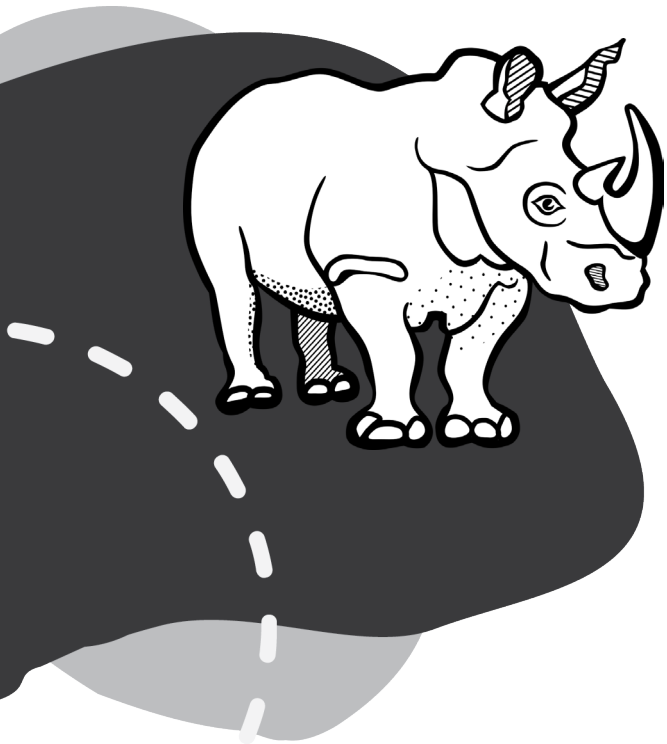
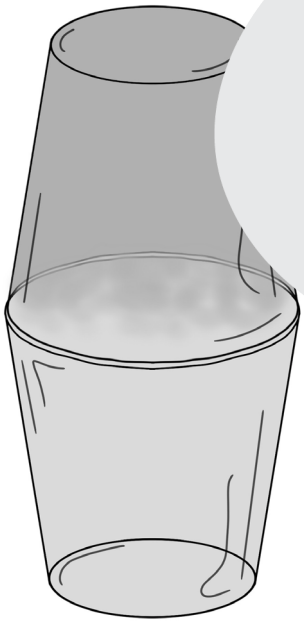
WISE Activity Booklets

A STEM activity booklet for fun on-the-go learning!

Made by WISE Kid-Netic Energy





DIY Activities
Puzzles
Challenges
... and more!

Grade 7
JULY 2020

Interactions within the ecosystems - Forces and structures - Particle theory of matter - Earth's crust

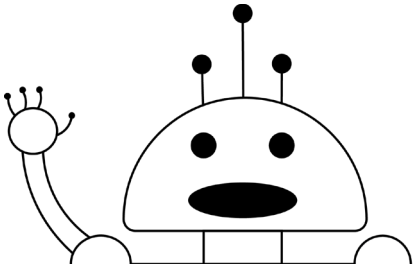
University of Manitoba

WISE Kid-Netic Energy is a proud member of Actua

A network member of actua.ca

actua Youth · STEM · Innovation

With funding from Canada



Hello there!

WISE Kid-Netic Energy is a not for profit STEM (Science, Technology, Engineering, and Math) outreach organization at the University of Manitoba. Our organization offers science and engineering workshops, clubs, camps and events to youth from Kindergarten to Grade 12 throughout the province of Manitoba. We reach on average 25 000 to 50 000 youth depending on funding levels. Our approach is simple – present STEM in messy, memorable and engaging ways so Manitoba youth feel motivated to learn more and more. We reach all Manitoba youth, and we particularly target underrepresented youth like girls, indigenous youth and youth facing socio-economic challenges.

All of us at WISE Kid-Netic Energy have been working hard to create these booklets to continue to bring our fun and educational STEM activities to Manitoba youth during these unprecedented times. We are disappointed that we cannot see you in person, and hope that these monthly booklets bring some STEM excitement to your life.

These booklets have been created by our student instructors who are all studying engineering, science, or in another STEM-related field at university. Peek the last page of this booklet to see who created the activities, experiments and recipes within.

All the activities in this booklet are based on the Manitoba Science curriculum. For any teachers viewing this booklet, all the SLO codes are listed at the bottom of each page.

If a link is listed at the bottom of the page, and you have access to the Internet, follow it to check out a video of the activity our instructors have created just for you.

We hope that you enjoy doing the experiments and activities as much as we loved creating them for you.

In this Grade 7 booklet, the science topics you will be exploring are: interactions within the ecosystems, forces and structures, particle theory of matter, earth's crust, and more!

Best of luck, and until we see you again,

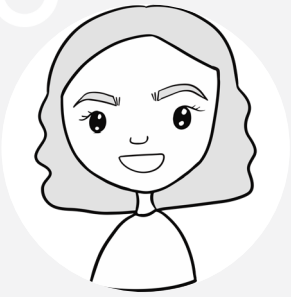
the WISE Kid-Netic Energy Crew

P.S. If you have any suggestions for activities or experiments you would like us to try, contact us through our website, or social media accounts that are listed on the last page of this booklet.

Meet our Amazing Authors!

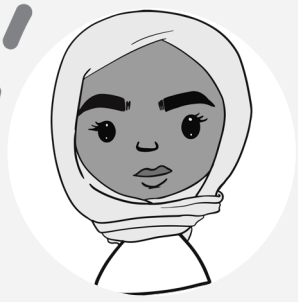
Brandi

Brandi just finished her first year in the Faculty of Science and plans to apply to the College of Pharmacy in the future. When she's not studying chemistry she loves to listen to music, hang with her cats, and nap!



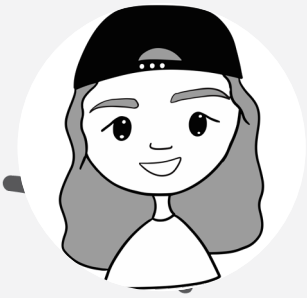
Brenna

Brenna is in her second year of mechanical engineering and loves science, especially physics! In her free time she likes to paint or draw, see friends, and play with her dog.



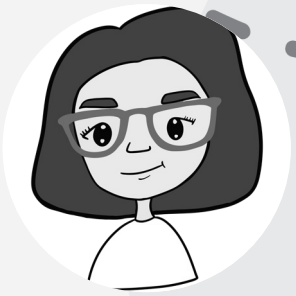
Reem

Reem is in her first-year of science at the U. of M and her favourite classes are psychology and microbiology. In her free time, she loves to watch movies and bake desserts.



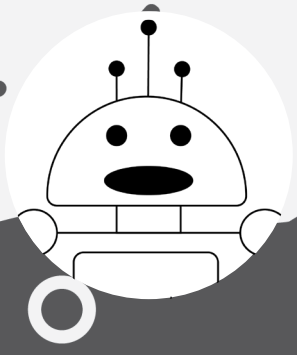
Toni

Toni is in her final year of study as a social work student at the University of Manitoba and she hopes to one day work in community development. Toni loves learning and teaching and is excited to join the WISE team this upcoming summer.



Victoria

Victoria just finished her first year as a Science student at the University of Manitoba and is planning on becoming a nurse. She loves to cook, read and take care of plants in her free time!

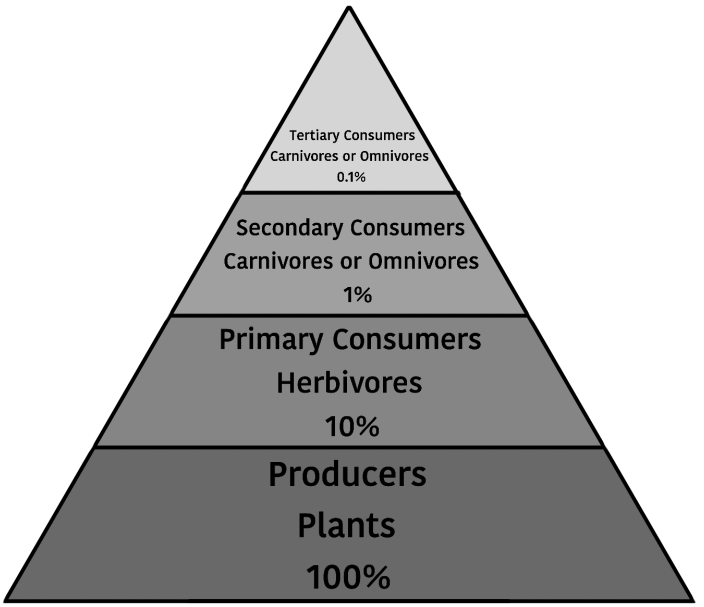


Esiw the Robot

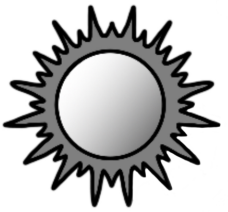
Esiw is a friendly robot that loves to help kids learn about computers & coding! Esiw loves to do math, solve problems and make people laugh!

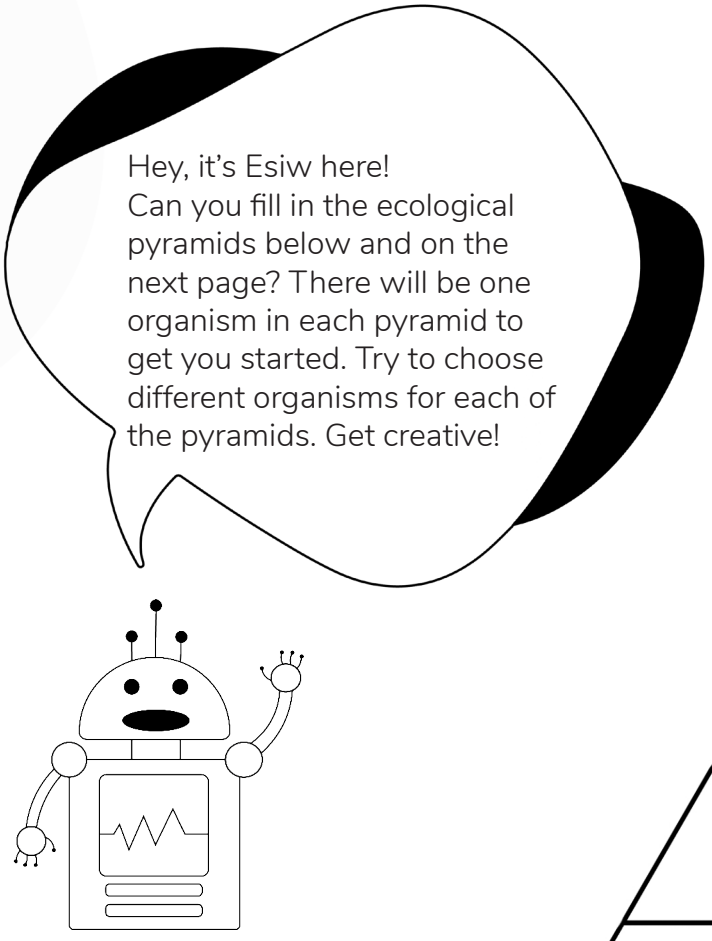
Exploring Ecological Pyramids

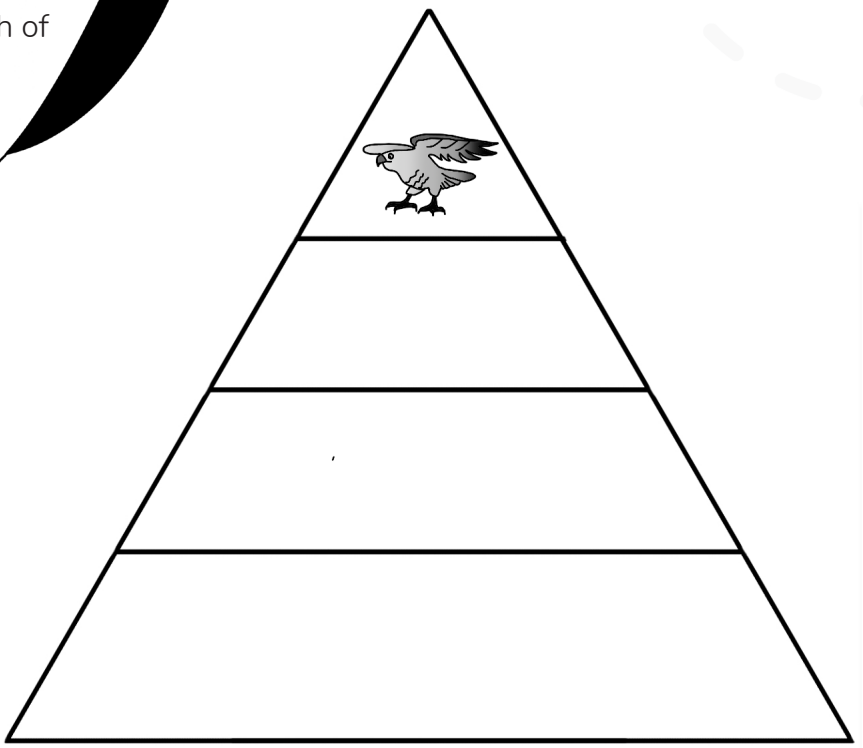
This diagram is shaped like a pyramid to show that the amount of energy transfer at each of the trophic levels decreases as you go up the food chain. Using the 10% rule in biology, each level gets only 10% of the previous level's energy. The highest amount of energy is contained within a producer (100%), which is why eating vegetables is so healthy for you! They are direct sources of energy, whereas meat only provides you with the energy leftover from an animal consuming plants.

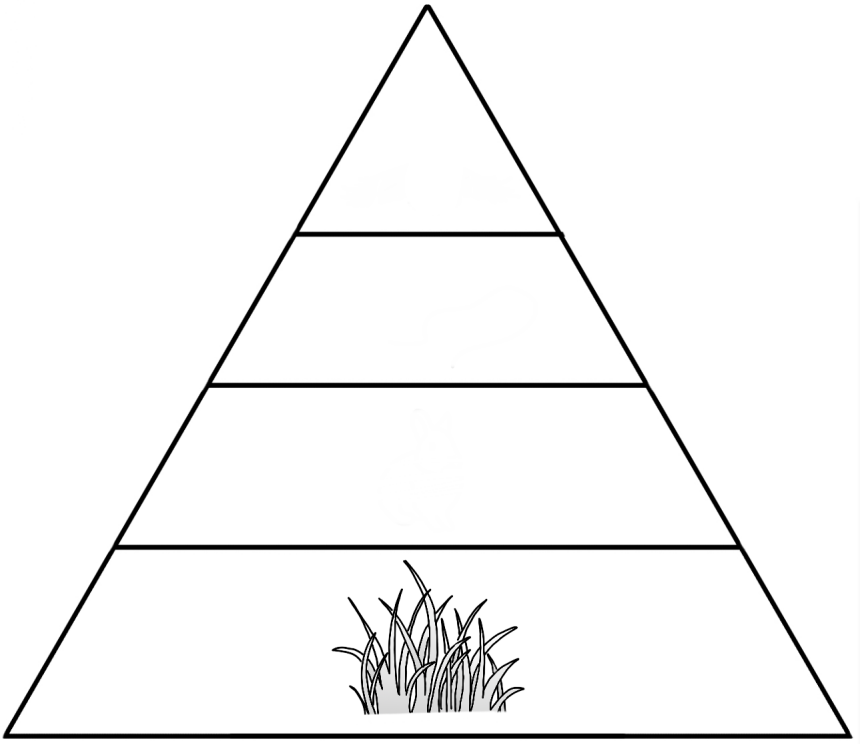


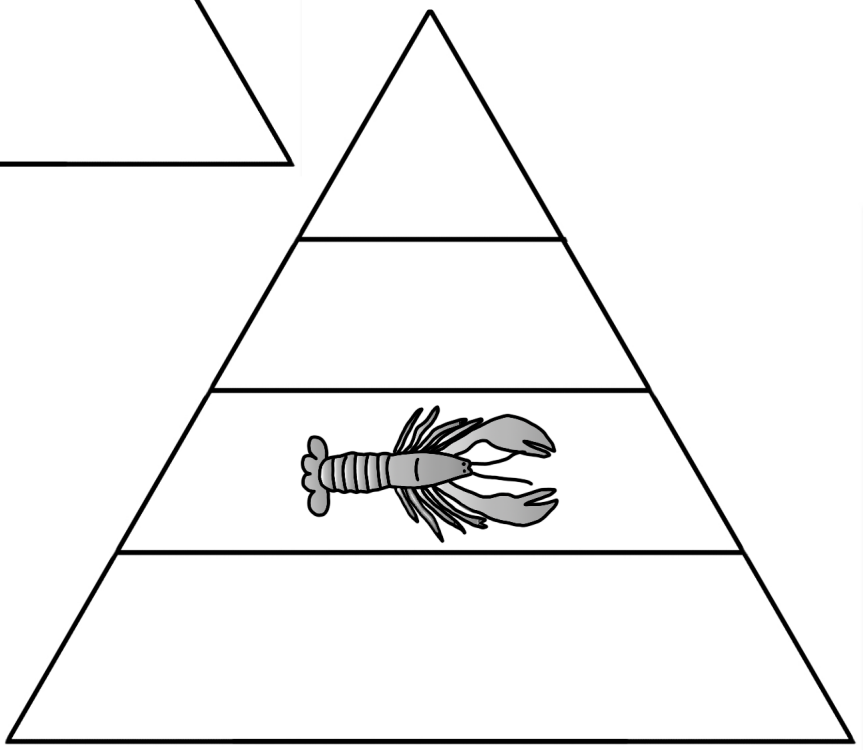
ENERGY PYRAMID

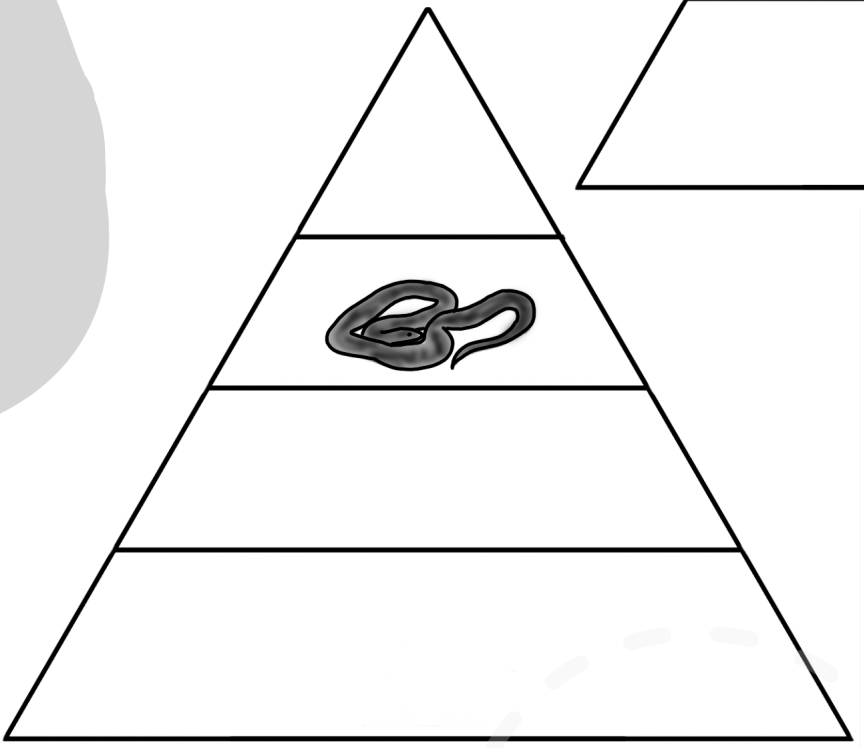








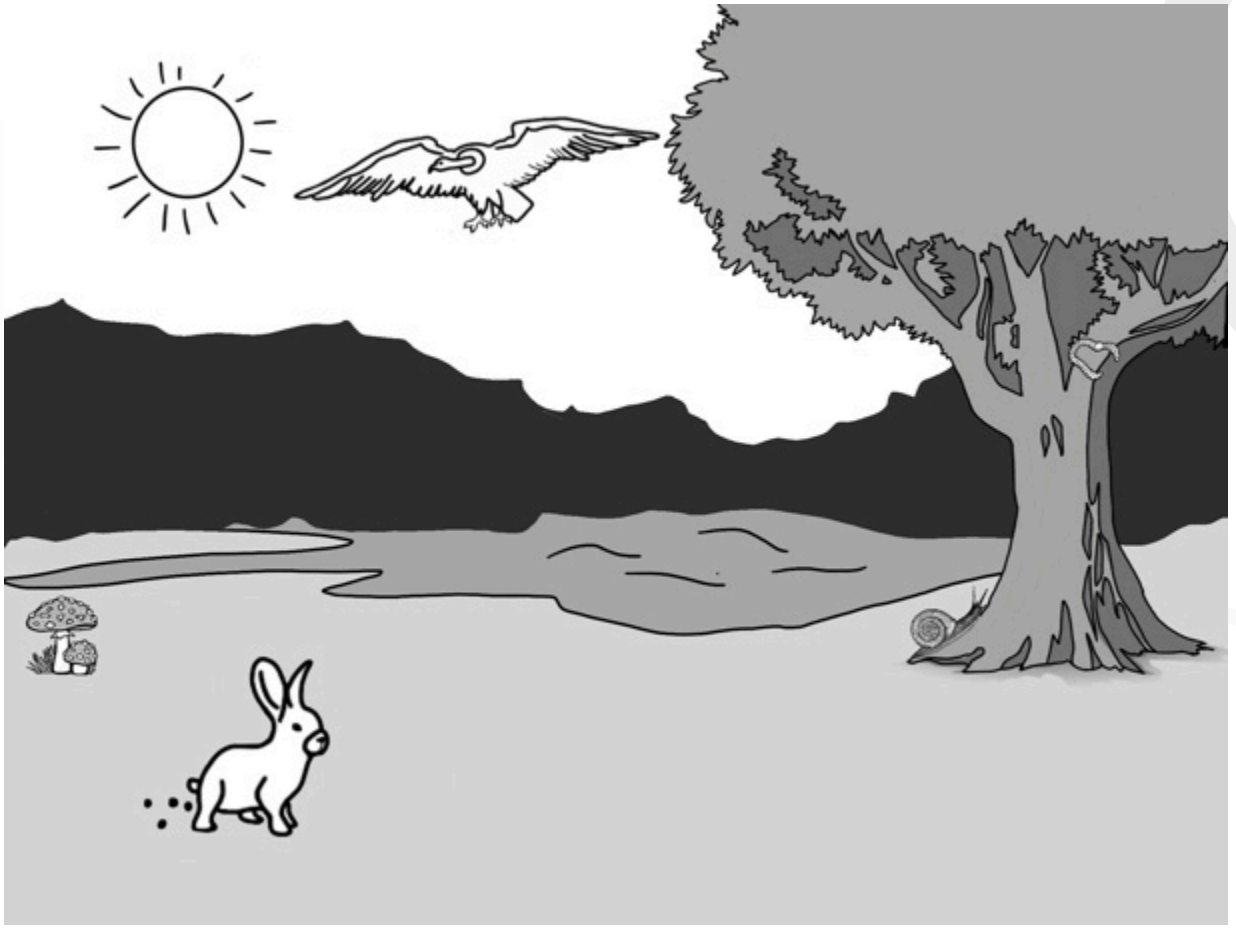




Ecosystem Challenge

Can you spot the abiotic (5), biotic (7), scavengers (1), decomposers (3), and micro-organisms (2) in the park below? Without the different types of plants, animals, and organisms in an ecosystem, it won't thrive and grow.
Which organism can use photosynthesis (1)?

Abiotic: Non-living chemical and physical parts of an ecosystem.
Biotic: Living organisms in an ecosystem.
Decomposers: Organisms that decompose organic material.
Micro-Organisms: Bacterium, virus, or fungus.
Scavengers: Animals that feed on dead materials.



List the abiotic, biotic, scavengers, decomposers and micro-organisms here! Circle them above too.

_____

_____

_____

_____

Extinction and Coding

Extinction is when the last of a species dies and that group no longer exists. Extinction can happen to any living organism.

There are several ways that extinction can happen:

1. **Pollution** happens when dangerous contaminants are added to an environment and causes a negative change.
2. **Loss of habitat** is when the place that a species lives is destroyed or taken over by another species.
3. **Overhunting,** when a species is hunted so much that it doesn't get a chance to reproduce before they are endangered or extinct. They are hunted more than they can reproduce their population.
4. **Trophy hunting**, when a human hunts an animal for fun. Poaching is when hunters kill animals for certain body parts (tusks, furs, teeth, fins) in order to sell them.
5. **Natural forces**, when a major natural event causes irreparable damage to an environment, including killing entire species. Examples include flooding, forest fires, mud slides.
6. **Introduction of a new species**, sometimes, humans introduce a new species into a foreign habitat. If this species becomes very strong and multiplies to high enough numbers, it may kill another species by hunting it or by taking over its home and leaving them with no place to live. The new species could also become a competitor to the original species, hunting the same food until the original species has nothing to eat.

Sometimes, it takes multiple factors to make a species go extinct. For example, a species that is losing its habitat and is being hunted, might become extinct quicker than a species that still has its habitat.

Do you know of any animals that are extinct? Write your answers below!

Now let's format extinction so it looks like a coding language. Here are a few rules to follow:

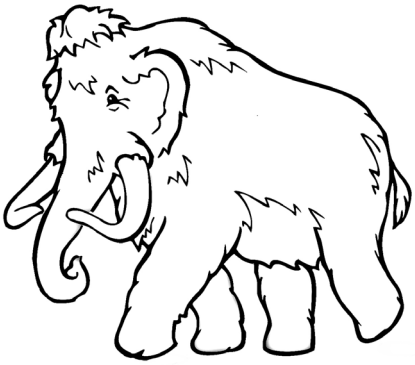
1. In coding, the simpler the code is, the better. This means that lots of words are shortened. For example, function becomes Func.

2. When writing out code, words don't have spaces in between them. Each new word in a line of code is also capitalized.

3. When you define a function, you need to include the word "function" at the beginning. This let's anyone reading the code know that the big event is seperate from the steps that it needed to complete it.

4. Functions are written as the first line of code. Components of the function are then put between curly brackets below the first line.

Coding an extinction
An easy way to visualize extinction is by using a coding language. In order to operate, computers follow a series of commands called functions. Functions are tasks that are made up of many little steps called components. Let's try and apply this thinking to the concept of extinction.



This is a Woolly Mammoth. It went extinct following an Ice Age.

Can you find the function in this example?
What is the component that made the function possible?

Take a look at the list of ways extinction can happen. What category does the Ice Age fit into?

Function: _____
Component: _____

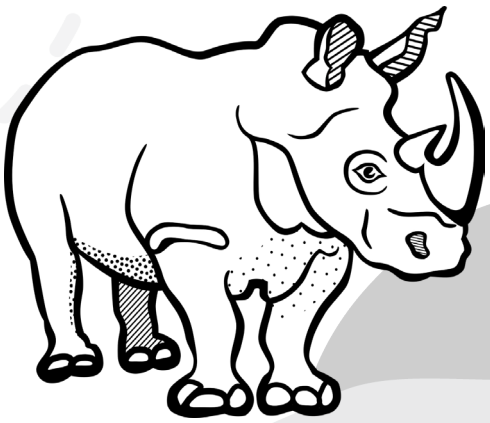
Let's try writing out the function and components in coding language

```
FuncExtinctionOfWoollyMammoth():
{

NaturalForce

}
```

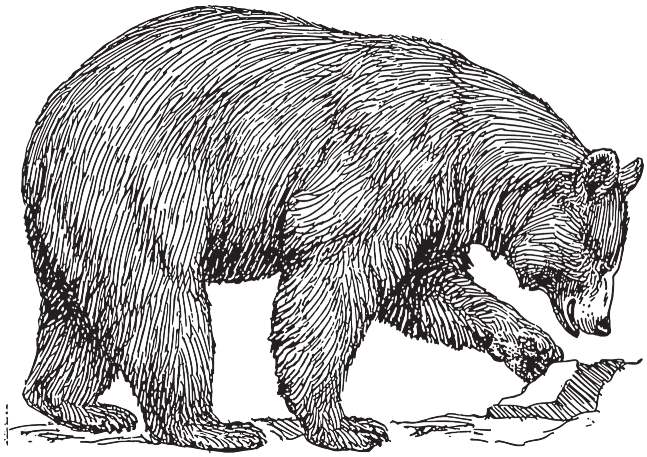
Now that you know how to write code and what you need to do it, test out your skills on the extinct species on the next page!

This activity continues on the next page.

This is the Western Black African Rhino. They went extinct in 2011 because their habitats in Africa were damaged by humans and they were being hunted and killed illegally for their tusks.



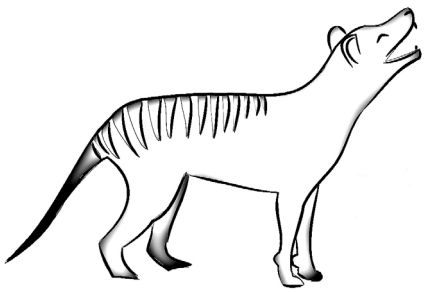
```
Func_____():
{



}
```



This is a California Grizzly Bear. The last one died in 1924. There used to be nearly 10 000 living in the wild but that changed after California was colonized in the late 1700s. When ranchers started raising cattle in California, the bears hunted the cows for food. To stop this from happening, ranchers would capture the bears and make them fight against their biggest bulls, which sometimes led to the bear dying. Ranchers would also actively hunt and kill the bears, even if the bear wasn't a threat to it's herd.

```
Func_____():
{



}
```

Turn the page to continue this activity!



This is a Thylacine, also known as a Tasmanian tiger. The last of it's species died in 1936 while living in an Australian Zoo. The thylacine was a species native to Oceania and came into existence 4 million years ago. Thylacines were carnivores and preyed on herds of sheep in Australia. Because of this, awards were given to farmers and hunters that would kill thylacines to stop the sheep population from declining. Thylacines also had a hard time finding food because they were competing with another predator. These predators were called Dingos and they were introduced to Australia a few thousand years ago.

```
Func_____():
{



}
```

Coding challenge

Your turn! Find a species that is nearly extinct. This is called being an endangered species. Find all the reasons that the species is going extinct. Write it out in a function and component form in the box below.

Species chosen: _____

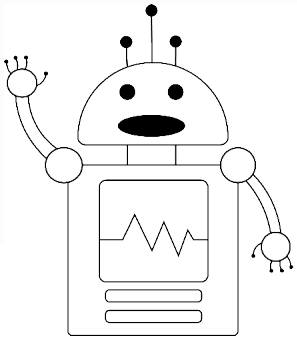
Reasons it's endangered:

You know all about how a species goes extinct. That means that you also know what humans need to do to stop it from happening. For the species you picked, write a code that will help the species survive. Make sure you include multiple strategies to help this species in your components!

```
Func_____():
{



}
```

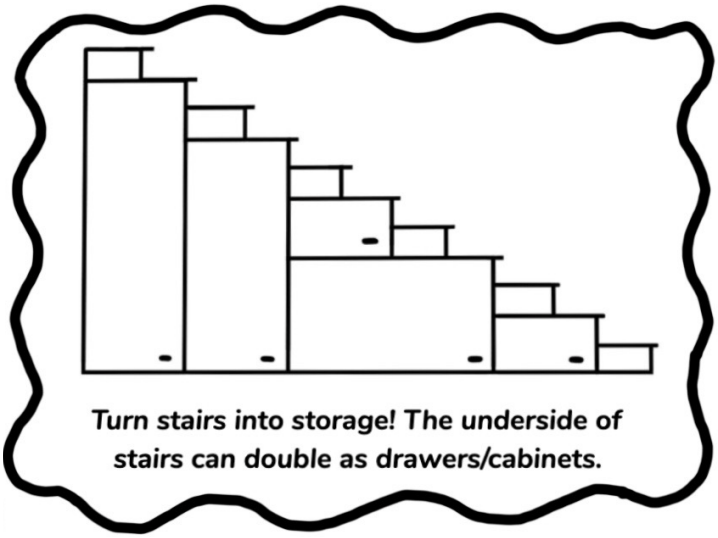
Esiw's Dream Tiny Home

Hey guys! So, I'm thinking about downsizing, but I'm not great at designing. I'd like a tiny home because they leave less of a carbon footprint than average-sized homes which take up large plots of land. I also think it will be great to learn how to live efficiently with less. I'd like my home to be mobile as well because I travel all around Manitoba for work. Can you help?

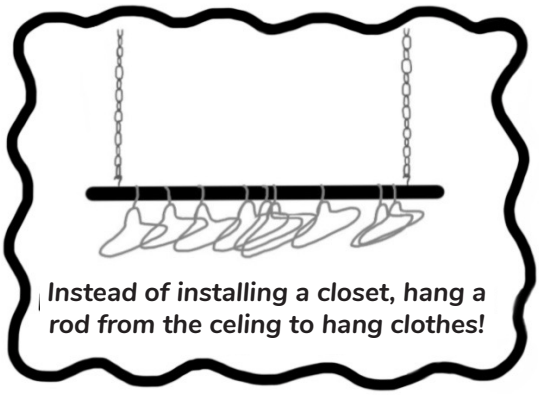


Tiny homes are designed to fill all the necessities of the average home into a smaller space, so you have to be innovative with your design. Often, storage spaces are hidden under beds or toilets are in closets. Below are some "hacks" you may use while designing:

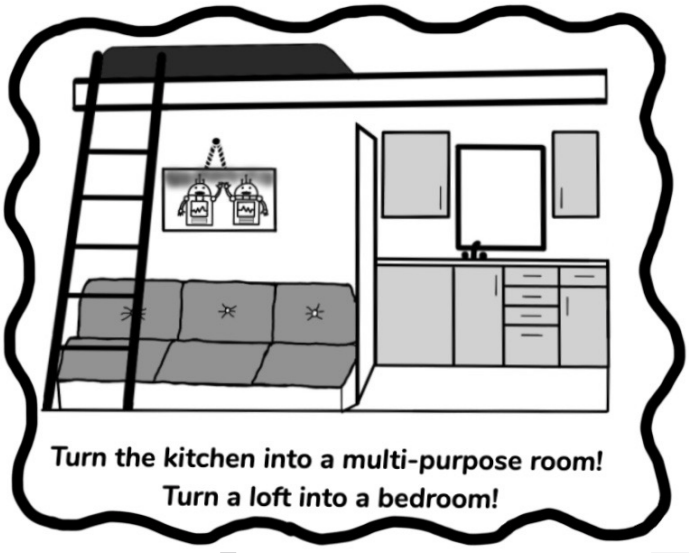
Instead of a table - add a small breakfast bar to the wall with some stools!



Turn stairs into storage! The underside of stairs can double as drawers/cabinets.



Instead of installing a closet, hang a rod from the celing to hang clothes!



Turn the kitchen into a multi-purpose room! Turn a loft into a bedroom!

This activity continues on the next page.

Esiw has a set budget of $20,000, and has given us a “must-haves” and an “extras” list. Try to budget in some extras … Esiw needs something to do on their time off! Think practicality! Labour costs are $10,000 of your budget, spend the rest wisely!

✳ LABOUR COST: $10000

MUST HAVES:

- Kitchen (dining table with chairs, fridge, stove, cabinets) $2000 ☐
- Bedroom $1000 ☐
- Toilet $100 ☐
- Sink $250 ☐
- Shower $500 ☐
- Closets (2) $1000 ☐
- Dresser $200 ☐
- Other storage $400 ☐

EXTRAS:

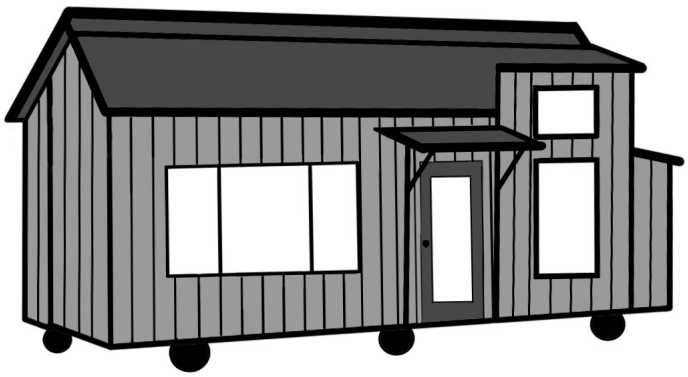
- Couch $1000 ☐
- Desk $200 ☐
- Television $800 ☐
- Ping-Pong table $350 ☐
- Deck $2500 ☐
- Barbeque $200 ☐
- Indoor garden $200 ☐
- Artwork $500 ☐

Must Haves Sub-Total: _____

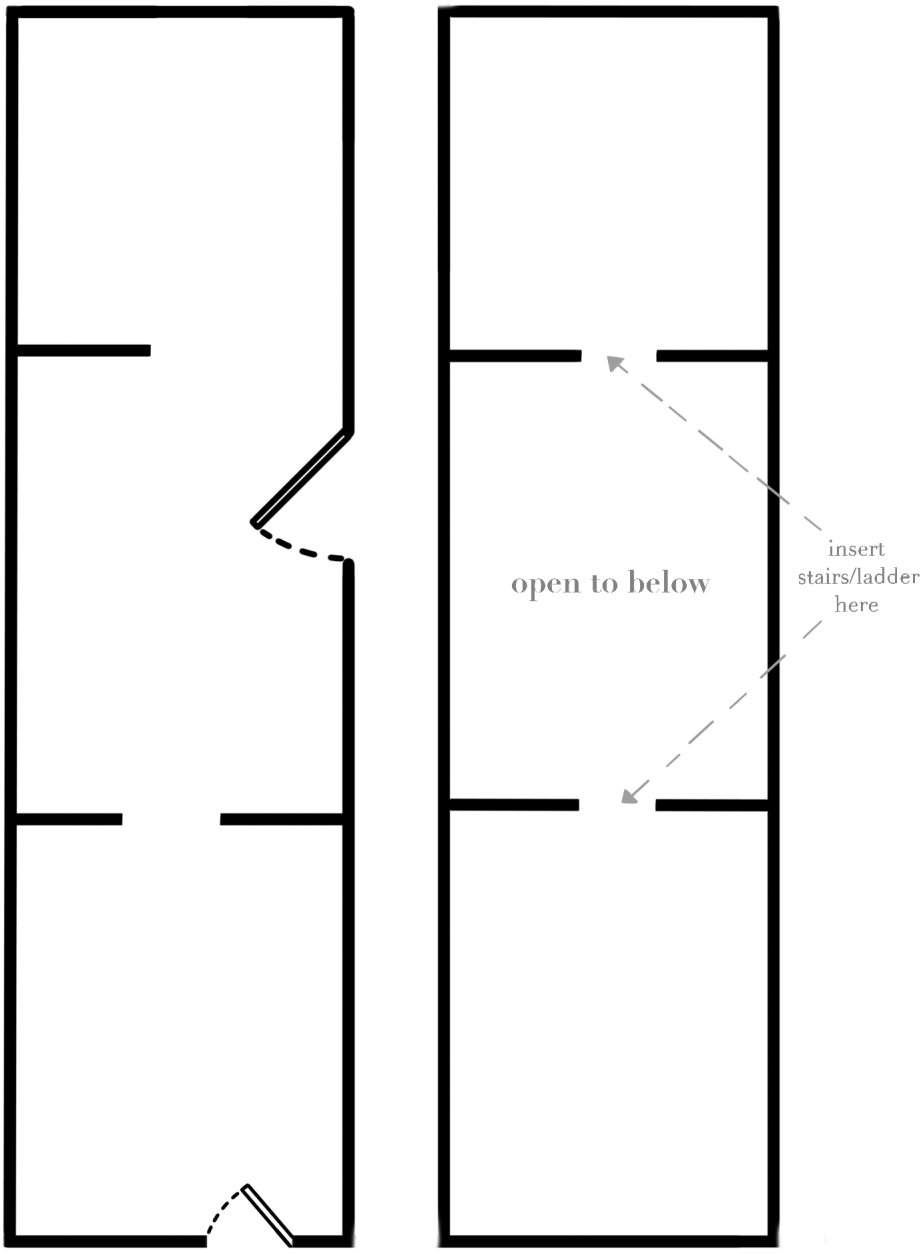
Extras Sub-Total: _____

Project Total (Must Haves + Extas + Labour Cost): _____

Let’s draw on your extras on the exterior of Esiw’s tiny home!



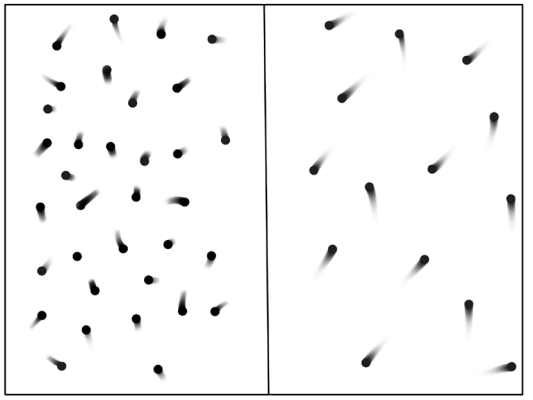
Now, to plan the interior, where will the bedroom, bathroom, and kitchen go?



Heat and Fluids Exploration

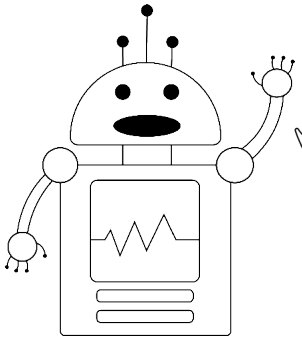
For all matter, adding heat makes the particles gain kinetic energy, so they move around more and take up more space. Hotter substances expand and are less dense than cooler ones.

Some real-world examples of this are air currents, ocean currents, and hot air balloons! Currents form when hot and cold fluids meet and interact with each other. The denser cold fluid sinks down, while the lighter hot fluids rises up. Hot air balloons work in a similar way; the hot air inside the balloon is less dense than the air around it, which lifts it up above its cooler surroundings.



Particles in a cold substance

Particles in a hotter substance



Reading instructions and completing steps in a certain order is how computers read code! Following step by step instructions to complete a task is called an algorithm.

Part One

You will need:

Two clear glass cups
A syringe (not necessary, but recommended)
Food colouring
Hot and cold water

Step 1 To begin, pour hot water into one glass until it is mostly full.

Step 2 Take cold water (just from the tap is fine), and add a few drops of food colouring, then stir until the food colouring is mixed in.

Step 3 Using the syringe, “inject” some cold water into the glass of hot water. If you don’t have a syringe, pour some cold water into the hot water while disturbing the hot water as little as possible.

Step 4 How does the cold water move and interact with the hot water?

SLO : 7-2-01, 7-2-03, 7-2-08

Step 5 Now, try the opposite! Add food colouring to some hot water, and then add it to the cold water in the glass.

Step 6 What happens this time? Can you see how the different temperatures of water act?

Part Two

You will need:

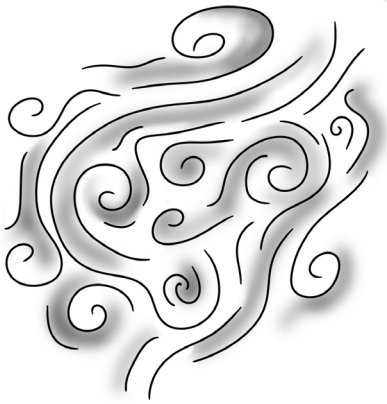
A large clear container (a vase or jar works well)
2 different colours of food colouring
Hot and cold water
A clear glass

This activity will show how ocean and air currents flow and interact!

Step 1 Start by filling the container about 3/4 full with cold water. Add in a few drops of food colouring, and stir until it is all a consistent colour.

Step 2 Take some hot water in a clear glass and add in a few drops of the second colour of food colouring. Stir until its a consistent colour.

Step 3 Slowly pour the hot water into the container of cold water until it's full (it will reach the top of a jar or vase).



Step 4 Watch how the colours swirl and interact with each other! Can you see the two distinct temperatures of water?

Step 5 Leave the container to sit. Over time, the heat will transfer from the hot water to the cold water until they reach equilibrium and are the same temperature. This transfer of heat through a fluid is called convection.

This activity continues on the next page.

Part Three

You will need:

2 clear glasses of the same size
2 different colours of food colouring
Hot and cold water
A piece of thin, hard plastic or sturdy paper

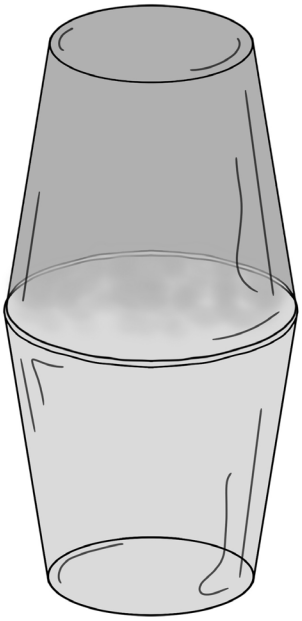
It is recommended to do this activity outside, in a sink, or over a large tray as it could get a bit messy!

Step 1 Fill a glass with cold water and add in a few drops of food colouring. Fill the second glass with hot water and add the other food colouring.

Note: Both glasses should be as full as possible, with the water rising slightly above the rim of the cup.

Step 2 Set the piece of plastic or paper on top of the glass of hot water, so it is completely covering the top. Press down so it touches the rim of the glass and creates a seal.

Step 3 Using the plastic/paper to prevent spilling, flip the glass of hot water upside down and set it on top of the cold water glass.



Step 4 Carefully pull out the plastic/paper while holding the glasses in place on top of each other.

Step 5 Ta-da! Look at how the different temperatures of water interact! There might be some mixing in the middle, but the colours should stay mostly seperated.

Step 6 Repeat this process with the cold water on top instead. Notice how the water acts differently! Because cold water is denser, it will quickly sink to the bottom.

Code Your Rock!

In order to understand minerals better let's think of them in coding terms.

Minerals are different because they have different formation processes and are made up of different things.

In coding a variable is like a labeled box where you can have many different things inside of the same category. For example a variable can be balls, and within the variable of balls we can find blue, red or green balls. A variable for minerals can be what they are made out of, they can contain plant debris or shells and corals.

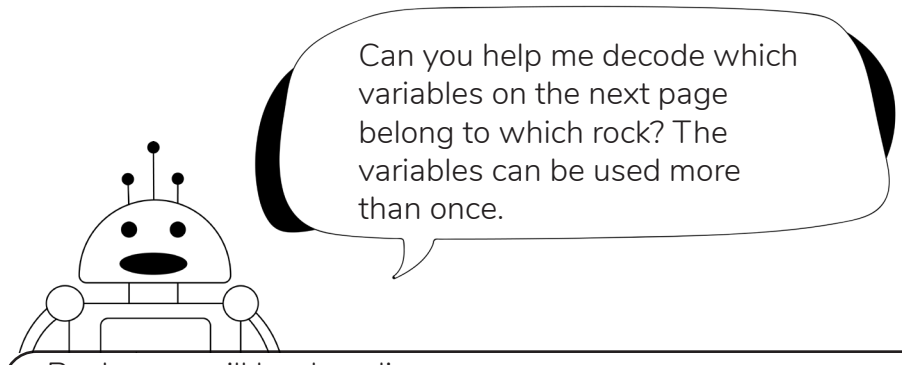
In coding **conditional statements** allow the computer to do something if something happens. An example of a conditional statement would be if the rock is igneous is formed as lava cooled down over the years.

Now that you know so much about coding, let's teach Esiw about the rocks that live on Earth. Since Esiw is a robot, he is not familiar with rocks. Computers need to be given information to them in order to function. Often this data is stored in something called data sets, where the data is stored as a collection of similar information. Today Esiw will be learning about rocks and storing them in a data set.

Here is what Esiw already knows about these rocks:

- Coal is a rock used all around the world to fuel things like cars and electricity, it has a negative impact in the environment as it pollutes a lot.
- You can find fossils in limestone rocks .
- Granite is a great rock to carve in.
- Basalt is found on the Moon because its volcanoes are composed of basaltic lava.
- Marble isn't made from marbles, marble got its name for their appearance.
- Quartzite was used by humans to make stone tools for over one million years.

In this activity you will learn to code the rocks below by matching them to their variables, helping Esiw to learn about rocks.



Rock type variable

Igneous	Metamorphic	Sedimentary
if igneous =	if metamorphic =	if sedimentary =
formed from solidified lava	formed from alteration of existing rock	formed from the accumulation of sediment

Formation variable

Sandstone is altered by heat, pressure, and chemical activity	Shell, coral, algal, and fecal debris	Plant debris	Limestone is subjected to heat and pressure
		Cooling of lava	

Physical appearance variable

Grey/white and shiny	Black fine-grained	Black and shiny	Translucent light coloured rock
Coarse-grained, light-colored			

Uses variable

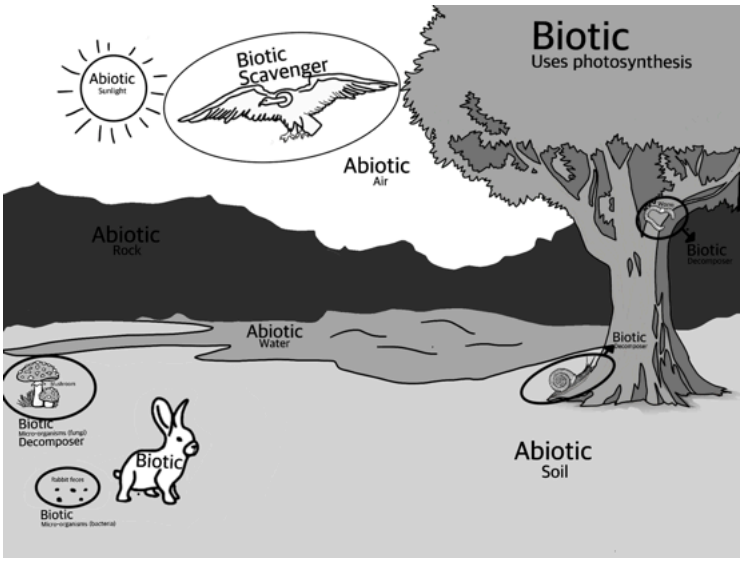
Sculpture and decoration	Construction, manufacturing, architecture	It is a component of concrete	Decoration in tiles and countertops
Construction material		Fuel	

Fill in the table below with the variables above for each rock!

	Coal	Limestone	Granite	Basalt	Marble	Quartzite
Rock Type						
Formation						
Description						
Uses						

Answer Key

Page 6:



Page 9-10: Western Black African Rhino: FuncWesternBlackAfricanRhino, TrophyHuntingAndPoaching;
California Grizzley Bear: FuncCaliforniaGrizzleyBear, Overhunting;
Thylacine: FuncThylacine, PoachingAndOverhuntingAndIntroductionOfANewSpecies.

Page 18:

	Coal	Limestone	Granite	Basalt	Marble	Quartzite
Rock Type	Sedimentary	Sedimentary	Igneous	Igneous	Metamorphic	Metamorphic
Formation	Plant debris	Shell, coral, algal, and fecal debris	Slow crystallization of magma	Cooling of lava flow	When limestone is subjected to the heat and pressure	Sandstone is altered by heat, pressure and chemical activity
Description	Black and shiny	Grey/white and shiny	Coarse-grained, light-coloured	Black fine-grained	Translucent light-coloured rock	Grey-white grainy
Uses	Fuel	Construction material	Decoration in tiles and countertops	It is a component of concrete	Sculpture and decoration	Construction, manufacturing, and architecture

Thanks to our Amazing Sponsors!

ENGAP

MANITOBA AEROSPACE

NSERC CWSE-Prairies
Women In Science & Engineering

MOTOROLA SOLUTIONS FOUNDATION

ENGINEERS GEOSCIENTISTS MANITOBA

green équipe team verte
Manitoba

NSERC CRSNG

UM | Price Faculty of Engineering

faculty of SCIENCE
discover the unknown + invent the future

WISE Kid-Netic Energy is a proud member of Actua.

A network member of actua.ca

actua
Youth · STEM · Innovation

With funding from Canada

For more fun, STEM content, visit us at wisekidneticenergy.ca and follow us on social media!

@wisekidnetic

WISE Kid-Netic Energy