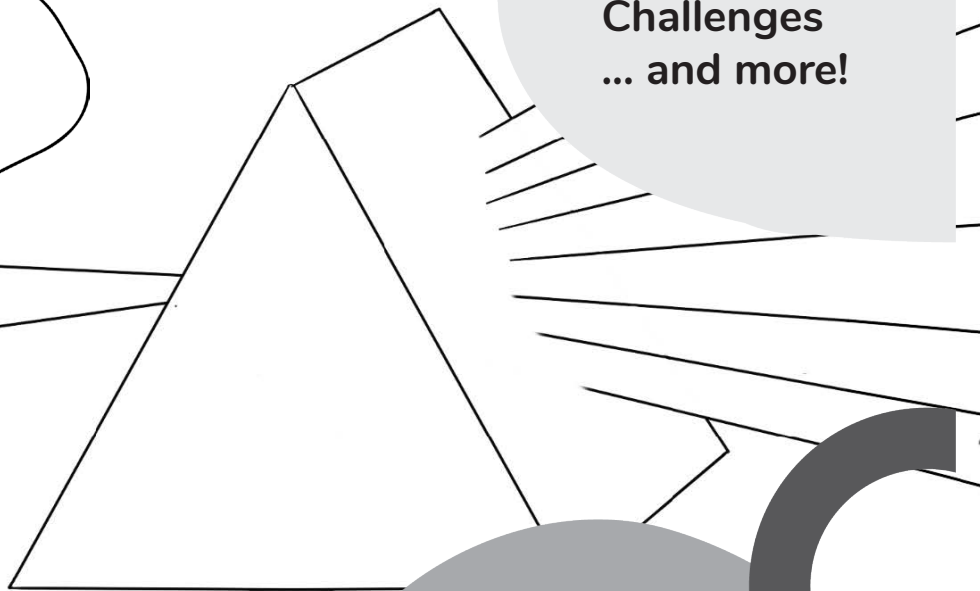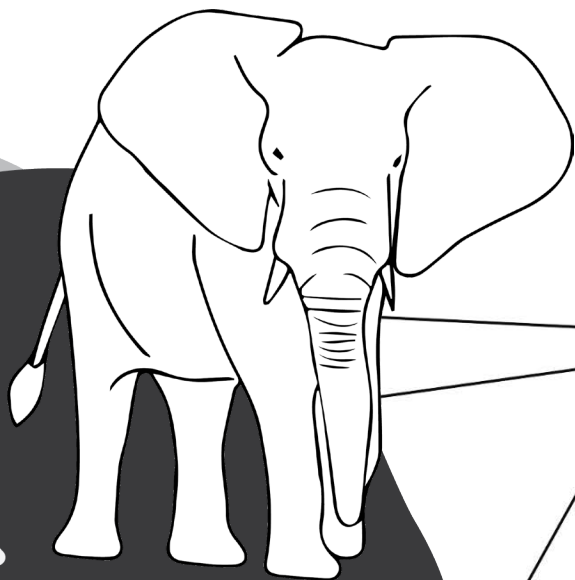# WISE Activity Booklets

A STEM activity booklet for fun on-the-go learning!
Made by WISE Kid-Netic Energy

DIY Activities
Puzzles
Challenges
... and more!

University of Manitoba

Grade 4
JUNE 2020

Habitats & Communities - Light
Sound - Rocks, Minerals & Erosion
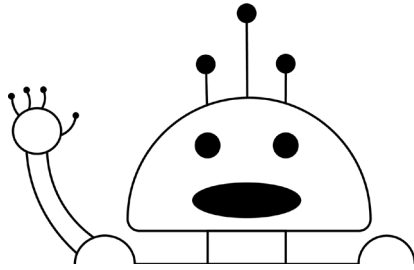
Hello there!

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 4 booklet, the science topics you will be exploring are: habitats and communities, light, sound, rocks, minerals and erosion, 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!

Gagan is a fourth-year BSc Honours Student in the Department of Psychology. She enjoys being creative and loves to learn! In her free time, she likes to try new things, read, and grow plants.

Gagan

Habiba

Habiba is a second year computer engineering student. In her free time, Habiba loves to learn about everything computer and internet related, but in her free time she likes to draw, go outside as well as cook.

Kajal just finished her first year of Computer Science and is pursuing a Bachelors of Computer Science. She loves to read, sketch, and make things.

Kajal

Toni just finished 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. She loves learning and is excited to be part of the WISE team.

Toni

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!

Victoria

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!
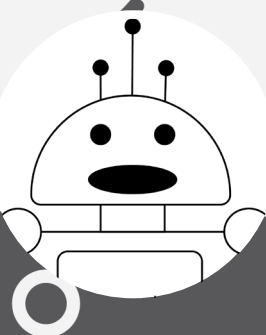
Code an Animal

Let's teach Esiw about the animals that live on Earth! Every type of animal has different characteristics and different requirements to survive in its environment. In this activity you will learn to code the animals below by matching up their characteristics, helping Esiw to learn about animals.
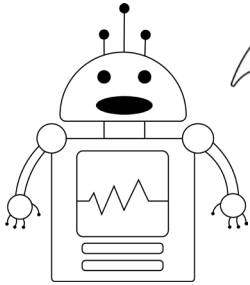
Hi! I'm Esiw. Computers like me need to be given information, or "**data**", in order to function. Often this data is stored in a "**data set**". You can think of a data set as a collection of organized information. Please help me complete my data sets for each of these animals!

Choose one (or more) of the animals below and help Esiw complete a data set for each one by filling in the animal's name, habitat, eater type, favourite food, adaptation, and fun fact! You can find all the possible options for each category on the next page.

DATA SET:

ANIMAL NAME	EATER TYPE	FAVOURITE FOOD
HABITAT	ADAPTATIONS	FUN FACT

SLO : 4-1-01, 4-1-02, 4-1-04, 4-1-07,
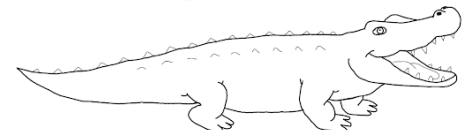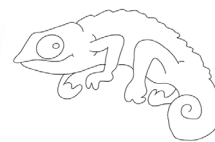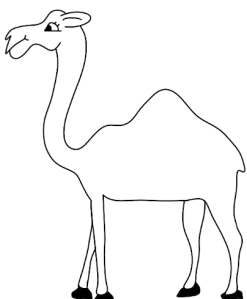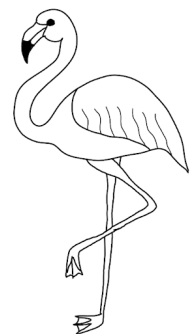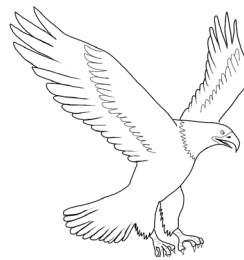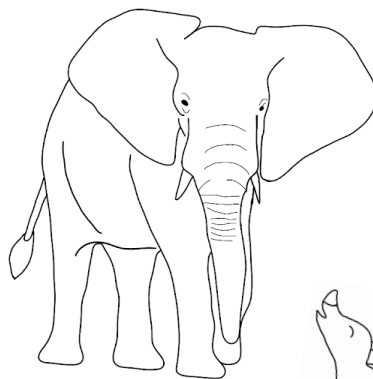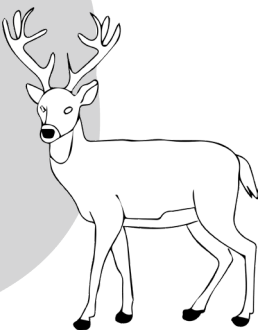
ANIMAL NAME

King Penguin
Flamingo
Elephant
Alligator
Camel
Deer
Bald Eagle
Chameleon
Grey Wolf

ADAPTATION

fast runner
talons to catch prey
flaps ears to cool down
long tail for swimming
long tongue to catch insects
long legs to walk in deep water
can handle cold AND hot climate
skin pockets for incubating eggs
two toes for walking on sand

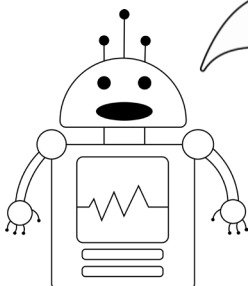**EATER TYPE**

carnivore
omnivore
herbivore

FAVOURITE FOOD

crickets & roaches
deer & moose
fish & birds
fish & rabbits
lantern fish & krill
worms & algae
shrubs & grass
twigs & stems
leaves & fruits

HABITAT

forest
tropical
desert
wetland / swamp
polar

FUN FACT

can jump the length of a school bus
can live up to 6 months without water
has approximately 7,000 feathers
howls to communicate with others
cuddles during blizzards to keep warm
can regrow lost teeth up to 50 times
changes colour based on temperature and light
sleeps standing on one leg
likes to swim, using trunk as a snorkel

In coding, a **variable** is like a labelled box. The box might be labelled "animal name" or "eater type". Your job on the previous page is to fill the box with something that fits the label! Above me, you can see all the possible **instances** of each variable. An instance is like one of the options for the variable. For example, "animal name" is a variable, and "elephant" is an instance of that variable.

Shadow Puppets

A shadow is a dark area that appears behind an opaque object that is blocking light. Shadows can be very useful. They give us shade on hot sunny days, and can create great hiding spots for hide and seek! But did you know that you can also tell stories with shadows?

1 Shine a strong light directly onto a blank wall. You can use a lamp of a flashlight for this step.

2 Place your hands halfway between your light source and the wall.

3 Follow the hand placements you see in the photos to make your shadow puppets!
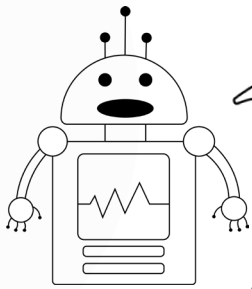
To a computer, the world is understood in **binary**: everything must be broken down to either an "on" or an "off" state (or sometimes "true" vs. "false", or "yes" vs. "no"). You can think of light and shadow in this way. Places with light can be described by a 1 (on) and places with shadows as a 0 (off).

→ TRY THIS:

What happens to your shadow when you move your hands closer to the wall?

What happens when you move your hands closer to the light?

Can you make up a story to go with your shadow characters?

Can you make up any new shadow characters?

Can you trace your shadow character on a piece of paper? Try getting a friend or parent to help you!

CARIBOU

SNAIL

BULL

EAGLE

WOLF

SLO : 4-2-07, 4-2-12

Habitats Across the World

Each of these animals belongs to a habitat where it can live comfortably (with a different climate, and among plants and other animals that suit its needs).

Can you match each animal to its home? Cut and glue each animal onto the map on the next page. Each of these creatures has a helpful hint on the back of this page!

Remember **variables** from page 4? What are the variables we are working with here, and what are some instances of those variables?

SLO : 4-1-01, 4-1-02, 4-1-03, 4-1-07
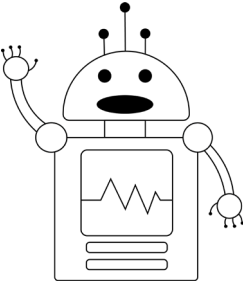
Can smell their food under snow and eat moss, herbs, and twigs

Can be found hanging out in trees in the Amazon forest

Live along rivers/ streams in meadows, woodlands and forests

Chew grass, can't last long without water, and continually clean their fur

Found in Africa, these animals eat mostly leaves, grass, and herbs

Go long periods without water and eat plants and grasses

Chew mostly on bamboo and live in trees and caves

Eyelashes protect them from sand & can live 6-months with no food/water

World's biggest cat, good swimmers, like forests, and tall grass jungles

These furry creatures are adapted well to cold climates and hunt on ice

In the deep south these animals store fat to adapt to the cold climate

Rest up to 20 hours to save energy and to escape the hot weather
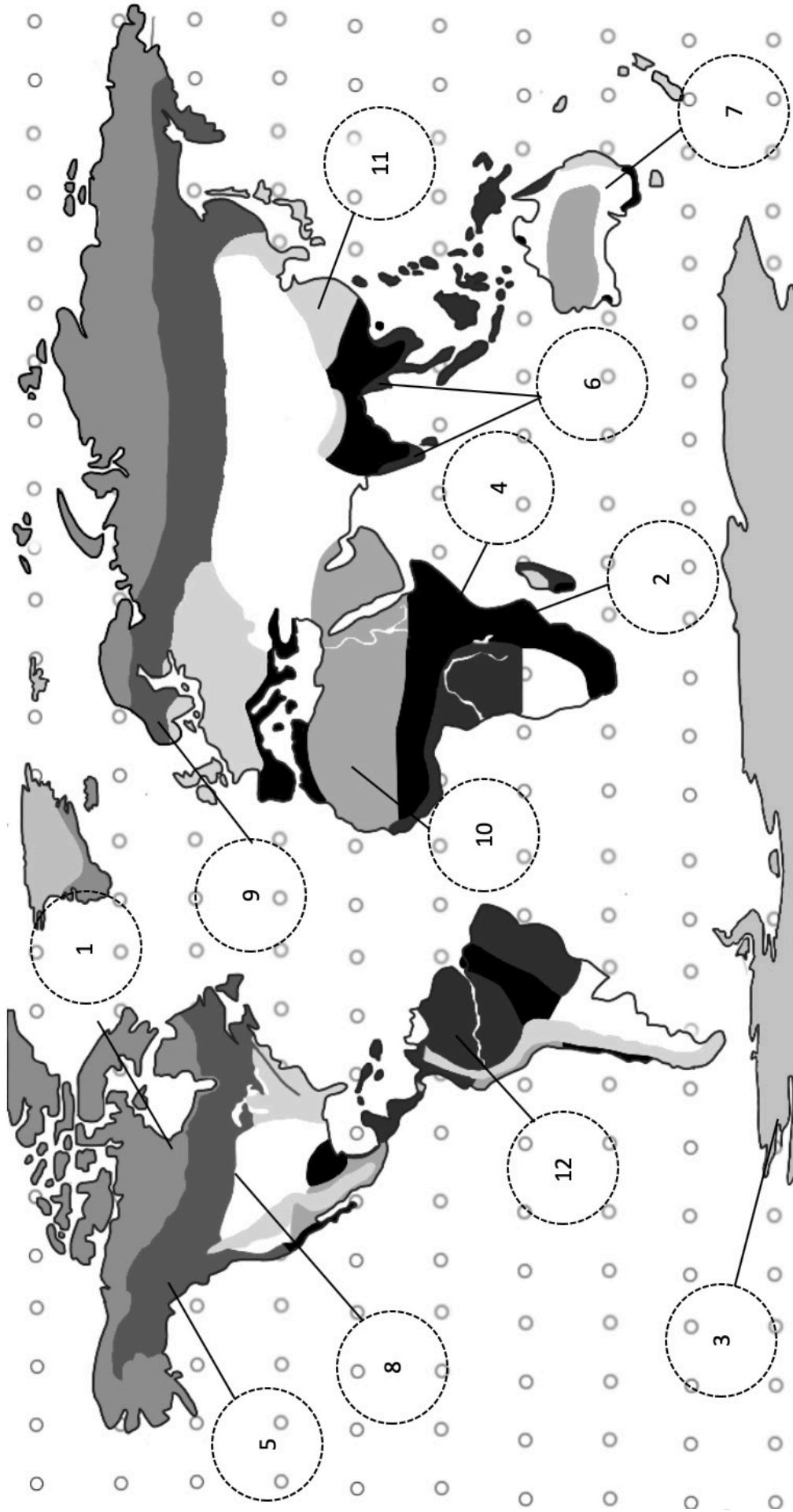
Ocean: saltwater, regulates Earth's climate

Grassland: mild rain, dry climate, grasses

Temperate Forest: dry, cool climate, many trees

Ice

Desert: dry, little rain, cool nights, small plants

Polar: ice / snow, cold, little rain, small plants (moss, shrubs)

Taiga/Boreal Forest: lakes / rivers, wetlands, mountains, trees

Rain Forest: warm, wet, many plants (vines, leaves), tall trees

Savanna/Tropical Grassland: little rain, grasses, shrubs, few trees

Sound Story

Some of the ways we can characterize sounds are what the sound in traveling through, the pitch, and the loudness. Esiw wants to hear how these characteristics affect how we hear sound. Will you read everything out loud exactly how you would hear it?

Shhh… that's too loud. I am whispering this part so you can see how quiet I can be. Then you won't hear me say poop! Or bloop bleep bleep. I bet you can't hear me at all right now. Unless I whisper in your ear!

This is how I sound normally, but sometimes when I sing I raise my pitch like this. R O O O O M B A D O O O O M B A D A D A D A A A A A L A L A L A I A M A S T A R! NOW I WILL SHOUT. HEY ESIW I AM A POTATO. OOPS I DID NOT MEAN TO SHOUT THAT. No one was supposed to know that I am a potato and not a human.

THIS IS WHAT ESIW SOUNDS LIKE. HELLO WORLD!

Anyways, sometimes I TaLk LiKe ThIs. I sOuNd LiKe A fIrE tRuCk WhEn I dO tHiS. tHiS iS sO mUcH fUn.
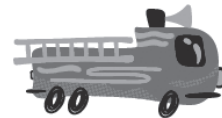
I can't really talk when I'm under water but this is what I hear _____.

When I go inside a cave I shout
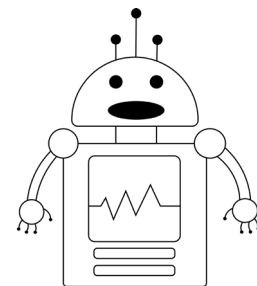HELLO!
    HELLO!
        HELLO!
WHO SAID THAT?
    WHO SAID THAT?
        WHO SAID THAT?
OH IT'S ME!
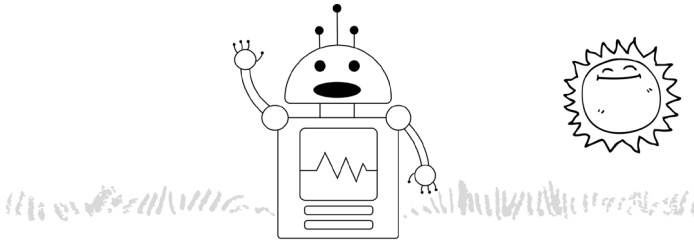   OH IT'S ME!
        OH IT'S ME!
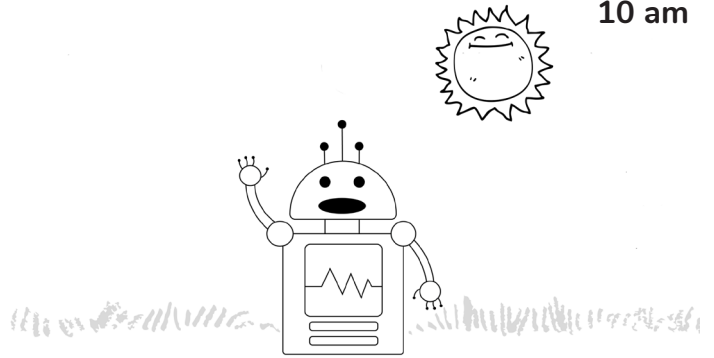
SLO : 4-3-04, 4-3-05, 4-3-07, 4-3-13

Draw the Shadow

Based on the position of the sun at the following times, draw where Esiw's shadow would be! Follow the hints in Esiw's code for help!
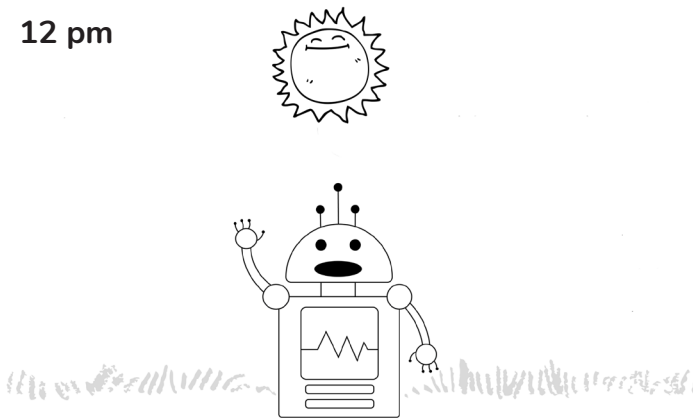
6 am


```
if sun position = 'lower right';
    shadow = 'long and to the left'
```
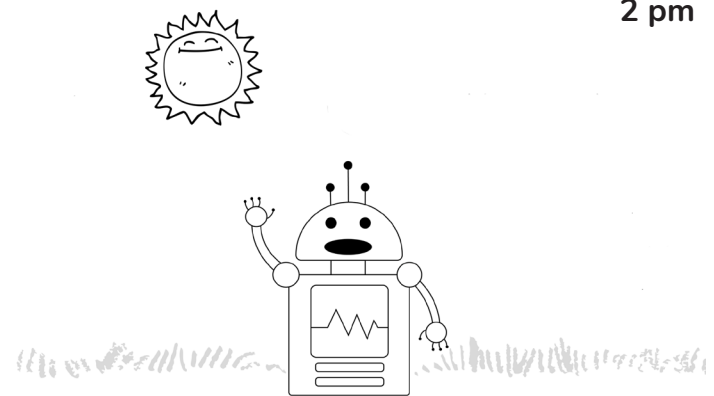
10 am


```
if sun position = 'upper right';
    shadow = 'short and to the left'
```
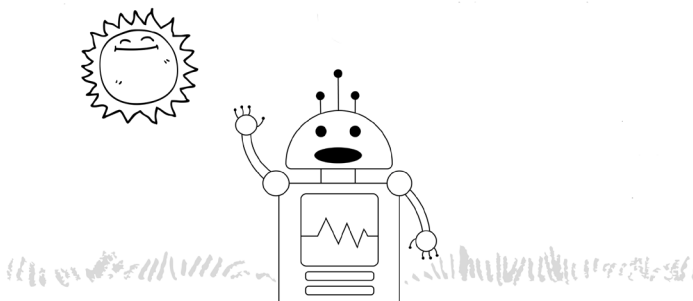
12 pm


```
if sun position = 'directly above';
    shadow = 'short and at the bottom'
```
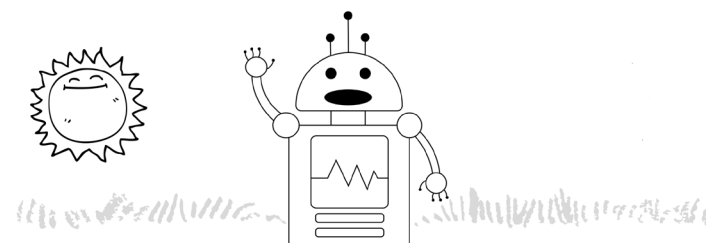
2 pm


```
if sun position = 'upper left';
    shadow = 'short and to the right'
```

5 pm


```
if sun position = 'centred left';
    shadow = 'medium and to the right'
```

8 pm


```
if sun position = 'lower left';
    shadow = 'long and to the right'
```

SLO : 4-2-07, 4-2-12

Habitats - Spot the Glitches

While learning about different habitats one day, Esiw noticed that Pola the Polar Bear's habitat wasn't quite right. Esiw calls these errors "glitches". Can you find everything that shouldn't be in Pola's habitat? Cross out all the glitches in the image below.


Now let's try and help Pola even more. What do you think could be **added** to Pola's habitat to make it even better for her to live in? List everything you think can be added:

Hint: Think about what makes your habitat great. What do you eat? Where do you sleep? Who do you spend time with? Is there a certain type of weather that makes you happy? Think of how Pola would answer these questions.

Now, using all the suggestions you wrote down above, go back to the image and draw the things that could make Pola's environment better. Make sure to colour in your new picture!

SLO : 4-1-02, 4-1-03, 4-1-07, 4-1-14

Build An Ear

Uh oh! The following ear parts have been scrambled. Are you able to help me recode the following ear parts and put them in the correct order? Cut the following pieces and place them in the correct order on the next page. **Hint:** use the colours of each piece to correctly group each section
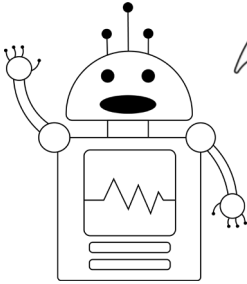
Like the parts of your ears, **functions** in code are used to complete specific tasks within a larger overall task. In the large task of hearing, **data** (sound waves), enters the ear and is processed by each part of the ear in turn. Eventually the information reaches the brain, giving an end result: hearing a noise!

Pinna: the part of the ear you can see outside the body. collects sound like a funnel and amplifies it (makes it louder)
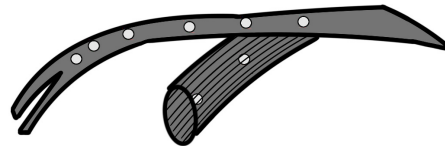
Ear Drum: receives vibrations in air, and changes them to vibrations inside the ear
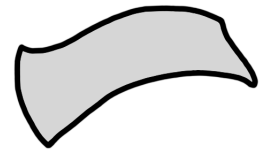
Ear Canal: an air-filled tunnel

Malleus: a bone like a little hammer that sends vibrations to the incus

Vestibular / Auditory Nerve: sends sound information to the brain after being activated by hair cells

Stapes: the tiniest bone in the body! sends vibrations to the cochlea

Cochlea: fluid inside it moves in response to sound vibrations, which causes tiny hairs on the inside to be tickled

Incus: a bone like a little anvil that sends vibrations to the stapes

SLO : 4-3-05, 4-3-09

This page is intentionally left
blank, because the previous
page is meant to be cut up.

Brain: receives and processes sound after it has moved through all the parts of the ear

Opacity Hunt

In this scavenger hunt you will use your classifying skills to group objects around you based on the amount of light that passes through them (whether they are translucent, transparent, or opaque).

For each item that you find, check **page 19** to collect a special symbol that will help you fill in the cartoon below! (Don't cheat - try to find the object before you check its symbol and decode the secret message!)

1. Opaque and heavy
2. Opaque and you can eat it
3. Opaque that bounces
4. Opaque and is in the bathroom
5. Opaque and you can drink
6. Transparent and translucent
7. Transparent and helps you see better
8. Transparent and you can see outside through it
9. Transparent and can be used as a container
10. Transparent and it is found inside something else
11. Transparent and you can drink it
12. Translucent and is in a cold place
13. Translucent and is in the sky
14. Translucent and can be filled with air or water
15. Translucent and you can drink it
16. Opaque and transparent

→ **CODE LEGEND:**

+ A	(J	§ S
~ B	? K	‖ T
{ C	& L	} U
^ D	* M	% V
! E	> N	// W
Ω F	@ O	:) X
= G	$ P	\\ Y
- H	< Q	:(Z
) I	# R	

Are we ___ ___ ___ ___ ___ ?
4 10 12 1 15

No, ___ ___ ___ ___ ___
11 3   16 13 5

___ ___ ___ ___ ___ ___
8   6   14 9   2   7
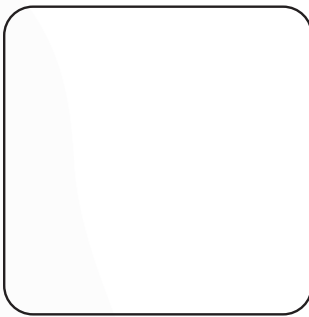
SLO : 4-2-01, 4-2-10
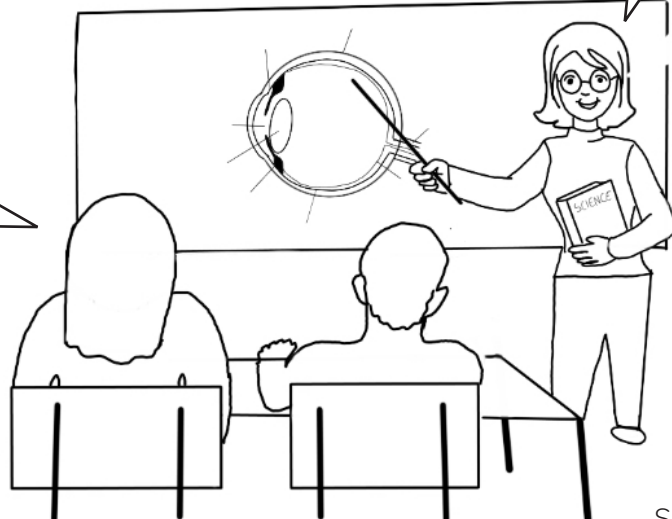
Tech Fossils

Fossils are the remains of a once living organism. They are important for helping us understand the past. They tell us about organisms that used to exist that are now extinct and about how the Earth has changed over time. We can use this information to learn about our past and how we evolved.

BODY FOSSILS are when we find preserved bones, teeth or claws of an animal, or imprints that parts of the animal have left on rocks.

Draw one more part of the body that we would most likely find.

TRACE FOSSILS tell us about how the animal lived and interacted with the world. These can be footprint, homes, and coprolites.
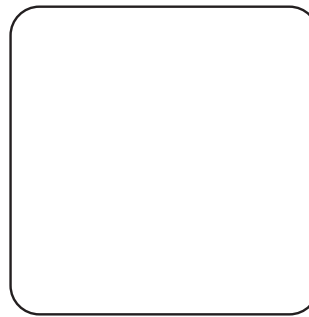
Draw another type of trace fossil that you can think of!

Can you find examples of **technological fossils** around your house? Which ones are now "extinct"? Sort each item into body fossils / trace fossils, and draw the current version in the 'now' column.
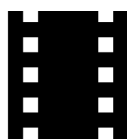
BODY FOSSILS
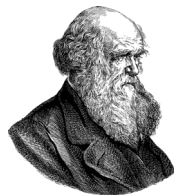
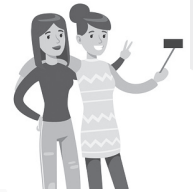portrait

typewriter

TRACE FOSSILS

stamp from a postcard

undeveloped film

NOW

selfie

texting

Hint: if you use an app or website instead of an object, you can still draw it! Try drawing the way you use it or what the app looks like.
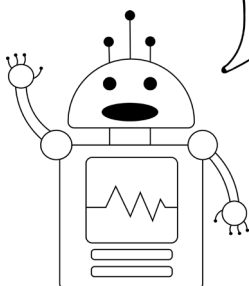
Prism Coloring Page

Did you know that sunlight is a combination of all the colors of the rainbow but it looks white? When that light goes through a prism, it bends, making all the colors separate, and creates a beautiful rainbow! Color in the following photo to see the refraction of white light into its colour components.

Red

Orange

Yellow

Green

Blue

Indigo
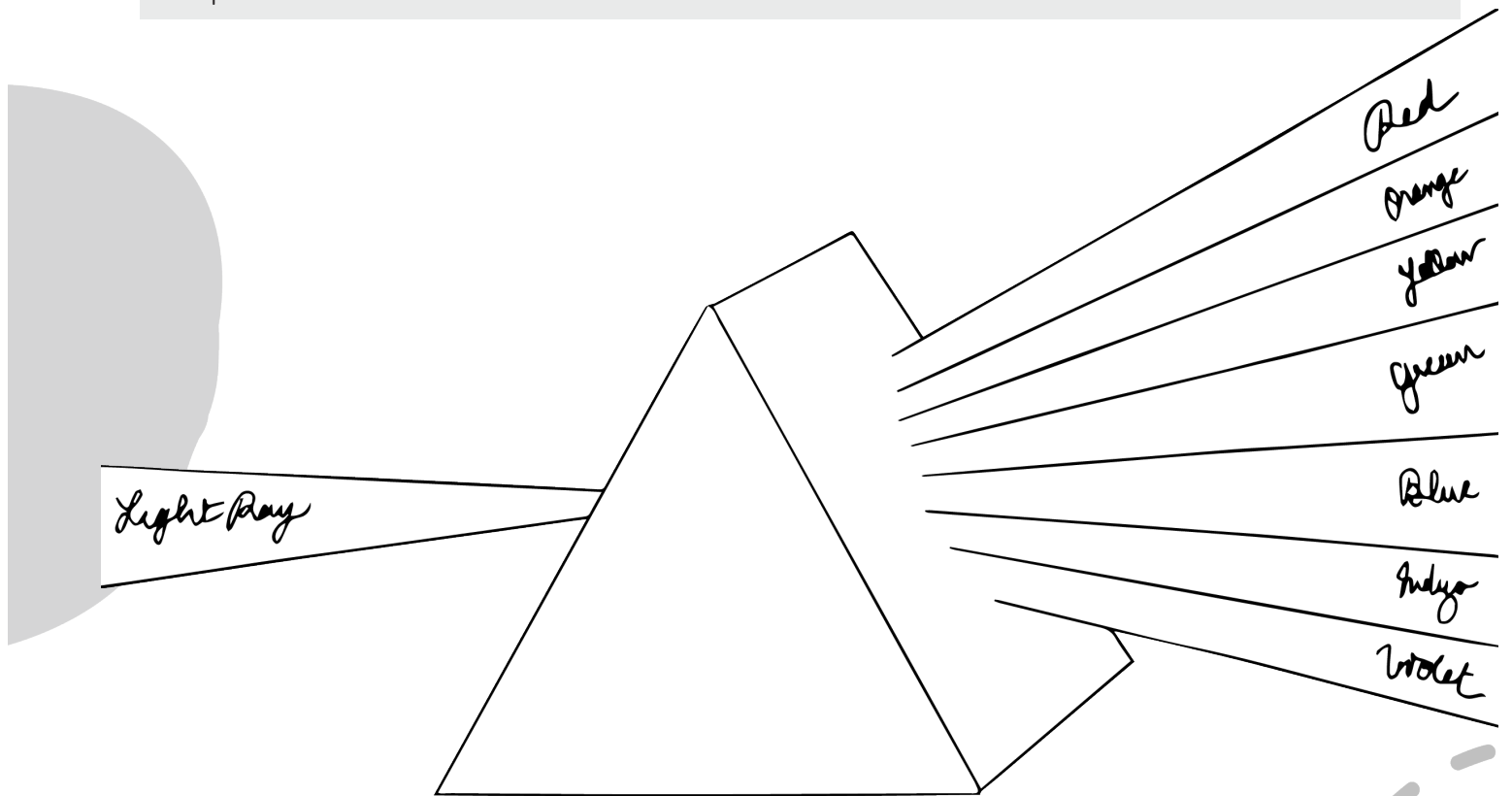
Violet

Light Ray

Hey there! This is how we express this prism as a **function** in my coding language:

```
while in = 'white light';
    lightRay = 'refracts and separates'
    out = ['red', 'orange', 'yellow', 'green', 'blue', 'indigo',
        'violet']
```
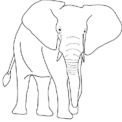
In other words, when white light goes in to the prism, the prism acts on it to refract and separate the colours, resulting in an output of light in all the colours from red to violet.

SLO : 4-2-04, 4-2-08
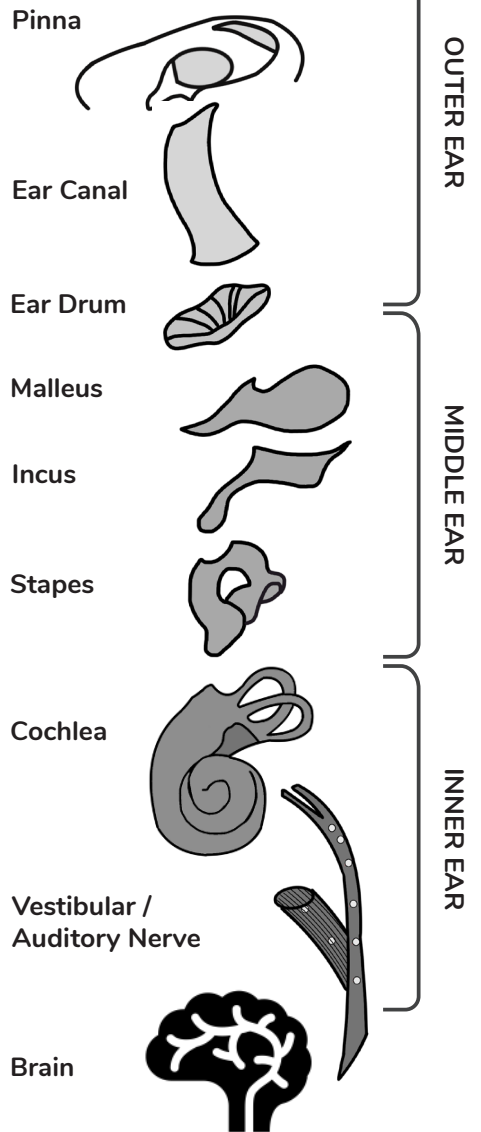
Answer Keys

ANIMAL NAME	EATER TYPE	FAVOURITE FOOD
deer	herbivore	shrubs & grass
forest	fast runner	jump bus length
HABITAT	ADAPTATIONS	FUN FACT

camel	herbivore	twigs & stems
desert	toes for sand	6 mo. no water

bald eagle	carnivore	fish & rabbits
wetland / swamp	talons	7,000 feathers

elephant	herbivore	leaves & fruit
tropical	flap ears to cool	trunk as snorkel

alligator	carnivore	fish & birds
wetland / swamp	tail for swimming	replace teeth

gray wolf	carnivore	deer & moose
forest	cold & hot temp	howl

flamingo	omnivore	worms & algae
tropical	long legs	sleep standing

chameleon	carnivore	cricket & roaches
tropical	long tongue	change colour

king penguin	carnivore	fish & krill
polar	skin pocket	cuddle for warm

13 - Build an Ear

Pinna

Ear Canal

Ear Drum

OUTER EAR

Malleus

Incus

Stapes

MIDDLE EAR

Cochlea

Vestibular / Auditory Nerve

Brain

INNER EAR

7 - Habitats Across the World

8, 5, 12, 9, 4, 1

10, 11, 7, 2, 3, 6

16 - Opacity Hunt

1	+	9	<
2	}	10	&
3	!	11	//
4	{	12	!
5	!	13	#
6	$	14	+
7	!	15	#
8	@	16	+

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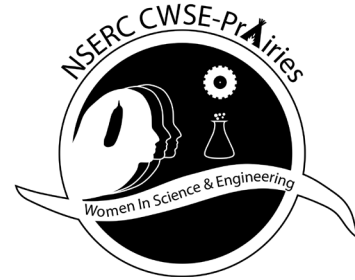
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