

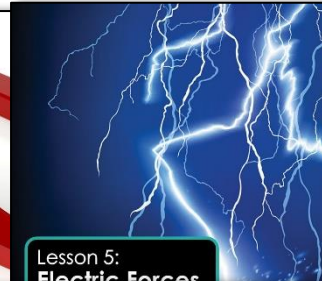
TEACHING POWERPOINT



6 IN-DEPTH TOPICS

- Position and Motion
- Patterns of Motion
- Forces and Motion
- Balanced & Unbalanced Forces
- Exploring Electricity
- Magnetism

23 ENGAGING LESSONS



EACH LESSON INCLUDES:

- Detailed, scripted lesson plan
- PowerPoint lesson slides
- Science journal activity
- Hands-on investigation/lab
- Exit tickets in 2 formats
- Vocabulary posters
- Objectives display cards
- Turn & talk partner questions
- Read aloud & video links
- Science center activity

Lesson 3 Quick
Name _____
If in the books to complete

Force & Motion
Videos

Investigation 1
How Does Shape Affect Motion?

Lesson 4
Balanced & Unbalanced Forces 7 Days

Investigation 2
Predicting Patterns

Investigation 3
Build a Chain Reaction Machine

Build a Chain Reaction Machine

Activity 5
Can static electricity go
Electric Force Diagram Label the charge of each balloon.

Equal and Opposite Forces

Think about the student sitting in his chair. His body is exerting force downward. The chair is exerting equal

The Floating Train

Forces occur in pairs.

The Third Law of Motion

Newton's Laws of Motion

Design a Structure

Lesson 4 JOURNAL Write About It

Complete Lesson 4 in your science journal.

ESSENTIAL QUESTION

How do forces on an object

ESSENTIAL QUESTION

How can you solve a problem using magnetic forces?

Activity 4.2

Condition	Average pulling force (N)
Starting off flat ground	160N
Slightly uphill	34N

MEASURING FORCE
There are five dogs pulling the sled.

QUESTION:
How can you use forces to hold up an object?

Design and build a structure that uses forces to hold up a steel ball.

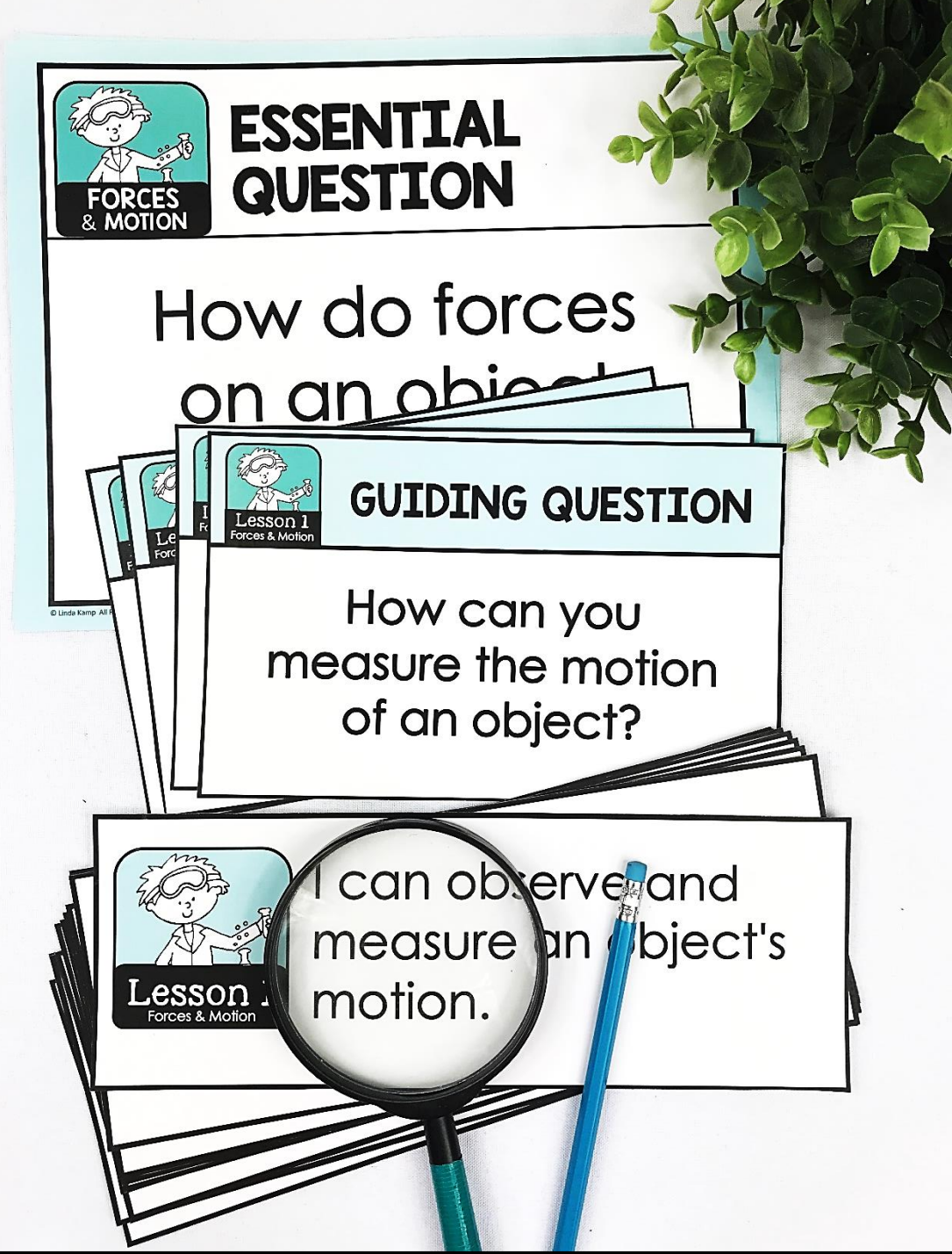
Lesson 3
I can identify forces acting on an object

Lesson 4
I can write a scientific explanation of how forces act on objects

FORCES AND MOTION

SAMPLE LESSON

Aligned to
**Next Generation
Science Standards,
TEKS**
and
**Common Core
State Standards
for 3rd Grade**



STANDARDS-ALIGNED

TEACHER GUIDE

Scripted lesson plans
 Lesson objectives
 Performance tasks
 Teacher's notes
 Management tips
 Lab procedures
 Extension activities
 Assessments

Force & Motion
Lesson 3 Forces and Motion 5 Days
TEACHER GUIDE
 OBJECTIVE: I can identify forces acting on an object.
 GUIDING QUESTION: What makes an object move?
 VOCABULARY: exert, contact force, tension force, spring force, air resistance, noncontact force, evidence, electric force, magnetic force
Day 1
KEY CONCEPT: The greater the mass of an object, the more force it will take for it to move.
LESSON:
 1. Set the purpose for the lesson by introducing the lesson objective and guiding questions.
 2. Use the posters or cards to introduce the lesson vocabulary.
 3. Explain to students, "Today we are going to explore forces and..."

Force & Motion
Lesson 6 Exploring Electricity 5 Days
TEACHER GUIDE
 OBJECTIVE: I can relate the causes and effects of electric forces between objects.
 GUIDING QUESTION: What causes an object to attract or repel other objects?
 VOCABULARY: electric charge, repel, attract, electric force, positive charge, negative charge, neutral
Day 1
KEY CONCEPTS: Matter is made of positively or negatively charged particles. If an object has mostly positive charged particles it will have a positive charge. If an object has mostly negatively charged particles it will have a negative charge. Objects with opposite charges attract each other.

Force & Motion
Lesson 6 Magnetism 5 Days
TEACHER GUIDE
Day 2 MAGNETIC FIELDS
 OBJECTIVE: I can identify the effect of Earth's magnetic field on a compass.
LESSON:
 1. Continue the lessons on magnetism by reading slides 105 -107 to students. Stop here to show students the video, *How Does a Compass Work?* After watching the video explain to students that forces have a cause & effect relationship with the objects they act on. "Let's look at the activity slide as an example."
 2. Students complete Activity 6.2. Project the Activity 6.2 slide. Call on students to explain how a compass works and what causes the needle to point north. Explain to students that the Earth's magnetic field is what causes the needle to point north.

Force & Motion
Lesson 6 Investigation 6 How Can Magnets Sort Objects By Weight?
TEACHER GUIDE
Lesson 6
QUESTION: How can magnets sort objects by weight?
OBJECTIVE: Students will build a device that can lift different objects according to weight.
MATERIALS: 10" of copper wire Metal objects:


Force & Motion
Lesson 2 Predicting Patterns
TEACHER GUIDE
Lesson 2
QUESTION: How can you predict how an object will move?


Force & Motion
Lesson 3 Build a Chain Reaction Machine
TEACHER GUIDE
Lesson 3
QUESTION: How can you demonstrate forces acting on objects?
OBJECTIVE: Students will build a chain reaction to demonstrate the causes & effects of forces acting on objects.
MATERIALS: Provide a variety of materials such as: dominoes toilet paper rolls small balls cardboard


Force & Motion
Lesson 1 How Does Shape Affect Motion?
TEACHER GUIDE
Lesson 1
QUESTION: How does shape affect motion?
OBJECTIVE: Students will investigate how shape affects motion.
MATERIALS: crumpled paper balls, stopwatch, flat sheet of paper, paper airplane, fourth sheet of paper


Force & Motion
Lesson 2 Patterns of Motion
TEACHER GUIDE
Lesson 2
QUESTION: How can you predict how an object will move?
OBJECTIVE: Students will investigate how shape affects motion.
MATERIALS: pattern, prediction, evidence
Day 1
KEY CONCEPTS: The motion of some objects forms a pattern. Patterns can be seen and predicted.
LESSON:
 1. Set the purpose for the lesson by introducing the lesson objective and guiding questions.
 2. Use the posters or cards to introduce the lesson vocabulary.
 3. Explain to students, "Patterns are phenomena we see happening over and over like a wheel spinning on a windy day. We can see the wheel spinning, but we can't see the motion. The pinwheel spins every time the wind blows. A pinwheel spinning on a windy day is an example of motion. A pattern is what we see when an object forms a pattern. A pattern is what we see when an object forms a pattern. A pattern is what we see when an object forms a pattern. Some patterns of motion are observed. Today we are going to observe some patterns of motion and learn how we can use those patterns to predict future motion, or how an object will move next.
 4. Work through the Lesson 2 slides up to the 2.1 Activity slide. As you read the slides give students time to look at and discuss the pictures.

31-Day Pacing Guide

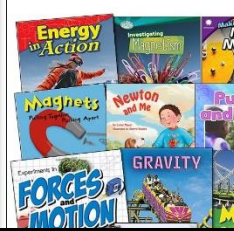
Forces & Motion
27-Day Unit Pacing

Day	Lesson
20	Lesson 5.1: Exploring Electricity
18	Lesson 5.2: Static Electricity
19	Lesson 5.3: Determining the Strength of a Magnetic Force

Forces & Motion
27-Day Unit Pacing

Day	Lesson
1	Lesson 1.1 Position and Motion
2	Lesson 1.2 Measuring Motion
3	Lesson 1 Lab: How does shape affect motion?

Next Generation Science Standards Alignment
TEACHER GUIDE
Disciplinary Core Ideas
PS2.A Forces and Motion
 -Recognizing that each force acts on one particular object and has both strength and a direction.
 -An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object.
 -Forces that do not sum to zero can cause changes in the object's speed or direction of motion.
PS2.B Types of Interactions
 -Understanding that objects in contact exert forces on each other.
 3-PS2-1
 3-PS2-2
 3-PS2-3

Force & Motion
Related Book List
TEACHER GUIDE


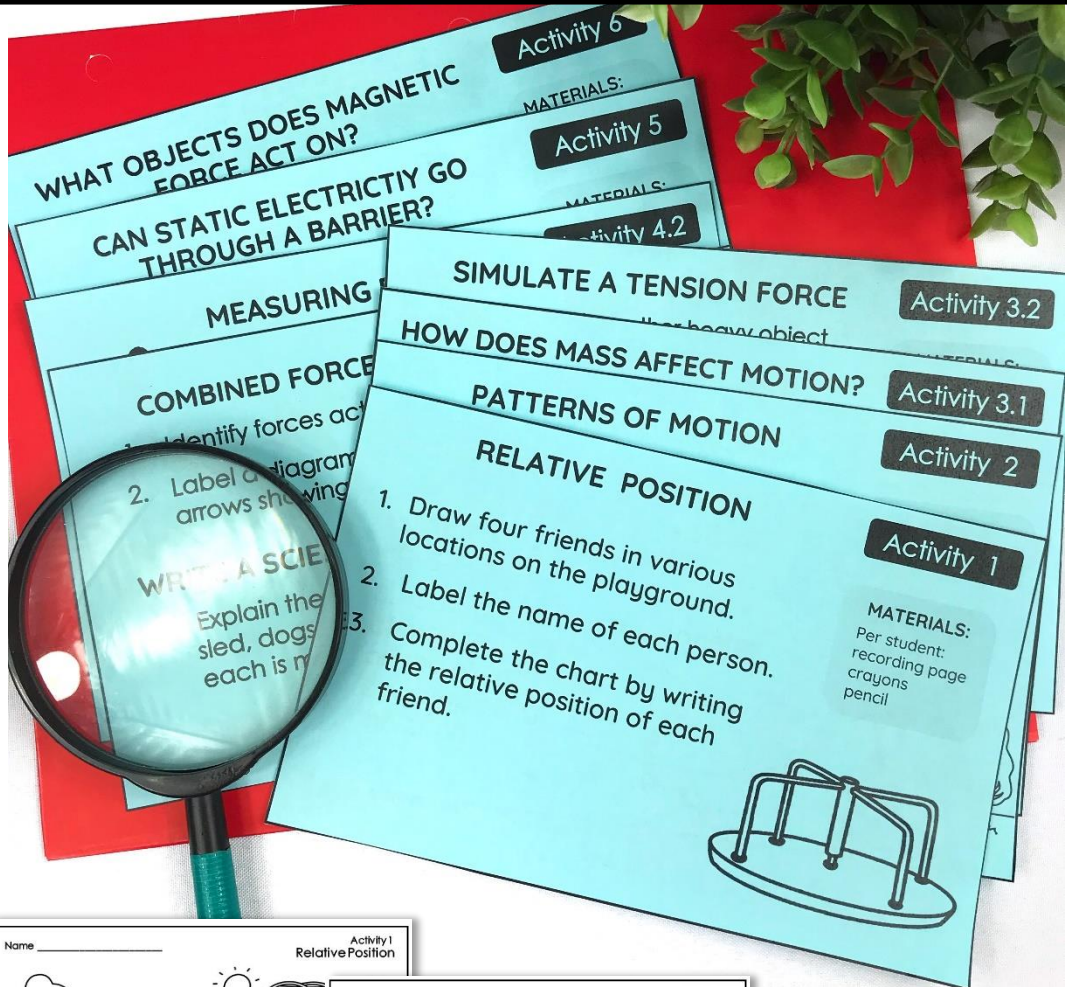
Forces & Motion
Videos
TEACHER GUIDE
Lesson 5
ELECTRICITY
 Introduction to Electricity
<https://www.youtube.com/watch?v=U7f5THANZc>
Lesson 5
STATIC ELECTRICITY
 Electric Charge Crash Course
<https://www.youtube.com/watch?v=6XKA>

Forces & Motion
Unit Materials
TEACHER GUIDE
 The following materials are needed to do the investigations. Please see the teacher notes for each lab as some of the materials are optional or can be replaced with items you may already have. Most items are found at the dollar store or Walmart.
 dominos
 marbles
 wooden blocks
 yarn
 string
 masking tape
 meter sticks
 rulers
 steel scouring pads
 scrap paper
 plastic spoons
 metal objects
 toilet paper or paper towel tubes
 cardboard or card stock for ramps
 yarn or string
 masking tape
 meter sticks
 rulers
 craft sticks
 2" or 3" long iron nails
 AA Batteries
 foam plates

DETAILED LESSON PLANS

LESSON ACTIVITIES

Engaging partner activities reinforce each lesson



Activity 1 Relative Position

Name _____

Name	Relative Position

Activity 4.2 Measuring Force

Name _____

There are five dogs on the racing sled.

Condition	Average pulling force (N) of each dog	Total force (N) of the team
Starting off flat ground	160N	
Slightly uphill	34N	
Uphill	50N	

1. Complete the chart by finding the total amount of pulling force the team exerts in each condition.

Activity 1

RELATIVE POSITION

1. Draw four friends in various locations on the playground.

2. Label the name of each person.

3. Complete the chart by writing the relative position of each friend.

MATERIALS:
Per student:
recording page
crayons
pencil

Activity: DRAW A FORCE DIAGRAM

Name _____

Explain what you observed after you let go of the bag.

Circle the words that describe what you observed.
gravity

Activity 6

MAGNETIC FORCES

Name _____

What objects are magnetic forces attracted to?

Object _____

Predict and explain v _____

Activity 5.1 Exploring Static Electricity

Can static electricity go through a barrier?

Name _____

What happens when you put the balloons close to each other?

Activity 3.1 Forces and Motion

How does mass affect motion?

Name _____

What I observed: _____

Activity 4.1 Option 2 Combined Forces

Name _____

forces acting on the sled _____

Activity Patterns of Motion

Name _____

Activity: DRAW A FORCE DIAGRAM

Name _____

Explain what you observed after you let go of the bag.

Object	Pattern	Predictable
		yes no
		yes no
		yes no
		yes no

Analyze and interpret data

What can you infer from your observations? Can static electricity go through barriers?

Ask new questions

Write a question about exploring static electricity that you could investigate with the materials you have.

How can you test your new question?

7 HANDS-ON INVESTIGATIONS

STUDENTS EXPLORE:

- Measuring motion
- Predicting patterns of motion
- Static electricity
- Combining forces into chain reactions
- Solving problems using magnets
- Simulating balanced forces
- Building electromagnets
- Measuring a magnetic field

Investigation 5
Lesson 6 How Can Electric Force Levitate Objects?
TEACHER GUIDE
QUESTION: How can an electric force levitate an object?
OBJECTIVE: Students will use static electricity to levitate objects.
MATERIALS: Per partners or group: balloon, scissors

Investigation 4
Lesson 4 How Can Balanced Forces Hold Up an Object?
TEACHER GUIDE
QUESTION: How can balanced forces hold up an object?
OBJECTIVE: Students will design a structure that uses balance forces to hold up a steel ball.
MATERIALS: Per group of students: ring magnet, 3 small bar magnets, steel ball, string or yarn, masking tape, wooden skewers, clay, small rubber band

Investigation 6.1
Lesson 6 How Can You Measure a Magnetic Field?
TEACHER GUIDE
QUESTION: How can you measure the size of a magnetic field?
OBJECTIVES: Students will design a procedure to measure the length of a magnetic field. Students will diagram the magnetic field of a bar magnet.
MATERIALS: bar magnet, paperclip, yarn, ruler, craft stick, lab sheet

Investigation 6.2
Lesson 6 How Can Magnets Sort Objects by Weight?
QUESTION: How can magnets sort objects by weight?
OBJECTIVE: Students will build a device that can lift different objects according to weight.
MATERIALS: 10" of copper wire, AA battery, iron nail, regular magnet, metal objects: paperclips, safety pins, coins

Investigation 1
Lesson 1 How Does Shape Affect Motion?
TEACHER GUIDE
QUESTION: How does changing the shape of an object affect its motion?
OBJECTIVE: Students will use observations and measurements to explain how to make paper fall faster or slower by altering its shape.
MATERIALS: Prep per group: 4 sheets of paper, meter stick, stopwatch, lab sheet

Investigation 5
Guided Lab Directions
1. Fold the produce bag and cut off the

Investigation 4
Guided Lab Directions

Investigation 6.1
Guided Lab Directions

Investigation 6.2
Guided Lab Directions

HIGH-ENGAGEMENT LABS

Students work with partners to discuss, write and investigate.

LESSON 6 INVESTIGATE Solve a problem using magnets

QUESTION: How can you use magnets to sort objects by weight?

Activity 6 What objects do magnetic forces act on?

Predict and Test

1. Make a prediction for each object. Record it in the data table telling why

Activity 5 Can static electricity do

Activity 2

LESSON 4 INVESTIGATE Design a Structure

QUESTION: How can you use forces to hold up an object?

Activity 3.2 SIMULATE A TENSION FORCE

1. Place a book or other heavy object in the Ziploc bag and
2. Bend a paperclip to form a hook.
3. Push the end of the paperclip into the top of the bag.
4. Pull on the other end of the paperclip.
5. The weight of the rubber band lift the bag.
6. Record the forces acting on the bag.

LESSON 5 INVESTIGATE Explore Electric Forces

QUESTION: How can you use an electric force to levitate an object?

LESSON 6: INVESTIGATE 1 Measure a Magnetic Field

QUESTION: How can you measure the size of a magnetic field?

Design a procedure to measure the size of a magnetic field. Use the magnet in your

Activity 3.1 HOW DOES MASS AFFECT MOTION?

1. Tie the end of a piece of yarn

LESSON 1 INVESTIGATE Measure the Motion of an Object

LESSON 3 INVESTIGATE Create a Chain Reaction

QUESTION: How can you show examples of different forces?

Build a chain reaction that includes a contact force, a magnetic force and an example of gravity.

LESSON 2 INVESTIGATE Predicting Patterns

QUESTION: How can you predict the way an object will move?

QUESTION: How does changing the shape of an object affect its motion?

Procedure to determine how changing the shape of a paper affects its motion.

Activity 4.2

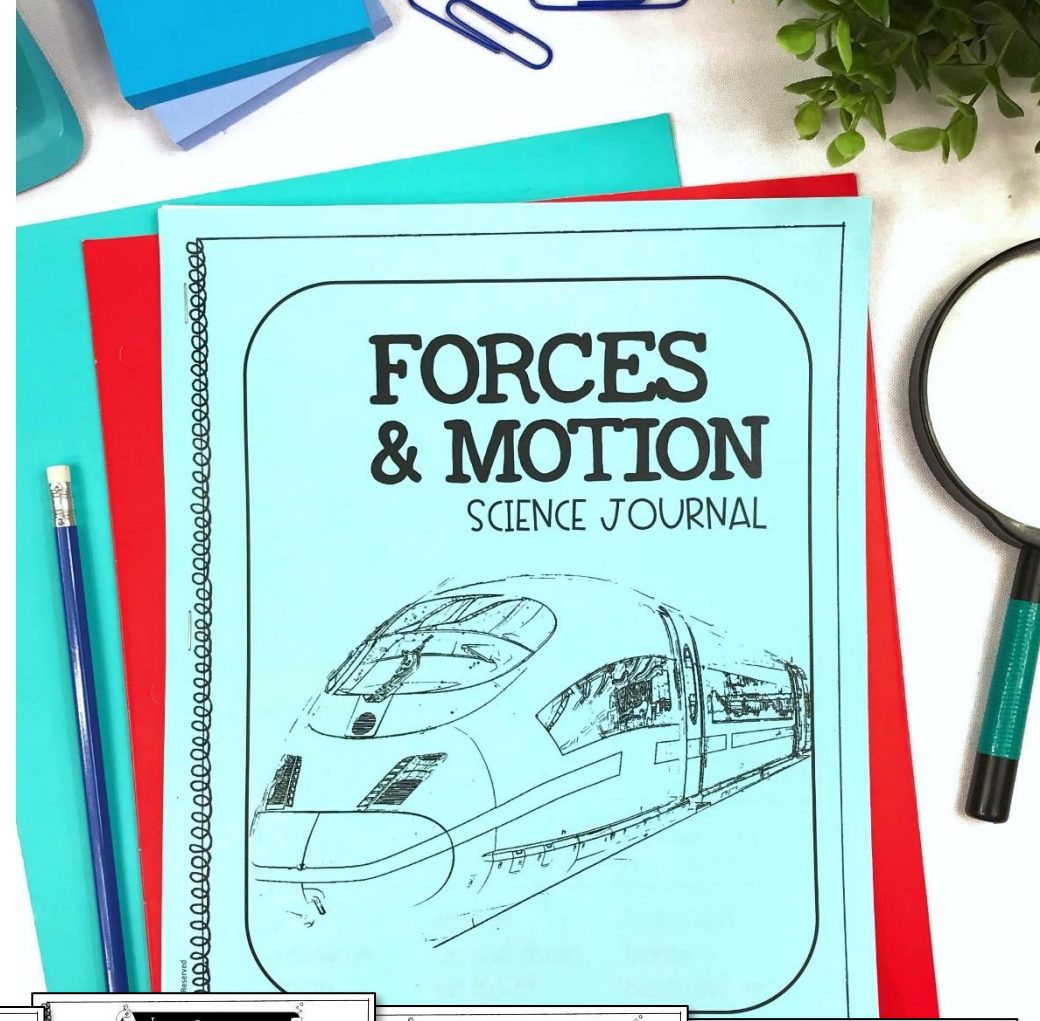
Condition	Average pulling force (N)
Starting off flat ground	160N
Slightly uphill	34N
Uphill	50N

MEASURING FORCE

- There are five dogs pulling the sled.
- Answer the questions using the chart.

JOURNALS INCLUDE:

- Applying vocabulary
- Short written response
- Writing to explain
- Labeling diagrams



Lesson 5 Electric Forces

What happens when you rub a balloon on your hair?

Does this create a contact or non-contact force?

Objects with the same charge will attract each other.

Label the diagram

Lesson 6 Magnetism

What kind of force do magnets have?

Circle the objects a magnetic force will act on.

Lesson 5 Electric Forces

Write the charge of each balloon. Write if the pair will attract or repel each other.

silver rubber

Lesson 1 Position and Motion

What is motion? What is force?

Lesson 2 Patterns of Motion

What is a pattern? Name an object that moves in a pattern. Describe the pattern of its movement.

Draw arrows to show the pattern of motion for each ride.

Lesson 3 Forces and Motion

What is a contact force? Mark an X to show the forces acting on the baseball.

Why will the baseball eventually fall to the ground?

What are some examples of non-contact forces?

Lesson 4 Balanced & Unbalanced Forces

What are balanced forces? What happens when forces become unbalanced?

Write T for true and F for false.

Forces can cause an object to start or stop moving.

More than one force can act on an object at the same time.

Unbalanced forces do not change the motion of an object.

Maglev trains run on solar power and electricity.

How can you tell if forces are balanced or unbalanced? Write an example of a balanced force.

Circle all the words that describe the forces acting on the apples in each picture.

push pull balanced unbalanced contact non-contact

What unit is force measured in? Who is the unit named after?

Explain It

Why is the net force on the rope 0 newtons?

300 N 300 N

Unit Vocabulary

motion force position speed direction distance relative motion relative position pattern predict net force electric charge exert mass tension force spring force electric force magnetic force balanced force unbalanced force static discharge electromagnetic contact force non-contact force

Write new vocabulary

in front of sideways north behind next to up and down on top of underneath

FORCES & MOTION SCIENCE JOURNAL

LESSON RESPONSE JOURNAL

LITERACY-BASED SCIENCE CENTERS

Use them as lesson extensions or for early finishers



Integrate science in your reading centers



Reinforce SCIENCE CONTENT



Practice MATH & LITERACY SKILLS



Centers included in color and black & white

LESSON SUPPORT

FORCES & MOTION

ESSENTIAL QUESTION

How do forces on an object affect its motion?

Lessons 1-4

GUIDING QUESTION

Lesson 1
Forces & Motion

How can you measure the motion of an object?

Vocabulary Cards

friction

balanced force

force

motion
moving from one place to another

Lesson 1

Lesson 1
Forces & Motion

I can observe and measure an object's motion.

Objectives Cards

Focus Wall Cards

friction



magnet



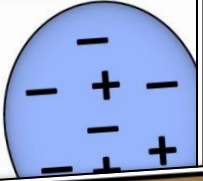
insulator



conductor



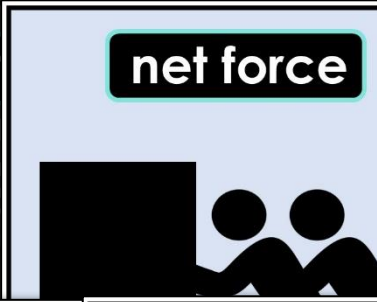
electric charge



position



net force



electromagnet



attract



repel



contact force



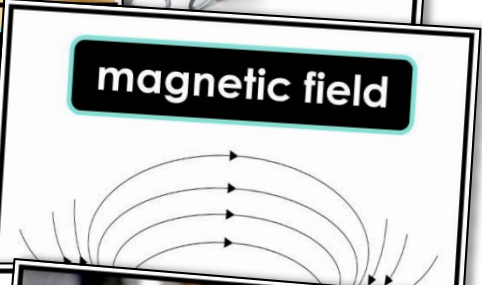
noncontact force



static discharge



magnetic field



balanced forces



Two equal forces

relative position



The position of an object compared to

speed



A measure of how fast or slow something

force



The push or pull that is applied to an

motion



Moving

Full Page Vocabulary Posters

UNIT PLANNING BINDER



Organize your unit
in a handy
planning binder

Binder includes:

- cover & spines
- section dividers
- divider tabs

**PLAN, TEACH &
ASSESS** an in-depth
and effective unit

FORCES AND MOTION

GRADE
3



STUDENTS GAIN AN UNDERSTANDING OF:

- Balanced & unbalanced forces
- Electricity and magnetism
- Collecting & analyzing data
- Planning & carrying out investigations
- Science process skills
- Engineering design process
- Building models
- Drawing force diagrams
- Using texts and other media to answer scientific questions

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