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Google Slides Lessons Preview

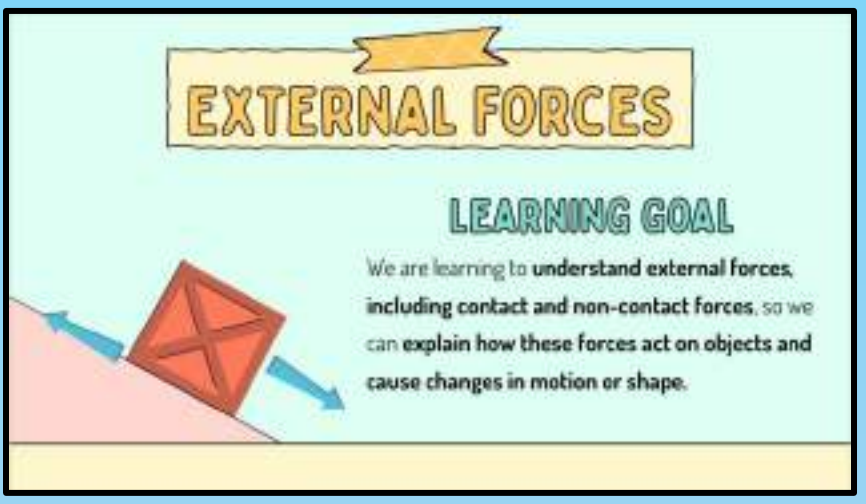
Alberta Science Curriculum

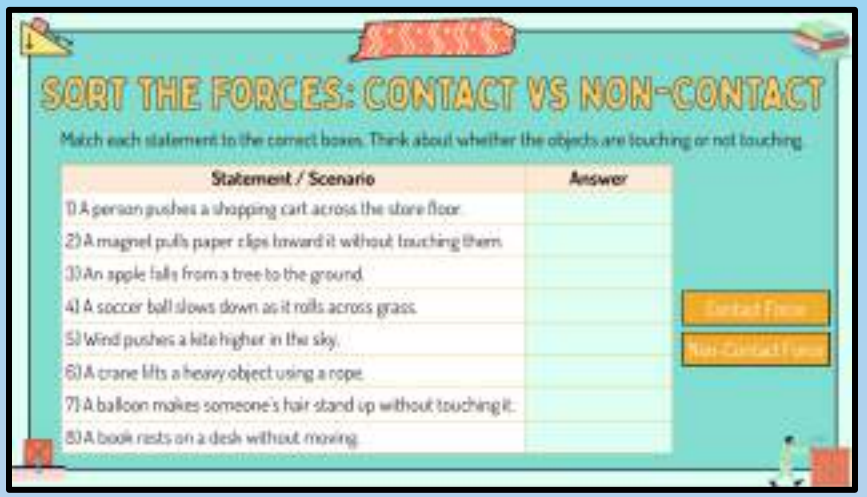
Energy (Forces & Resources) – Grade 6

3-Part Lesson Format

Part 1 – Minds On!

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





Part 2 – Action!

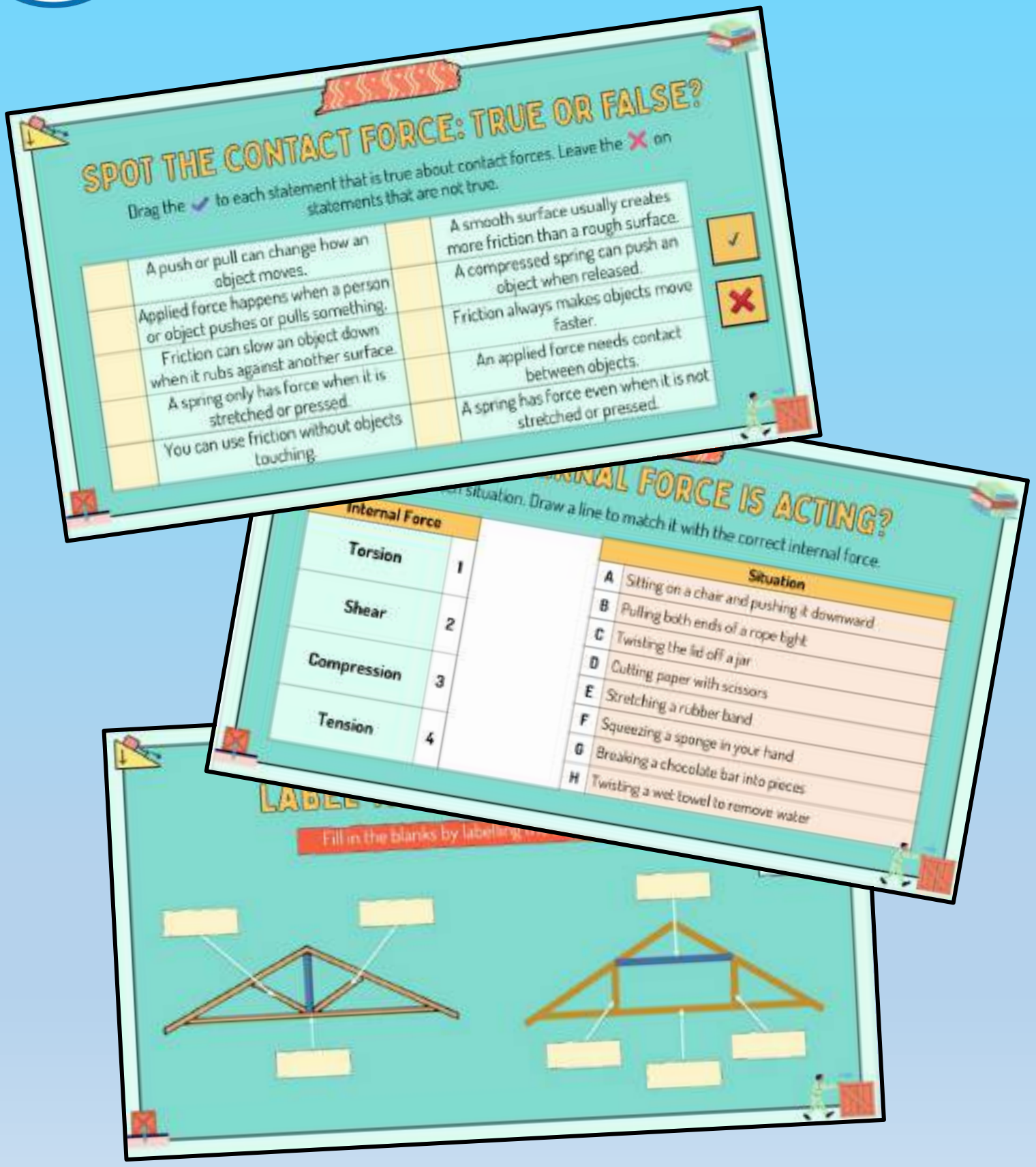
- Writing
- Matching
- Drag and Drop
- Drawing
- And More!

Part 3 – Consolidation!

- Exit Cards
- Quizzes
- Reflection
- And More!

Alberta Science Curriculum

Energy (Forces & Resources) – Grade 6



Alberta Science Curriculum

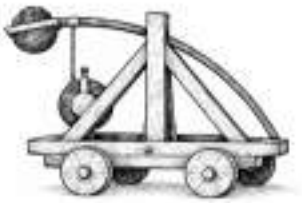
Energy (Forces & Resources) – Grade 6

Workbook Preview

Grade 6 – Science Unit

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

Guiding Question: Students analyze forces and relate them to interactions between objects.



	Learning Outcome – Students investigate and compare how forces affect living things and objects in water and air.	**Pages**
E.1	Forces within an object are internal forces, including tension, compression, shear, torsion Forces that act on an object from outside the object are external forces, including applied force, friction, elastic or spring force External forces cause internal forces within an object.	7 – 22
E.2	compressed or stretched elastic object or spring. Compression is a force exerted on an object that squeezes, squashes, or compacts the object. Shear is a force that pushes parts of an object in opposite directions, resulting in bending or breaking. Torsion is a force that twists an object	23 - 46
E.3	Plasticity is a property that leads to permanent changes in an object's shape; e.g., bending a paper clip. Elasticity is a property that enables temporary changes in an object's shape; e.g., stretching a rubber band.	47 - 48
E.4	An action force is exerted on an object in a particular direction. A reaction force acts in the opposite direction of an action force. One object experiences an action force while another object experiences a reaction force in an interaction.	49 - 57

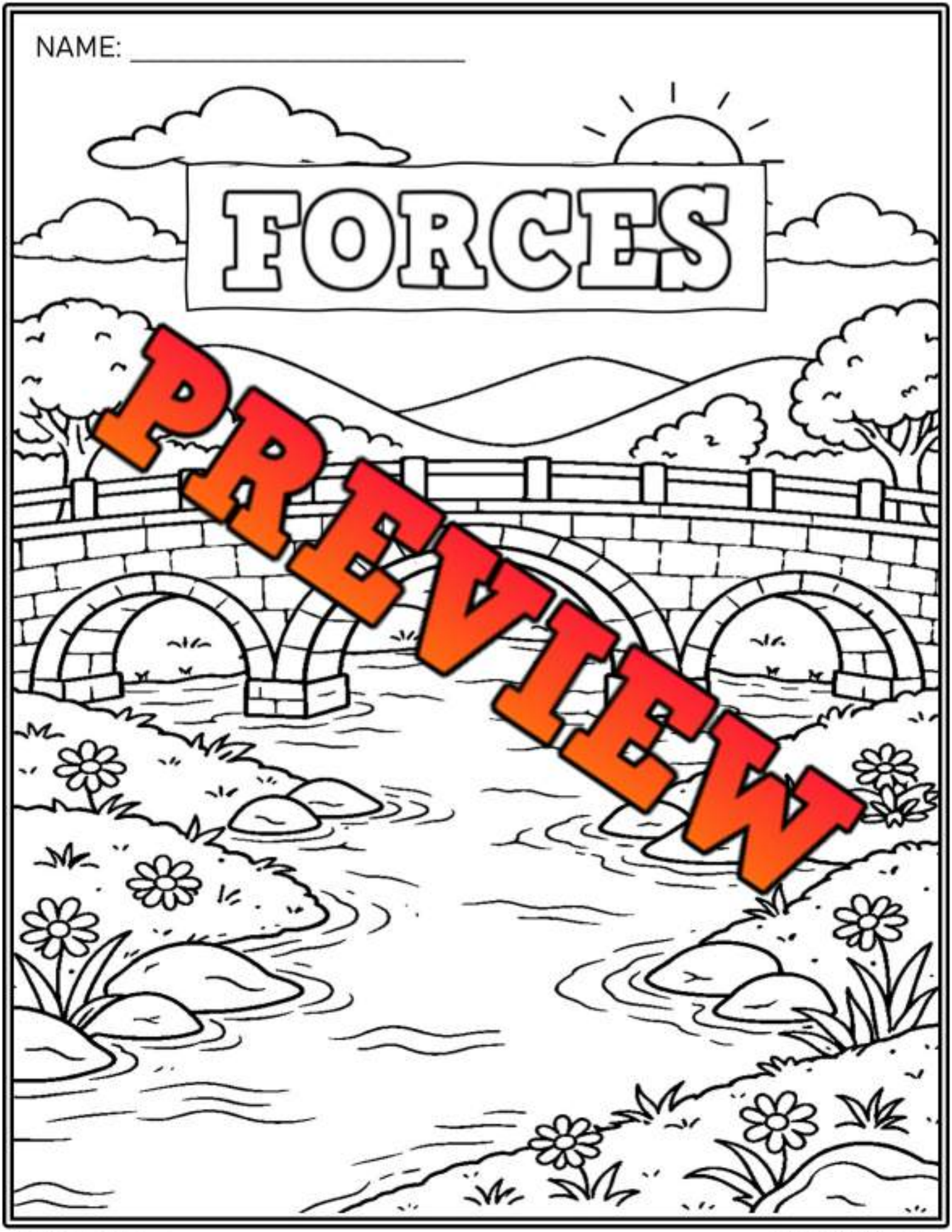
Grade 6 – Science Unit

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

Guiding Question: Students analyze forces and relate them to interactions between objects.

	Learning Outcome – Students investigate and compare how forces affect living things and objects in water and air.	**Pages**
E.5	Factors that influence selection of energy resources include availability and accessibility, societal impacts, economic impacts, environmental impacts	58 - 66
E.6	Responsible management of energy resources includes minimal disruption to nature, restoration of extraction areas, waste management practices, respect for land and resource rights	67 - 71
E.7	Many energy resources are processed into electricity. Some energy resources can be used before processing, such as wood, wind, water Some energy resources can be used after processing, such as wind, solar, fossil fuels, nuclear, hydro, biofuel	72 - 79
E.8	Some energy resources can be used before processing and after processing; e.g., wind can be used before processing to sail a boat and after processing as electricity. Energy resources can be used in daily life in various ways, such as heating and cooling, lighting, cooking, transportation	80 - 106
Computer Science:		
CS.1	Students examine abstraction in relation to design and coding, and describe impacts of technologies.	107 - 124

NAME: _____



Name: _____ 7

Curriculum Connection
E1

External Forces
Contact and Non-Contact Forces

External Forces

An **external force** acts on objects from the outside. External forces are a result of the environment pushing or pulling the structure. This pushing or pulling force can be from c forces, or non-contact forces.

Non- c

A **non-contact** f h an object without touchi mple contact forces are gravitati f 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 is acting on all of us right now! **Gravity** is the pulling force that keeps us o **magnet** can also push or pull an object towards it or away from it. M ets use the magnetic field. Lastly, electric forces are non-contact. An example is static electricity that might 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: _____ 8

Curriculum Connection
E1

Definition

What do the terms below mean?

Non-Contact Force	
Contact Force	

Contact or Non-Contact

Does the picture show a contact or non-contact force?

Leaves Falling 		 Baseball Moving
Contact Non-Contact	Contact Non-Contact	Contact Non-Contact

Making Connections

Give an example of when you have seen these forces below

Non-Contact Force	
Contact Force	

Name: _____ 9

Curriculum Connection
E1

Experiment – Egg Drop

Research Question

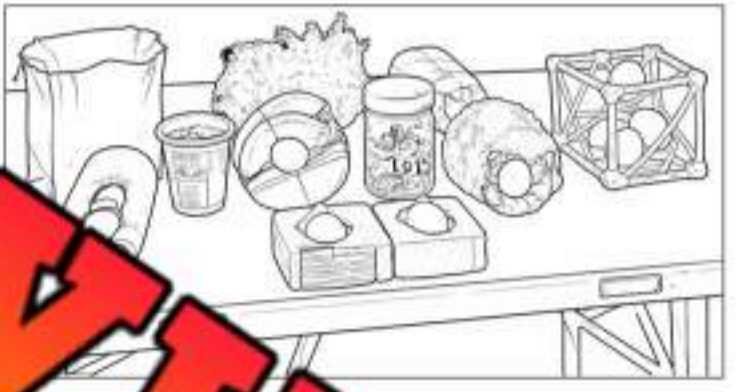
What are we learning about?

The egg drop experiment is a classic science experiment that demonstrates the principles of physics, particularly the concepts of force and gravity. 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

- ❑ E[illegible]e per
- ❑ A variety o[illegible]ch straws, pape[illegible]aper, cardboard, strin[illegible]ber bands, glue, etc.
- ❑ A high surface such as a stairway, a ladder, or a bleachers to drop the egg from.



Method

How you wil[illegible]lete [illegible]ent

1) Gather materials: Provide each group with a raw e[illegible]ariet[illegible]aterials they can use to create their egg-protecting contraption.

2) Plan and design: Allow each group to plan and design their co[illegible]an use any combination of the materials they were provided with. They can [illegible]p egg 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: _____ 10

Curriculum Connection
E.1

Plan Answer the questions below to plan your egg holder

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

2) Draw a d[illegible]am of your egg holder. Label the materials

Results What happened with your car[illegible] the q[illegible]ns below.

1) What was pulling the egg down to the ground? Was the force str[illegible] heights?

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

Name: _____ 11

Curriculum Connection
E.1

Contact Forces - Frictional Force

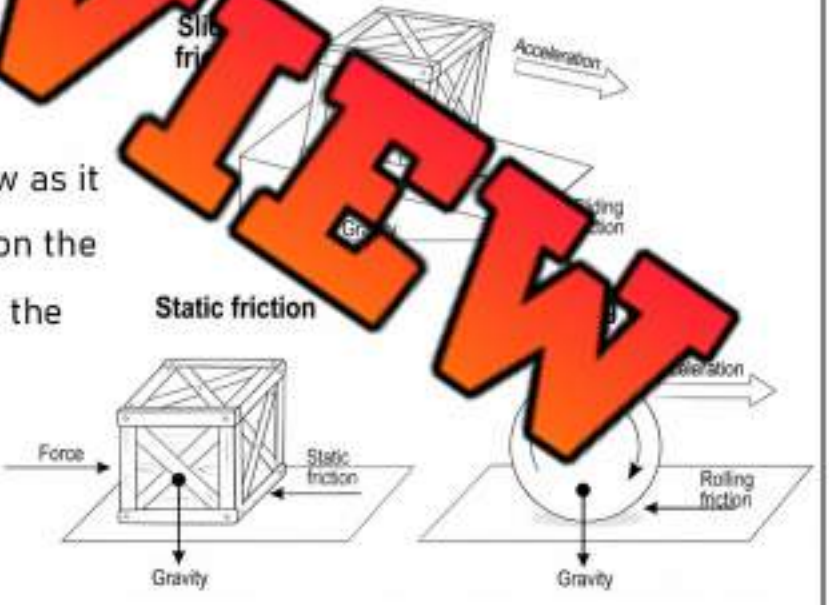
Frictional Force

Friction is a force that makes it harder to slide objects across each other. For example, if you tried to slide a box on ice, there isn't much friction to slow the box down. But, if you slide the same box on pavement, there is a lot of friction to slow down the box. Friction is that force that makes objects stick together.

Friction is important because it allows us to walk on the ground without slipping. Some surfaces have more friction, like rubber, which is why shoes have rubber soles on the bottom.

Three Types of Friction – Sliding, Rolling

Static Friction – The frictional force that keeps an objects still. For example, your desk has static friction right now as it isn't moving. The bottom of the legs on the desk have enough static friction with the floor to stop it from sliding.



Sliding Friction – The frictional force that slows the movement of two surfaces that slide against one another. When you push your desk and it begins to move, it will still need a lot of force because there is sliding friction.

Rolling Friction – The frictional force that slows the movement when an on object rolls over it. This happens when you roll a wheel, ball, or cylinder over a surface.

Name: _____ 12

Curriculum Connection
E1

Questions

Use information from the text to support your answer

1) What is friction?

2) Why is it better to wear basketball shoes while playing basketball than just socks?

Which Force?

Write the name of what is happening in the pictures

Definitions

What do the forms of friction mean?

Static Friction	
Sliding Friction	
Rolling Friction	

Curriculum Connection
E1

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class

Name: _____

Fill in the blanks using the word bank.

Static Friction	Friction	Mark
Sliding Friction	Rolling Friction	

1) The force that makes it harder for objects to slide is called _____.
2) The friction that slows surfaces moving past each other is called _____.
3) The friction that slows wheels, balls, or cylinders is called _____.
4) The type of friction that keeps an object from moving is called _____.

Name: _____

Fill in the blanks using the word bank.

Static Friction	Friction	Mark
Sliding Friction	Rolling Friction	

1) The force that makes it harder for objects to slide is called _____.
2) The friction that slows surfaces moving past each other is called _____.
3) The friction that slows wheels, balls, or cylinders is called _____.
4) The type of friction that keeps an object from moving is called _____.

Name: _____

Fill in the blanks using the word bank.

Static Friction	Friction	Mark
Sliding Friction	Rolling Friction	

1) The force that makes it harder for objects to slide is called _____.
2) The friction that slows surfaces moving past each other is called _____.
3) The friction that slows wheels, balls, or cylinders is called _____.
4) The type of friction that keeps an object from moving is called _____.

Name: _____

Fill in the blanks using the word bank.

Static Friction	Friction	Mark
Sliding Friction	Rolling Friction	

1) The force that makes it harder for objects to slide is called _____.
2) The friction that slows surfaces moving past each other is called _____.
3) The friction that slows wheels, balls, or cylinders is called _____.
4) The type of friction that keeps an object from moving is called _____.

Name: _____ 14

Curriculum Connection
E1

Experiment – Friction Car Ramp

Research Question

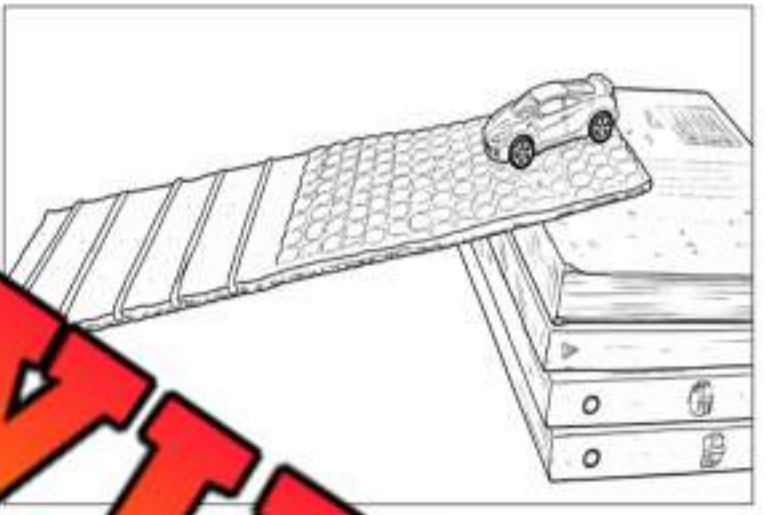
Does more friction slow down a moving car?

If we roll a car down a smooth ramp, will it go further than a bumpy ramp?

Materials

What do we need?

- ✓ Card[illegible] make the ramps
- ✓ B[illegible] to rest on
- ✓ [illegible] car p[illegible]
- ✓ Glue
- ✓ Textured ma[illegible]
  - ➢ Bubble wr[illegible]
  - ➢ Bread tabs
  - ➢ Rubber bands
  - ➢ Rice
  - ➢ Staples



Method

How do we complete the experim[illegible]

1) Each group will make one ramp. The teacher can be [illegible] co[illegible] a ramp that is smooth
2) Groups will need cardboard cut into a rectangle that will act as [illegible] amp
3) Students can use some of the textured materials listed above to make a textured ramp. They can glue rice to the ramp, put staples in it, glue bubble wrap down, or wrap rubber bands around the ramp. Be creative!
4) Have each group test their ramps with their toy car
5) When all groups are finished, they can demonstrate their car going down the smooth ramp versus the textured ramp.
6) Mark how far the toy car travelled on the smooth ramp versus the textured ramp. Record your results on the back of the page.

Name: _____ 15

Curriculum Connection
E1

Observations | What happened?

1) How did you make your textured ramp? Which materials did you use?

_____

_____

_____

2) Did th... ...el further on the smooth or textured ramp?

Smo...	Textured Ramp

Results | An... ...uestions below

1) Which ramp did the car ha... ...re ... ...it travelled down it?

Smooth Ramp	...tured Ramp

2) Why did the car travel further on the smo... ...mp?

_____

_____

_____

3) If the car raced on ice, would the ice give more or less friction?

More	Less

4) Would the car travel further if it travelled on ice? What do you think?

_____

_____

_____

Name: _____ 16

Curriculum Connection
E.1

Contact Forces - Applied Force

Exploring Applied Forces

Applied forces represent an important part of our daily experiences. They are the pushes or pulls we exert on objects to start or stop their movement, or to change their direction. These forces are everywhe round us and directly result from human or mechanic Let's delve deeper into the fascinating world of applied forces.

Und ding Ap es

Applied force of ct forces. They occur when an external object or person imparts pull er object. For instance, when you strike a soccer ball with your ot against the ball is an applied force. Similarly, consider a book a t table exerts an upward applied force o k, preventing it from sinking into the table urface.

Examples of Applied Forces

- Pushing a Lawnmower: When you push a lawnmower, ysi ove the lawnmower forward is an applied force. You are using your me the friction between the lawnmower and the grass.
- Rowing a Boat: When you row a boat, the force you use to push the water with the oars, moving the boat forward, is an applied force.
- Writing with a Pen or Pencil: Even when you write with a pen or a pencil, the force you apply to press the pen or pencil against the paper is an applied force.

In each of these scenarios, the common factor is the application of a force to initiate or change the motion of an object. The human effort applied directly results in the object's motion.

Name: _____ 17

Curriculum Connection
E1

True or False

Is the statement true or false

1) Throwing a ball is an applied force	True	False
2) A ball rolling down a hill with no one touching it is an applied force	True	False
3) Pulling a wagon is an applied force	True	False
4) An apple falls from a tree because of an applied force	True	False
5) Pushing [illegible]g is an applied force	True	False

Com[illegible] Strip

[illegible]el comic strip that shows an example of an applied force. Ex: Ki[illegible]cer ball or pushing a grocery cart

Questions

Answer the questions below

1) What is an applied force? Write some you have used today.

2) Explain how the applied force works when you push a lawnmower.

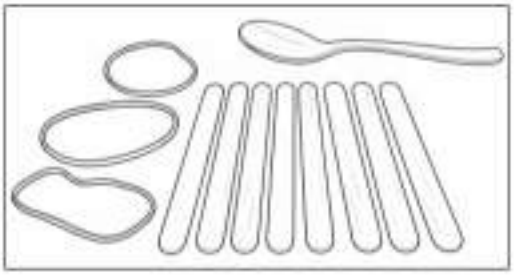
Name: _____ 21

Curriculum Connection
E1

Experiment – Popsicle Sticks Catapult

Research Question Can I build something that makes something move?

Can I build a structure that moves paper balls without me throwing them?

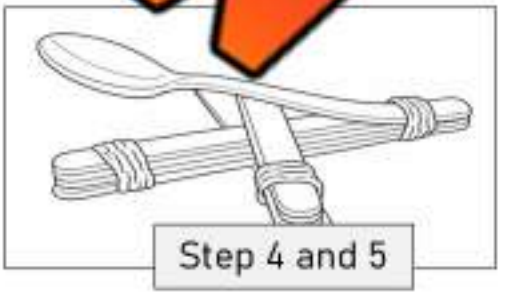


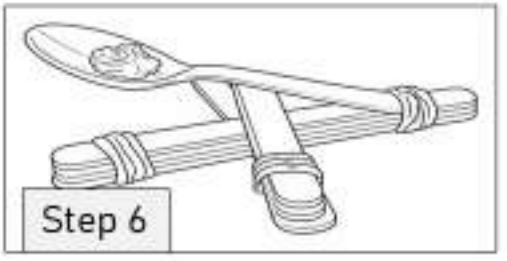
Materials What do we need?

- ✓ [illegible]
- ✓ 3 [illegible]
- ✓ 1 plastic [illegible]

Method How do we co[illegible]

1) Stack 7 popsicle sticks
2) Wrap one rubber band around the sev[illegible] sticks on one side and another band on the other side
3) Put the last popsicle stick through the bottom stick and the one above it.
4) Lay the spoon in the same direction as the one stick. Put the spoon on top of the stack of 7 sticks
5) Use the last elastic to attack the spoon to the sticks
6) Put a paper ball in the spoon.
7) Pull down on the spoon while holding the catapult.





Name: _____ 22

Curriculum Connection
E.1

Results | What happened?

1) What happened when you pulled down on the spoon?

_____

_____

2) Is the sp[illegible]n a bendy or rigid material?

Bendy Rigid

3) If y[illegible]ed a rig[illegible]ial that didn't bend at all, would the catapult move?

No

4) What type of for[illegible]at w[illegible]

C[illegible]n-Contact

5) What type of force moved the obje[illegible]the ai[illegible]

Muscular Force	Gravity	[illegible]gneti	Spring Force

6) How does spring force move objects?

_____

_____

_____

7) Draw a diagram of the catapult you made.

Internal Forces

Internal Forces

There are also internal forces that happen inside a structure. An **internal force** resists external forces that act on it from the outside. Therefore, external forces cause motion in an object, while internal forces resist the motion. The two forces work against each other. If the external force is stronger than the internal force of the structure, the structure will move and could fail or break.

Internal vs External Forces

When an external force like [illegible] a structure, it might cause the structure to bend, twist, [illegible], or [illegible] external force is causing the structure to move internally. [illegible] internal forces.

Tension	The structure is being pulled apart.
Compression	The structure is being squeezed or pushed down, making it more compact.
Torsion	The structure is being twisted
Shear	The structure has forces acting on it in opposite directions
Bending	Forces that make a straight material curved. One side of the material is squeezed (compression) while the other side stretches (tension)

Name: _____ 24

Curriculum Connection
E 2

Questions

Answer the questions below using evidence from the text

1) What are internal forces? What causes a structure to have internal forces?

2) How are compression and tension opposite internal forces? Explain.

Matching

Match internal forces to its description

Answer	Term	Description
	Compression	a) A piece of steel is curved so it fits around a chair
	Tension	b) Ashley rips a piece of paper by pulling in opposite directions
	Shear	c) Courtney sits on a chair
	Torsion	d) A rope is used to tow a boat
	Bending	e) A bottle cap is turned to get it off the bottle

Draw

Draw a diagram of each type of internal force below

Compression	Tension	Shear	Torsion	Bending

Name: _____ 26

Curriculum Connection
E.2

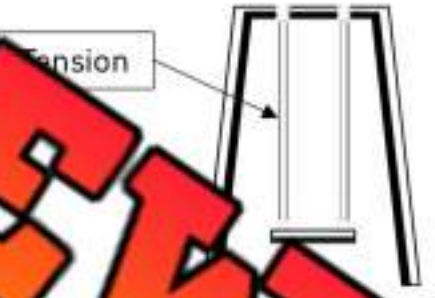
Internal Forces – Compression and Tension

Compression: The Art of Pushing

Compression is a force that occurs when an object is squeezed or pushed together. Picture yourself sitting on a chair. Your body weight applies a downward force that compresses the chair. The chair must be able to withstand this force to support you.

The s e applies when you squeeze a sponge. As you apply a pushing the sponge, it gets compressed and shrinks in size. ck to its original form when you releas his res ue to its ability to resist compression.

Think of stand the force of its own weight (and more) ng d mpressive force. If the structure isn't strong can b der this pressure.



Tension: The Power of Pulling

Tension is the exact opposite of compression. It ce t pulls materials apart or stretches them. For example, were to pull on both ends of a popsicle stick, you'd be apply tension. But because wood is resistant to this force, it's unlikely to ion. A rope or a rubber band, however, could easily break if enough tension is ed. These materials are less resistant to tension.

Consider an awning in front of a shop. When it's attached and stretched out, it's under tension. The awning must be strong enough to resist this pulling force; otherwise, it could tear or sag.

Therefore, understanding tension and compression is crucial when designing and building structures. They help determine what materials are best to use to ensure the structure's longevity and safety.

Name: _____ 27

Curriculum Connection
E.2

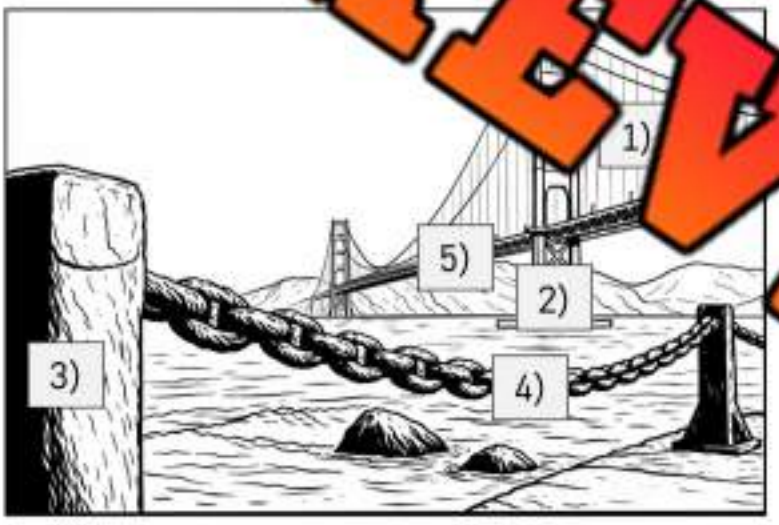
Definitions

Explain what the following terms mean.

Compression	
Tensi	

Examine

...nb... ...in the picture under compression or tension?



1)	
4)	
5)	

Compression or Tension?

Label the examples below

Telephone wires	
Sitting on a chair	
Standing on a stage	

Punching a punching bag	
Guitar strings	
Swinging on a rope	

Name: _____ 28

Curriculum Connection
E2

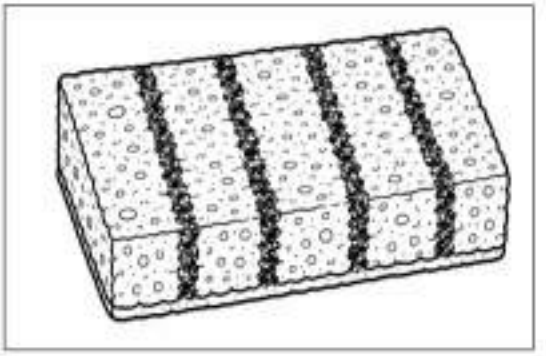
Investigate – Compression/Tension

Research Question What are we trying to learn more about?

What is the difference between compression and tension? What do compression and tension do to a bridge when acting on it at the same time?

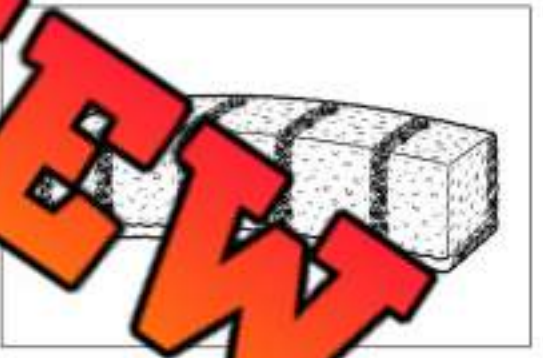
Materials you will need for this experiment

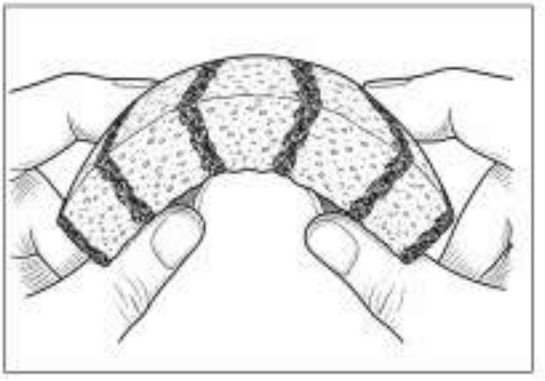
- A [illegible]ge
- A black o[illegible]r



Method How you [illegible] the [illegible]iment

1. With a dark marker, draw a series [illegible] across the side of the sponge. Do this to the [illegible] and bottom of the sponge.
2. Pass the sponge around and bend it into a U-shape.
3. Observe what happens to the lines on the top and bottom of the sponge. Ask yourself the following questions while investigating.
    - Do some lines get closer together?
    - Do some lines get further apart?
    - Which side of the sponge is under tension?
    - Which side of the sponge is under compression?





Name: _____ 29

Curriculum Connection
E 2

Observations

What happened? How much load did your beam hold?

1) Did some lines get closer together?	
2) Did some lines get further apart?	
3) Which side of the sponge is under tension?	
4) Which s sponge is under compression?	

Results

A the o elow

1) How can a bridge be unde an n at the same time?

2) Draw a diagram of the sponge when it was in its U-shap bel er tension and compression.

3) Put a circle around the parts of the pencil that are under tension and a rectangle around the parts that are under compression.	

Name: _____ 30

Curriculum Connection
E.2

Internal Forces – Shear and Tension

Forces in Motion: Torsion and Shear Forces

Just like compression and tension, torsion and shear forces are constantly at work in the world around us. Understanding these forces is important to comprehend the stability and longevity of different structures.

Torsion

Torsion (twisting) force can be seen when you twist the lid of a jar to open it. You applies a torsional force to the lid.

A toy rubber airplane uses the principle of torsion. When the propeller is wound, the rubber band gets twisted. The energy in the twisted rubber band is what powers the propeller when released.

Any structure that cannot withstand torsion applied to it will either twist or break. For example, a twisted metal rod will permanently distort if the torsion force surpasses its limit.

Shear Forces

Shear is a force that causes parts of a material to slide past one another in opposite directions. For instance, when you use a pair of scissors to cut paper, the blades slide past each other and apply a shear force to the paper, making it separate.

Another example is when you try to break a chocolate bar into pieces. The force you apply with your hands makes the layers of chocolate slide past each other and break apart.

Just like with other forces, if a structure or material can't resist the shear force applied to it, it will deform or break. Understanding shear forces is crucial in designing buildings to withstand forces like strong winds that can cause different parts of a structure to move in opposite directions.

Name: _____ 31

Curriculum Connection
E2

Questions

Use information from the text to support your answer

1) Explain in your own words what torsion forces are and give an example.

2) What is [illegible] force and how does it affect structures like buildings?

Draw

Draw a diagram [illegible] of scis[illegible]ting paper and label where the shear force is acting.

True or False

Circle whether the statement is true or false

1) A pair of scissors cutting paper is an example of torsion.	True	False
2) Torsion involves twisting.	True	False
3) Breaking a chocolate bar demonstrates shear force.	True	False
4) Twisting a jar lid open is an example of shear force.	True	False
5) Shear forces move in the same direction.	True	False

Name: _____ 32

Curriculum Connection
E 2

Experiment – Testing Internal Forces

Objective

What are we trying to learn more about?

To investigate and understand the four internal forces: shear, torsion, compression, and tension using common materials.

Materials

What you will need for this experiment

- A
- A icle stic
- A sponge

Method

How you w e experiment

1) Rubber Band:

- **Compression:** Lay the band down ss do t.
- **Tension:** Hold the rubber band at both ends ull a
- **Shear:** Hold on both ends and try to bend t.
- **Torsion:** Hold the rubber band at both ends and t it.

2) Popsicle Stick

- **Compression:** Lay the stick down and press down on it.
- **Tension:** Hold the stick at both ends and try to stretch it.
- **Shear:** Try to snap or bend the stick.
- **Torsion:** Hold the stick at both ends and attempt to twist it.

3) Sponge

- **Compression:** Push the sponge together from the ends.
- **Tension:** Hold the sponge at both ends and pull apart.
- **Shear:** Hold the sponge on opposite sides and try to snap or bend it.
- **Torsion:** Hold the sponge at both ends and attempt to twist it.

Name: _____ 33

Curriculum Connection
E 2

Observations | What happened?

Rubber Band	
1) Did it break or deform under compression?	
2) Did it break or deform under tension?	
3) Did it break or deform under torsion?	
4) Did it br deform under shear force?	

Popsicle Stick	
1) Did it break pression?	
2) Did it break or und	
3) Did it break or deform ion?	
4) Did it break or deform under ar fo	

Spong	
1) Did it break or deform under compression?	
2) Did it break or deform under tension?	
3) Did it break or deform under torsion?	
4) Did it break or deform under shear force?	

Results | Which objects are strong under the internal forces? Which didn't deform/break?

Compression	
Tension	
Shear	
Torsion	

Curriculum Connection
E 2

Forces Destroy Tacoma Narrows Bridge

Background

The Tacoma Narrows Bridge was built in 1940, in Washington State, USA. It cost $6.4 million to build, which is the equivalent of approximately $130 million today. The bridge spanned 853 metres as it connected Tacoma city and the Kitsap Peninsula.

The bridge was a suspension bridge made of steel and cable wire.

Galloping Gertie

Construct[illegible]the bridge started in 1938. As soon [illegible]k was built, it began to move[illegible]ndy conditions. The const[illegible]n work[illegible]amed the structure "Gallo[illegible]".

The mo[illegible]f [illegible]e de[illegible]tinued even after the br[illegible]pene[illegible]. People still trusted t[illegible]o[illegible] br[illegible] should be flexible, movin[illegible]t of snapping due to external for[illegible].

Collapse of the Tacoma Narrows Bri[illegible]

The bridge collapsed the same year it opened. O[illegible] m[illegible] of November 7th, the deck was hit with strong 64 km/h winds. The [illegible]move[illegible]down, but its momentum became too strong.

The torsional force inside the bridge became[illegible]g for [illegible]dge to stay stable. A large portion collapsed as the bridge twisted[illegible]nd [illegible]th[illegible]trong winds.

The cause of the collapse was due to the strong winds ge[illegible]the closed trusses that are usually open to allow wind to pass through. [illegible]nd caused the bridge to twist – "gallop". As it twisted back and forth, it picked up momentum and eventually fell.

Therefore, the external force of the wind became too strong for the internal force acting on the bridge. The torsion force inside the bridge caused it to collapse.

Cost of the Disaster

In 1950, a second bridge was built to replace Galloping Gertie. The new bridge has open trusses, allowing wind to pass. The cost of the new bridge was almost double, at $11.2 million ($206 million today). This cost gets passed on to the taxpayers.

The engineers were blamed for their poor design. A lot of taxpayer money was wasted because the engineers did not predict the external forces that would act on the bridge. They did not use a design that would lessen the internal forces.

Name: _____ 38

Curriculum Connection
E 2

Questions

Use information from the text to support your answer

1) What external and internal forces caused the bridge to collapse?	
Internal	
External	

2) How [illegible] fail in their first bridge?

True or False

Circle whether [illegible] true or false

1) Torsion is an external force that made the [illegible] collapse	True	False
2) The wind is an external force that caused the bridge collapse	True	False
3) The bridge began to twist, causing a torsion internal [illegible]	[illegible]	False
4) The open trusses caused the bridge to collapse	[illegible]	False
5) The new bridge has open trusses, allowing wind to pass through [illegible]	[illegible]	False

Draw

Draw the bridge with open trusses and closed trusses

Closed Trusses	Open Trusses

Name: _____ 39

Curriculum Connection
E.2

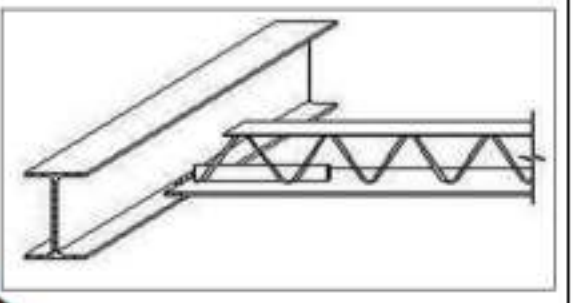
Beams and Trusses

Stable Structures

A structure that does not topple over when forces act on it must be designed and built with certain structural features that give it strength. Engineers need to understand the forces that will act on the structure.

Whe ding bridges, houses and other structures that must withstand live loads, engineers beams and trusses to create stable structures.

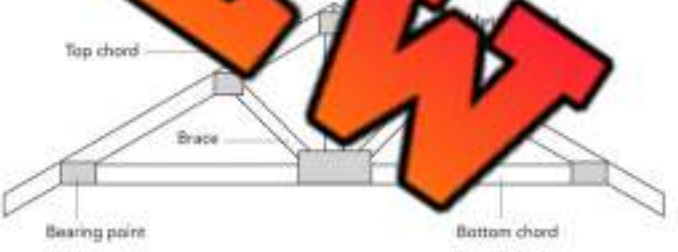
Steel Beams



The **steel beam** ref d to as an I-beam or H-beam and is pe of steel structures. The design of the beam make it capable of handling of l

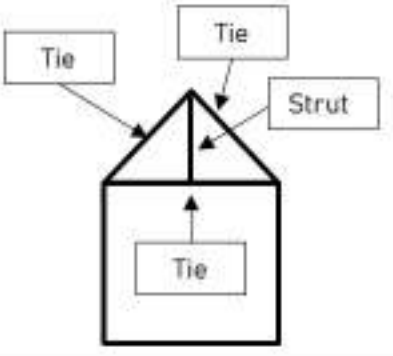
Engineers use the I-beam for hor d ve purposes to frame in heavy structures like buildings and bridges. St beams r end r extreme forces, but it will not break or buckle. It is an expensive mate t is u mercial buildings and large bridges. They are not commonly used in

Truss



The truss is a frame that is used to make stable structures. A truss takes advantage of triangles as the triangle is the strongest shape. Triangles are the strongest shape because when a force is applied to a triangular shaped structure, it is spread through all three sides.

Houses use trusses for their peaked roofs that provide stability throughout the entire frame of the house. Truss bridges also take advantage of the strength of the triangle.



Trusses have struts and ties. A strut is a beam that is under compression while a tie is a beam under tension.

Name: _____ 40

Curriculum Connection
E 2

Questions

Use information from the text to support your answer

Why are steel beams used to build strong structures? Why are they not used in houses?

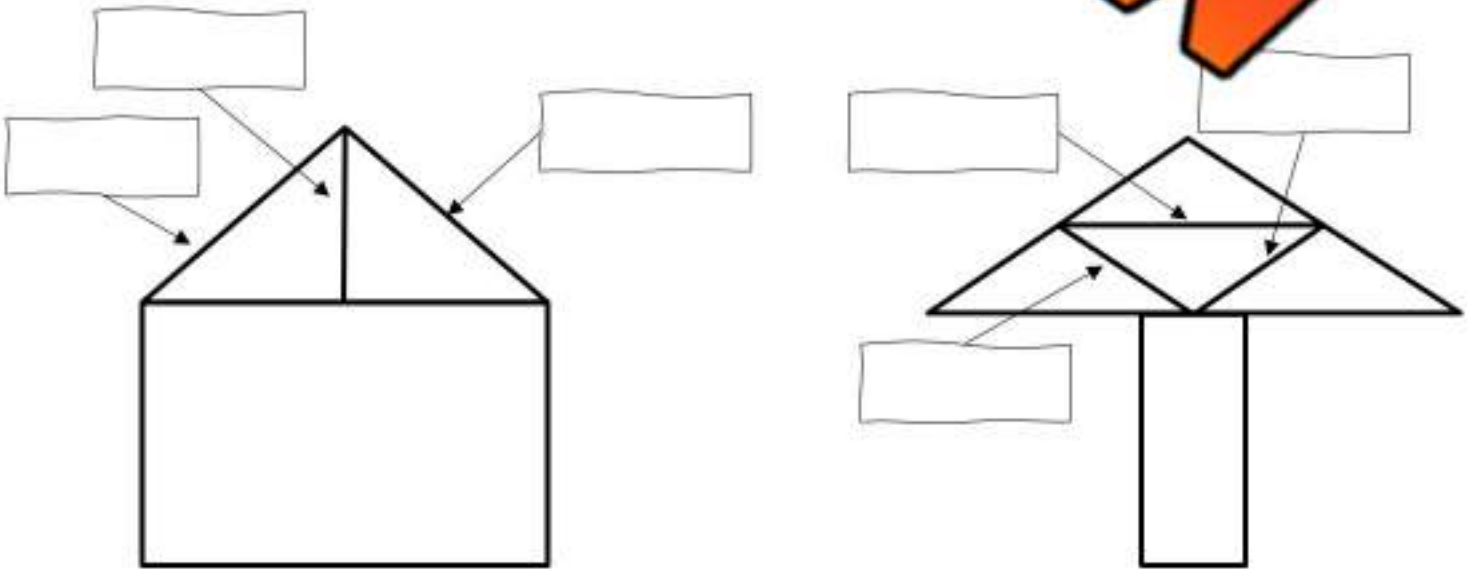
Draw

es of structures that use I-Beams and Trusses

	Truss

Diagram

Fill in the blanks by labelling the struts and t

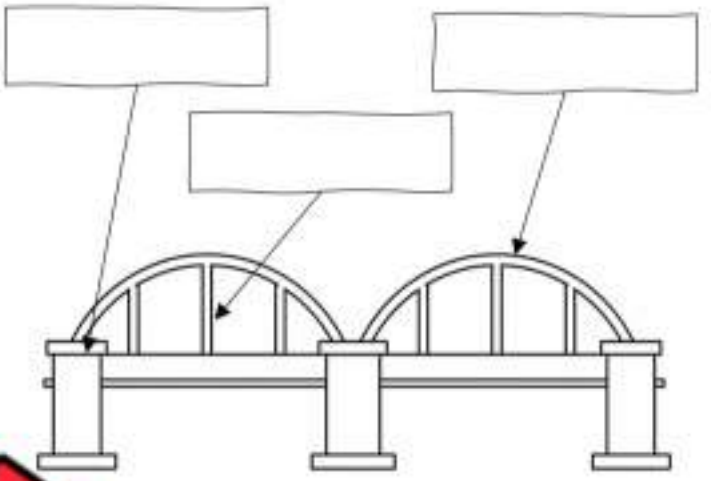


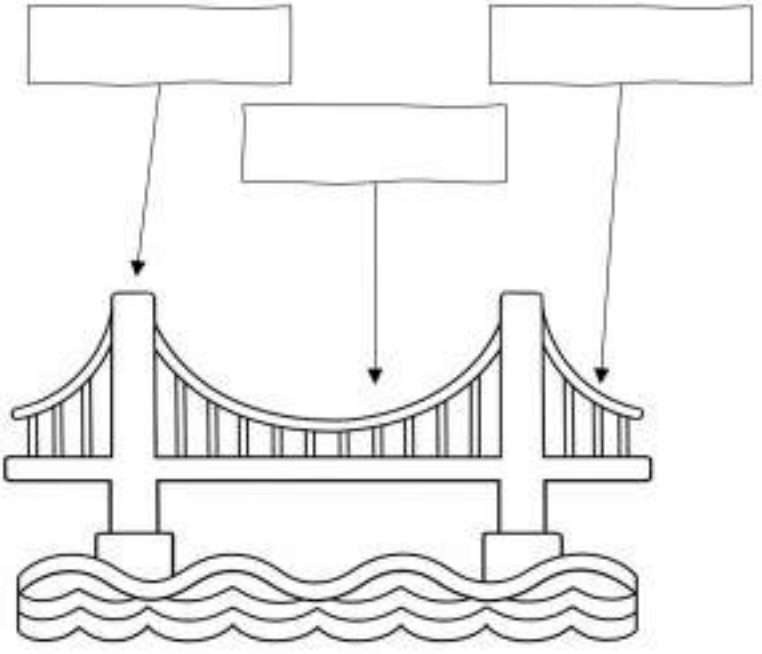
Name: _____ 42

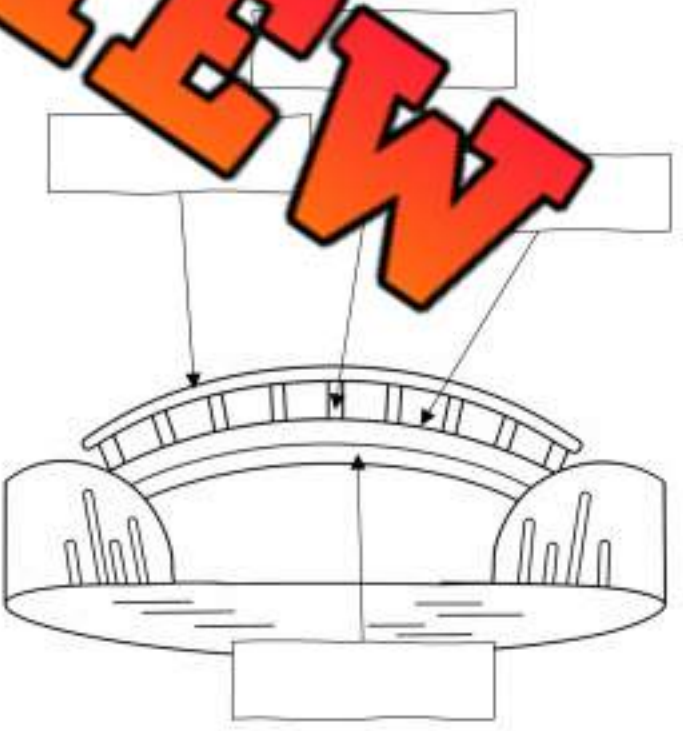
Curriculum Connection
E 2

Bridges – Tension or Compression?

Question	Is the part of the bridge under tension or compression?







Name: _____ 52

Curriculum Connection
E.4

Newton's Third Law of Motion

What is Newton's Third Law of Motion?

Newton's Third Law of Motion states that for every action, there is an equal and opposite reaction. This means that if something pushes or pulls on something else, the thing that is being pushed or pulled will push or pull back with the same amount of force.

It can be simply put as: "For every action, there is a reaction that is equal in strength but opposite in direction".

Examples of Newton's Third Law

A rocket launch is a great example of Newton's Third Law of Motion in action. When a rocket is launched, it is propelled into the sky by the force of the hot gases expelled out of the bac[illegible]

[illegible]rocket's engines burn fuel and create high-pressure hot gases. These gases are expelled out of the bottom of the rocket through the nozzle at high speeds. The reaction to this action is that the rocket is pushed forward in the opposite direction to the expelled gases.

Newton's Third Law states that for every action, there is an equal and opposite reaction. In the case of a rocket launch, the action is the expulsion of the hot gases out of the back of the rocket and the reaction is the movement of the rocket in the opposite direction.

During the launch, the rocket exerts an upward force, this force is opposed by the gravitational force pulling it down. The action is the force of the rocket engines on the rocket and the reaction is the force of the rocket pushing back on the expelled hot gases.

More examples of Newton's Third Law of Motion in action:

- If you push a book across a table, the book will push back against your hand with an equal force.
- When you jump off the ground, your feet push against the ground and the ground pushes back against your feet with the same force, propelling you upwards.
- A swimmer pushes against the water with their arms and legs, and the water pushes back with an equal force, allowing the swimmer to move through the water.
- When you hit a tennis ball with your racket, the racket applies a force to the ball, and the ball applies an equal and opposite force back to the racket.

Name: _____ 53

Curriculum Connection
E.A

Questions Answer the questions below using evidence from the text

1) What is Newton's Third Law of Motion?

2) How is a launch a good example of the Third Law of Motion? Explain.

True or False Circle whether the ue or false

1) For every action, there is an equal and opposite reaction	True	False
2) When jumping, if you put more force into the gr you	True	False
3) A rocket doesn't need much force to move upwards	True	False
4) As a rocket leaves the atmosphere, it needs more force		False
5) When a basketball is bounced, the action is the upward movement the ball		False

Draw Draw a diagram of an example of the Third Law. Label the action and reaction

Name: _____ 54

Curriculum Connection
E.4

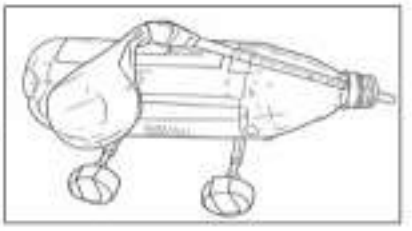
Activity – Balloon Car

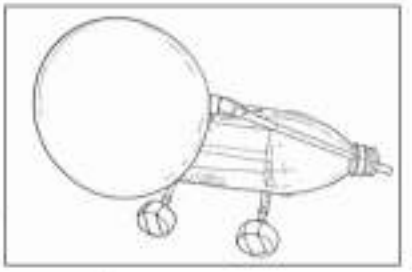
Research Question — What are we learning about?

We will be creating a car that will move because of Newton's Third Law.

Materials — What you will need for the experiment

- ❑ Plastic
- ❑ Four [illegible] caps with holes [illegible] that are large enough for a skewer through
- ❑ 2 wooden skewers long enough to span over the width of the bottle
- ❑ Balloon
- ❑ Two straws
- ❑ Tape
- ❑ Scissors





Method — How you will complete the [illegible]

1) Cut one of the straws in half
2) Tape both pieces of the straw to one side of the wa[illegible]
3) Put the wooden skewers through the straws
4) Press each bottle cap onto the ends of the wooden skewers. T[illegible] Wheels and axles
5) Give your car a push to see if it will roll properly. If it gets stuck or if the wheels don't roll, make sure your axles are parallel to each other.
6) Tape the neck of the balloon around one end of the other straw. Wrap the tape very tightly so the connection is airtight.
7) Cut a small hole in the top of the water bottle so that it is just big enough to push a straw through. Ask your teacher for help on this step!
8) Push the free end of the straw through the hole and out the mouth of the bottle
9) Tape the straw to the bottle so it is secured to the bottle
10) Blow up the balloon by blowing air into the straw. Keep your finger over the end of the straw until you are ready for the car to move!

Name: _____ 55

Curriculum Connection
E.4

Diagram

Draw a picture of your balloon car. Label the wheels, axles, and power source. Use arrows to show which way the wind is blowing

Results

...ha...ed with your car? Answer the questions below.

1) How did your car ...? E...

2) How could you improve the design of your car so ... trave...er? Think about the following in your answer: weight, straw diame... ...ls, si... ...alloon.

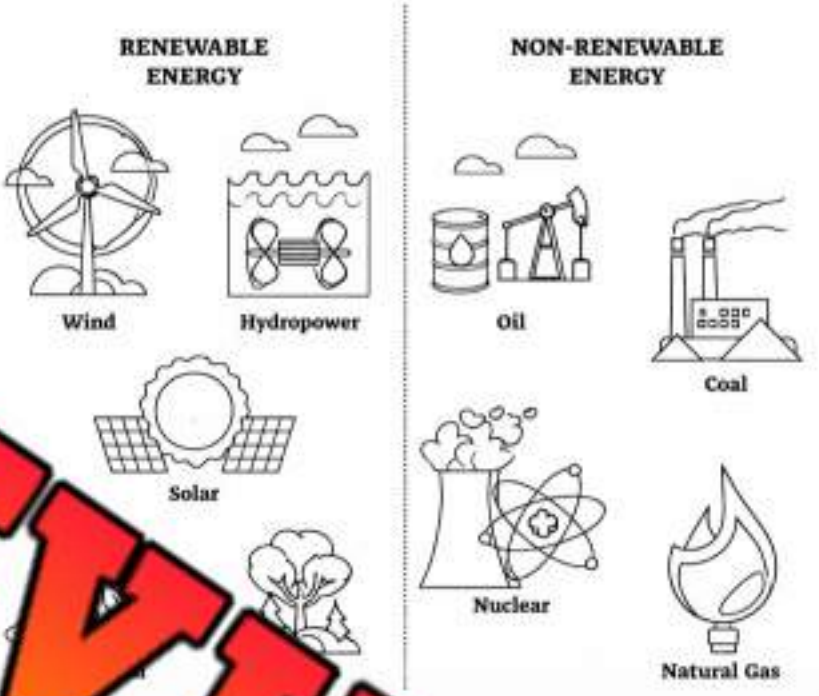
3) Newton's third law of motion states that for every action, there is an equal and opposite reaction. Why is this experiment an example of this law?

Name: _____ 58

Curriculum Connection
E.5

Renewable vs Non-Renewable Energy

Renewable and Nonrenewable Energy
Energy, an essential part of our lives, falls into two categories: renewable and nonrenewable.



Renewable Energy
Renewable energy comes from replenishi[illegible]irtually limitless sources li[illegible]n, wind, water, geother[illegible]nts.

Advanta[illegible]:
- Sustainabi[illegible]rce won't run ou[illegible]
- Environmentall[illegible]ndly greenhouse gas emi[illegible]
- Long-term Affordabilit[illegible] after initial setup.

Disadvantages:
- Unpredictability: Weather-dependent energy[illegible]ction[illegible]ergy on cloudy days.
- High Initial Costs: Setup can be expensive.
- Large Land Requirement: Facilities can take up [illegible].

Nonrenewable Energy
Nonrenewable energy sources like coal, oil, natural gas, and nuclea[illegible] replenish within a human lifetime.

Advantages:
- Reliability: Steady energy supply.
- High Energy Output: Large amounts of energy production.
- Existing Infrastructure: We already have systems to deliver non-renewable energy.

Disadvantages:
- Limited Resources: Will eventually run out.
- Environmental Impact: Contributes to climate change.
- Health Risks: Pollution from these sources can harm health.

Understanding these energy types helps us aim for a balanced energy mix that respects our environment and meets our needs.

Name: _____ 59

Curriculum Connection
E5

Think What are the advantages/disadvantages of renewable/non-renewable energy?

Renewable Energy	
Advantages	**Disadvantages**

Non-Renewable Energy	
	Disadvantages

Question If you were Premier of Alberta, wh[illegible]rgy [illegible]ose for Alberta?

True or False Is the statement true or false?

1) Renewable energy sources never run out.	True	False
2) Nonrenewable energy is always environmentally friendly.	True	False
3) Renewable energy depends on weather conditions.	True	False
4) Renewable energy sources don't require much land.	True	False
5) Nonrenewable energy sources don't contribute to climate change.	True	False

Story: A Tale of Renewable Energy

The Unplanned Switch: A Tale of Renewable Energy

Once upon a time, in a city called Petrolville, people relied heavily on non-renewable energy sources, like coal and oil. It powered their homes, cars, factories, and the city thrived on the booming energy industry.

One day, Mayor Green, an environmental enthusiast, decided to change Petrolville's energy sources to renewable ones, like wind and hydroelectric, without creating a plan. He wanted a cleaner environment, but didn't realize the full impact such a change.

First, the economic problem surfaced. The oil and coal industries, which provided many jobs, suddenly closed. Many people lost their jobs and the city's economy started to suffer. The new energy equipment was also expensive and there were costs to train people to use it, which put further strain on Petrolville's resources.

Next, the environmental impact became noticeable. Large wind turbines and solar panels were installed everywhere, taking up valuable green space. Although the air was cleaner, some citizens were unhappy about losing their beautiful parks and gardens.

Then, there were societal impacts. While many were happy about cleaner air, others were upset about the loss of jobs. The city became divided and the sense of community in Petrolville started to crumble.

Lastly, availability became an issue. On cloudy, windless days, there wasn't enough renewable energy to power the whole city. The lack of a backup plan caused power shortages, affecting hospitals, schools, and homes.

In the end, Mayor Green realized his mistake. He understood the importance of planning and considering all the impacts of such a significant change. From then on, he involved the community in his decisions and created a more balanced energy plan that considered economics, the environment, society, and availability. Petrolville learned a valuable lesson about the importance of planning and considering all factors when making big changes.

Name: _____ 64

Curriculum Connection
E5

Questions Answer the questions below using evidence from the text

1) What were the four problems Petrolville faced when they switched to renewable energy?

2) How would you have planned the switch to renewable energy if you were Mayor Green.

Draw Draw a before and after of Petrolville, showing how it changed after switching to renewable

Before	After

True or False Circle whether the statement is true or false

1) Mayor Green wanted to protect the environment.	True	False
2) All citizens were happy about the cleaner air.	True	False
3) Power shortages occurred on windless, cloudy days.	True	False
4) Many people lost their jobs when the coal and oil industries shut down.	True	False
5) The renewable energy installations took up green space.	True	False

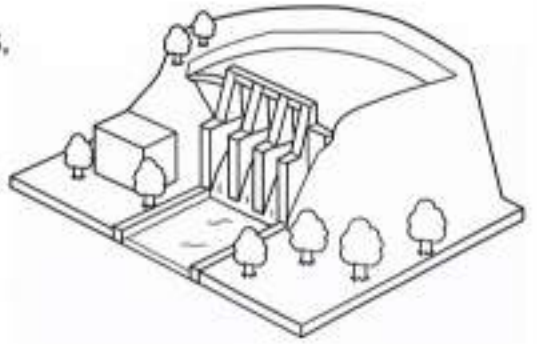
Name: _____ 65

Curriculum Connection
E5

Alberta's Energy Usage

Fueling Alberta: Fossil Fuels' Major Role

Alberta is rich in fossil fuels, with oil sands, natural gas, and coal deposits driving the province's energy production. These fossil fuels, contributing about 66% of the ene upply, power our vehicles, heat our homes, a ze our industries.



Harnessing the P ric Power in Alberta

Alberta takes a of its to generate hydroelectric power. Facilities like the Brazeau Dam on P the water's flow into energy, contributing about 2% to Alberta's total ner

Utilizing the Wind: Wind Power in Alber

The vast landscapes of Alberta are ideal for wi ns. In n region, farms like the Pincher Creek Wind Farm turn the strong w ctricit ing up around 7% of the province's energy supply.

From Waste to Energy: Biomass in Alberta

Biomass energy is another renewable resource utilized in Alberta. Facilities like the Whitecourt Power biomass plant convert plant and animal waste materials into electricity or use them as heating fuel. Biomass contributes about 5% to Alberta's energy generation, helping to reduce waste and promote sustainability.

Type of Energy	% o
Coal	
Natural Gas	
Oil	14%
Hydro	2%
Wind	7%
Solar	1%
Biomass	5%
Geothermal	5%

Name: _____ 66

Curriculum Connection
E5

Questions

Answer the questions below using evidence from the text

1) What are fossil fuels? Name the 3 types and how they are used.

2) Does Al[illegible]se enough renewable energy? Explain your thoughts.

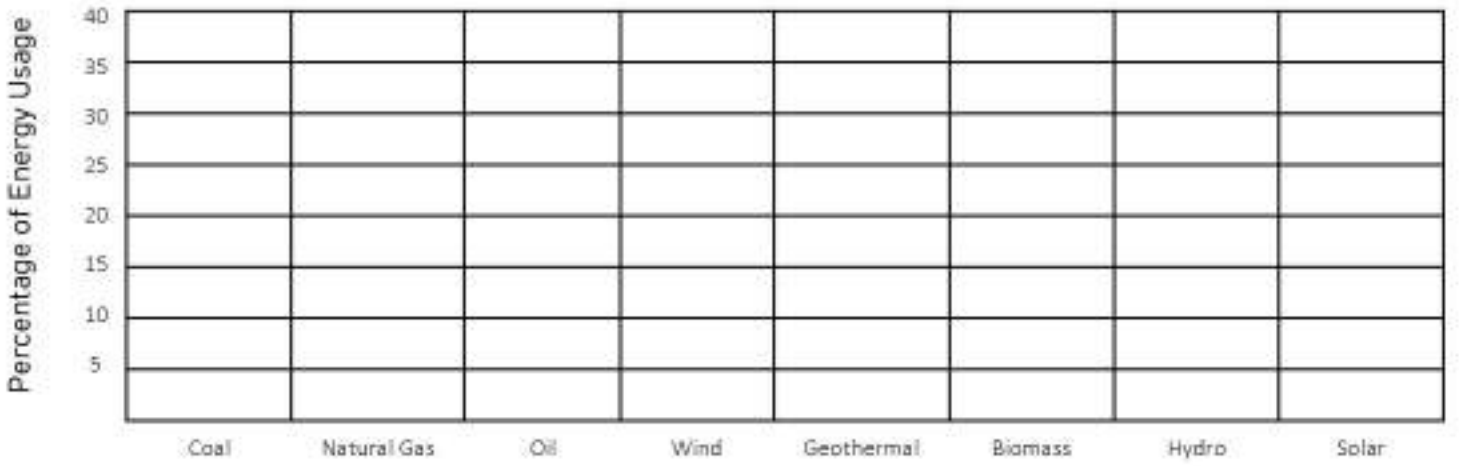
Multiple Choice

[illegible] best

1) What is the major source of energy i[illegible]?	Fossil Fuels	Wind
2) Which river hosts the Brazeau Dam?	Athabasca	Peace
3) What source of energy contributes 2% to Alber[illegible]tal [illegible]	[illegible]oelectric	Oil
4) How much energy does wind power contribute in Alb[illegible]	[illegible]	7%
5) What is the energy contribution of biomass in Alberta?	[illegible]	10%

Graph

Draw a bar graph of the energy sources in Alberta



Name: _____ 69

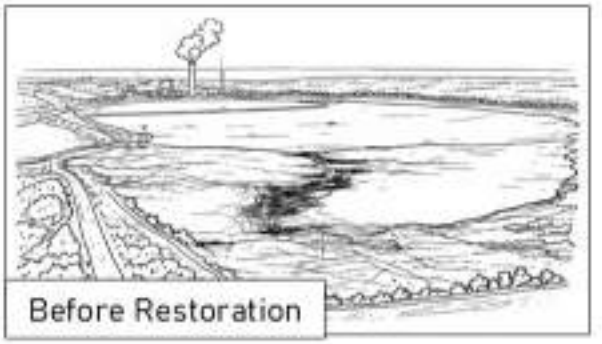
Curriculum Connection
E.6

Restoration of the Wapisiw Lookout

Before Restoration

Before the restoration, the area around the Wapisiw Lookout was a hub of oil sands mining. Mining these oil sands is a heavy process, using large machinery to dig up the earth and extract the valuable oil. The process of mining not only changed the landscape but also created a lot of waste, known as tailings.

These **tailings** were a mix of sand, clay, water, and leftover bitumen (a thick, sticky form of crude oil). They were stored in large ponds. These tailings ponds were not healthy for the environment as they contained substances that could be harmful to animals.



Before Restoration

Steps in Restoration

1) Drying Out the Tailings: The first step in reclaiming the tailings pond was to let the waste materials dry out. This process helped to transform the liquid tailings into a more solid landform.

2) Shaping the Land: Once the tailings were dry, the area was reshaped to mimic the natural landscape of Alberta. This involved forming hills and valleys for the new pond.

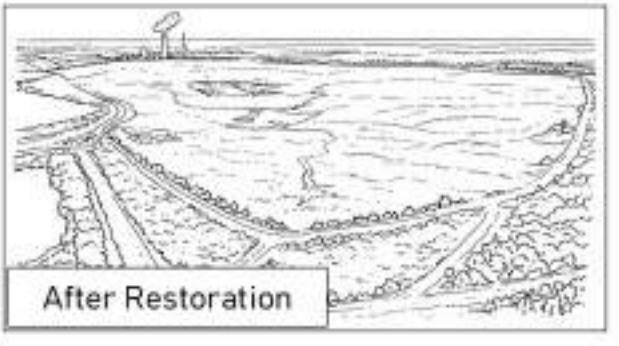
3) Adding Topsoil: After the land was shaped, a layer of topsoil was added over the dried tailings. This topsoil was collected and stored before mining started, ensuring that the area could be restored later.

4) Planting: After adding the topsoil, it was time to plant. Thousands of trees, shrubs, and grasses were native to Alberta and would thrive in a wetland environment. These plants helped to stabilize the soil and began to attract wildlife back to the area.

5) Monitoring: The final step wasn't just a one-time thing but is ongoing. Scientists are continuously watching the pond and the surrounding area to make sure the plants are growing well and the water in the pond is clean and healthy.

After Restoration

Thanks to these efforts, what was once a tailings pond is now a beautiful wetland area. The Wapisiw Lookout now hosts a variety of plant species and has become a home for wildlife, creating a new ecosystem where there was once waste.



After Restoration

Name: _____ 70

Curriculum Connection
E.6

Questions

Use information from the text to support your answer

1) What is a tailings pond, and why is it harmful?

2) Describ cess of restoration of the Wapisiw Lookout.

Draw

Draw a before and afte tur w Lookout, showing it as a tailings pond and then as a we

Before	**After**

True or False

Circle whether the statement is true or false

1) The area around the Wapisiw Lookout was an oil mining site.	True	False
2) Tailings are a mix of sand, clay, water, and leftover oil.	True	False
3) Tailings are harmful to plants and animals.	True	False
4) Plants chosen for planting were not native to Alberta.	True	False
5) The monitoring of the area is done only once.	True	False

Curriculum Connection
E.6

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class

Name: _____ | Mark

Number the restoration steps from 1 to 5 in the correct order.

	Adding topsoil to the dried land
	Drying out the tailings pond
	Monitoring the pond and surrounding area
	Planting native plants to stabilize soil
	Shaping the land to match Alberta's landscape

Name: _____ | Mark

Number the restoration steps from 1 to 5 in the correct order.

	Adding topsoil to the dried land
	Drying out the tailings pond
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Name: _____ | Mark

Number the restoration steps from 1 to 5 in the correct order.

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	Monitoring the pond and surrounding area
	Planting native plants to stabilize soil
	Shaping the land to match Alberta's landscape

Name: _____ 72

Curriculum Connection
E.7

Processed and Unprocessed Energy

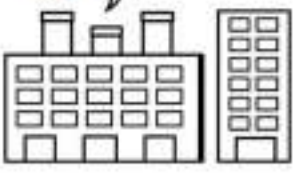
Energy Resources: Before and After Processing
Energy comes to us in many forms, and we use it in different ways. Some energy resources can be used directly to do work, while others must be processed first. Let's explore this distinction further.

Unprocessed Energy Resources
Some energy resources can be harnessed directly without converting them into another form of energy. Here are some examples:

- Wood: For centuries, people have used wood to create heat and light by burning it directly in fireplaces, stoves, or campfires.
- Wind: Windmills have been used for thousands of years to grind grain and pump water. The wind pushes the blades, turning a wheel that does the work - all without electricity.
- Water: Flowing or falling water has powered mills and mechanical devices directly for centuries. Think of a water mill where a large wheel spins to grind grain into flour.

Processed Energy Resources
Some energy resources must undergo a process of transformation into a form we can use. This typically involves changing the energy into electricity. Here are a few examples:

- Solar: Solar energy requires solar panels to capture the sun's rays and convert them into electricity. This electricity then powers our homes and devices.
- Fossil Fuels: Oil, coal, and natural gas must be extracted, refined, and often combusted to create electricity.
- Nuclear: Nuclear energy comes from the splitting of atoms in a reactor. This process creates heat, which then produces steam. The steam turns a turbine to generate electricity.



- Hydroelectric Power: While flowing water can power a mill directly, for it to power our homes, it needs to be converted into electricity in a hydroelectric power plant.
- Biofuel: Organic materials, like corn or waste, are converted into biofuels through various chemical processes. These biofuels can then be used to power vehicles or generate electricity.

Name: _____ 73

Curriculum Connection
E.7

Questions Use information from the text to support your answer

1) How is wind energy used directly without processing it into electricity?

2) What is [illegible]ence between processed and unprocessed energy?

Think Is the energy [illegible] unprocessed?

1) Sun drying clothes	[illegible]ssed	Unprocessed
2) Wood burning in a fireplace	[illegible]	Unprocessed
3) Hydroelectric dam generating electricity	[illegible]	[illegible]ocessed
4) Solar panels on a house	Pro[illegible]	[illegible]essed
5) Gas stove used for cooking	Processe[illegible]	[illegible]nprocessed
6) Water wheel grinding grain at a mill	Processed	Unprocessed
7) Food cooking on a charcoal grill	Processed	Unprocessed
8) A car powered by gasoline	Processed	Unprocessed
9) Wind pumping water from a well	Processed	Unprocessed
10) Biofuel used in a bus	Processed	Unprocessed
11) A candle providing light	Processed	Unprocessed
12) Light bulb illuminating a room	Processed	Unprocessed

Name: _____ 74

Curriculum Connection
E.7

Unprocessed Energy - Windmill

How a Windmill Uses Unprocessed Energy

Windmills are incredible inventions that utilize the natural power of the wind. They have been around for centuries and were first used to grind grain into flour. Nowadays, modern wind turbines are used to generate electricity. But how does this work? Let's go through the steps:

Step 1: [illegible]

A wind[illegible] starts [illegible]en the wind blows. The wind is a natural, unpro[illegible]d [illegible]e of [illegible]. It's the motion of air caused by differen[illegible] air p[illegible]f[illegible] atmosphere. When the wind blows, it pushes [illegible]t [illegible]e bla[illegible] windmill.

Step 2: Turning the Blades

The blades of a windmill are shaped in a special w[illegible]mila[illegible]lane wings) to catch the wind efficiently. This design causes the blad[illegible]pin [illegible]h[illegible] blows. The spinning of the blades is the first transformation of wi[illegible]o into m[illegible]cal energy.

Step 3: Rotating the Shaft

The blades are connected to a shaft (a long, cylindrical object). When the[illegible]s turn, the shaft also turns. This rotating shaft now has the mechanical energy that came directly from the wind's energy.

Step 4: Doing the Work

In a traditional windmill, the spinning shaft directly powers a machine. For example, in a grain mill, the shaft would be connected to a grinding stone. As the shaft spins, it turns the stone, which grinds the grain into flour. The wind's unprocessed energy has now been converted into useful mechanical work without any processing.

Name: _____ 75

Curriculum Connection
E7

Questions

Use information from the text to support your answer

1) How does a windmill use unprocessed energy?

2) Describe the role of the shaft in the operation of a windmill.

Draw

Draw a labeled diagram and show how it works. Use arrows to show the path of the wind and the energy as it gets transferred from one part to another.

True or False

Circle whether the statement is true or false

1) Wind is a natural, unprocessed source of energy.	True	False
2) In a grain mill, the spinning shaft grinds the grain directly.	True	False
3) The energy from the wind is processed before it does work in a windmill.	True	False
4) The wind pushes against the base of the windmill.	True	False
5) In a traditional windmill, the wind is used to spin an electrical turbine	True	False

Name: _____ 76

Curriculum Connection
E.7

Activity – Unprocessed Energy: Sailboat

Research Question

What are we learning about?

The goal of this activity is to demonstrate how unprocessed wind energy can be harnessed to propel a simple sailboat.

Materials

What you will need for the experiment

- ❑ Plastic tub (to serve as a small pool)
- ❑ Piece of cardboard (approximately 6x6 inches)
- ❑ Drinking straw
- ❑ Piece of cloth or paper for the sail
- ❑ Scissors
- ❑ Tape
- ❑ A fan (to generate wind if there's no natural wind)

Method

How you will complete the experiment

1) Cut a triangular sail from the cloth or paper.
2) Attach the sail to the drinking straw using tape.
3) Cut a small slit in the middle of the cardboard and insert the straw (with the sail attached) through the slit. Make sure the sail is standing upright.
4) Place the cardboard boat in the plastic tub filled with water.
5) Position the fan or naturally occurring wind so that it's blowing towards the sail of your boat.
6) Observe how the boat moves when the wind blows against the sail.

Name: _____ 77

Curriculum Connection
E.7

Diagram Draw a diagram of your sailboat. Use arrows to show the wind's energy and how it affects the sailboat.

Results ...with your boat? Answer the questions below.

1) How does the sailb... ...essed energy?

2) What happens to the boat when the wind stops?

3) How can you change the direction of the boat using the sail?

4) Could you think of a way to control the speed of the boat using the wind's energy?

Name: _____ 80

Curriculum Connection
E 8

Electricity

How Does Electrical Energy Work?

Power plants are responsible for taking different forms of energy, like solar and fossil fuels and transforming them into electrical energy. **Electrical energy (electricity)** is the most common form of energy used as it can be delivered from place to place easily.

Wire[illegible]e excellent energy conductors that carry energy away from a power plant to house[illegible]s. When we plug a cord into an outlet, we are connecting to the wires that c[illegible]t[illegible] the power plants. The power plants charge us money for using their e[illegible]y. They [illegible]ow much energy we are tapping in to.

Power Plants

Electricity is made [illegible]er [illegible] different energy sources. The most popular forms of power plants are [illegible] power[illegible]ssil fuel power plants (oil, coal, natural gas), and renewable resource p[illegible] pla[illegible]

Nuclear power is one form of po[illegible]nt that [illegible]machines called nuclear reactors. Heat is produced by these reactors wh[illegible]ns ar[illegible]part. The heat is then used to boil water and create steam. The steam t[illegible]urb[illegible] electricity.

Fossil fuels are another form of power plant tha[illegible] mat[illegible] heat water and create steam to turn turbines. Solar, wind, and water are **renewable resources** that are also used to produce electricity. The power plants are responsible for transforming the natural energy sources into electricity.

Electricity Transforming

When we plug machines into these outlets, the electrical energy often changes form to provide us with heat, light, or sound.

Think of how a television uses electrical energy to provide light and sound energy to the viewer. It also provides heat energy as I'm sure you have noticed when a TV gets warm after being on for an extended period of time. The energy begins as electrical energy, but transforms into thermal, light, and sound energy.

Name: _____ 81

Curriculum Connection
E 8

Questions

Use information from the text to support your answer

1) How does electricity work and how do we get access to it at home?

2) Describe the role of the shaft in the operation of a windmill.

Summarize

Write a summary from the reading passage

Matching

Draw a line from the term to the description

Term	Description
Nuclear Energy	Burned to provide energy that is converted to electricity.
Fossil Fuels	Used to turn turbines and generate electricity
Renewable Energy	Nuclear reactors split atoms to heat water and produce steam.
Outlet	Energy that will come back after it is used
Steam	A device that allows people to have access to electricity.

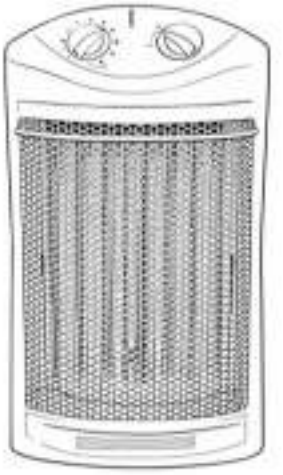
Name: _____ 83

Curriculum Connection
E.8

Transforming Electricity

Transforming Energy – Forms of Energy

Remember, energy is never created, nor destroyed. This means it can only be transformed into other forms of energy. When a wind turbine spins, it transforms mechanical energy into electrical energy.



Transformi ctricity

Electricit one of the most influential inventions in human histo ility to create an easily transportable form of energy hat can me into any other form of energy. We are constantly trans lectri ght from our light bulbs, heat from our electric baseboards, sound fr chanical energy from our electric vehicles.

Electricity Transforming Into

An electric heater is an electrical device verts ricity into heat. When an electrical current travels through a wire, wire n s e nergy added to it. The extra energy causes the atoms in the wire to vib ster. n creates heat.

An electric heater will have many wires that a elect urrent to travel through it to heat it up. When the heater is turned o res as there are no electrons travelling through it.

Electricity Transforming Into Sound

Sound comes from vibrations. In order to create vibrations, mechanical energy is needed. Therefore, electricity is used to create movement within a speaker. The movement creates vibrations that we hear in the form of music.

As electricity travels through the wires in a speaker, it travels to a motor that has an electromagnet inside. The electromagnet uses magnetism to vibrate a diaphragm based on the electrical signals it is being sent. The diaphragm creates sound waves that travel out of the speaker and into our ears so we can hear.

Name: _____ 84

Curriculum Connection
E.8

Questions

Answer the questions below using evidence from the text

1) What forms of energy can electricity be transformed into?

2) How do[illegible]tricity transform into heat for an electric space heater?

True or False

Is the statement t[illegible]lse?

1) Electricity can be transformed into heat, sou[illegible] mech[illegible]gy	True	False
2) Electricity can be created using wires and a batter[illegible]	True	False
3) Other forms of energy can be transformed into electricit[illegible]	[illegible]	False
4) The flow of electrons through a wire creates heat	[illegible]	False
5) The use of a electromagnet in a speaker creates mechanical energy	[illegible]rue	False

Questioning

Write 3 questions you have about the reading

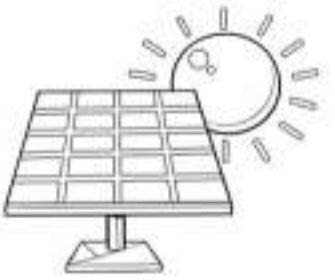
1)	
2)	
3)	

Name: _____ 87

Curriculum Connection
E 8

Solar Energy – Generating Electricity

What is Solar Energy?



Solar energy is energy given off by the sun's rays. The sun has been providing humans with solar energy for thousands of years. The sun has given us thermal energy to keep us warm and dry our clothes, and light energy to allow us to see.

As t gies advance, humans are now using solar energy to create electricity. Using so f electricity means the sun is powering our electronics, machines, elec s and m

Solar en wa nergy source because we cannot use it up. It is an esou g the supply is endless.

How Solar Energy Work

Solar energy is harnessed by ane and store the sun's energy. The stored energy is p ener used on demand. Solar panels are made of many solar cells that re all co ted.

The solar cells have two sides. One side h ctron itively charged and the other side has a negative charge. When the su kes the cell, the energy knocks the electrons loose and they begin to flow f e s creating an electrical circuit. We can plug our electronics into a sol e flowing electrons can continue through the circuit inside the electronic d

Benefits and Drawbacks to Solar Energy

Benefits	Drawbacks
Renewable energy we won't run out of	Solar energy can only be collected when it is sunny. Cloudy, rainy days will slow down energy storage
No greenhouse gases (no air pollution)	Batteries store the solar energy. Batteries don't decompose, meaning they will end up in landfills when they no longer work
Once setup in homes, the cost is free to use electricity	It costs a lot to install solar panels

Name: _____ 88

Curriculum Connection
E 8

Questions Answer the questions below using evidence from the text

1) What is solar energy?

2) How does solar energy work?

Benefits and Drawbacks List the benefits and drawbacks of solar energy

Benefits	Drawbacks

Reaction Do you think we should use more solar energy? Explain.

Name: _____ 90

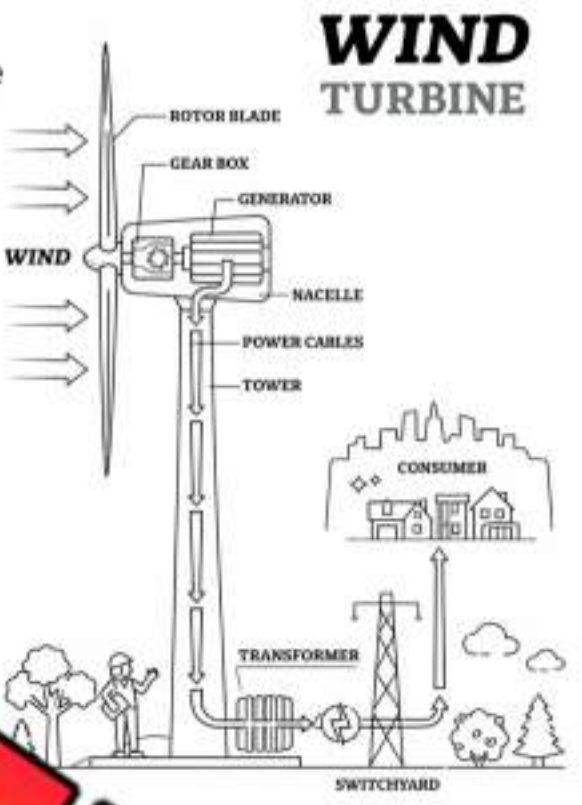
Curriculum Connection
E 8

Wind Energy

What is Wind Energy?

Wind is the movement of air from areas of high-pressure to areas of low pressure. When the gases that make up our air are warmed, they spread out and have higher pressure. When the air is cooled, the pressure is lower as the gas p[illegible]s get closer together.

Wind [illegible] the energy we harness from the move[illegible] energy can fly a kite, move a sailboat and spin [illegible]ne. When we use a wind turbine, we can [illegible] energy [illegible] electricity.



What is a Wind Turbine?

A wind turbine is like a windm[illegible] the [illegible] are spun by wind energy, they spin a shaf[illegible] a generator. The generator converts the [illegible]anical [illegible] electrical energy by forcing the electrons through an electrical circuit. The el[illegible]y is s[illegible] a transformer, so it is the proper voltage. It is carried to a switchyard an[illegible] homes.

Use of Wind Energy in Canada

Wind energy is the second most used renewable energy source in Ca[illegible]% of Canada's electricity. Moving water is number one, with 59% of Canada's ele[illegible] generation.

Benefits and Drawbacks of Wind Energy

Benefits	✓ Clean energy that doesn't produce greenhouse gases and won't run out ✓ Free energy once you have setup the wind turbine ✓ Wind turbines don't take up much space on the ground
Drawbacks	✓ Dangerous to birds and bats who can fly into the blades ✓ They are noisy so they are usually built in rural areas ✓ Are expensive to setup ✓ They only work when the wind is blowing. This causes unpredictable amounts of energy. If it isn't windy for a long period of time, the stored wind energy will run out

Name: _____ 91

Curriculum Connection
E 8

Questions Answer the questions below using evidence from the text

1) Why does wind happen?

2) How does wind energy work?

Benefits and Drawba efits and drawbacks of wind energy

Benefits	
Drawbacks	

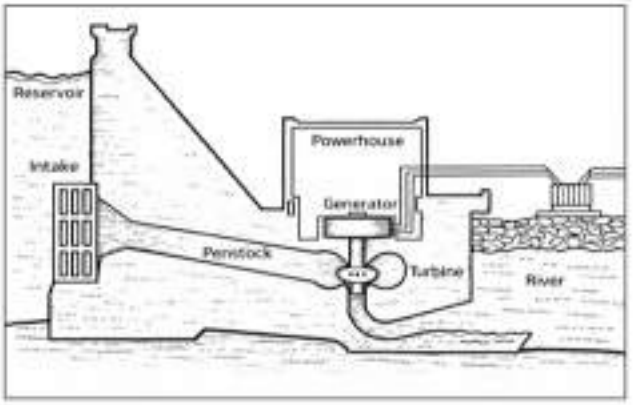
Reaction Do you think we should use more wind energy? Explain.

Name: _____ 92

Curriculum Connection
E 8

Hydro Energy

What is Hydro Energy?



Hydro energy is energy that is harnessed from the flow and movement of falling water. You have likely noticed in a stream or river that there is a current that sends water downhill. This movement of water can be harnessed to create energy for humans to use, like electricity.

Hydro energy is one of the oldest forms of energy. Watermills were first used in the 3rd century by the Greeks. The movement of water would spin a watermill that would spin a pipe. The pipe was connected to a machine that could do work.

How Hydro Energy Works

A hydroelectric dam is built across the river. The water is built up in a reservoir that acts like a lake. The water stored in the reservoir at high altitudes is potential energy. At the bottom of the concrete wall, there is an intake that allows water to travel down the penstock. The water flow consists of spinning the turbine and generating electricity.

Hydroelectric Dams in Canada

The Canadian government is serious about using less fossil fuels for energy and more renewable forms of energy. This is why there are over 15,000 dams in Canada. Hydro creates 59% of all electricity used by Canadians! Canada makes the second most hydroelectricity, behind only China.

Benefits and Drawbacks

Benefits	✓ Renewable source of energy that we won't run out of ✓ The energy is clean because it doesn't emit greenhouse gases ✓ It's the most reliable form of renewable energy as water always flows
Drawbacks	✓ It has an impact on fish because the dam stops the natural flow of water ✓ Can only be built in certain areas where water flows already. It can be difficult to get the electrical energy to big cities from remote locations ✓ High cost to build dams

Name: _____ 93

Curriculum Connection
E 8

Questions

Answer the questions below using evidence from the text

1) What is hydro energy?

2) Does Canada use hydroelectricity? Why do you think they do?

Benefits and Drawbacks

e the s and drawbacks of hydro energy

Benefits	
Drawbacks	

Reaction

Do you think we should use more hydro energy? Explain.

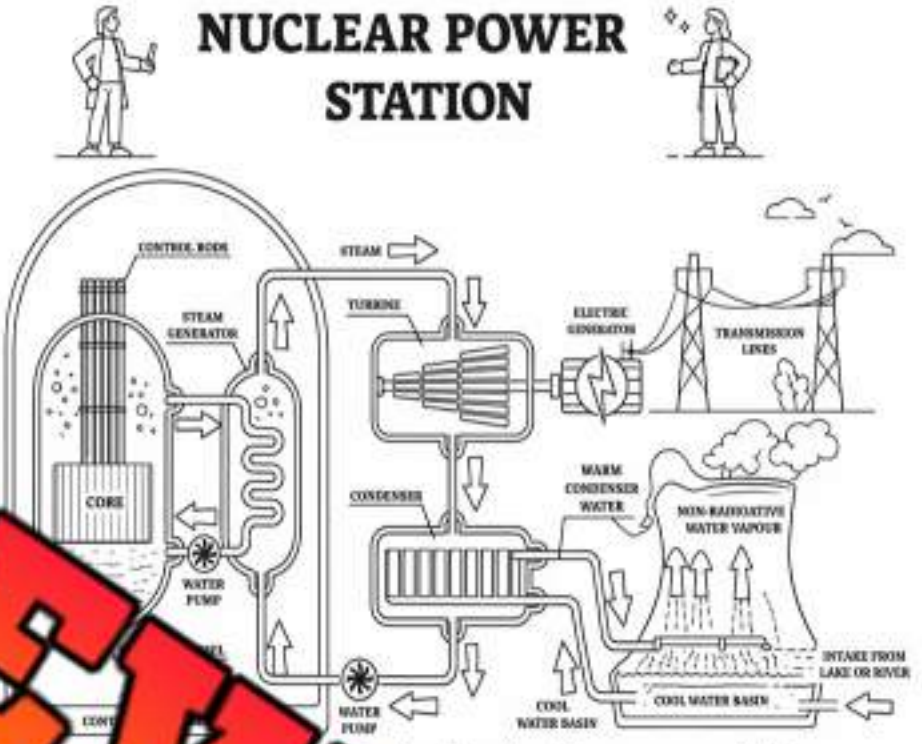
Name: _____ 95

Curriculum Connection
E 8

Nuclear Power

Nuclear Power

Nuclear energy is produced by splitting a uranium atom into two smaller atoms. This process releases heat from the nucleus of an atom that is used to cr[illegible]. [illegible]s inside the nuclear reactor. [illegible] that is created e[illegible]. This creates a lot of press[illegible] th[illegible] steam has to go somewhere. [illegible] travels up through the pipe creating a ma[illegible] pins the turbine very quickly, creating a lot of mechanical energy and [illegible]ore, ele[illegible].



Nuclear Energy in Canada

In Canada there are 19 nuclear reactors. Ontario has [illegible] Brunswick. Nuclear power plants provide 15% of Canada's electricity.

Advantages of Nuclear Energy

- It does not use large amounts of land to generate energy. In fact, it use[illegible]nes less land than solar energy to generate the same amount of power.
- It is a stable consistent source of energy. It can be produced around the clock while solar and wind only produce energy 10-30 percent of the day depending on weather conditions
- Nuclear energy does not emit greenhouse gases.

Disadvantages of Nuclear Energy

- The risks of an accident at a generating station could cause damage to people and the environment.
- The used uranium is radioactive waste for thousands of years and must be disposed of carefully to avoid contamination.

Name: _____ 96

Curriculum Connection
E 8

True or False

Circle whether the statement is true or false

1. Nuclear energy is renewable energy	True	False
2. Nuclear energy generates heat by splitting atoms	True	False
3. Nuclear energy generates no greenhouse gases	True	False
4. Fear of nuclear accidents is why people are against using nuclear energy	True	False
5. Nuclear energy is not used much around the world	True	False

Summarize

Summarize the reading by writing the important information

Questions

Use information from the text to support your answers

1) Do you think we should build more nuclear power generating stations? Why or why not?

2) What are the benefits of nuclear power?

Generating Electricity – Effect on Environment

Why We Generate Electricity

Electricity is an energy source we rely on in our everyday lives. It is used for lighting, heating, cooling, refrigeration, appliances, computers, electronics, and even electric vehicles. When the electricity has gone out, you've ... felt this reliance to it!

Gene... ...ect on Environment

In Cana... genera... ...ity produces far less air pollution than other countries, like the United Sta... ...over 8... ...he electricity Canadians use comes from sources that produce no air ...ion. ... are hydroelectricity, wind, solar, and nuclear.

This is not to say th... ...ing el... has no effect on the environment. The creation of hydroelectric dams, ... s ar... ...nd nuclear power plants all have an effect on the environment.

Hydroelectric Dam	• The dams block the flow o... and t... e some water from time to time. This changing ... nm... ...rd for wildlife living in the water to survive. • The structure itself is massive. It u... ...f lar... • Many of the dams are built in the north... ...arts... ...re the Indigenous have rights to the land
Wind	• Pose a threat to flying wildlife like birds and bats. • They also change ecosystems with their large struct... • Noise pollution as the spinning blades are loud
Solar	• They need a lot of land to generate a significant amount of electricity • These panels get very hot and cause a threat to birds that land on them
Nuclear	• When a nuclear accident happens, radioactive pollution enters our air. It is poisonous to humans • Radioactive waste is created in the process of generating electricity. The waste is being buried underground • The nuclear power plants release their used water back into rivers, lakes, or oceans they are near. They filter it, but many believe the water is still contaminated

Name: _____ 98

Curriculum Connection
E.8

Explain Write the effects of each energy source in your own words

Hydroelectric Dam	
W	
Solar	
Nuclear	

Reaction Which energy source(s) do you think is best for the environment? Explain

Curriculum Connection
E.8

Exit Cards

Cut Out Cut out the exit cards below and have students complete them at the end of class

Name: _____ Mark

Draw a line to match each energy source to its environmental effect.

Hydroelectric dam	❑ Can release radioactive pollution during accidents
Wind power	❑ Changes river flow and affects wildlife
Solar energy	❑ Can harm birds and create noise
Nuclear power	❑ Requires large land areas and heats nearby land

Name: _____ Mark

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Nuclear power	❑ Requires large land areas and heats nearby land

Name: _____ 102

Curriculum Connection
E.8

Moving Electricity in Alberta

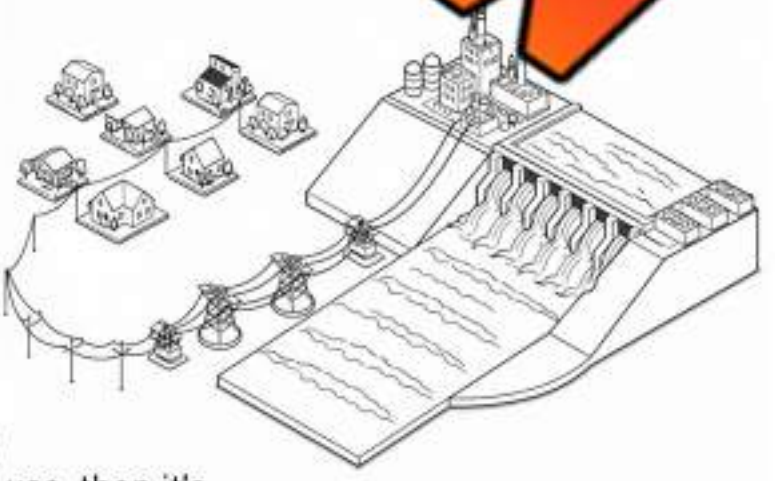
How Electricity Travels from Power Plants to Our Homes and Businesses
Let's imagine electricity as a team of runners in a relay race, going from the power plants to your house or a business!

Start of the Race: The Power Plants
The race begins at the power plants, like Keephills Power Station, Genesee Generating Station, a heerness Generating Station. These power plants combust coal or natural g t water, converting it into steam that spins a turbine.
At azeau Hydroelectric Dam, water from a reservoir is used to spin the t kspring Ridge Wind Project, wind powers the turbines.

Passing the Bato me
Once the elec ated, s to be sent on its way. But first, it needs a boost to travel long dis This device called a transformer. Transformers increase the electric vel far without losing energy.

The Long Journey: Transmis es
The electricity now travels along trans se are like the long straight parts of the race track. They're the ta t towe across the countryside carrying high-voltage electricity over big distanc

Getting Closer: Substations
Before the electricity can reach your home, it needs own. e a runner adjusting speed before passing the baton, another set rm ations lower the voltage of the electricity. Substations are like litt enc lots of wires and metal things, and you might see them in your to



Final Stretch: Distribution Lines
Now, the electricity is ready to run the final leg of the relay race. It travels along smaller poles, which are the distribution lines that you usually see along the streets.

Finish Line: Your Home
Finally, the electricity reaches your house or a business. It comes through a meter that measures how much you use, then it's ready to power everything from lights to computers to ovens.

Name: _____ 103

Curriculum Connection
E.8

Questions

Answer the questions below using evidence from the text

1) What role do transformers play in the transmission of electricity?

2) Describe the journey of electricity from a power plant to a house or a business.

True or False

Is the statement

1) Transformers are used to decrease the voltage of electricity	True	False
2) Transmission lines carry low-voltage electricity	True	False
3) Transformers at substations increase the voltage of e	True	False
4) Substations are usually located in fenced-off areas.	True	False
5) Distribution lines are the small poles seen along the streets.	True	False

Diagram

Draw a diagram of electricity travelling from a power plant to a city

Name: _____ 107

Curriculum Connection
CS.1

Electricity and Coding

Electricity and Coding

The field of science and technology has grown massively since the invention of electricity. Electricity has been used to provide energy in the form of light, heating, cooling, and to power our appliances as well as gadgets.

Coding has also changed the field of science and technology. Coding is used to tell an electronic what to do. Therefore, electronics and coding now work hand in hand. Just about every electronic you can think of uses coding to allow it to work.

For example, your washing machine runs on electricity. It also uses code to allow the user to program what they want the washing machine to do. The code might look like this:

Multiple Choice

Circle the correct answer

1) Coding was invented before/after electricity?		After
2) Coding is used to tell computers	to d	The time
3) Appliances use _____ to give the user options	Electric	
4) Electricity is used to provide energy in the form of	Ligh	oughts
5) Which uses electricity	Television	Carpets

Question

How does electricity and coding work together to make many things we use today?

Name: _____ 108

Curriculum Connection
CS.1

What is Binary Code?

What is Binary Code?

Binary code is a coding system using the numbers 0 and 1 to represent everything a computer needs to know. The 0s and 1s are called bits.

For example

- The on button is represented by 1 while the off switch is represented by 0
- Letters are represented by 0s and 1s. A = 01000001 or 1, B = 01000010 or 10
- Numbers are also represented by 0s and 1s. The number 1 = 1, 2 = 10, 3 = 11, 4 = 100

Why Do Computers Use Binary?

Computers need binary to make sense of complicated data. The binary counting system is the simplest method available because it uses only two numbers. Computers can process 0s and 1s to allow them to understand what we are sending to it.

Binary Code Alphabet

Below you can find the binary number for each letter and number in our alphabet. Binary is read from right to left. You will notice uppercase and lowercase have their own binary code because they are different when written to the computer. The circles also represent binary. The black circles represent 1s while the white circles represent 0s.

01000001	A	○●○○○○○●	01100001	a	○●●○○○○●	00110000	0	○○●●○○○○
01000010	B	○●○○○○●○	01100010	b	○●●○○○●○	00110001	1	○○●●○○○●
01000011	C	○●○○○○●●	01100011	c	○●●○○○●●	00110010	2	○○●●○○●○
01000100	D	○●○○○●○○	01100100	d	○●●○○●○○	00110011	3	○○●●○○●●
01000101	E	○●○○○●○●	01100101	e	○●●○○●○●	00110100	4	○○●●○●○○
01000110	F	○●○○○●●○	01100110	f	○●●○○●●○	00110101	5	○○●●○●○●
01000111	G	○●○○○●●●	01100111	g	○●●○○●●●	00110110	6	○○●●○●●○
01001000	H	○●○○●○○○	01101000	h	○●●○●○○○	00110111	7	○○●●○●●●
01001001	I	○●○○●○○●	01101001	i	○●●○●○○●	00111000	8	○○●●●○○○
01001010	J	○●○○●○●○	01101010	j	○●●○●○●○	00111001	9	○○●●●○○●
01001011	K	○●○○●○●●	01101011	k	○●●○●○●●			
01001100	L	○●○○●●○○	01101100	l	○●●○●●○○			
01001101	M	○●○○●●○●	01101101	m	○●●○●●○●			
01001110	N	○●○○●●●○	01101110	n	○●●○●●●○			
01001111	O	○●○○●●●●	01101111	o	○●●○●●●●			
01010000	P	○●○●○○○○	01110000	p	○●●●○○○○			
01010001	Q	○●○●○○○●	01110001	q	○●●●○○○●			
01010010	R	○●○●○○●○	01110010	r	○●●●○○●○			
01010011	S	○●○●○○●●	01110011	s	○●●●○○●●			
01010100	T	○●○●○●○○	01110100	t	○●●●○●○○			
01010101	U	○●○●○●○●	01110101	u	○●●●○●○●			
01010110	V	○●○●○●●○	01110110	v	○●●●○●●○			
01010111	W	○●○●○●●●	01110111	w	○●●●○●●●			
01011000	X	○●○●●○○○	01111000	x	○●●●●○○○			
01011001	Y	○●○●●○○●	01111001	y	○●●●●○○●			
01011010	Z	○●○●●○●○	01111010	z	○●●●●○●○			

Name: _____ 109

Curriculum Connection
CS.1

Writing Binary

When these letters are typed, what does the computer see?

Input	Binary Code Version
Example Sam	01010011 01100001 01101101
Your Name (Choose a form)	
Canada	
I am 11	

Reading Binary

Read the binary code and dec... comp... as told
Hint – it is all t...

Binary Code Version	Input
01100011 01101111 01100100 01100101	
01101101 01100001 01110100 01101000	
01110011 01100011 01101001 01100101 01101110 01100011 01100101	
01100110 01110101 01101110	

Name: _____ 110

Curriculum Connection
CS.1

What is Binary Code?

Writing Binary

Shade in the 1s and leave the 0s white

Input	Binary Code Version
Example Sam	
code	
binary	
bit	

Reading Binary

Read the binary code and [illegible] was told
Hint – it is a[illegible]

Binary Code Version	

Name: _____ 111

Curriculum Connection
CS.1

Writing Code – TV Remote

How Does a TV Remote Work?
The battery inside the remote gives it electricity. The remote has an LED light that sends binary code to the TV. The TV has been programmed to understand the binary code it is being sent.

For example

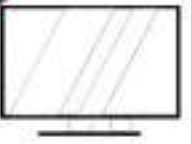
Remote Code
if [on] [illegible] is pressed
then [illegible] 01101110 to the television

TV Code
if [on] but[illegible]
then [close] the[illegible]

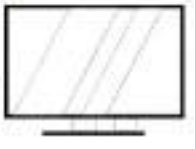
Binary When the rem[illegible]tton [illegible] at binary code is sent to the TV?

[illegible]ote Cod[illegible]
if volume [up] button is pres[illegible]
then send [illegible] [illegible]televi[illegible]

Remote Code
if channel [down] button is pressed
then send [ ] to the television



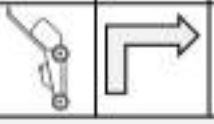
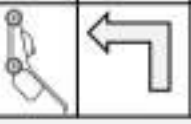
Remote Code
if [off] button is pressed
then send [ ] to the television



Name: _____ 119

Curriculum Connection
CS.1

Coding – Robot Lawn Mower

This is a self-driving lawn mower	Right makes it turn right	Left makes it turn right	Forward makes the car move forward by the number shown
			
It under… co…	**Right**	**Left**	**Forward 2**

Directions …de … the lawn mower to cut the field of grass

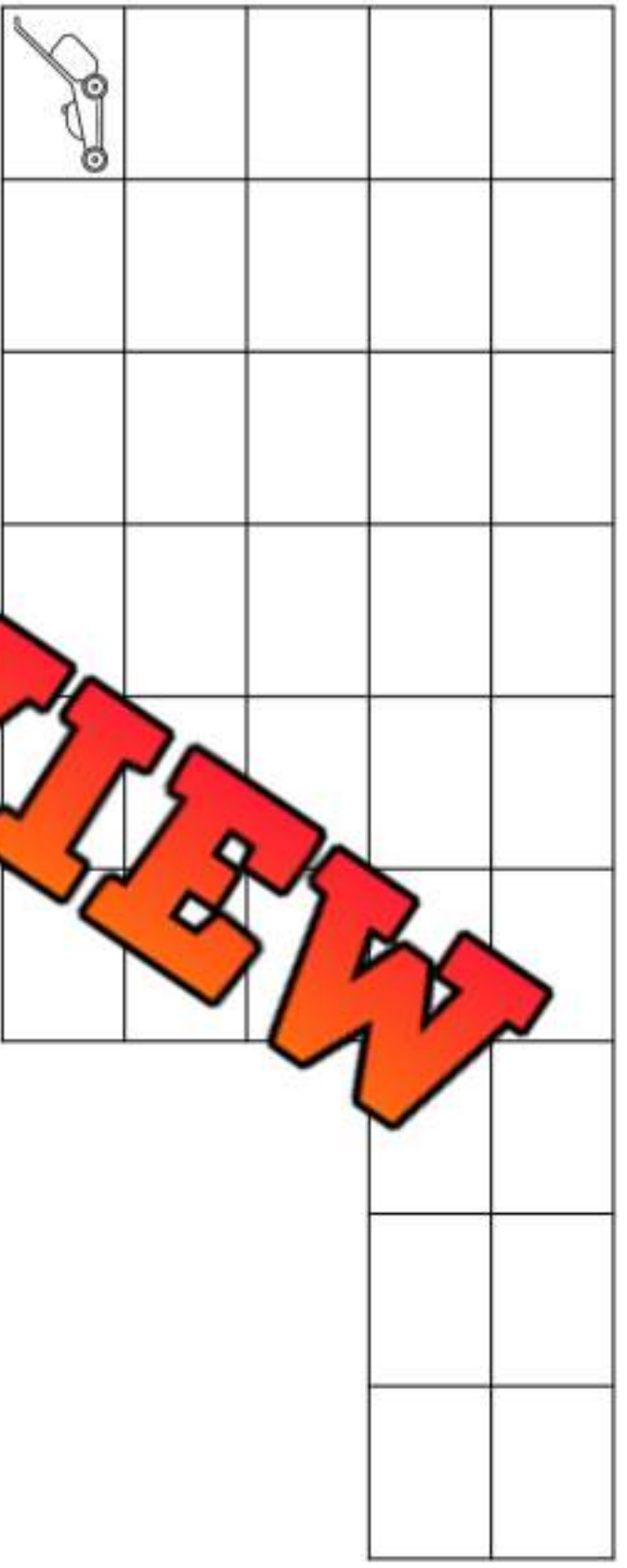
Codes – Forwar… …ht
Line 1
Line 2
Line 3
Line 4
Line 5
Line 6
Line 7
Line 8
Line 9

Name: _____ 120

Curriculum Connection
CS.1

Directions Write code to get the lawn mower to cut the field of grass

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	
Line 17	
Line 18	
Line 19	
Line 20	
Line 21	

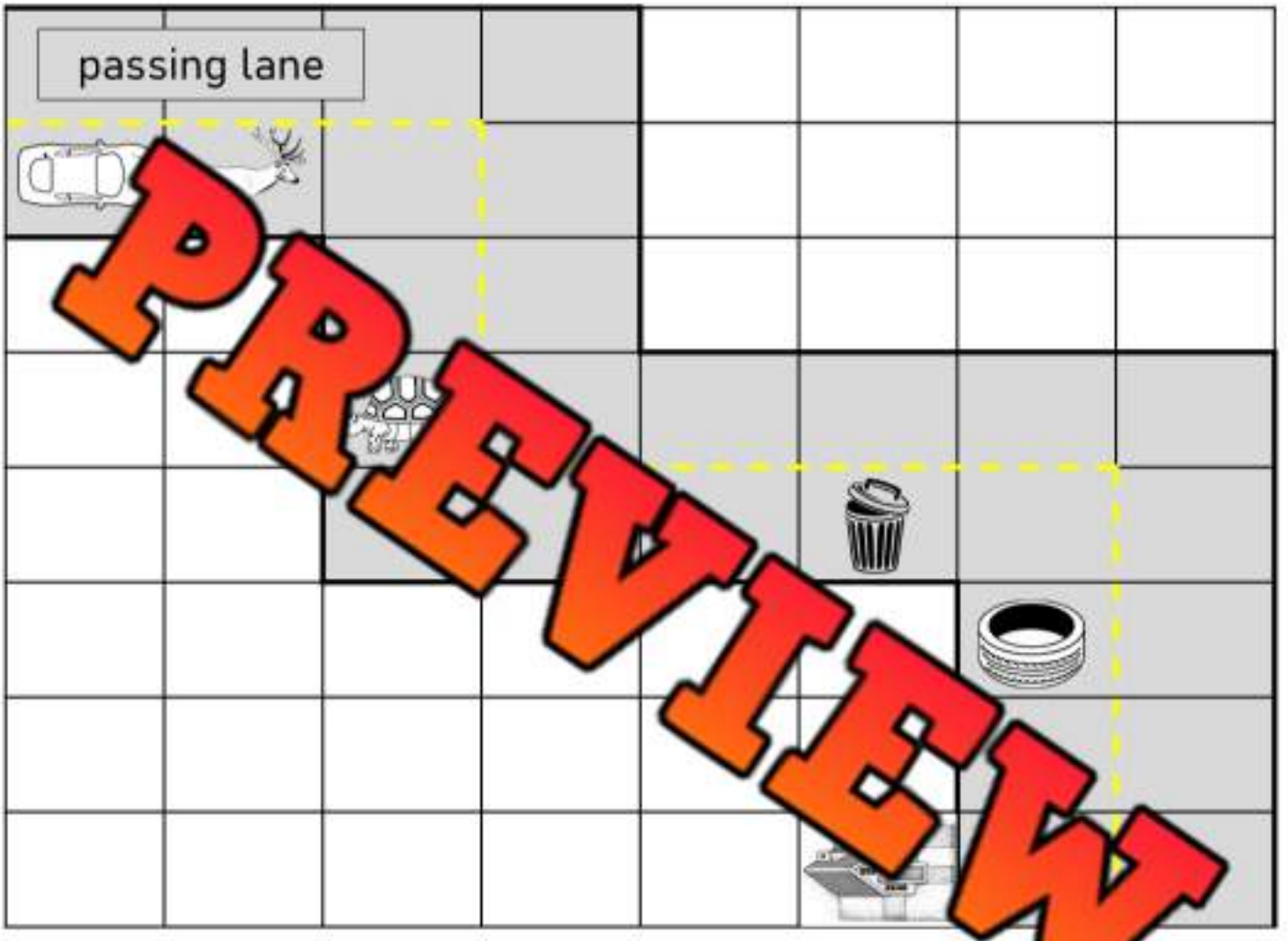


Name: _____ 121

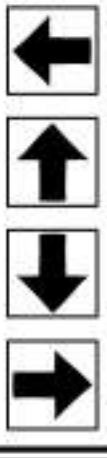
Curriculum Connection
CS.1

Coding – Self Driving Car

Self-driving cars use codes to drive around obstacles. Many self-driving cars are on the road now. By 2030, it is possible that we all enjoy safe, self-driving cars.



Direction Code the car around the obstacles.
The car can only be in the passing lane for 3 spaces in a row



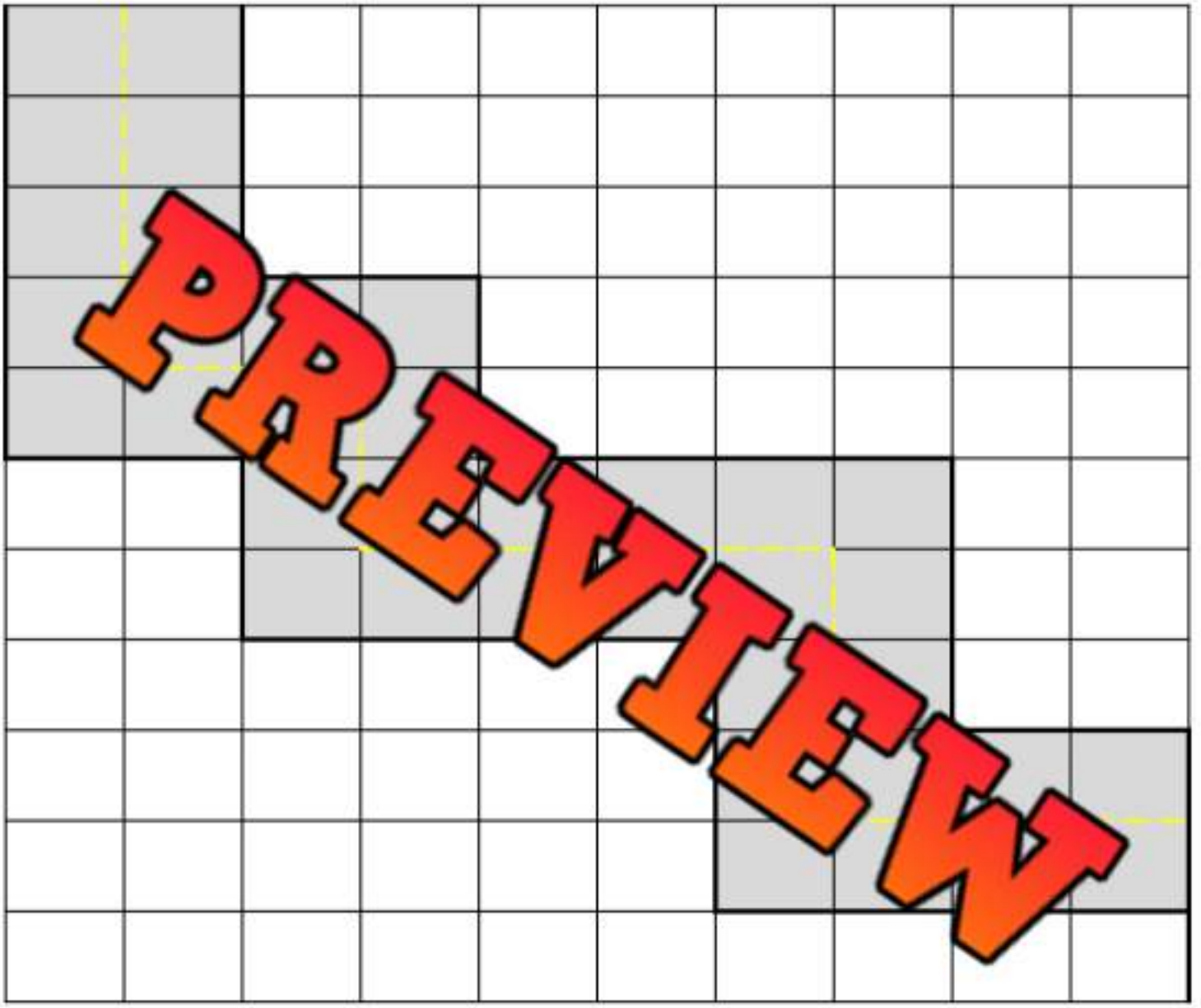
1	2	3	4	5	6	7	8	9	10

11	12	13	14	15	16	17	18	19

Name: _____ 122

Curriculum Connection
CS.1

Direction Create your own challenge by drawing obstacles on the road, a car, and a house it needs to get to. Have a friend write the code to get the car home



1	2	3	4	5	6	7	8	9	10	11	12

13	14	15	16	17	18	19	20	21	22	23	24

Name: _____ Date: _____

Unit Test - Energy

Multiple Choice /10

1) Which force acts in the opposite direction of an action force? A) Shear B) Torsion C) Reaction D) Compres	2) Which is a renewable energy source? A) Oil B) Coal C) Solar D) Gas
3) Which force? A) Fricti B) Torsion C) Compression D) Tension	4) What property allows temporary changes in an object's shape? A) Plasticity B) Elasticity C) Torsion Shear
5) Which force tries to squash an t? A) Compression B) Shear C) Torsion D) Tension	property leads to permanent object's shape? A) El B) city C) D) Compr
7) What force is experienced when twisting an object? A) Torsion B) Shear C) Tension D) Elastic	8) What is the th between two surfaces A) Tension B) Shear C) Friction D) Elastic
9) What force is experienced when pulling an object apart? A) Tension B) Shear C) Torsion D) Elastic	10) Energy that cannot be replenished in a lifetime is considered... a) Non-Renewable Energy b) Renewable Energy c) Inefficient Energy d) All of the above

Definitions

What does each term mean? (1 mark each)

Term	Definition (what does it mean)
Internal Forces	
External Forces	
Tensio	

Short Answer

Answ estio – Each question is worth 3 marks

1) What is the difference between elas nd pla

2) How is energy used before and after processing. Give example

3) What is the difference between an action force and a reaction force?

Long Answer Answer the long answer questions. Each question is 5 marks

1) Explain the energy sources being used in Alberta. Why are they being chosen? What effects does it have on the environment and the people of Alberta? What energy should they use more of and why?

2) Think of an object or structure that has many ... acti... ...scribe the internal forces acting inside the object/structure.