conveyer Belt	
	Zipline	

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Transfer of Learning

What is Transfer of Learning?

Transfer of learning is an indicator of training effectiveness because it measures the extent to the learning occurred from the training course is applied on the job.

Successful learning that occurs during a training session does not automatically translate into successful performance in the work environment.

Think about how you will transfer any concepts, strategies or activities into daily teaching opportunities.

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Vocabulary Words

Move
Moving
Force
Push
Pull
Slide
Bounce
Roll
Weight
Friction

Incline
Steep
Slope
Ramp
Accelerate/decelerate
Heavy
Light
Zip line
Wheel and Axle
Machine
Hauling/Haul

Catapult
Launch
Pulley
Lower/Lift
Lever
Heavy
Light
Farther
Closer
Balance

Pendulum
Back
Forward
Conveyor Belt

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Applying New Knowledge:
Learning & Transfer

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Thank you for choosing
Child Care Training Consultants, LLC.,
for your CDA Training Needs!

Learning Assessment

Read the material provided, take the 5-10 quiz questions and

complete the training evaluation at the end of the course.

Participants must receive 100% on individual courses to obtain a certificate of completion.

Questions?
We are happy to help.

Support Services:

Please contact us 24/7 at

childcaretrainingconsultants1@gmail.com

Business # 702.837.2434