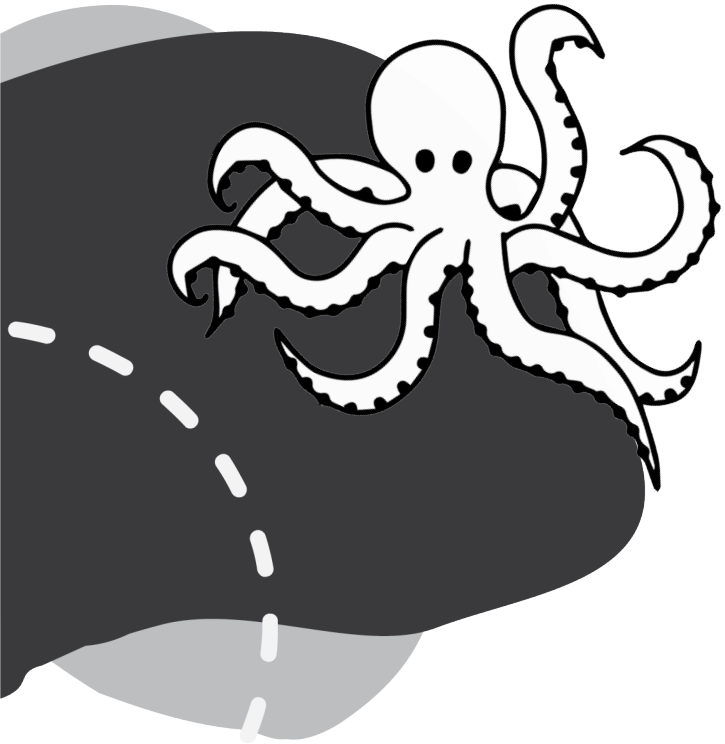
WISE Activity Booklets

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

DIY Activities
Puzzles
Challenges
... and more!



Grade 6
Volume 5 2020

Diversity of Living Things - Electricity
Flight - Exploring the Solar System

University of Manitoba

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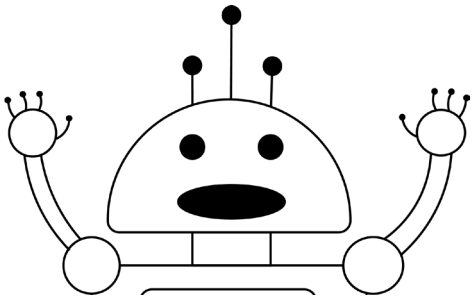


Hello there!

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 next 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.

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

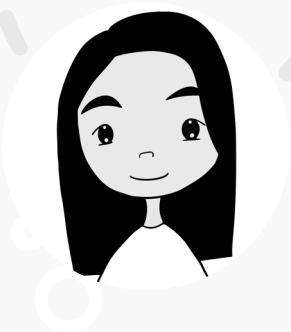
In this Grade 6 booklet, the science topics you will be exploring are: the diversity of living things, flight, electricity and the solar system!

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!



Amaris

Amaris is in her second year in sciences at the University of Winnipeg and plans on majoring in biology. In her free time, Amaris likes reading, playing piano and baking.

Brandi

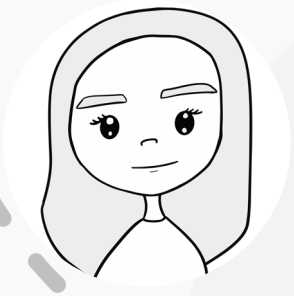
Brandi is in her second year of the Bachelor of Science program and plans to apply to the College of Pharmacy in the future. When she's not studying chemistry she loves to listen to music, hang with her cats, and nap!

Shannon

Shannon is in her second year of Engineering at the University of Manitoba, with a plan to go into biomedical engineering. Her favourite animals are giraffes and dogs. In her spare time she enjoys drawing, exercising, being outdoors, and trying new things.

Zoe

Zoe is in her second year of Engineering, and just entered the department of Civil Engineering. She loves math, and in her free time enjoys walking her dog, as well as playing volleyball and ultimate frisbee.



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!

... and our Incredible Editors!

Alex

Bea

Mahalia

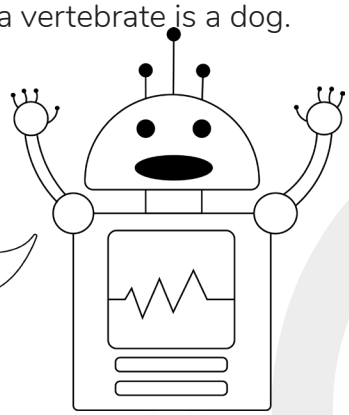
Michelle

Vertebrates vs. Invertebrates

There are two main classifications of animals: vertebrates, and invertebrates. **Invertebrates** are animals that don't have a backbone or spinal column, and **vertebrates** are animals that have an internal skeleton, so they do have a backbone and spinal column.

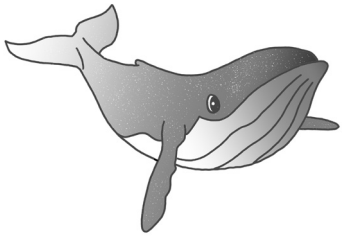
An example of an invertebrate is a crab, and an example of a vertebrate is a dog.

Hey everyone, it's me, Esiw again! In my robot language, saying "yes" and "no" is like turning a light switch on and off. The number 1 means yes, and the number 0 means no. Can you help me understand whether these animals are vertebrates or invertebrates by writing your answers in my language?

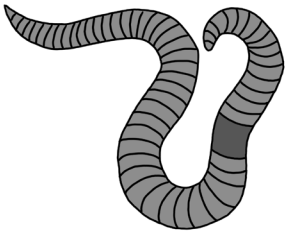


Below, identify each animal as "vertebrate" or "invertebrate" by using code: Vertebrate = 1 and Invertebrate = 0.

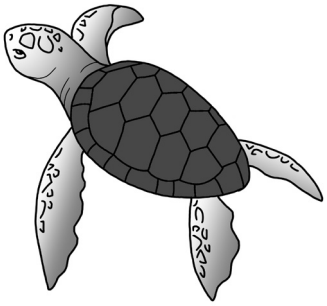
People



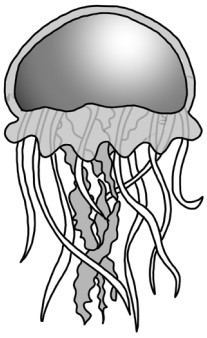
Whale



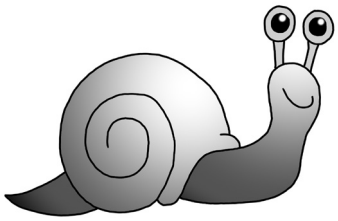
Worm



Sea Turtle

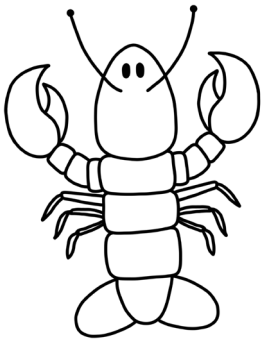


Jellyfish

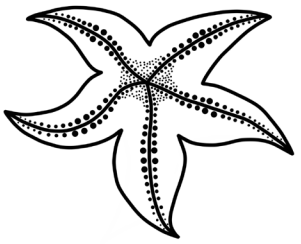


Snail

This activity continues on the next page!

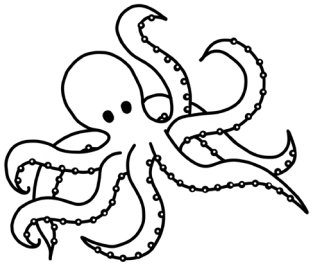


Lobster



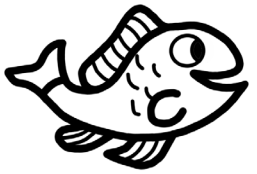
Seastar

Hedgehog



Octopus

Goose



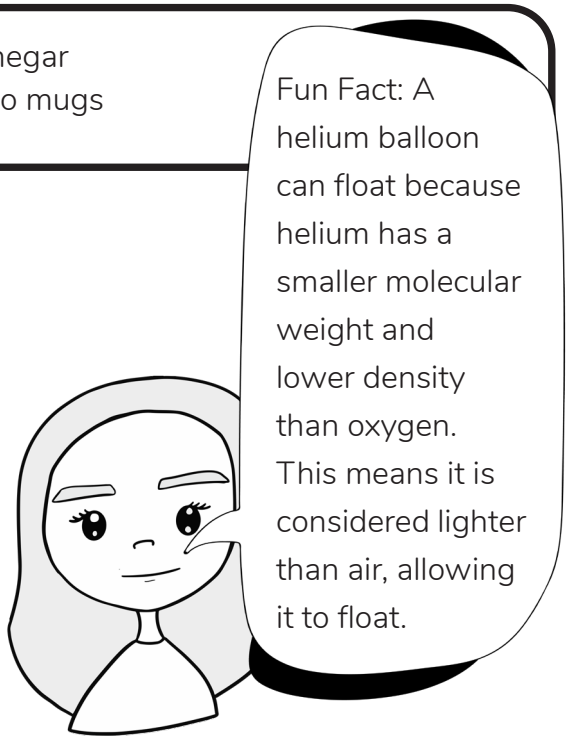
Fish

CO_2, A Gas Heavier Than Air

CO_2 is a very common gas produced all around the world. It can be found in places such as when we light a fire, when we drive a car, and even when we breathe out of our lungs. In this experiment, you will see how CO_2, also known as Carbon Dioxide, is heavier than air.

Materials

- A candle
- A lighter or match
- Baking soda
- Vinegar
- Two mugs



Step #1

Pour about 2 tbsp of baking soda into one of the mugs.

Step #2

Pour about 3 tbsp of vinegar into the mug with the baking soda.

Step #3

Wait for this mixture to stop fizzing.

Step #4

Light your candle.

Step #5

Fun Fact: The reaction of baking soda and vinegar makes CO_2 gas! Once the mixture is done fizzing, pour the **clear** CO_2 gas into the empty cup, making sure the liquid does not fall in.

Note: In this step, it seems like you aren't doing anything because you can't see the CO_2 gas, but just hang on, it will be worth it!

Step #6

Take the cup you just poured the clear CO_2 into, and pour it over the flame of the candle.

Step #7

Watch the magic happen!

Did you know that carbon dioxide is heavier than air before doing this experiment? The molecular weight of carbon dioxide is higher than oxygen (O_2), and it has a higher density, making it heavier. Also, fire needs O_2 to burn, not CO_2. That is why it has the ability to "pour" downwards and put out the flame.
This experiment is very similar to the reason why a helium balloon floats, or a hot air balloon can fly.

Unbalanced Forces

Background

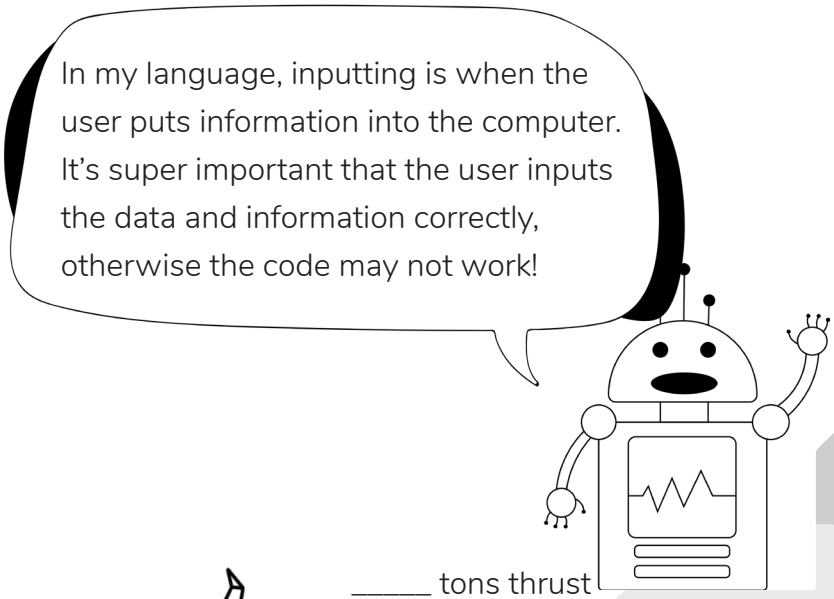
There are four factors that must be considered in order to fly any aircraft: thrust, drag, weight and lift.

- Thrust is a force that moves an aircraft in the direction of motion.
- Drag is the force that acts opposite to the direction of motion. It tends to slow an object.
- Weight is the downward force caused by gravity.
- Lift is the force that holds an aircraft in the air.

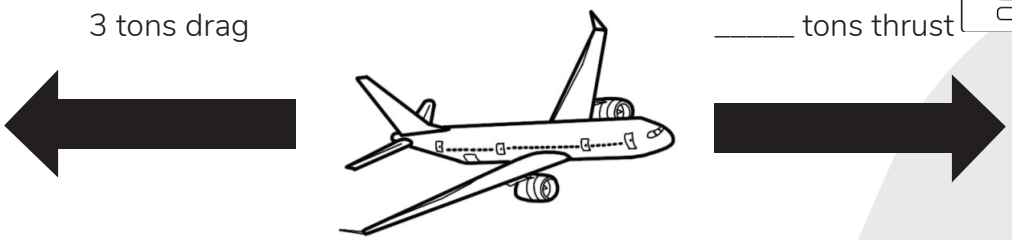
Each force has an opposite force that works against it; lift works opposite of weight, and thrust works opposite of drag.

When all the forces are balanced, a plane will fly in a flat, horizontal direction. The plane will rise if lift is more than weight. The plane will accelerate if thrust is more than drag.

Your turn!
Given the diagrams, can you input the correct value in order to make the aircraft fly the right way? Then justify your reasoning, writing in terms of the four forces.



1



a) How much thrust is needed to accelerate the plane forward?

_____

b) Why will it move in that direction?

_____

_____

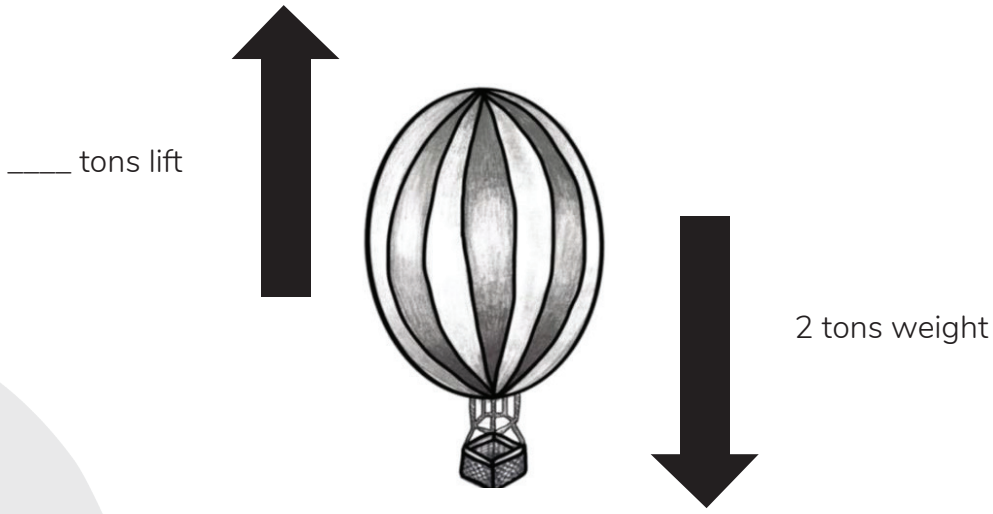
This activity continues on the next page!

2

a) How much drag can the plane handle before it can't fly properly?

b) What allows the plane to fly flat?

3



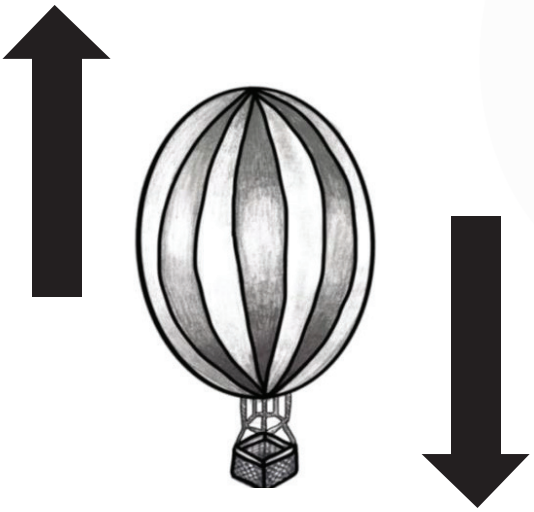
a) How much lift is needed to get the hot air balloon to rise?

b) Why will it move in that direction?

This activity continues on the next page!

4

4 tons lift



____ tons weight

a) How much weight is needed for the hot air balloon to come back down to the ground?

b) Why will it move in that direction?

5

____ tons lift

20 tons weight

a) How much lift is needed to lower the helicopter?

b) Why will it move in that direction?

This activity continues on the next page!

6

a) How much drag is needed for the helicopter to go to the left?

b) Why will it move in that direction?

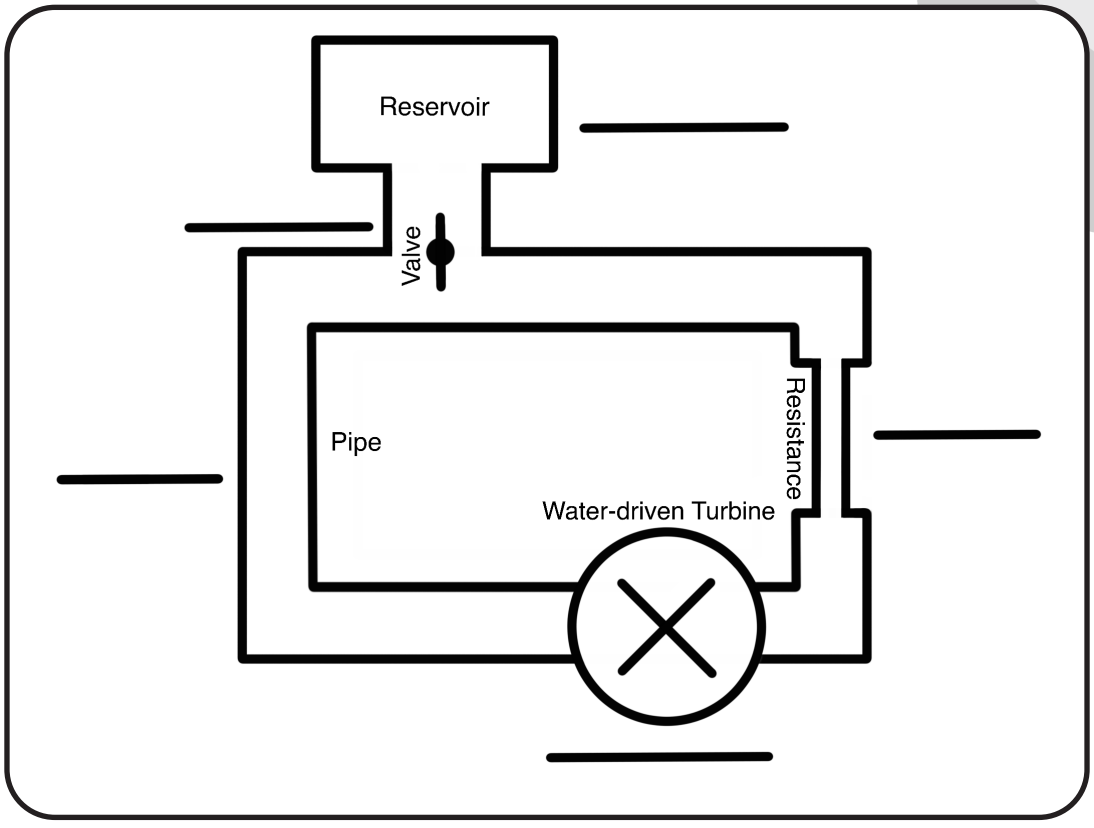
Water Circuit

Electricity is a form of energy that's used to power many things in our daily life such as lights and appliances. Electricity is the flow of negatively charged particles called electrons. In order for the electrons to flow, there needs to be a space where they can move around; this is called a circuit. An electrical circuit often has many components to ensure the electrons don't move too quickly or too slowly.

A **switch** is used to open and close the circuit. When the switch is open, the circuit isn't closed and the electricity can't flow. When the switch is closed, the circuit is closed and electricity can flow.
Wires are used to conduct the flow of electricity, or give the electrons a place to flow through. The wires are usually made of copper because copper is a relatively light, inexpensive metal that conducts electricity well.
There needs to be a **power source** for there to be electricity. This usually comes in the form of a battery.
Circuits often have **resistors** which slow the flow of electrons and ensure that the circuit doesn't short, resulting in no flow of electricity.

Electricity can be confusing since the flow of electrons can't be seen. To make understanding electricity easier, it can be compared to water.

Using the **bolded** words above, write on the line the equivalent component on a circuit. E.g. water = electrons.



Code the Solar System

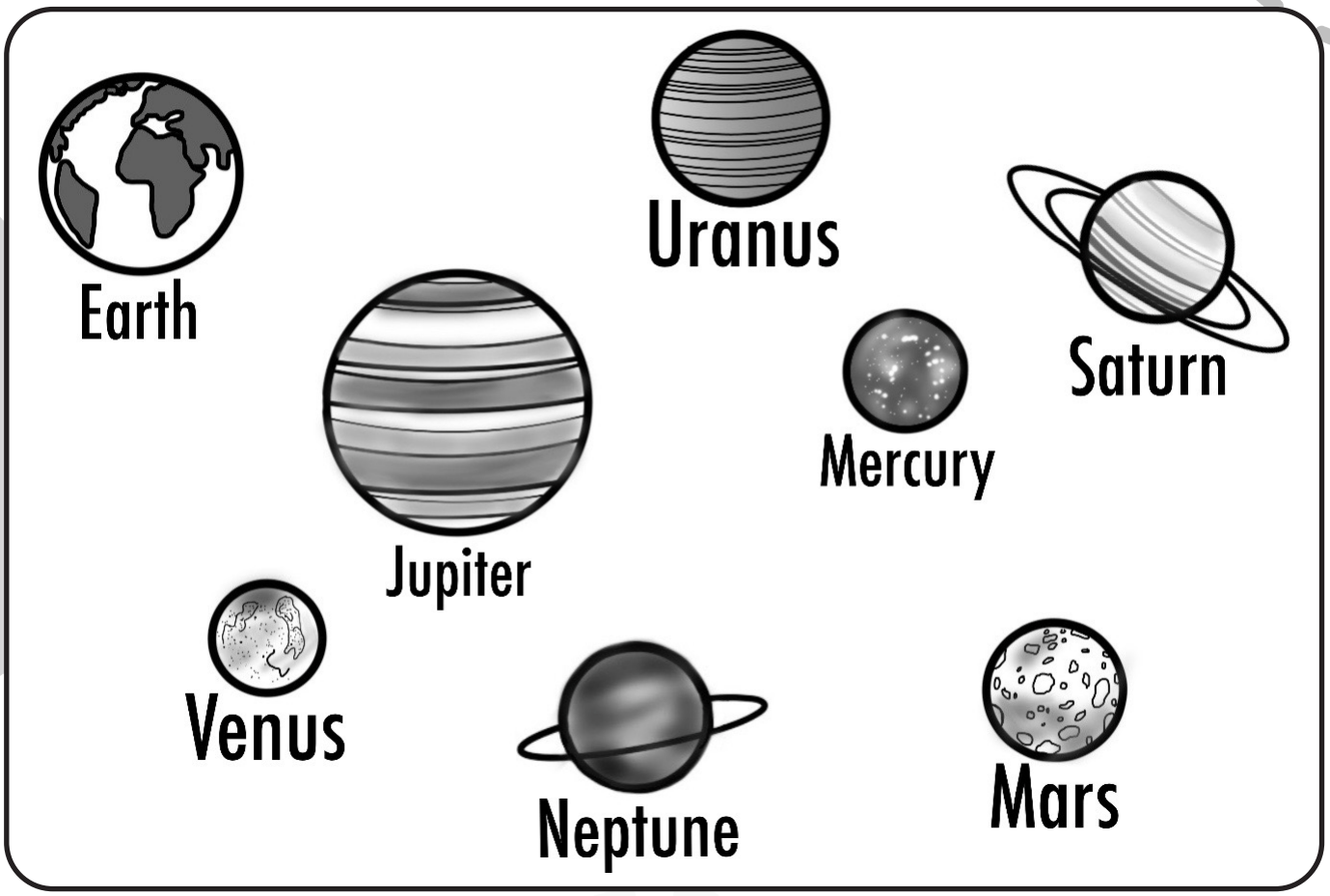
Solve the puzzles below to help code the solar system on page 14!

1 Unscramble the words in **bold**!

Inner planets have warmer average temperatures than the outer planets since they are **elcos** to the sun. ___ ___ ___ ___ ___

Outer planets have very low average temperatures because they are **rfa** from the sun. ___ ___ ___

2 Inner planets are smaller and rocky, while outer planets are large spheres of gas! Put a circle around the inner planets, and a square around the outer planets.



This activity continues on the next page!

SLO : 6-4-10

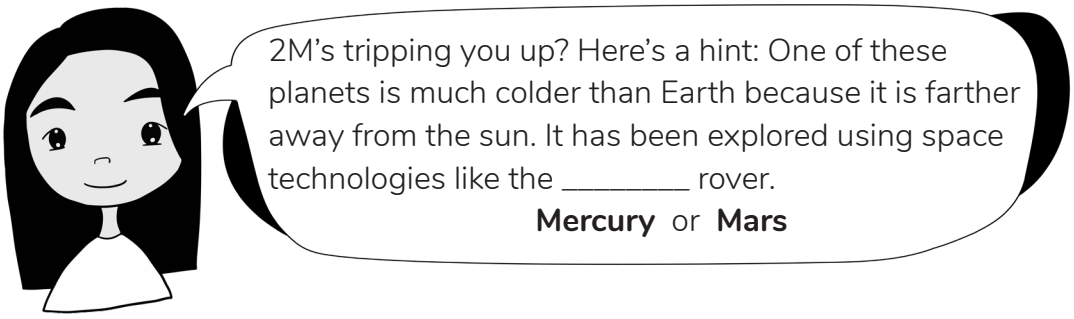
3

The asteroid belt contains many rocks which are the remains of planets that did not form. To find where it is located in relation to the inner planets, connect the large rocks with a line - they will form a word!

4

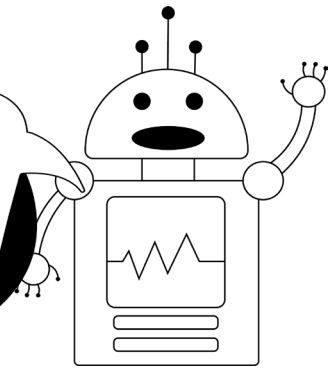
Almost there! Now we need to figure out which order the planets go in. To do so, fill in this acronym with the planets' names. (Each letter represents the first letter of a planet's name)

M V E M J S U N



This activity continues on the next page!

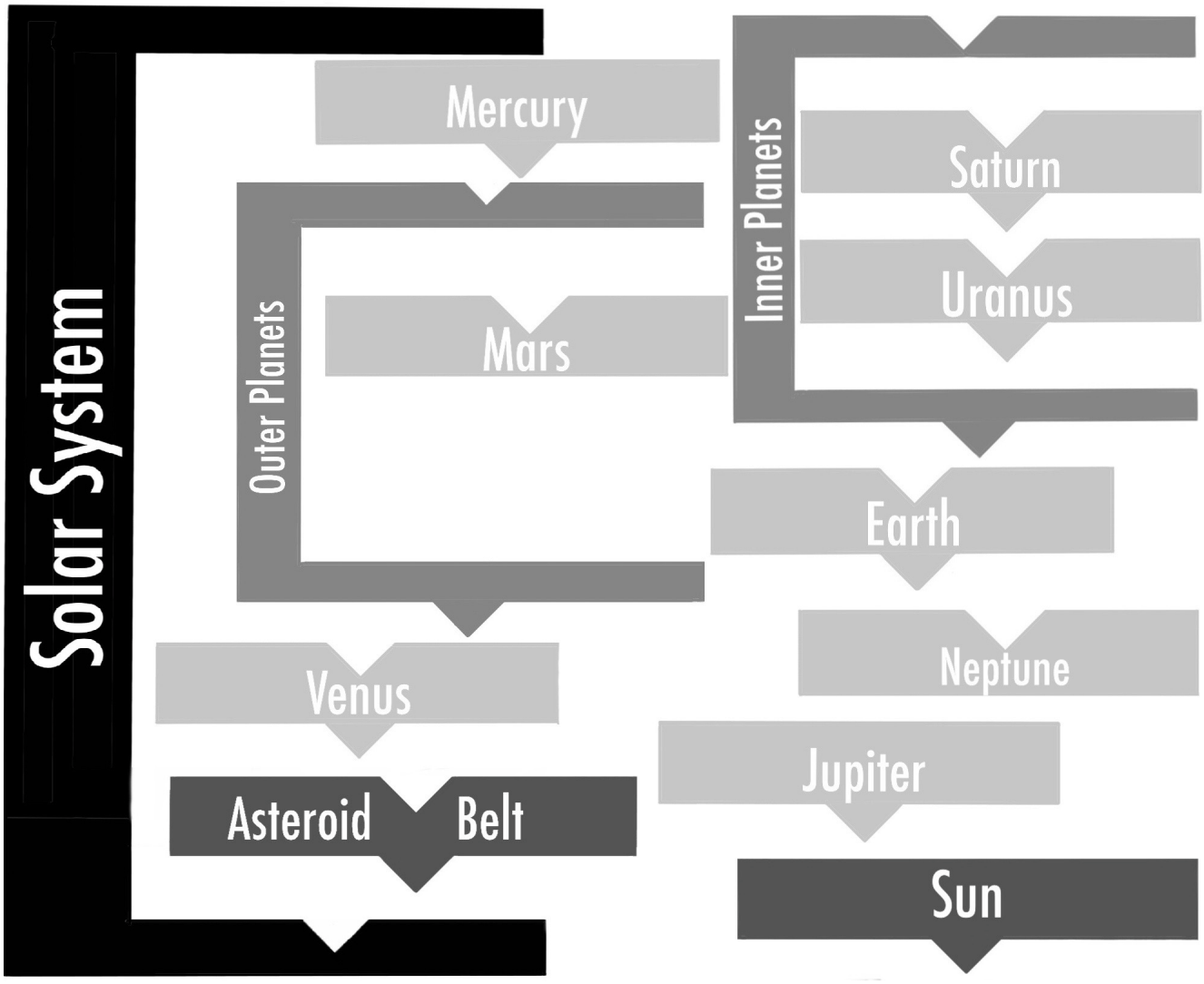
Let's write the code for our solar system! We can think of it like the one big set of steps or information, a function, with other functions inside of it. The "inner planets" and "outer planets" will be functions within the bigger "solar system" function. We must input the sun, the planets, and the asteroid belt in the proper order to get the output of the solar system!



Using the space below, cut out the code on page 15 and assemble it below. Hint: Use the answers you found on pages 12-13!

This activity continues on the next page!

Cut out the code below and assemble them in the correct order on page 14.



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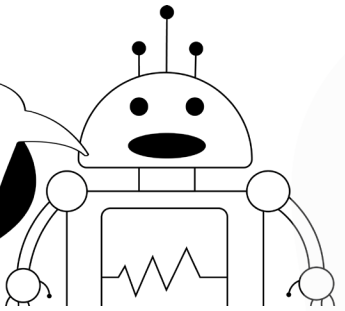
because the previous page is meant

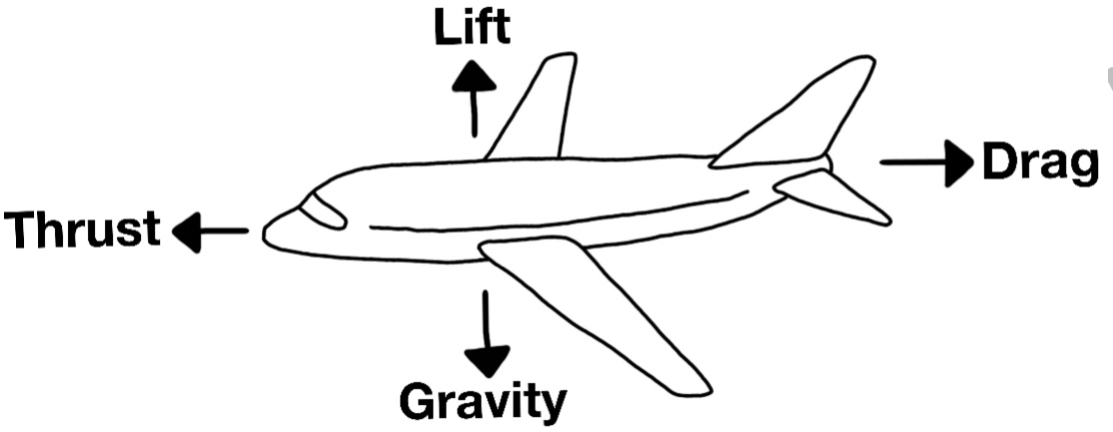
to be cut up.

Flight Scenarios



This activity is very similar to inputs and outputs in coding. The input is the situation, and the output is the solution or answer to the situation. Every input has a unique output which is very similar to how a code works!

There are four main forces that help a plane to fly. Lift, thrust, drag, and gravity. Lift opposes gravity, and when the amount of lift is greater than the amount of gravity, the plane moves upwards. Gravity is what pulls the plane downwards. Thrust opposes drag, and when the amount of thrust is greater than the amount of drag, it moves the plane forwards. When a plane is flying at a constant velocity in a straight line, lift equals gravity, and thrust equals drag.



These four forces don't just act on planes, they also act on other objects that have the ability to fly as well.

Using the word bank provided below, identify which output (force acting on the object in flight) would be best to use for each input (situation). Hint: you may need to use an answer more than once.

Lift	Thrust
Drag	Gravity

This activity continues on the next page!

1. It's a sunny day outside, you and your friend are throwing a frisbee at the park. What force holds the frisbee up as it flies?

_____

2. You and your friends are going cliff jumping, and you are brave enough to jump off first. What force is acting on you as you are being pulled into water?

_____

3. Ben has a remote-control airplane and he invites you over to test it out. You accidentally fly the plane through a bush, and a stick gets stuck to it. What force increases due to the stick being stuck to it?

_____

4. What type of force would *not* be present causing an airplane to stay grounded if it didn't have an engine?

_____

5. It's a windy day outside and Sarah goes to the park to fly her kite. How many of the four forces (lift, gravity, thrust, drag) are acting on the kite for it to fly?

_____

6. You and your friend are throwing rocks into a lake to see who can throw the farthest. What force causes the rock to fall into the water?

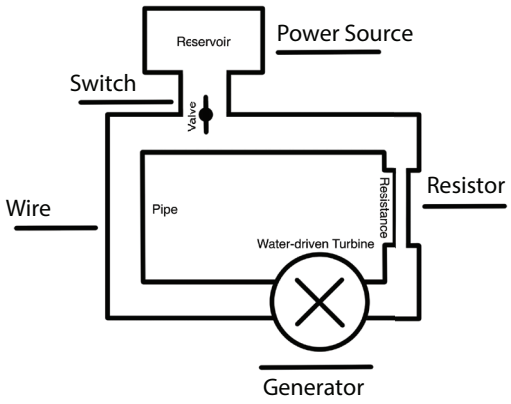
_____

Answer Keys

Vertebrates and Invertebrates (pages 4-5)

People - 1
Whale - 1
Worm - 0
Sea Turtle - 1
Jellyfish - 0
Snail - 0
Lobster - 0
Seastar - 0
Headgehog - 1
Octopus - 0
Goose - 1
Fish - 1

Water Circuit (page 11)

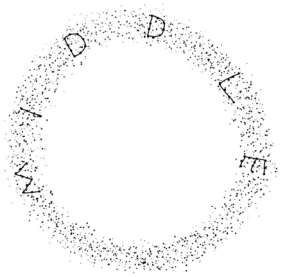


Unbalanced Forces (pages 7 - 10)

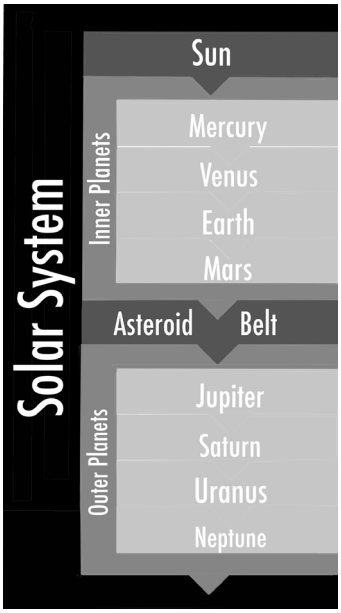
1. a) 4 tons or more. b) A plane will accelerate forward if the thrust is more than the drag.
2. a) 5 tons. b) In order to keep a plane at a level flying, the forces must balance each other out. Meaning, they must be equal.
3. a) 3 tons or more. b) To raise a hot air balloon, the lift must be more than the weight.
4. a) 3 tons or less. b) If you want the balloon to rise, or increase in altitude, the life must be more than the weight.
5. a) 19 tons or less. b) A helicopter has the ability to move directly vertical, unlike a plane. To lower a helicopter, the weight must be more than the lift.
6. a) 13 tons or more. b) To accelerate a helicopter forward, the thrust must be more than the drag.

Code the Solar System (page 12-15)

1. Close, far.
2. Inner: Mercury, Venue, Earth, Mars. Outer: Jupiter, Saturn, Uranus, Neptune.
3.



4. Hint: Mars.



Flight Scenarios (pages 18)

1. Lift.
2. Gravity.
3. Drag.
4. Thrust.
5. All four: Lift, gravity, thrust and drag.
6. Gravity.

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