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Machines and Motion Hi/Lo Curriculum Map

This program was developed to make the basic Physical Science curriculum accessible to all kinds of learners. The clear, straightforward presentation of essential facts, the colorful, highly visual elements, and the hands-on activities will capture the interest of students with a variety of learning styles and skill levels. The content supports the Physical Science curriculum that covers force and motion, simple and compound machines, and the basics of flight presented in grades 4 and up. It is useful as a reinforcement and review tool for older students who need extra help with these concepts.

Each set of facts is presented in several different ways and enhanced with photo images that bring the information to life and visually engages students in the learning process. Students will have many learning opportunities as they work with the binder materials. The short, manageable bits of important information presented in the Fast Facts Folders and Fast Facts Mini-Posters are appealing to struggling learners and pave the way for further instruction.

Teacher Notes

- Introduction
- Words to Know
- Pre/Post-Test

Extras:

- Bingo Game for Machines & Motion
- Photo Activity Cards & Labels
- 14 Mini Posters
- Reading Folders – Layed up to print as booklets

FORCE & MOTION SECTION

Lesson 1: Force & Motion

- Force Fast Facts Mini-Poster
- Motion Fast Facts Mini-Poster
- Force & Motion Activity Page
- Force & Motion Facts Sheet #1: Force & Motion
- Force & Motion Facts Sheet #2: Force & Motion Terms
- Force & Motion Facts Sheet #1 & 2 Activity Page
- Force & Motion Facts Sheet #3: Types of Movement
- Force & Motion Facts Sheet #4: Normal & Applied Force
- Force & Motion Facts Sheet #3 & 4 Activity Page

Lesson 2: Friction

- Friction Fast Facts Mini-Poster
- Force & Motion Facts Sheet #5: Frictional Force
- Force & Motion Facts Sheet #5 Activity Page
- Force & Motion Facts Sheet #6: Resisting Forces
- Force & Motion Facts Sheet #6 Activity Page

Lesson 3: Buoyancy

- Buoyancy Fast Facts Mini-Poster
- Force & Motion Facts Sheet #7: Upward Forces
- Force & Motion Facts Sheet #7 Activity Page

Lesson 4: Gravity

- Gravity Fast Facts Mini-Poster
- Force & Motion Facts Sheet #8: Gravitational Force
- Force & Motion Facts Sheet #8 Activity Page

Lesson 5: Magnetic

- Magnetic Fast Facts Mini-Poster
- Force & Motion Facts Sheet #9: Magnetic Force
- Force & Motion Facts Sheet #9 Activity Page

Lesson 6: Centripetal Force

- Centripetal Fast Facts Mini-Poster
- Force & Motion Facts Sheet #10: Centripetal, Tension, & Spring Force .
- Force & Motion Facts Sheet #10 Activity Page

Force & Motion Review Activities

- Force & Motion Review Activity 1
- Force & Motion Review Activity 2
- Force & Motion Review Activity 3

MACHINES SECTION

Lesson 1: Simple Machines

- Machines Facts Sheet #1: Simple Machines
- Machines Facts Sheet #1 Activity Page

Lesson 2: Inclined Planes

- Inclined Planes Fast Facts Mini-Poster
- Machines Facts Sheet #2: Inclined Planes
- Machines Facts Sheet #2 Activity Page

Lesson 3: Wedges

- Wedges Fast Facts Mini-Poster
- Machines Facts Sheet #3: Wedges
- Machines Facts Sheet #3 Activity Page

Lesson 4: Screws

- Screws Fast Facts Mini-Poster
- Machines Facts Sheet #4: Screws
- Machines Facts Sheet #4 Activity 1
- Machines Facts Sheet #4 Activity 2

Lesson 5: Levers

- Levers Fast Facts Mini-Poster
- Machines Facts Sheet #5: Levers
- Machines Facts Sheet #5 Activity 1
- Machines Facts Sheet #5 Activity 2

Lesson 6: Pulleys

- Pulleys Fast Facts Mini-Poster
- Machines Facts Sheet #6: Pulleys
- Machines Facts Sheet #6 Activity

Lesson 7: Wheels & Axles

- Wheels & Axles Fast Facts Mini-Poster
- Gears Fast Facts Mini-Poster
- Machines Facts Sheet #7: Wheels & Axles
- Machines Facts Sheet #7 Activity Page

Lesson 8: Compound Machines

- Fast Facts Folder: Compound Machines
- Machines Facts Sheet #8: Compound Machines
- Machines Facts Sheet #8 Activity 1
- Machines Facts Sheet #8 Activity 2

Machines Review Activities

- Machines Review Activity 1
- Machines Review Activity 2
- Machines Review Activity 3
- Machines Review Activity 4

FLIGHT SECTION

Lesson 1: Early Flight

- Fast Facts Folder: Early Flight
- Early Flight Folder Activity Page

Lesson 2: Modern Flight

- Fast Facts Folder: Modern Flight
- Modern Flight Folder Activity Page

Lesson 3: Pioneers of Flight

- Flight Facts Sheet #1: Pioneers of Flight
- Flight Facts Sheet #2: Early Airplane Manufacturers
- Flight Facts Sheet #3: Early Aviators
- Flight Facts Sheet #1, 2, 3 Activity 1
- Flight Facts Sheet #1, 2, 3 Activity 2
- Flight Facts Sheet #1, 2, 3 Activity 3

Lesson 4: Air Travel

- Flight Facts Sheet #4: Air Travel
- Flight Facts Sheet #4 Activity Page

Lesson 5: Parts of an Airplane Print & Google Slides

- Flight Facts Sheet #5: Parts of an Airplane
- Flight Facts Sheet #5 Activity Page
- *PDF with a link to Google Slides

Lesson 6: How Airplanes Fly

- Flight Facts Sheet #6: How Airplanes Fly
- Flight Facts Sheet #6 Activity Page

Lesson 7: Gliders

- Flight Facts Sheet #7: Gliders
- Flight Facts Sheet #7 Activity

Lesson 8: Helicopters

- Flight Facts Sheet #8: Helicopters
- Flight Facts Sheet #8 Activity Page

Flight Review Activities

- Flight Review Activity 1
- Flight Review Activity 2
- Flight Review Activity 3
- Flight Review Activity 4

Force *Fast Facts*

Force can be described as a **push** or a **pull**.

If something is being pushed or pulled, force is being applied to it. If forces are completely balanced, there is no motion. The interaction between balanced and unbalanced forces creates motion. Forces can be great or small. They can come from left or right, up or down.



PUSHING



PULLING

FORCE IN USE



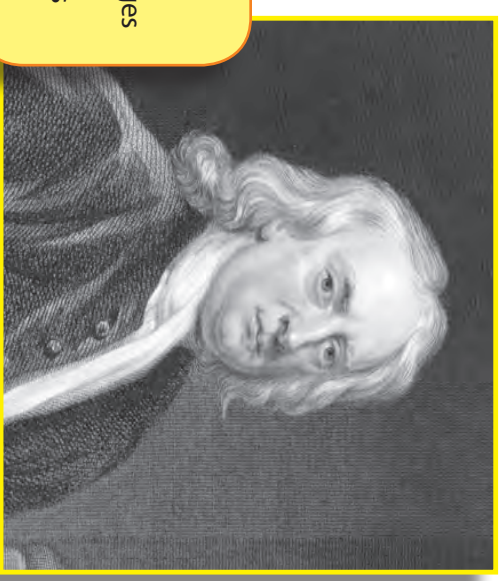
These two women are working together – pushing and pulling the sled – moving in the same direction. The forces they are using are added together, making it easier to move the sled.



These kids are in a tug-of-war. They are not working together. They are pulling in opposite directions. Their forces are subtracted, making movement more difficult.

Force is measured in **newtons**. Newtons can be added or subtracted. Forces working together are added. Forces pulling apart are subtracted.

Motion *Fast Facts*



Motion is the act of **changing place** or **position**. But motion needs some kind of **force** to cause that change. When forces interact, an object is put into motion or a moving object changes speed or direction. In 1687, Sir Isaac Newton published his three laws of motion. These laws explained how the concepts of force and motion work together.

NEWTON'S LAWS OF MOTION

FIRST LAW

Unless acted on by an outside force, a body in motion tends to remain in motion, a body at rest tends to remain at rest.



This skater will continue to move in a straight line until interrupted by an outside force.

SECOND LAW

A force, acting on an object, will change its velocity by changing either its speed or its direction or both.



When this soccer ball flew into the net, the force of the net changed its speed and direction.

THIRD LAW

For every force and action, there is an equal and opposite reaction.



When this moving ball meets the force of the swinging bat, the movement of the ball changes to the opposite direction. The speed of the ball is equal to the power of the force of the bat.

Name _____

FORCE & MOTION
MINI-POSTERS
ACTIVITY

Force & Motion

Write your answers in a complete sentence.

1. Write a brief description of force.

2. Write a brief description of motion.

3. How is force measured?

Circle the correct answers.

4. Forces pulling in opposite directions make movement _____.

easier

harder

5. Which of Newton's Laws of Motion are being described in the following sentence?

Unless acted on by an outside force, a body in motion tends to stay in motion, a body at rest tends to stay at rest.

First Law

Second Law

Third Law

6. Which of Newton's Laws of Motion are used in the following action?

A moving tennis ball being hit by a tennis racket.

First Law

Second Law

Third Law

Force & Motion

FORCE & MOTION FACTS SHEET # 1

Everything in the universe is constantly in motion. It may just be a very, very slow, small amount of movement, but movement is always happening. Even when it appears that things are standing still, the earth is moving around the sun and the sun is moving around our galaxy.

Motion cannot happen without some kind of force. When a force interacts with an object, it can either put the object in motion or change the speed or direction of its motion. A force is a push or a pull. If you pull a wagon up the street or push a child on a swing, you are applying force and causing motion.



Balanced Force

Balanced Forces

There are two kinds of force – balanced and unbalanced. Balanced forces are equal and opposite in such a way that no change occurs in the motion of an object. The forces acting on a stack of books sitting on a desk are balanced. The books are not in motion; they are at rest.



Unbalanced Force

Unbalanced Forces

Unbalanced forces are forces that are stronger in one direction than another. An unbalanced force occurs when a force interacts with an object at rest or in motion and changes its state. A force can come from any direction and can be weak or strong. When you give a sled a push down a hill, you are creating an unbalanced force that changes the position and motion of the sled. The more unbalanced the force becomes, the faster and farther the sled will go.

Force & Motion terms

FORCE & MOTION FACTS SHEET #2

Understanding the meaning of the following force and motion terms will help in the understanding of what happens when forces interact to create different kinds of movement.

Speed is how fast an object moves over a distance.

Velocity is the speed of an object moving in one direction. If a moving object makes a turn, it changes its velocity because it is no longer moving in its original direction.

Acceleration is a measure of how much the velocity or speed of an object changes in a certain time (usually in one second).

Mass is the measure of the amount of matter in an object. Mass is measured in grams or kilograms. An elephant has more mass than a dog. A tree has more mass than a flower.

Weight is the measure of the force of gravity on an object. When you step on a scale to find out your "weight," you are actually measuring your mass. The weight of a mass depends on the amount of gravitational pull on that mass. The same mass would weigh less on the moon since the pull of gravity is less there.

Inertia is a property of mass. It is the tendency for an object at rest to stay at rest or an object in motion to stay in motion. It is described in **Sir Isaac Newton's First Law of Motion**. The more mass an object has, the greater the inertia and the more force it takes to get it to move. Once an object is moving, the greater the inertia, the more force it takes to get the object to stop or change directions.

Name _____

FORCE & MOTION
FACTS SHEET #1 & 2
ACTIVITY

Force & Motion

Match up the words in the word box with the correct definition.

Write your answers on the blank lines.

balanced forces	speed	inertia	acceleration
unbalanced forces	velocity	weight	mass

- _____ the tendency for an object to stay at rest or to stay in motion
- _____ forces that are stronger in one direction than another
- _____ the measure of the force of gravity on an object
- _____ the speed of an object moving in one direction
- _____ the measure of the amount of matter in an object
- _____ forces that are equal and opposite so that no change occurs in an object's motion
- _____ how fast an object moves over a distance
- _____ a measure of how much the velocity and speed of an object changes in a certain time frame

Types of Movement

Simple Movement

Simple movement is an object moving in a straight line at a constant velocity. A marble rolling across the floor with no force acting on it would be an example of the most simple kind of movement. If the marble speeds up or slows down, a force is acting upon it and the movement becomes slightly more complicated. A skateboard moving down the street in a straight line is a simple movement until forces act on it to change its speed or direction.

Complex Movement

Complex movement happens when an object changes direction while it's moving. Throwing a football in the air and watching it gradually rise and then fall is an example of a complex motion. A curved movement, like a circular motion, is also a complex movement. Pushing a merry-go-round produces a circular motion. For a complex motion to happen, forces act on a moving object at different angles to the movement. The force could come from up or down, left or right, front or back.



Simple Movement



Complex Movement

Normal & Applied Forces

Normal Force

A chair sitting on the floor, not moving or accelerating, is being held in place by two opposing, balanced forces. Gravity is pulling the chair toward the earth. The floor is providing the opposing and equal force. This force is called the normal force.

To see normal force in action, place a wood or plastic ruler across the top of two equal stacks of books. Press down on the center of the ruler. The harder you push down the more the wood bends and the harder it pushes back. It wants to straighten out so it exerts an upward force. This upward force is a normal force.



Normal Force

Applied Force

Applied force is transferred from one person or object to another person or object. When a grocery cart is pushed down an aisle, a force is being applied to it. When the button on a TV remote control is pressed, it is applied force. A force is being applied to a soccer ball when it is kicked down the field.



Normal Force



Applied Force



Applied Force

Name _____

FORCE & MOTION
FACTS SHEET #3 & 4
ACTIVITY

Movement & Force

Match up the words in the word box with the correct definition.

Write your answers on the blank lines.

normal force

simple movement

applied force

complex movement

1. _____ a force transferred from one person or object to another person or object
2. _____ an object changing direction while it's moving
3. _____ an object moving in a straight line at a constant velocity
4. _____ an equal and opposing force to gravity

Use the words from the word box to correctly label what is being represented in each picture.



5. _____

6. _____

7. _____

8. _____

Answer Key

Page 1

- 1) A force is a push or pull.
- 2) Motion is the act of changing place or position.
- 3) Force is measured in newtons.
- 4) harder
- 5) First Law
- 6) Third Law

Page 4

- 1) inertia
- 2) unbalanced forces
- 3) weight
- 4) velocity
- 5) mass
- 6) balanced forces
- 7) speed
- 8) acceleration

Page 7

- 1) applied force
- 2) complex movement
- 3) simple movement
- 4) normal force
- 5) normal force
- 6) simple movement
- 7) complex movement
- 8) applied force