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Google Slides Lessons Preview

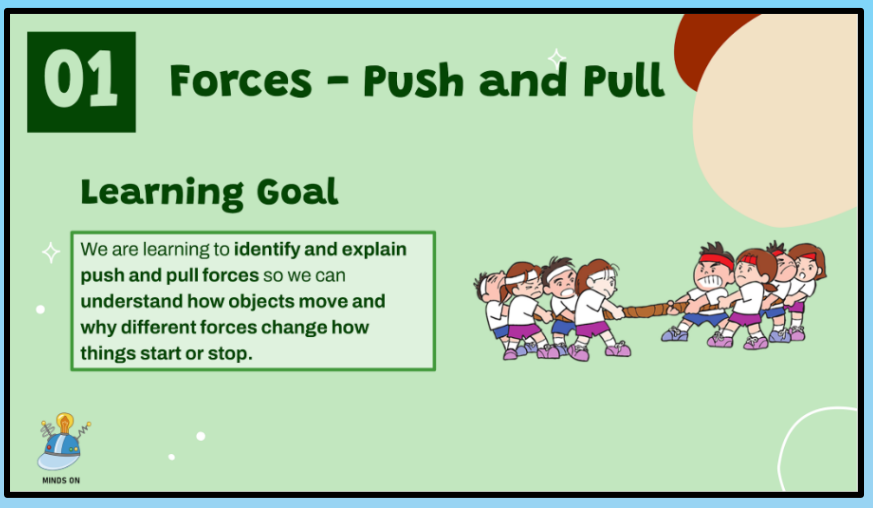
Alberta Science Curriculum

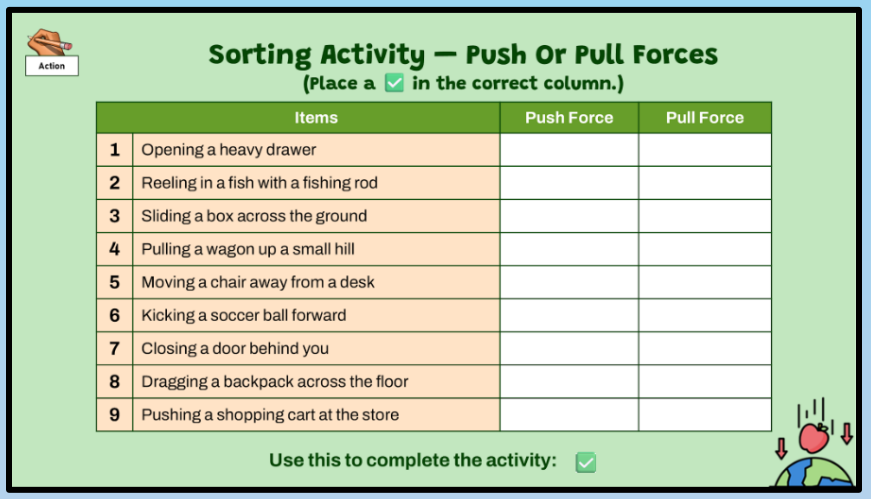
Energy Non-Contact Forces – Grade 4

3-Part Lesson Format

Part 1 – Minds On!

- Learning Goals
- Discussion Questions
- Quotes
- And More!



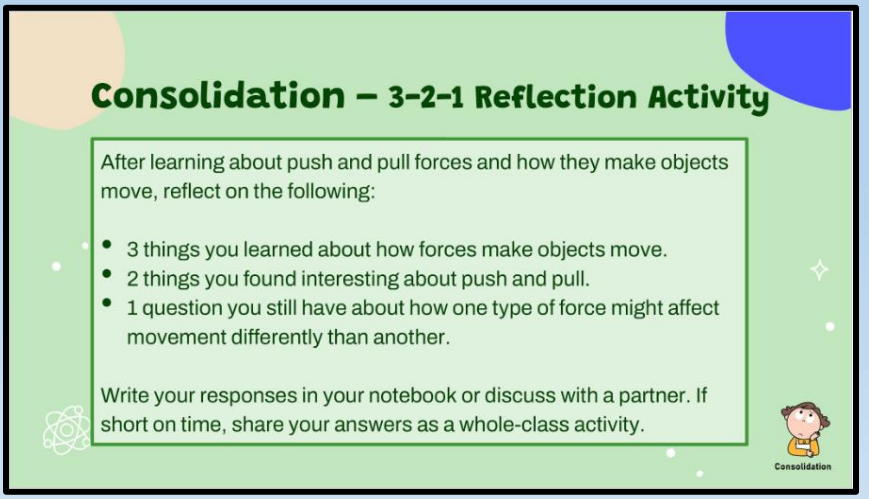


Part 2 – Action!

- Writing
- Matching
- Drag and Drop
- Drawing
- And More!

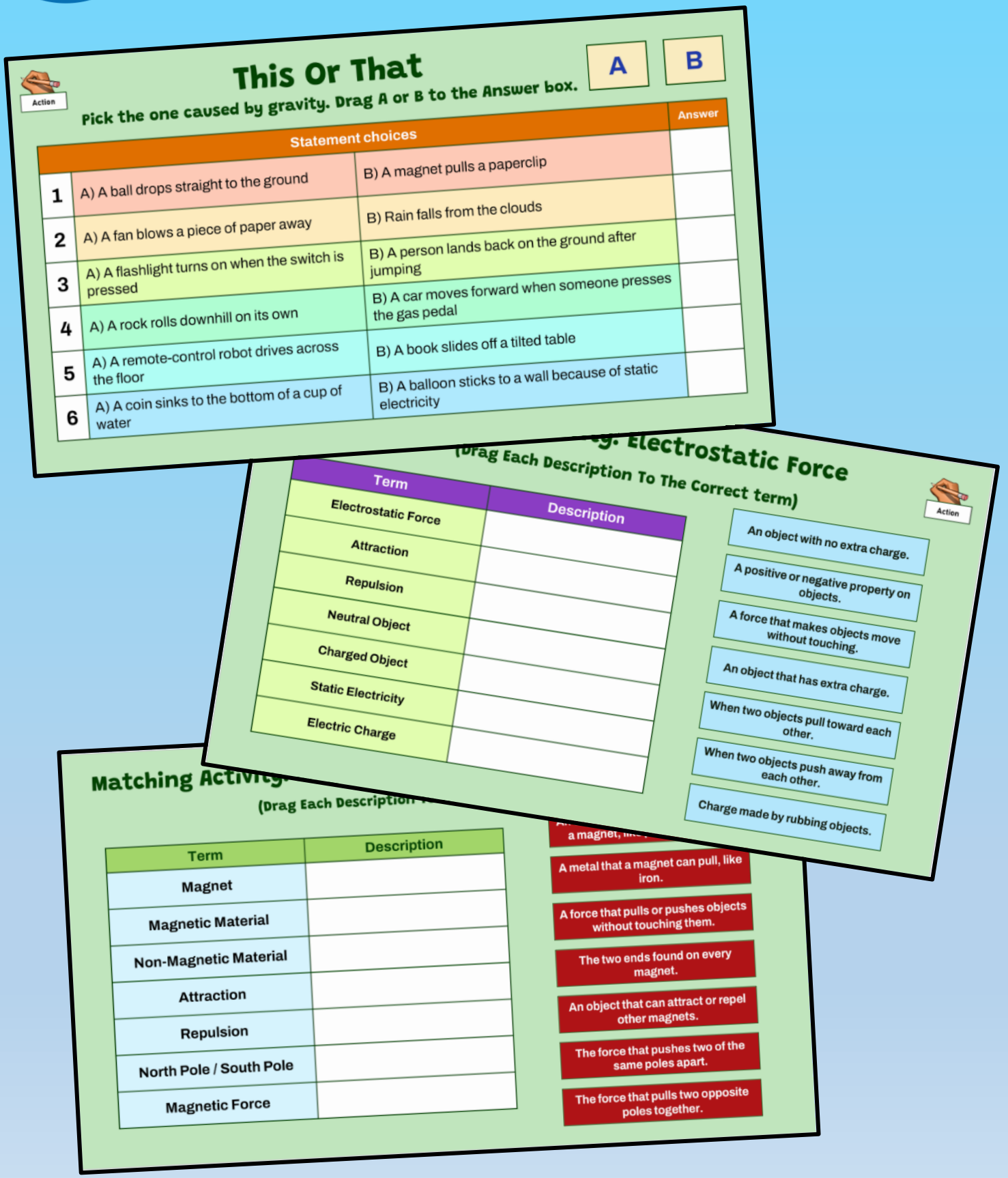
Part 3 – Consolidation!

- Exit Cards
- Quizzes
- Reflection
- And More!



Alberta Science Curriculum

Energy Non-Contact Forces – Grade 4



This Or That

Action

Pick the one caused by gravity. Drag A or B to the Answer box.

A B

	Statement choices		Answer
1	A) A ball drops straight to the ground	B) A magnet pulls a paperclip	
2	A) A fan blows a piece of paper away	B) Rain falls from the clouds	
3	A) A flashlight turns on when the switch is pressed	B) A person lands back on the ground after jumping	
4	A) A rock rolls downhill on its own	B) A car moves forward when someone presses the gas pedal	
5	A) A remote-control robot drives across the floor	B) A book slides off a tilted table	
6	A) A coin sinks to the bottom of a cup of water	B) A balloon sticks to a wall because of static electricity	

Electrostatic Force

(Drag Each Description To The Correct term)

Action

Term	Description
Electrostatic Force	
Attraction	
Repulsion	
Neutral Object	
Charged Object	
Static Electricity	
Electric Charge	

An object with no extra charge.

A positive or negative property on objects.

A force that makes objects move without touching.

An object that has extra charge.

When two objects pull toward each other.

When two objects push away from each other.

Charge made by rubbing objects.

Matching Activity

(Drag Each Description

Term	Description
Magnet	
Magnetic Material	
Non-Magnetic Material	
Attraction	
Repulsion	
North Pole / South Pole	
Magnetic Force	

a magnet, like

A metal that a magnet can pull, like iron.

A force that pulls or pushes objects without touching them.

The two ends found on every magnet.

An object that can attract or repel other magnets.

The force that pushes two of the same poles apart.

The force that pulls two opposite poles together.

Alberta Science Curriculum

Energy Non-Contact Forces – Grade 4

Word Search – Magnetizing An Object

Z B O P M A G N E T I C D P L N F
S Q I Y A R M M Z J A K E T R G N
L N Y N Z C H T E M P O R A R Y O
F L A K U T E N W Y V P L P T N R
O K K E U M B L I W E H O E U C T
R Z E O F Y X G X A R N N L B S H
C F S K G W J Z Y W S G A C E H H
E P A P E R C L I P A T L Z L S K
B D B Z O E X W S M E L Q D U W W
S T R I K I N G H M U Z S V A P B
A T T R A C T F H P R U B B I N G

Find the words related to magnets and magnetizing hidden in the puzzle and circle them!

MAGNET	SOUTH
PAPERCLIP	ATTRACT
RUBBING	PUSH
STRIKING	PULL
METAL	TEMPORARY
POLES	FORCE
NORTH	MAGNETIC

Action

1) A compass has a small _____ inside that moves to
2) The Earth has a _____ that pulls on the compass needle.
3) The red end of the compass needle points toward _____.
4) A compass works because the needle is made of _____ metal.
5) Explorers used compasses to find their _____ on long trips.
6) A compass near a large piece of _____ can point the wrong way.
7) A compass must be held _____ so the needle can move freely.
8) The Earth acts like a giant _____ with two poles.

point | position | needle | north | magnet
metal | flat | Vertically | magnetic field | steel

ices Using Non-Contact Forces

Check **True** Or **False** For Each Statement Based On What You Learned.

	True/False
1) Magnets can pull certain metals without touching them.	
2) Static electricity can make paper move toward a balloon.	
3) A balance scale uses gravity to compare weight.	
4) All metals are attracted to magnets, including aluminum.	
5) A compass works because Earth has a magnetic field.	
6) Gravity pushes objects upward when they fall.	
7) Doorbells can use magnets to help make a ringing sound.	
8) Magnets attract objects made of iron or steel.	
9) Static electricity always works better when surfaces are wet.	
10) Gravity only affects objects that are very heavy.	

True | False

Workbook Preview

Grade 4 – Science Unit

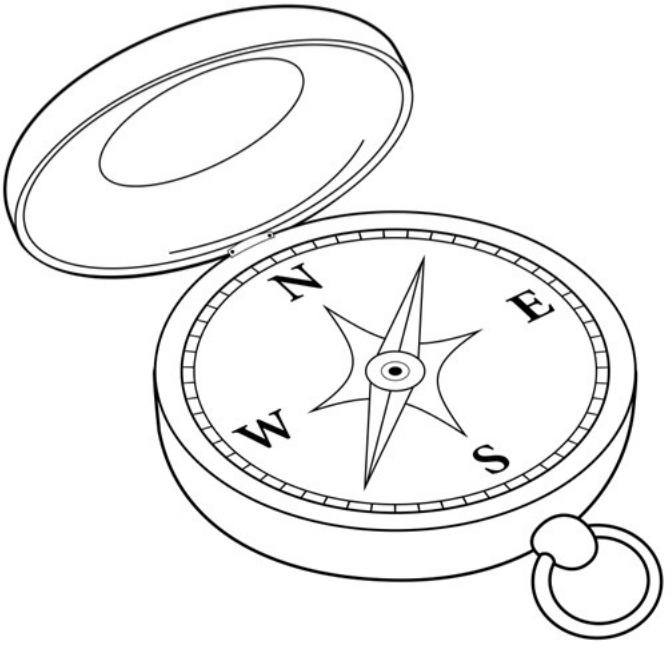
Organizing Idea: Energy: Understandings of the physical world are deepened by investigating matter and energy.

Guiding Question: How can forces affect objects from a distance?

	Learning Outcome – Students investigate how forces can act on objects without contact.	**Pages**
NCF.1	Non-contact forces occur between objects that are not in direct contact.	7 – 12, 21 – 34, 54, 59 – 60, 64 – 65, 68 - 69
NCF.2	Gravity on Earth is a non-contact force that pulls objects	13 – 20
NC		5
NC	Non-contact forces can act through some materials.	
NCF.5	Magnetic force is strongest at the magnetic poles. Magnets have two magnetic poles, known as north and south. Opposite magnetic poles attract each other and like magnetic poles repel each other. Both magnetic poles attract magnetic material.	37 – 42, 55 – 58
NCF.6	Some materials can become magnetized by interacting with a magnet.	50 – 53
CS.1	Students examine and apply design processes to meet needs.	43 – 44, 61 – 63, 66 – 67

NAME: _____

NON-CONTACT FORCES

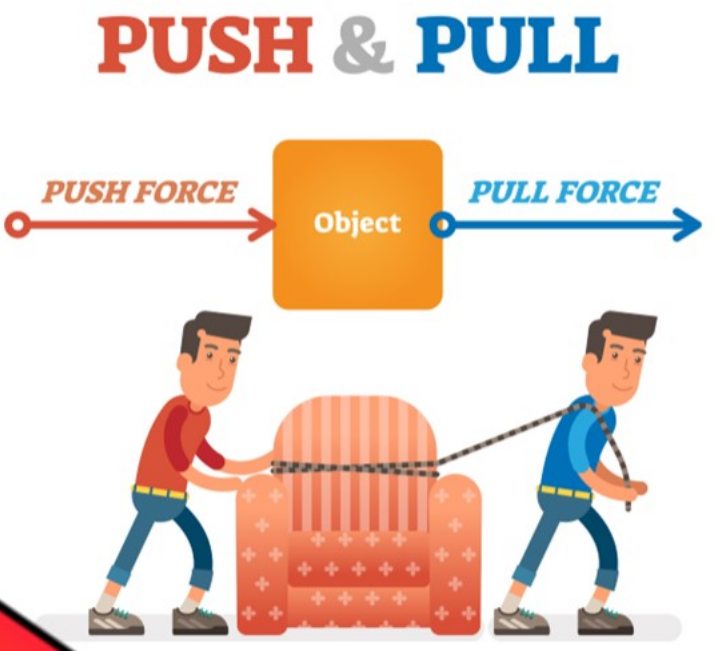


Name: _____ 7

Curriculum Connection
NCF.1

Forces - Push and Pull

What is a Force?



A **force** is any push or pull that causes an object to move. Think about it, if an object moves, a force must have acted on the objec

A frie have pushed a book across d you, or maybe they pull a penci ur hands. These are two o of pus pull forces that caus bjec

Pushing Force

A **push** is when move an ect y from us. The child on this swing is the obj ng m man is pushing the child using a pushing fo c han d apply enough pushing force, the child v ve h n they won't swing very far!

Pulling Force

A **pull** is when we move an object closer to us. A fun game of tug of war is an example of two teams using pulling forces. The team that uses the most pulling force will win. Check out more examples below:

- Lifting a bag – we pull the object closer to us
- Opening a drawer – we pull the drawer open

Name: _____ 8

Curriculum Connection
NCF.1

Forces - Push and Pull

Push or Pull

Is the example a push or pull force?

1) Shooting a basketball into the net	Push	Pull
2) Plugging in a cord to an outlet	Push	Pull
3) A tow-truck towing a car behind them	Push	Pull
4) Kicking a	Push	Pull
5) Climbin	Push	Pull

Think

xample of a push and a pull force

Push	
Pull	

Visualizing

Draw what you were picturing while you were reading ure

_____

_____

_____

_____

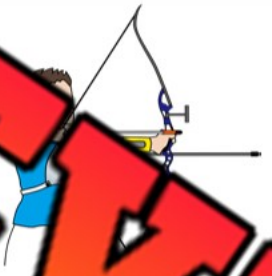
_____

Name: _____ 9

Curriculum Connection
NCF.1

Push or Pull?

Directions Is the picture a push or pull?

 Push Pull	 Push Pull	 Push Pull
 Push Pull	 Push Pull	 Push Pull
 Push Pull	 Push Pull	 Push Pull
 Push Pull	 Push Pull	 Push Pull

Name: _____ 11

Curriculum Connection
NCF.1

Non-Contact Forces

Contact and Non-Contact Forces

Forces are a push or a pull that causes the movement of an object. Forces can be non-contact or contact forces.

Non-Contact Forces

A **non-contact force** can an object without touching it. Examples of non-contact forces are gravitational force, electric force, and magnetic force.

When an object moves without being touched, a non-contact force has acted on the object.

Gravity is the most common non-contact force that affects all of us right now! **Gravity** is the pulling force that keeps us on Earth. A magnet can also push or pull an object towards it or away from it. Magnets have a magnetic field. Lastly, electric forces are non-contact. An example is static electricity that can move your hair on a trampoline without touching it!

Contact Forces

A **contact force** is any force that uses contact to move an object. If you see something move, was it touched by something else? Perhaps it was the wind moving a tree branch, or someone kicking a soccer ball. Either way, these are contact forces as something touched the object to make it move.

Name: _____ 12

Curriculum Connection
NCF.1

Non-Contact Forces

Definition

What do the terms below mean?

Non-Contact Force	
Cont	

Push or Pull

Do e show a push or pull force?

Leaves Falling	Nail	all Moving
		
Contact Non-Contact	Contact Non-Contact	tact Non-Contact

Making Connections

Give an example of when you have see e below

Non-Contact Force	
Contact Force	

Name: _____ 13

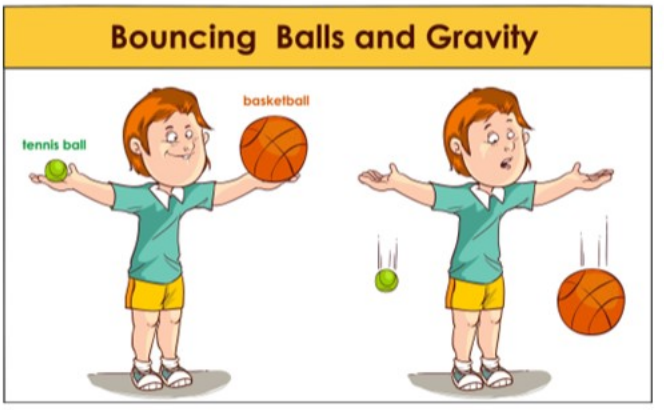
Curriculum Connection
NCF.2

Gravity - A Pulling Force

What is Gravity?

Gravity is the force that pulls objects to the centre of the Earth. Without gravity pulling us, we would fall right off the Earth's surface and float away!

Gravity is also the reason why when you throw a ball into the air, it comes back down. [illegible] you throw a ball, you are applyi[illegible]rce by pushing it into t[illegible] Gravit[illegible]s much stronger than y[illegible] ball will come back [illegible] inst[illegible] higher and higher.



Gravity and our Weight

Our weight is based on gravity. Weight [illegible]easu[illegible]t of the force of gravity pulling us down. This means our **weight** is how ha[illegible]avit[illegible]lling us towards the Earth's surface.

On other planets or on the moon, we weigh a d[illegible]t [illegible]moun[illegible]use their gravitational pull is stronger or weaker. Someone weighing [illegible]0 p[illegible] would weigh only 16 pounds on the moon.

This means that gravity's force is not very strong on the moon. If [illegible] applied a pushing force into the ground by jumping, you would go a lot higher on the moon because there is less pulling force bringing you back to the moon's surface.

Gravity in our Lives

When you spill a drink, gravity pulls the liquid as far towards the centre of the Earth as it can. The same with a pencil that fell off a desk. Gravity is a non-contact force that never stops!

Name: _____ 14

Curriculum Connection
NCF.2

Gravity - A Pulling Force

Making Connections

What does this remind you of in your life?

Questions

Answer the questions below using evidence from the text

1) What is gravity? How does it work?

2) How is the force of gravity different on the Earth than on the Moon?

Word Scramble

Unscramble the words below using the word bank

Gravity	Force	Non	Contact	Pulling	Spill	Drop	Fall

ACOCTNT		NLULPIG	
LLFA		ITYARVG	
OECFR		PODR	
LSLIP		ONN	

Name: _____ 15

Curriculum Connection
NCF.2

Gravity - Science Experiment

Information | What is this experiment about?

What affects the forces of gravity? If we drop two objects that weigh the same but are different in shape, which will fall first? What if the objects are different weights but have the same shape?

Research Question

Out of the 5 items we chose, which item will fall the fastest (have the strongest gravitational ...)? Which will fall the slowest?

Hypothesis ... objects in order of how fast they will fall

_____

_____

_____

Materials

1. 5 different objects – choose ... wit... ...wind resistance (no feathers)
2. Stopwatch
3. High point to stand on

Procedure

1. Move to the high point where you will drop your ...
2. Have a friend ready with a stopwatch
3. The stopwatch operator says go when they are ready, a... person up high drops the object
4. When the object hits the floor, the stopwatch operator clicks st...
5. Do this for all 5 objects and record your times in the chart below

Object	Time

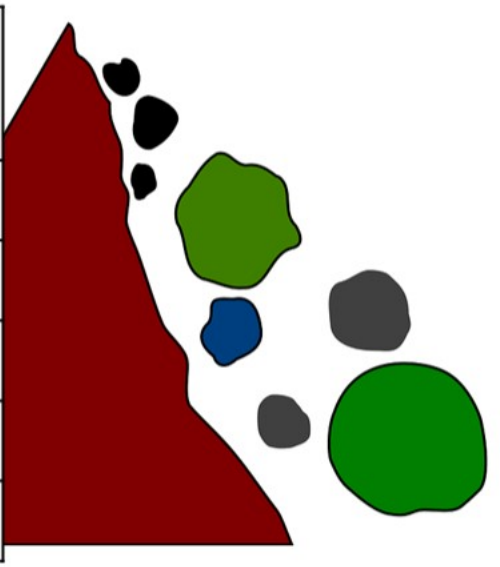
Name: _____ 16

Curriculum Connection
NCF.2

Gravity - Science Experiment

Rank Rank the objects in order of how fast they fell

Rank 1 – Fastest 5 - Slowest	Object
1	
2	
4	
5	



Result Answer the ons d on the experiment

1) Was your hypothesis correct? Why o y not?

_____

_____

2) What did you notice about the results? Does the weight o n ob t gravitational pull on the object? Does the shape of the object affe

_____

_____

_____

_____

3) Why do you think you saw these results?

_____

_____

Name: _____ 17

Curriculum Connection
NCF.2

Experiment - Egg Drop

Research Question

What are we learning about?

The egg drop experiment is a classic science experiment that demonstrates the principles of physics, particularly the concepts of force, gravity, and Newton's Laws of Motion. The goal of the experiment is to create a contraption that will protect an egg from breaking when dropped from a certain height.

Materials

What you will need for the experiment

- ❑ Egg
- ❑ A vari of mat as straws, pape cardboard, sti er bands, glue, etc.
- ❑ A high surface such as a stairway, a ladder, or a bleachers to drop the egg from

Method

How you will co e the ment

1) Gather materials: Provide each group with a raw g riety c rials they can use to create their egg-protecting contraption.

2) Plan and design: Allow each group to plan and design their contra e any combination of the materials they were provided with. They drop experiment online to find ideas for creative contraptions.

3) Build: Once the group has a plan, they can begin to build their contraption. They should be careful to use the materials to protect the egg, not to overbuild or over-weight the egg.

4) The Final Drop: After the group is satisfied that their contraption is successful, each group can take turns dropping their egg from the highest point (stairway, ladder, or bleachers) to test their contraption.

5) Observation and conclusion: Observe the results, and examine how their contraption worked, what materials protected the egg best, and how they could improve their design.

Name: _____ 18

Curriculum Connection
NCF.2

Plan

Answer the questions below to plan your egg holder

1) What materials will you use to support your egg?

2) Draw a diagram of your egg holder. Label the materials

Results

What happened with your ca... A...le qu...s below.

1) What was pulling the egg down to the ground? Was the force ...ong ... heights?

_____

_____

_____

2) If you could make the egg holder again, what would you do differently? Explain.

_____

_____

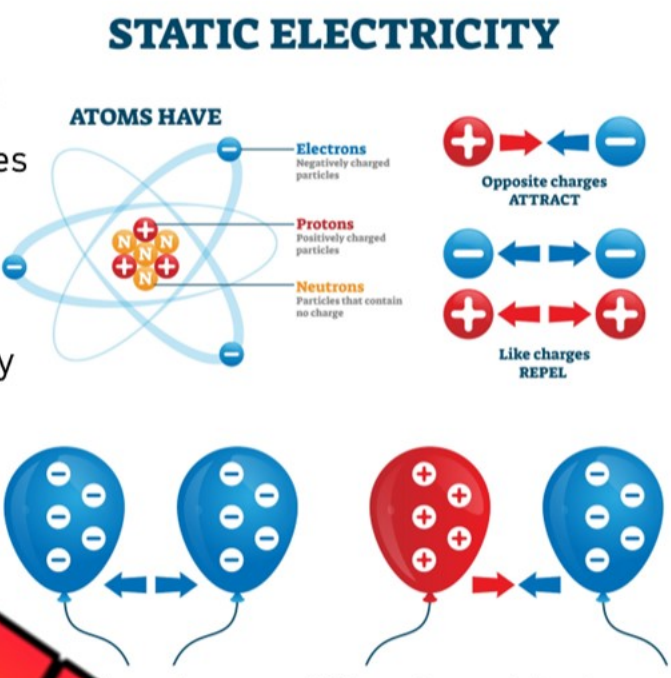
_____

Name: _____ 21

Curriculum Connection
NCF.1

Electrostatic Force

Electrostatic Force



Everything is made up of tiny particles that are too small to be seen. These tiny particles can have an electrical charge, either positive or n ative.

When ticles are the same, they repel (ea er. If they are opposite, y attr wards) each other.

Most objects ar utr they have the same numbe ive a ve charges. When two objects touch or nearly touch, charged pa icle one object to the other and can affect whether the object will repe attract ob ts. When objects move due to their charge, it is called an electrostati .

The Cat

This poor cat has st it. This is an example of a electrostatic force. The styrofoam and cat have opposite charges, which means they are attracted to each other.

This is a non-contact force because the styrofoam is moving without being touched. The styrofoam is being pulled towards the cat's body. You may have experienced this on a trampoline when your hair moves and sticks straight up.

Name: _____ 22

Curriculum Connection
NCF.1

Electrostatic Force

Questions

Answer the questions below using evidence from the text

1) What does electrostatic force mean?

2) What i[illegible] the cat in the photo? Explain.

3) What do the terms below

Repel	
Attract	

Word Search

Find the words in the wordsea[illegible]

Static	Repel
Attract	Object
Positive	Negative
Cat	Charge
Pull	Particles

G	S	K	A	H	R	S	P	O	S	[illegible]	[illegible]	I	V	E
T	B	Q	O	H	V	E	E	Z	L	N	R	C	L	J
Z	V	L	I	Y	N	L	T	J	C	M	D	Z	B	N
L	F	T	E	T	T	C	S	A	P	I	L	Z	T	E
J	P	T	O	P	Q	I	T	U	F	Z	I	N	C	G
Z	Q	H	L	H	E	T	A	G	U	W	Z	D	E	A
P	I	G	M	H	R	R	T	Z	X	H	I	T	J	T
U	U	N	V	A	P	A	I	J	T	N	V	B	B	I
L	C	R	C	E	C	P	C	H	A	R	G	E	O	V
L	M	T	S	F	Z	G	Y	F	C	S	J	B	A	E

Name: _____ 25

Curriculum Connection
NCF.1

Experiment - Magic Spoon

Research Question

What are we learning about?

Can I pick up salt and pepper grains using static electricity? Do I need to touch the salt and pepper or can I move the grains using a non-contact force?

Materials

What do I need to do the experiment?

- ✓ 1 Teaspoon
- ✓ 1 Teaspoon p r
- ✓ Plastic spoon
- ✓ Dish cloth
- ✓ Black piece of paper (optiona

Method

How do we complete the experiment?

1) Put the salt and pepper on the black piece of paper
2) Rub the spoon on a dish cloth for about 10 seconds
3) Hold the round part of the spoon up to the salt and pepper mixture
4) Watch for the particles to jump from the paper up to the spoon

Name: _____ 26

Curriculum Connection
NCF.1

Experiment - Magic Spoon

Observations | What did you notice?

1) What happened to the salt and pepper when you put the spoon over the mixture?

2) Did [illegible] pper cling to the spoon? Why might that be the case?

3) How could you use this method to s[illegible] mixt[illegible]

Draw | Draw a diagram of what happened. Label the spoon, salt, [illegible]epper

Name: _____ 29

Curriculum Connection
NCF.1

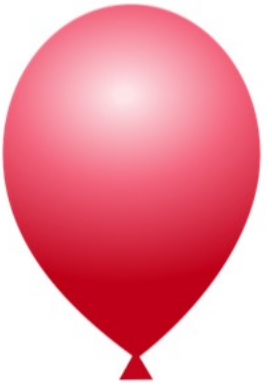
Experiment - Rolling a Can

Research Question — What are we learning about?

To learn about static electricity by making a can roll without touching it.

Materials — What do I need to do the experiment?

- ✓ An em… can
- ✓ A bal…
- ✓ A … hair
- ✓ Ti… option
- ✓ Tape – optio…



Method — …experiment?

1) Make sure the soda can is …y a…
2) Place the soda can on its side on …table.
3) Blow up the balloon and tie it closed.
4) Rub the balloon quickly back and forth on the w… …oth or …air. This will create static electricity!
5) Hold the balloon close to the soda can without touching it. W… happens!
6) Optional: create a start and finish line using tape. Then have students time how long it takes for them to get the can from the starting line to the finish line.

Name: _____ 30

Curriculum Connection
NCF.1

Experiment - Rolling a Can

Observations	What did you notice?

1) What happened to the can when you brought the balloon near it?

2) Why do y ink the can moved without being touched?

3) What happens if you n wit balloon?

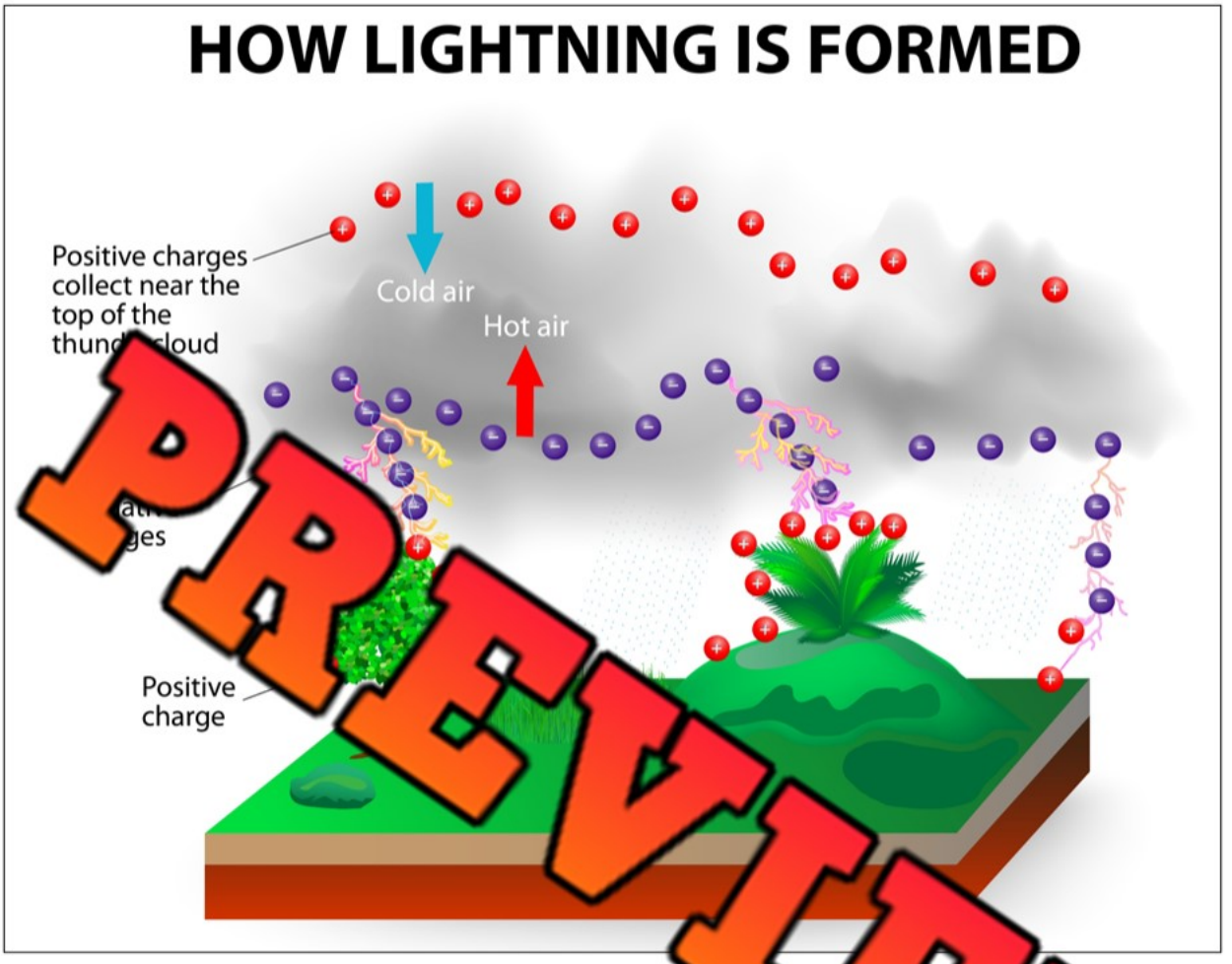
4) How can we make the can move faster or slower?

5) What do you think would happen if we used a bigger or smaller can? Would it move the same way?

Name: _____ 33

Curriculum Connection
NCF.1

Lightning - Electrostatic Force



How Lightning Is Formed

Lightning is an electrostatic current that travels from one electrically charged object to another. When a thundercloud forms, raindrops bump into each other causing a static electric charge.

In the diagram, you can see the thundercloud is becoming negatively charged at the bottom. When this happens, the positively charged objects on the earth's surface will become attracted to the negatively charged thundercloud. Once the charge is strong enough, their attraction will cause lightning, which is an electrical current between the two objects that are oppositely charged.

The diagram shows the thundercloud making lightning strikes with a tree, shrub, and the ground because they are positively charged.

Name: _____ 34

Curriculum Connection
NCF.1

Lightning - Static Electricity Force

Questions

Answer the questions below using evidence from the text

1) What is lightning?

2) How does [illegible]ng form?

Visualizing

Draw what you we[illegible]ctur[illegible]ere reading. Explain the picture

True or False

Is the statement true or false?

1) Lightning forms because of magnetic forces	True	False
2) Lightning forms when thunderclouds change their charge	True	False
3) Opposite charges attract which makes electrostatic currents	True	False
4) Lightning is an electrostatic current	True	False
5) Lightning happens when objects have the same charge	True	False

Name: _____ 35

Curriculum Connection
NCF.3

Magnetic Force

Magnetism

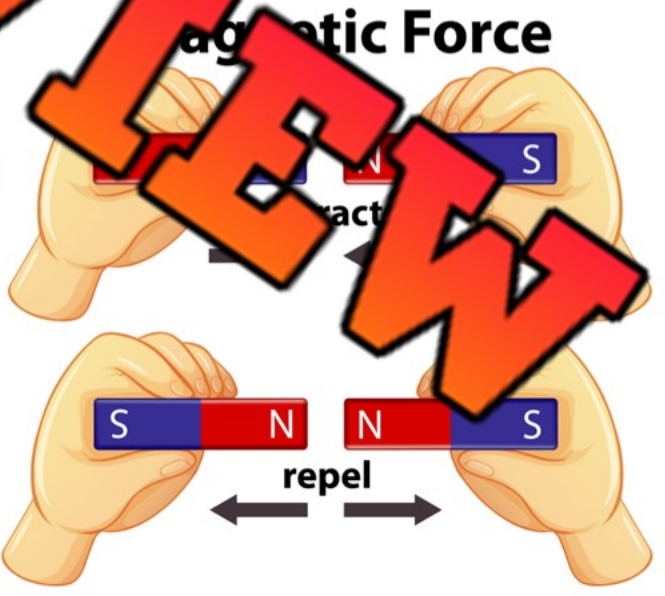
You've seen magnets and how helpful they can be. We use them for many purposes, including sticking things on our fridge. They work because of magnetism.

Magnetism is an invisible force that happens when magnets either attract or repel each other.

Magnetism is a force because it pulls or pushes objects if they are made of a magnetic material. Magnetic materials are metals made from iron, nickel, cobalt and many more.

If you try to stick a magnet to your fridge that is not made of a magnetic material, it will not have any effect so it will fall off. Magnetic materials have tiny particles called electrons. When these electrons are in a certain way, they will attract or repel other magnets depending on how they are facing.

Magnets



Magnets use magnetism, which is a non-contact force. A magnet can pull something towards it or push something away from it without touching it. This means magnets can create a force that moves another object.

A **magnet** is an object that can attract or repel other magnets. We sometimes say someone is magnetic if they attract a lot of friends.

Magnets have a north and a south pole. You can attach two magnets by putting opposite poles together. If you try to put the same poles together, they will repel each other.

Name: _____ 36

Curriculum Connection
NCF.3

Magnetic Force

Questions

Answer the questions below using evidence from the text

1) Why is magnetism an example of a non-contact force?

2) What is ? ich materials are magnetic?

True or False

s th ue or false?

1. Magnets are made from plastic materia	True	False
2. The south pole of a magnet will be attracted t er s	True	False
3. Magnetism is an invisible force that pushes and pu bjects	ue	False
4. Iron is a metal that has magnetic properties	ue	False
5. Magnets have 2 poles – a north and south pole		lse

Word Search

Find the words in the wordsearch

Magnetic	Repel
Attract	Poles
North	South
Fridge	Force
Metal	Iron

V J K B F M A G N E T I C E
W R A I Q G B D F X O O R M
A J T R E P E L Z Z M M T W
G Y T V D M E T A L I O K O
I K R T H P O L E S B A S M
R Q A O V A M N U F O R C E
O U C S O U T H B N O R T H
N F T F R I D G E H V K V F

Name: _____ 37

Curriculum Connection
NCF.5

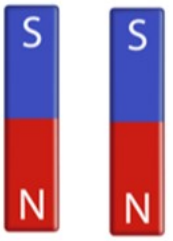
Attract or Repel

Magnets Will the magnets attract or repel each other?

1)

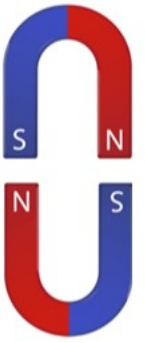
Attract	Repel

2)



Attract	Repel

3)



Attract	Repel

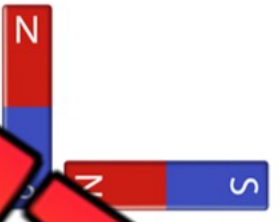
4)

Attract	Repel

5)

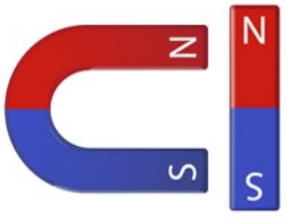
Attract	Repel

6)



Attract	Repel

7)

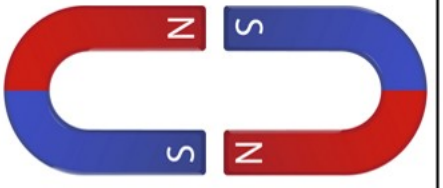


Attract	Repel

8)

Attract	Repel

9)



Attract	Repel

Name: _____ 38

Curriculum Connection
NCF.5

Experiment - Magnetic Car

Research Question — What are we learning about?

Can I create a car that I can move using magnets?

Materials — What do we need?

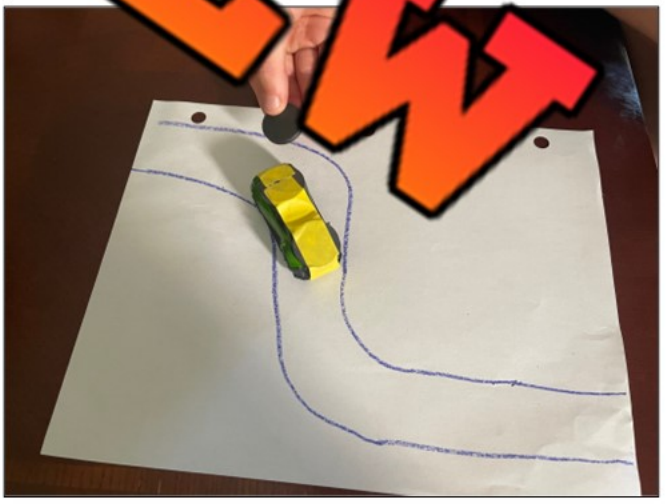
- ✓ 2 ma[illegible] bar magnet and another st[illegible] the best.
- ✓ A toy [illegible]ar
- ✓ Tape
- ✓ A racetrack – [illegible]can [illegible] provided or make y[illegible]

Method — How do we complete the [illegible]erime[illegible]

1) Tape the bar magnet to the toy car

2) Use the other magnet to pull the car. You will need to adjust how far your hold the magnet away from the car

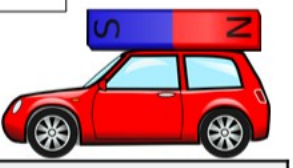
3) Now that you know how to move your car, try moving it around the racetrack. You may need to flip the magnet to repel or attract the car. We found it easier to repel the car around the track.



Name: _____ 39

Curriculum Connection
NCF.5

Experiment - Magnetic Car



Results	What happened?

1) What force is moving the car?

_____

_____

2) Is the for[illegible]acting the car or is it a non-contact force?

[illegible]act	Non-Contact Force

3) Did you repel th[illegible]tra[illegible]t with the magnet? Explain.

_____

_____

_____

4) If you repelled the car, did you line up the north[illegible]e of [illegible]magnet to the south pole of the car's magnet? Or did you line up th[illegible]e pol[illegible]

Same Pole	[illegible]osite P[illegible]

5) Draw a car that is powered by magnetism.

Name: _____ 41

Curriculum Connection
NCF.5

Maglev Cars: Zooming into the Future!

What are Maglev Cars?

Have you ever seen a car floating in the air? Sounds like something from a science fiction movie, right? But guess what? It's real! There are cars called 'Maglev cars' that can do just that. Maglev is short for "Magnetic Levitation," which means these cars float above the track instead of rolling on wheels.

How Do The

Maglev ve n t iple of magnets. Remember how two like poles re l each other? That's exactly how Maglev cars work! They have magnet t ottom tracks they run on have magnets too. These magnets are set so the e p e her, and as you might remember, similar poles repel. This repulsion li abo making it float in the air.

Benefits of Maglev Cars

- Speedy: Maglev cars are really fast because th e no w ow them down
- Smooth Ride: No wheels also mean no bumps. So, ri per sm
- Less Noise: Since there's no contact with the track, Maglev s are
- Eco-friendly: They use electricity instead of fuel, so they are better for e et.

Drawbacks of Maglev Cars

- Expensive: Building tracks for Maglev cars is pricey
- Limited Use: They can only go where tracks have been built. You can't just drive one anywhere like a regular car.
- Power Hungry: They use a lot of electricity, which can be a problem if there isn't a strong enough power supply.

Name: _____ 42

Curriculum Connection
NCF.5

Maglev Cars: Zooming into the Future!

Questions

Answer the questions below using evidence from the text

1) What is a Maglev Car? How does it work?

2) What ar[illegible]nd drawbacks of a Maglev Car?

Draw

Look up pictures of [illegible]nline and draw your own

Multiple Choice

Circle the correct answer

1) Maglev cars are _____.	Expensive	Inexpensive
2) Maglev cars are _____.	Fast	Slow
3) Maglev cars use _____.	Gravity	Magnets
4) The car magnets _____ the track's magnets.	Repel	Attract
5) A maglev car has lots of friction, so it is _____.	Loud	Quiet

Name: _____ 43

Curriculum Connection
CS.1

Coding - Maglev Cars

Maglev cars can be self-driving. The driver enters where they want to go, and the car moves to that location. The car interacts with the track to pull it to where it needs to go. If the car needs to go forward, the magnets in the track in front of the car turn on, attracting it. If it needs to go backwards, the magnets behind the car turn on.

This is a self-driving maglev c

It understands 3 commands

Right makes it turn right

Left makes it turn right

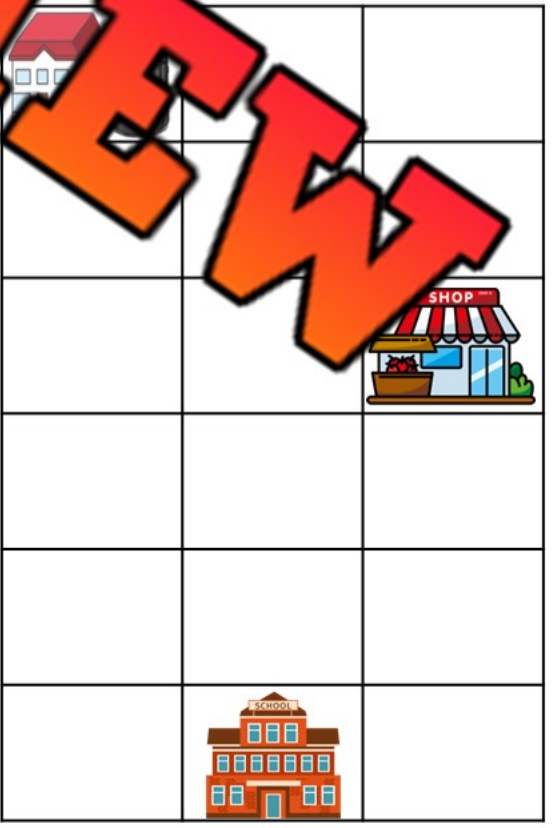
Left

Forward makes the car move forward by the number shown

Forward 2

Directions Write code to get the ar to ol, e store, and then back home

Codes – Forward, Turn Left, Turn Righ	
Line 1	
Line 2	
Line 3	
Line 4	
Line 5	
Line 6	
Line 7	
Line 8	
Line 9	



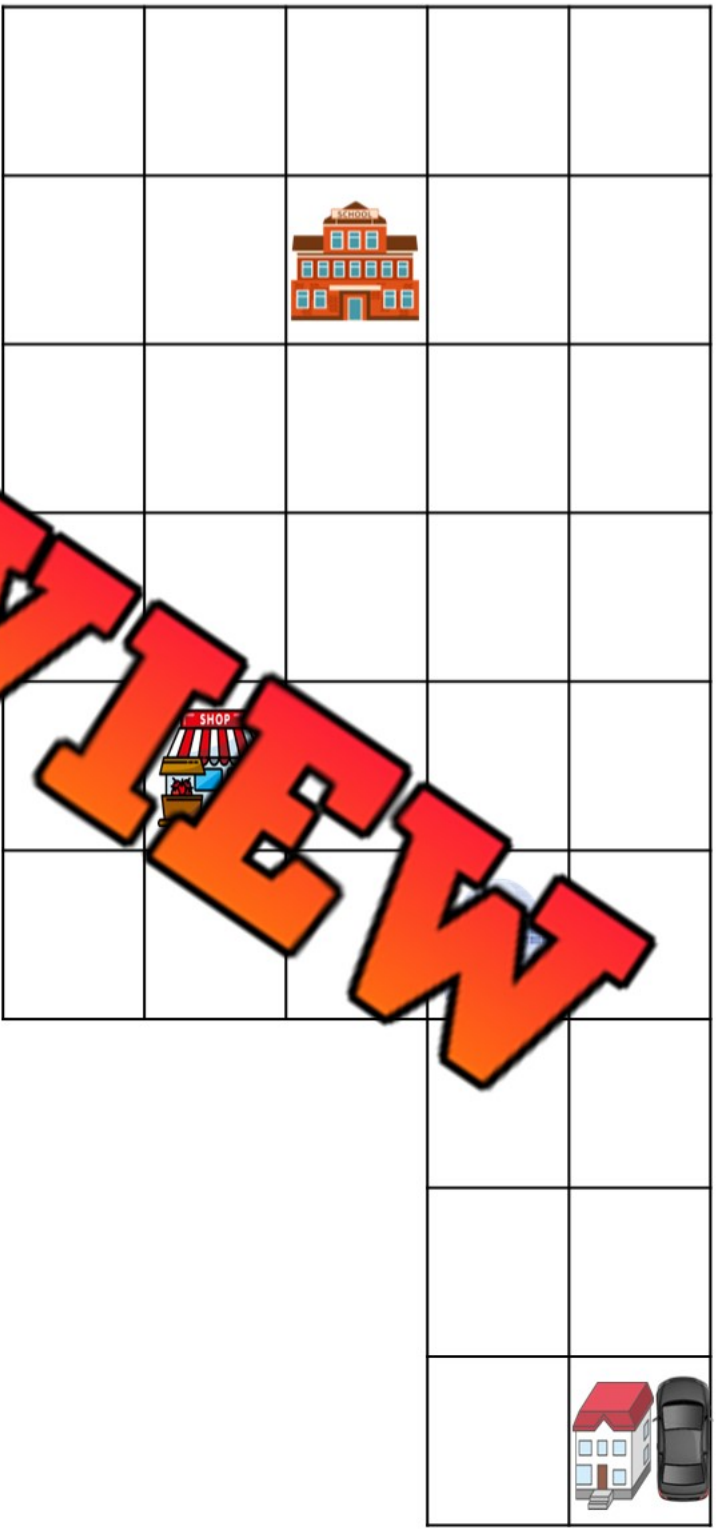
Name: _____ 44

Curriculum Connection
CS.1

Coding - Maglev Cars

Directions Write code to get the car to the school, to the arena, to the store, and then back home

Codes – Forward, Turn Left, Turn Right	
Line 1	
Line 2	
Line 3	
Line 4	
Line 5	
Line 6	
Line 7	
Line 8	
Line 9	
Line 10	
Line 11	
Line 12	
Line 13	
Line 14	
Line 15	
Line 16	

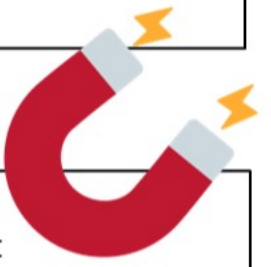


Name: _____ 45

Curriculum Connection
NCF.3

Magnetic or Not?

A magnetic material will be strongly attracted to a magnet. A magnet is a material or object that produces a magnetic field with a north and south pole. Test to see if the following materials are magnetic or not. If the material is magnetic, it will be attracted or repelled by the magnet.



Procedure | What to do

1. Gather th rials in the table below and a magnet
2. Make an or a guess whether the material will be magnetic or not
3. Touch t magnet and fill in whether it was magnetic or not

Mate ial	ma - (Magnetic or Not)	Magnetic or Not
Pencil		
Coin		
Paper		
Cardboard		
Paperclip		
Eraser		
Popsicle Stick		
Rubber Band		
Brad Nail		
Scissors		

Questions | Use information from the text to support your answer

1. From the experiment you just did, what types of materials are magnetic?

_____

_____

2. Did any of the results surprise you or were all your estimates correct? Explain.

_____

_____

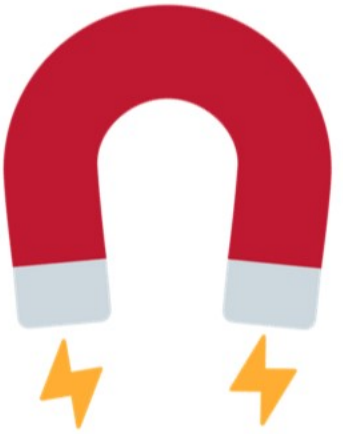
Name: _____ 46

Curriculum Connection
NCF.4

Experiment - Magnetic Strength and Distances

Research Question — What are we learning about?

To understand how the strength of a magnet changes with distance.



Materials — What do we need?

- ✓ M… …ize and strength)
- ✓ Ruler or tap…
- ✓ Small metal… …ts (li… …ips)

Method — How do we… …ple… …ent?

1) Lay the ruler or tape measure flat on a table.
2) Place the magnet at one end of the ruler.
3) Begin by placing a paperclip at the same end as the magnet. Slowly move the paperclip away from the magnet until it is no longer attracted to the magnet. Record the distance at which the paperclip is no longer attracted to the magnet.
4) Repeat this process with the other paperclips. Each time, start the paperclip closer to the magnet and move it away slowly until it is no longer attracted. Record each distance.
5) Repeat steps 3 and 4 at least three times to get an average distance for each paperclip.

Name: _____ 47

Curriculum Connection
NCF.4

Experiment - Magnetic Strength and Distances

Observations	What happened?

Paperclip	Distance – In CM
Paperclip 1	
Paperclip 2	
lip 3	
lip	
Average (Add up the 5 distances and divi	

Results	What happened?

1) How does the distance between the magnet and the pa p a gth of the magnetic force?

_____

_____

_____

2) If you were trying to pick up a heavy magnetic object, where would you put the magnet?

_____

_____

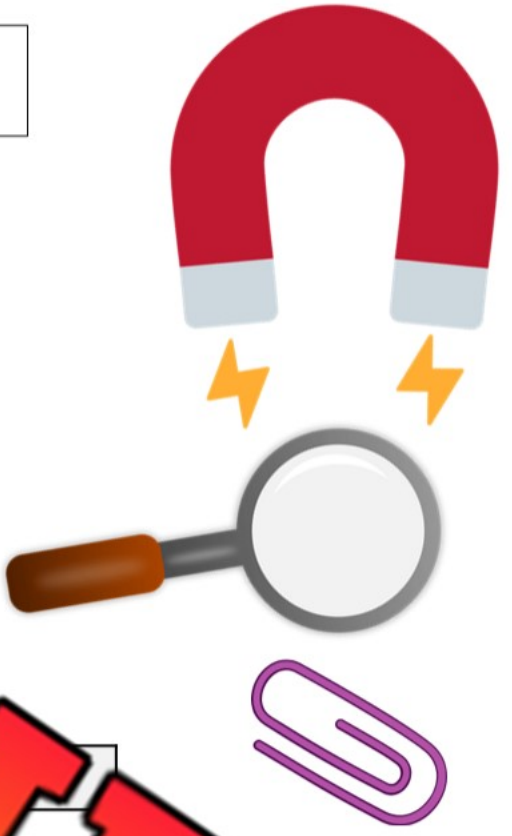
Name: _____ 48

Curriculum Connection
NCF.4

Experiment - How Materials Affect Magnets

Research Question — What are we learning about?

To understand how different materials can affect the strength of a magnet.



Materials — What do we need?

- ✓ Magne[illegible]e same size and strength)
- ✓ Diffe[illegible]ri[illegible]
  - [illegible]ard
  - ❑ [illegible]aper
  - ❑ Plas[illegible]
  - ❑ Glass
  - ❑ Metal – Al[illegible]um
- ✓ Metallic objects (suc[illegible]aperclip[illegible]

Method — How do we complete t[illegible]perime[illegible]

1) Start by placing a magnet and a paperclip [illegible]to[illegible]a table so that the paperclip is attracted to the magnet.

2) Slowly move the paperclip away from the magnet until it is [illegible] where it is no longer attracted to the magnet. Measure this [illegible] record it as the base measurement.

3) Place one of the materials (let's start with cardboard) between the magnet and the paperclip. Move the paperclip closer to the magnet until it is attracted again. Measure this distance and record it.

4) Repeat this process with each of the different materials, always measuring the distance at which the paperclip is attracted to the magnet.

5) Compare the measurements for each material to the base measurement.

Name: _____ 49

Curriculum Connection
NCF.4

Experiment - How Materials Affect Magnets

Observations	What happened?

Object We Are Measuring	Distance It Attracted The Paperclip
Paperclip 1 – Nothing In Between	
Paperclip 2 – Cardboard	
Paperclip 3 – Paper	
Paperclip Glass	
Paperclip Metal	
Paperclip Plastic	

Results	What happened?

1) What materials affected the magnet the most? Which the least?	
The Most	
The Least	

2) Why do you think these materials affected the strength of the magnet the most?

_____

_____

3) What other factors might affect the strength of the magnet more than what the material is simply made of?

_____

_____

Name: _____ 50

Curriculum Connection
NCF.6

Magnetizing an Object

How to Magnetize Objects

Magnetizing objects means that you make an object become a magnet. A paperclip is not magnetic, but if you use one of the following techniques, you can turn a paperclip into a magnet for a short period of tim

Rubbing

If you ru magnet in ection along a metal object, you can make the object magnetic. You n o tinue g in the same direction because you are lining up all of the atoms i met th direction.

When you are done, t it will etic as the object will be attracted to other magnetic materials. You ew magnet will only last for a short perio of time until the atoms line up in their original spots.

Striking

To perform this technique, align your object so that it is pointing along the north-south axis of the Earth. You can use a compass to find out which direction this is. Strike the object with a hammer repeatedly. This shakes the atoms out of their original spots, causing them to realign to the Earth's magnetic field.

Now your object will become a magnet that attracts other magnetic materials. Eventually the object will lose its magnetic powers as the atoms line up in their original spots.

Name: _____ 51

Curriculum Connection
NCF.6

Magnetizing an Object

True or False

Is the statement true or false?

1. You can turn metal objects into magnets	True	False
2. Metal objects will become magnets forever	True	False
3. Rubbing a magnet along a metal object makes it magnetic	True	False
4. Objects h oms in them	True	False
5. You can bject in any direction and it will be magnetic	True	False

Question

Answer the questions below using evidence from the text

1) How can you turn tal o magnet?

2) Can any object become magnetic? Explain.

Word Scramble

Unscramble the words below using the word bank

Magnet	Striking	Rubbing	Atoms	Particles	Metal	Objects	Direction

SAMTO		NBUGBIR	
TLMEA		GETMNA	
TIGNISRK		STEBJCO	
ITNREDICO		RSCLAEPTI	

Name: _____ 52

Curriculum Connection
NCF.6

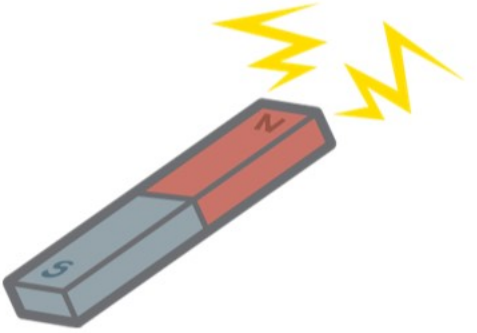
Experiment - Magnetizing an Object

Research Question — What are we learning about?

To understand how objects can be magnetized using a permanent magnet

Materials — What do we need?

- ✓ Steel [illegible] magnetic
- ✓ Bar [illegible]
- ✓ S[illegible] ob[illegible]e paper clips)



Method — How [illegible]e co[illegible]t[illegible]e [illegible]xperiment?

1) Start by explaining to the s[illegible]ents [illegible]n[illegible]nes of metals (like iron, nickel, and coba[illegible]n beco[illegible] magnets when they are exposed to a mag[illegible]ield.

2) Give each student a steel nail and a bar magnet.

3) Ask the students to rub the bar magnet along the length of the nail in one direction, from the head to the point. Do this about 20-30 times. This aligns the tiny magnetic fields within the nail with the magnetic field of the bar magnet.

4) Once done, ask students to test if their nail has been magnetized. They can do this by seeing if it can pick up small metal objects like paper clips.

Name: _____ 53

Curriculum Connection
NCF.6

Experiment - Magnetizing an Object

Results	What happened?

1) What happened when you struck the metal nail with the magnet?

2) Why does the n... ma...etic?

3) Does the nail become more magnetic as yo... e/rub... Try only 30 seconds versus 1 minute of rubbing. Which works bet...

4) How long does the nail stay magnetic? Will it be magnetic forever now?

Name: _____ 54

Curriculum Connection
NCF.1

Examples of Non-Contact Forces

Examine Describe the non-contact forces at work in the pictures below

1)

2)

3)

4)

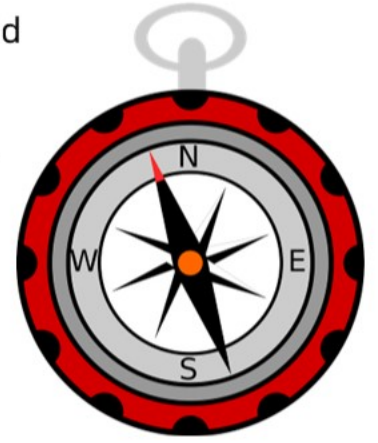
Name: _____ 55

Curriculum Connection
NCF.5

How a Compass Works

What is a Compass?

A compass is a navigational tool that tells people which direction they are going. The compass was invented in 1300 by an Italian explorer named Flavia Goia.

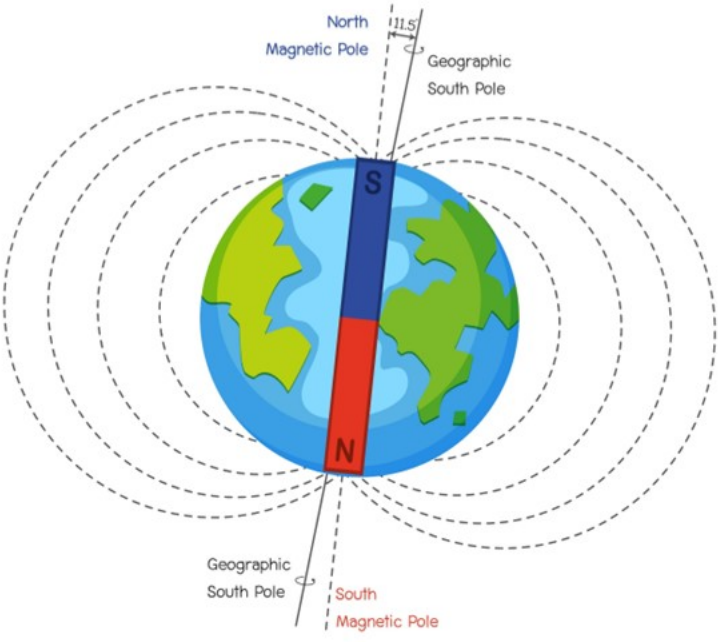


Combined with a map, a compass was very important for sailors to know which direction they were going. This is because when they were in the middle of an ocean, you cannot see any landmarks like the sun. Therefore, it is impossible to know which direction you are going!

How a Compass Works

We have learned that the Earth is like a magnet that has its own magnetic field. Deep in the Earth's core, there is a south pole that attracts and repels other magnets.

EARTH'S MAGNETIC FIELD



A compass made from a magnet needle points to the directions east and west. When you hold a compass inside of the magnet will be attracted or repelled by the Earth's poles.

Depending on how you hold the compass, the needle will move so that the north pole is attracted to the Earth's south pole. The movement of the needle will show you which direction you are facing.

Name: _____ 56

Curriculum Connection
NCF.5

How a Compass Works

Making Connections What does this remind you of in your life?

Questi An questions below using evidence from the text

1) Why were com nport ilors?

2) How does a compass tell us which direction e goi

Draw Draw a picture of a compass. Label it N, E, S, W

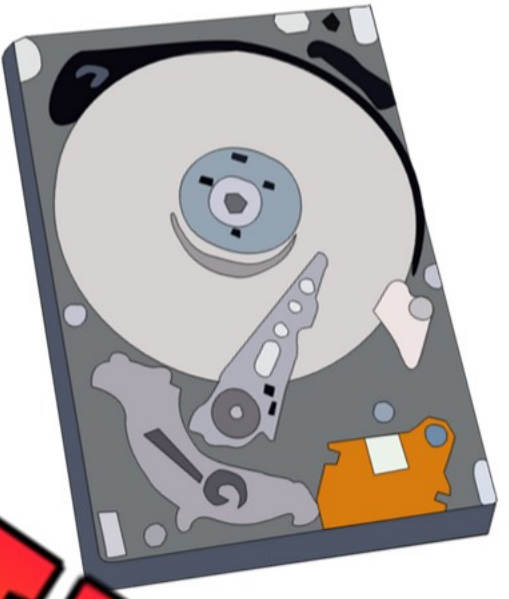
Name: _____ 57

Curriculum Connection
NCF.5

Magnets Harmful Effects on Technology

Magnets Effect on Magnetized Objects

Many great technologies use magnetism in order to work. Credit cards and hard drives store information using the force of magnetism. Read below how you can damage these objects by touching a magnet to them.



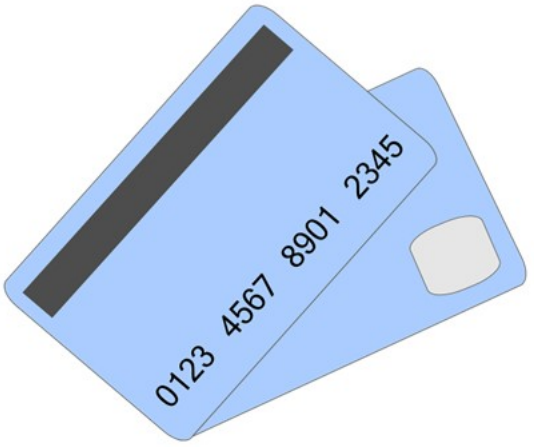
Magnets Ca ge Computers

A comp a ive that holds information about the npute documents and games you download g hard The hard drive works because of a c lex ss. This means the hard drive uses m to ta.

If you hold a strong magne p to could ruin the magnetic field in the ha ve. This wipe the hard drive clean and delete all your and It could also break the hard drive.

Magnets and Credit Cards

The thin strip on a credit card uses magnetism to store informatio ab card.



If a strong magnet touches the magnetic strip on the credit card, it can erase all of the information about the card.

This happens because the electrons change their charge when a magnet is put close to it. This is just like when we rub metal with a magnet, we can change the metal's magnetic ability.

Name: _____ 58

Curriculum Connection
NCF.5

Magnets Harmful Effects on Technology

Questions

Answer the questions below using evidence from the text

1) How does a magnet affect a hard drive?

2) What wi[illegible]to a credit card?

True or False

[illegible] true or false?

1. A hard drive makes a computer run [illegible]	True	False
2. A hard drive stores information using magn[illegible]	True	False
3. The thin strip on a credit card uses magnetism	[illegible]ue	False
4. Touching a magnet to a computer can wipe clean a ha[illegible]	[illegible]ue	False
5. You can wipe a hard drive clean using a weak fridge magnet		[illegible]lse

Word Search

Find the words in the wordsearch

Magnet	Damage
Harmful	Technology
Hard	Drive
Clean	Wipe
Credit	Card

Q F J T D H D E W F U H D V
Z V L M C R E D I T B A E G
C A R D A M A G E D U R P L
P G C L E A N S U Z E D W B
M T E C H N O L O G Y G I L
H S H C H A R M F U L Z P T
T V L D R I V E V H Q B E N
F P X B B M A G N E T W Y F

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Curriculum Connection
NCF.1

Devices Using Non-Contact Forces

Devices that Use Magnetism

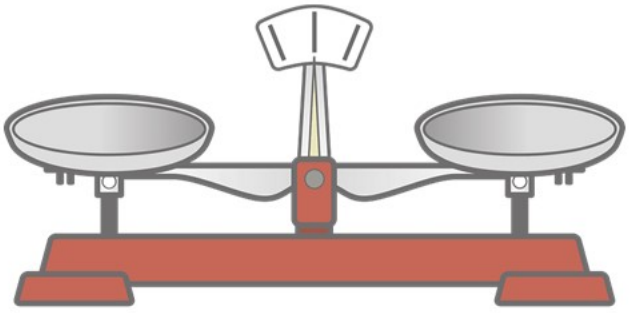
Magnets are used in the following devices:

- ❑ Computer hard drives to store information
- ❑ Microphones, speakers, headphones, and telephones all use magnets to create a magnetic field that allows sound waves to travel loudly
- ❑ Doorbells use magnets to move a plate that comes in contact with another plate to make the "ding-dong" sound.

Devices Using Electrostatic Forces

An electrostatic mop is used to collect dust. It works because it is made of polyester and polyamide materials that make a lot of electricity when they spin on the ground.

As they build-up static in the mop, the dust attaches to the mop just like a balloon attaches to the hair on your head. You may notice when handling these mops that you will get small shocks!



Devices Using Gravitational Forces

A balance is used to find out how much an object weighs. It works by placing the object on the platform.

The heavier the object, the more gravity will pull it down. This will exert more force on the platform and will raise the other side up higher.

Name: _____ 60

Curriculum Connection
NCF.1

Devices Using Non-Contact Forces

Questions

Answer the questions below using evidence from the text

1) Which invention that uses these forces do you think is the most important?

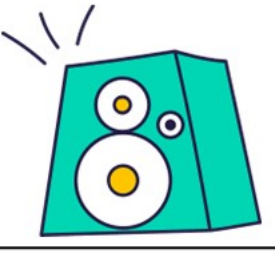
2) Can you [illegible]er invention that uses one of these forces? Explain.

Visualizing

Draw what you wer[illegible]ctur[illegible]ere reading. Explain the picture

Which Force?

Write the force that is used in the devices below

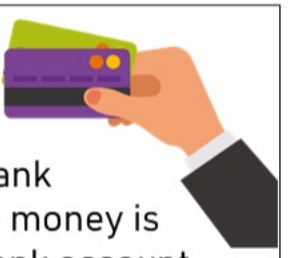
			

Name: _____ 61

Curriculum Connection
CS.1

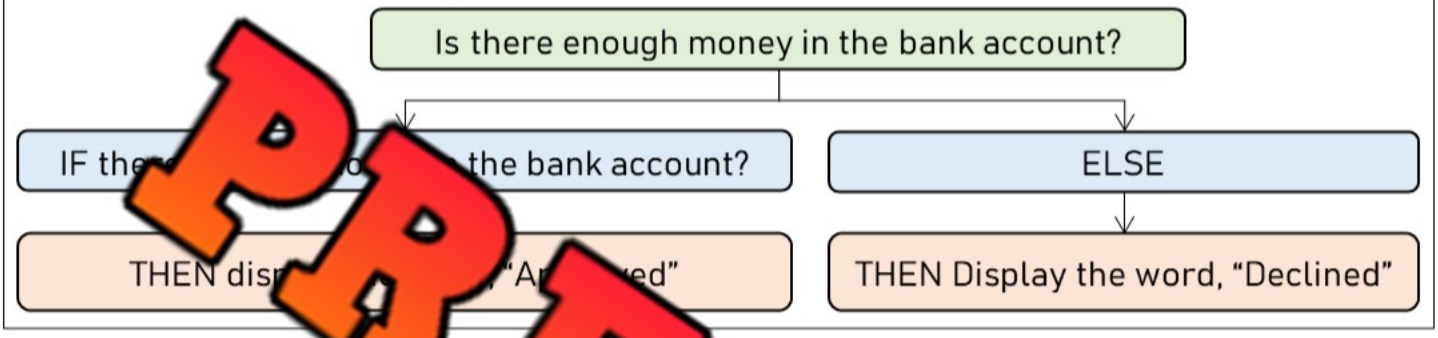
Coding - Bank Cards and Magnets

Magnets and Bank Cards



Bank cards have a magnetic strip that stores codes on it. The codes link to a bank account. When you swipe your card, the card reader detects the magnetic code in the card. It connects to your bank account so that the transaction can be made. A transaction is when money is taken from the card's bank account and sent to the store owners bank account.

The code uses an IF/ELSE statement.



Directions If there is e ney t the purchase, it will say approved. If there is not, de

	Cost of Purchase	Money in Acc	IF or	Approved or Declined?
1)	$50	$150		
2)	$120	$95		
3)	$209.99	$210		
4)	$318.75	$318.75		
5)	$452.25	$385.99		
6)	$491.50	$492.10		
7)	$509	$511		
8)	$750.99	$750.97		
9)	$825.75	$825.50		
10)	$999.99	$999.99		

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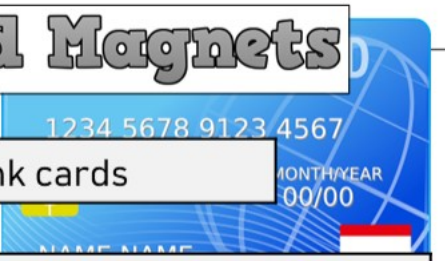
Curriculum Connection
CS.1

Research - Bank Cards and Magnets



Research | Learn more about the invention of bank cards

1) Who invented the first bank card?

2) What was the Charge-It card? How did it work?

3) What is an ATM?

4) ATM's were made before online debit cards. Do AT[illegible]ect to [illegible]on's bank account?

5) What is a debit card? How does it work?

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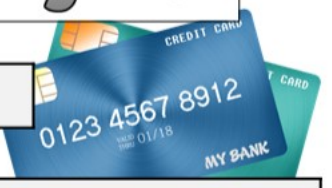
Curriculum Connection
CS.1

Research - Bank Cards and Magnets



Research Learn more about the invention of bank cards

6) Make a connection – do you or anyone you know have a debit card? Have you used it? Explain.

7) What would life [illegible] if we [illegible] debit cards?

8) Draw a debit card below.

Name: _____ 64

Curriculum Connection
NCF.1

How Hard Drives Work

What is a Hard Drive?

A hard drive is like the brain of your computer. It's where all your documents, pictures, and software live when you're not using them. But it's not magic—it's magnets!

How Does a Drive Work?

A hard dri mation on a round piece called a disk. This d oated w cial kind of paint that can be magnetized. Im as g circle with millions of tiny spots on it. Each spot can be a '1' or a '0' calle de, and it's the language computers use.

Role of Magnets in Hard Drive

Now, here is where the magnets come i s a t m, called the read/write head, which hovers above the disk. This head has a mag it. When your computer wants to write a '1' or '0', it moves the to th nd uses the magnet to change that spot's magnetism. If the magne s one wa pot is a '1'. If it points the other way, it's a '0'.

When your computer wants to read the information, it does t moves the head over the spot and checks which way the magnetism is p g. That way, it knows if the spot is a '1' or a '0'.

Spinning and Searching

The disk in the hard drive is always spinning very fast, like a merry-go-round. The read/write head can move in and out, just like you might move towards the center or edge of the merry-go-round. Between the spinning and the moving head, the computer can find any spot on the disk super quickly!

Name: _____ 65

Curriculum Connection
NCF.1

How Hard Drives Work

Questions

Answer the questions below using evidence from the text

1) What is a hard drive? Why do we need them?

2) How do hard drives make

Making Connections

What does this remind you of

How do you use hard drives? Do you want a big hard drive or small hard drive? Do any of your gaming systems, tablets, or computers use hard drives?

Name: _____ 66

Curriculum Connection
CS.1

Coding Activity - Hard Drive

Leah is working on her computer. To find the information she has saved on her hard drive, the arm will move to the correct binary code. To find the binary code, use ordered pairs. Start with the x-axis (horizontal number →) as the number you will write as the first ordered pair. Use the y-axis (vertical number) as the second number in the ordered pair.

Name: _____ 67

Curriculum Connection
CS.1

Coding Activity - Hard Drive

Code | Write the binary code to find the files below on the hard drive

File	Ordered Pair – Binary Code
	(00000, 000)
	
	
	

File	Ordered Pair – Binary Code
	
	
	
	

Questions | Answer the questions below

1) Why do you think a computer uses binary code and words?

2) What files do you save on computers you have used?

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Curriculum Connection
NCF.1

Photocopiers Using Static Electricity

Static Electricity and Photocopiers

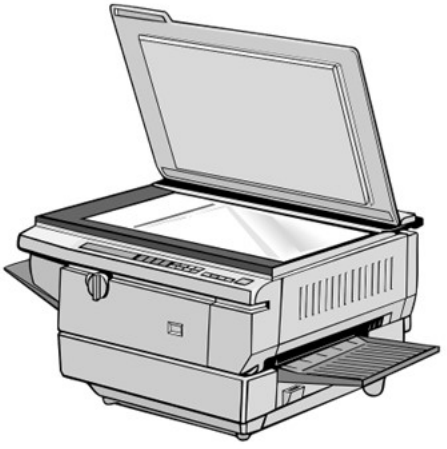
Static electricity is just like when you rub a balloon on your hair and it sticks up! But do you know photocopiers use the same trick to copy your documents? Let's dive deeper!

Making Electricity in a Photocopier

Inside a photocopier is a special drum. This drum gets a static electric charge when it's hit with a bright light. The light shines on the paper you want to copy. Where the paper is white, light bounces back and hits the drum. This makes the parts of the drum lose their charge.

Toner and Static Electricity

Then, there's something called toner, which is the powder. The toner has an opposite charge to the drum. Remember how opposites attract? Because of that, the toner sticks to the charged parts of the drum.



Making the Copy

Next, a blank piece of paper is rolled over the drum. This paper is given a stronger charge than the drum, so the toner jumps from the drum to the paper! Then, the paper is heated up, so the toner melts and sticks to the paper. And there you have it, your copied document!

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Curriculum Connection
NCF.1

Photocopiers Using Static Electricity

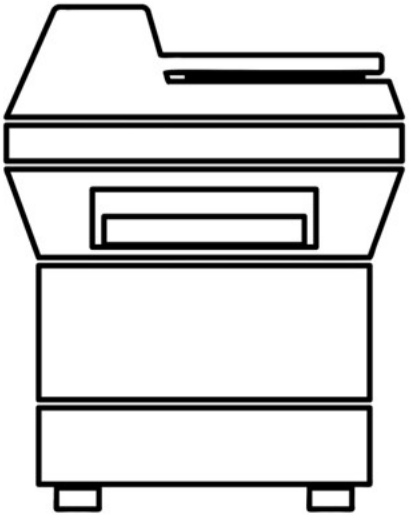
Questions Answer the questions below using evidence from the text

1) What is the drum inside the photocopier charged with?

2) How does the toner get from the drum to the blank paper?

3) Have you ever used a ph[illegible]er? Ex[illegible]hen and where.

Draw Draw your own photocopier and colour the one



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Forces - Activities

Word Search

Find the word bank words in the puzzle!

Word Bank

- ❑ Force
- ❑ Push
- ❑ Pull
- ❑ Object
- ❑ Electrostatic
- ❑ Magnet
- ❑ Charge
- ❑ Repel
- ❑ Attract
- ❑ Gravity
- ❑ Movement
- ❑ Metal
- ❑ Iron
- ❑ Nickel
- ❑ North
- ❑ outh

Word Scramble

Read the clue and then unscramble the word

ROITELSTCCETA		JOBCTE	
REFOC		ETAMNG	
KNIELC		LPERE	
ETMLA		SHUP	
HRCGAE		TGVARYI	

Name: _____ Date: _____

Unit Test - Forces

Multiple Choice /10

1. An example of a pulling force is... a) Kicking a ball b) Punching a punching bag c) Playing tug of war d) Pushing som… a swing	2 A ball comes back down to the Earth because of... a) Electrostatic Force b) Gravity c) Friction d) Muscular Force
3. Lightning … of which force? a) Electr… Force b) Gravity c) Friction d) Muscular Force	4. How many poles are there on a magnet? a) 1 b) 2 c) 3 d) …
5. A balloon sticks to our hair becau… a) Static electricity b) Magnetism c) Friction d) None of the above	…) …material is magnetic? a) …lass b) Alu… c) … d) Wood
7. A compass works because of? a) Electrostatic Force b) Gravity c) Friction d) Magnetism	8. Bank cards use … for… a) Electrostatic Force b) Gravity c) Friction d) Magnetism
9. Photocopiers work using... a) Electrostatic Force b) Gravity c) Friction d) Magnetism	10. Who came up with the theory of gravity? a) Galileo Galilei b) Thomas Edison c) Isaac Newton d) Ben Franklin

Definitions – What does the term mean (1 mark each) /3

Term	Definition (what does it mean)
Gravity	
Electrostatic Force	
Mag	

Short Answer

Answer [illegible] – Each question is worth 3 marks

1) What is a non-contact force? Give exa

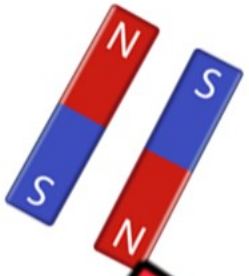
2) How can you make a steel nail magnetic?

3) How does the distance from a magnet to a magnetic object affect the strength?

Magnets

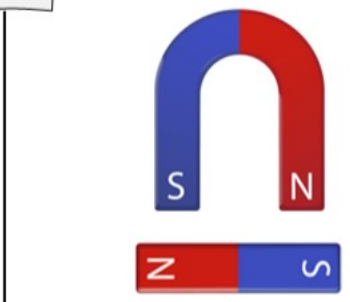
Will the magnets attract or repel each other?

1)



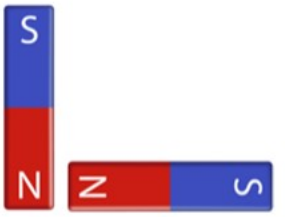
Attract	Repel

2)



Attract	Repel

3)



Attract	Repel

Long Answer

Answer the questions below – Each question is worth 5 marks

1) How does a compass work? What does it use?

2) Who is Isaac Newton? What theory did he made? How does it explain the world around us?