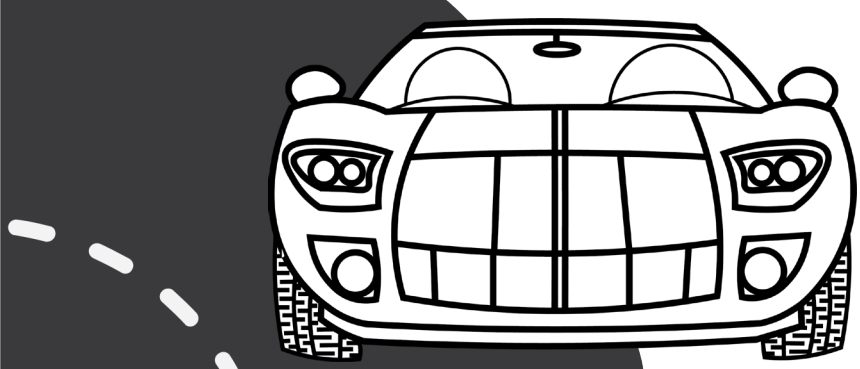
WISE Activity Booklets

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

Made by WISE Kid-Netic Energy

DIY Activities
Puzzles
Challenges
... and more!



Grade 6
July 2020

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

University of Manitoba

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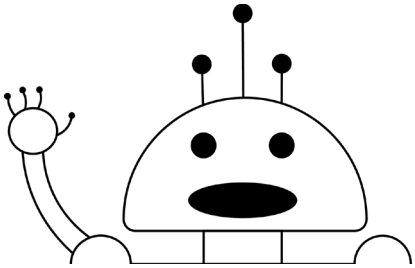


Hello there!

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 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 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.

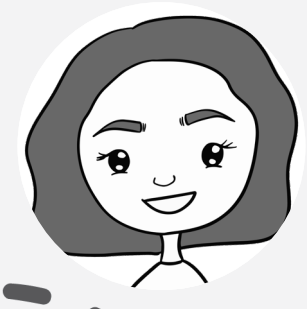
Meet our Amazing Authors!

Huda

Huda is in her first year taking general science courses and she is trying to decide between a degree in Microbiology or Genetics. She enjoys baking and cooking and her favourite activity is watching YouTube videos.

Kajal

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

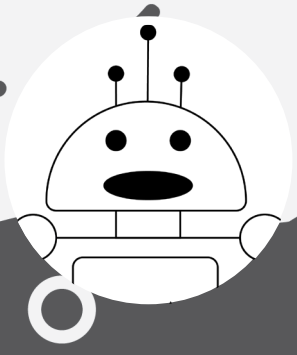


Robyn

Robyn is going into her fourth year of Civil Engineering at the University of Manitoba. She enjoys riding her bike, soaking up sunshine and watching live music.

Shannon

Shannon is finishing up her first year of Engineering. In her spare time she enjoys drawing, exercising, being outdoors and trying new things. She is super pumped to be a part of WISE this summer.



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!

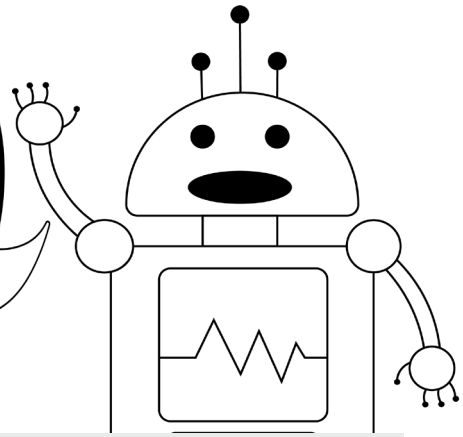
Classification Station

In our everyday lives we use and see different classification systems everywhere we go. Classification systems are systems in which items, number words and more are sorted.

I use classification systems all of the time in my code! Order is really important to me and all of coding! Some examples of classification systems in our daily lives are :

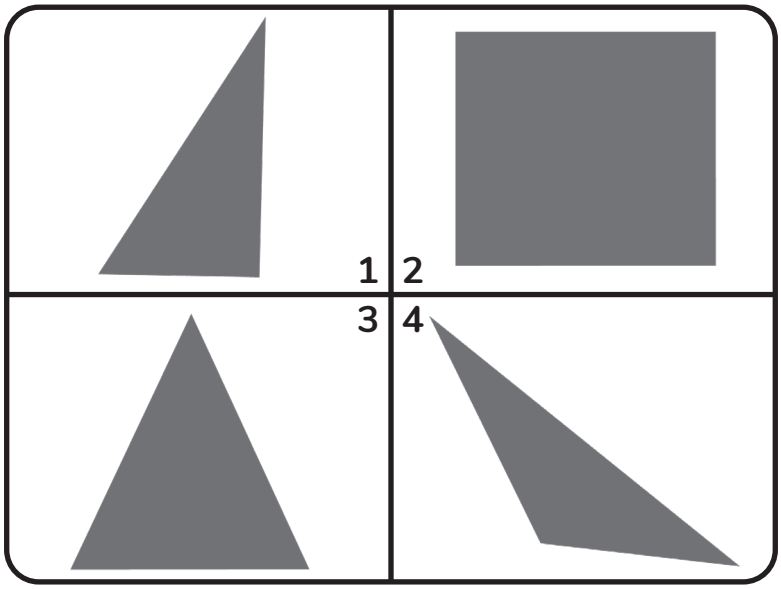
- Phone numbers in a contact list
- Library books
- Groceries in a market

Groceries? That seems odd, but when you think about it, that makes sense. You wouldn't want to keep the bread on a shelf beside the ice cream! That would not work! You'd either have melted ice cream or frozen bread! So classifying them as frozen or non frozen is essential!



Keeping classification systems in mind, can you figure out what image doesn't belong in the following sets? What seems to be out of place and why?

CLASSIFICATION SYSTEM 1



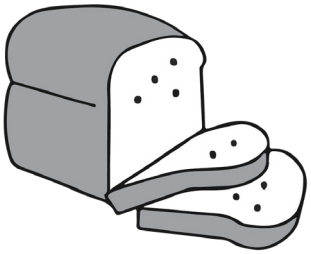
CLASSIFICATION SYSTEM 2

SLO : 6-1-02

CLASSIFICATION SYSTEM 3

14	84
147	93

CLASSIFICATION SYSTEM 4

CLASSIFICATION SYSTEM 5

11	1110
1101	10011

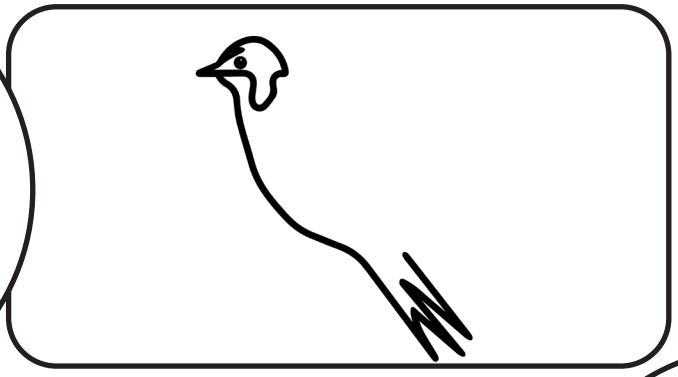
Use the Forces To Complete the Drawings

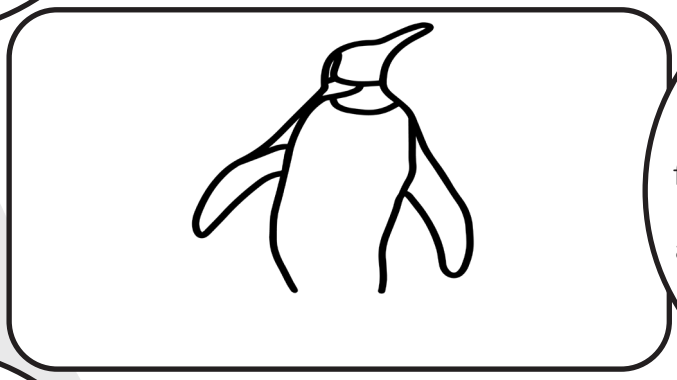
There are many different forces that affect the movement of objects and animals. They are often shaped to reduce the forces that slow them down and to best use the forces that help them move. Some of the common forces that affect movement are:

- Lift: this is a force that is perpendicular to the flow around it, often meaning it is pushing up, rather than forwards.
- Drag: this is a force that often slows down movement by causing friction and air resistance, to avoid too much friction streamline and smooth shapes are often incorporated.
- Thrust: is a force that uses propulsion to move things forward.
- Downforce: is a force that is the combination of gravity and air resistance that pushes down, it is often used in race cars to help them go faster.

Follow the directions in the bubbles to add parts to the animals and objects and learn about the forces the different parts effect.

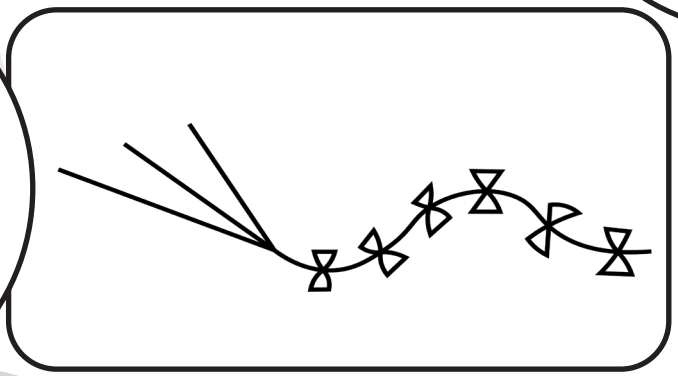
Draw the wings and back of the barn swallow. The barn swallow uses it's wings to create lift and fly, while it's steam-lined body lets it fly better by lowering the drag and resistance their body has with the wind.





Draw the webbed feet of the penguin. Their webbed feet helps propel them forward faster. This allows them to have more thrust and swim very fast, due to the increased surface area the webbing creates.

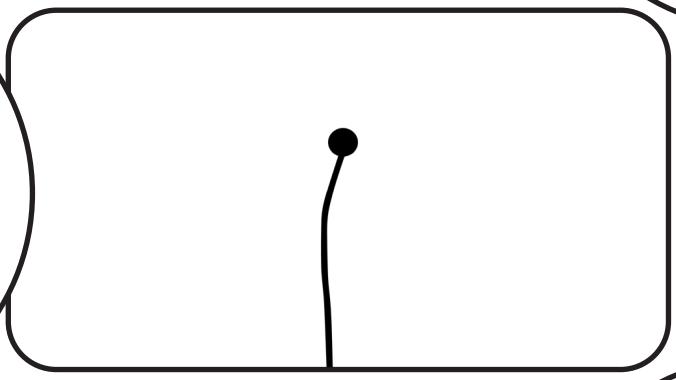
Draw the top of the kite. The shape of the kite creates a streamline shape to reduce drag, while also acting a lot like a wing to generate lift and make it fly.



This activity continues on the next page!

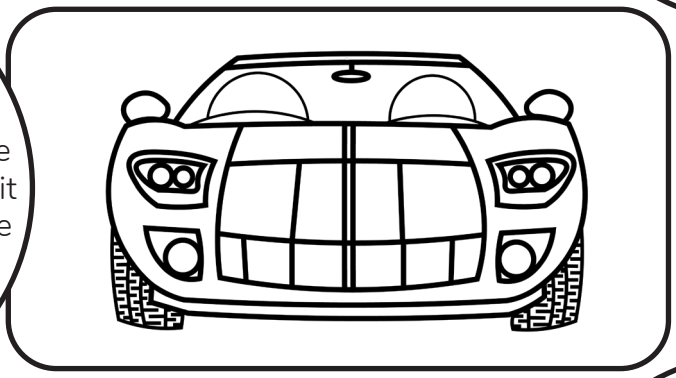
Draw wings on the bumble bee. Bees use their wings to thrust themselves by pushing the air aside and generating lift.

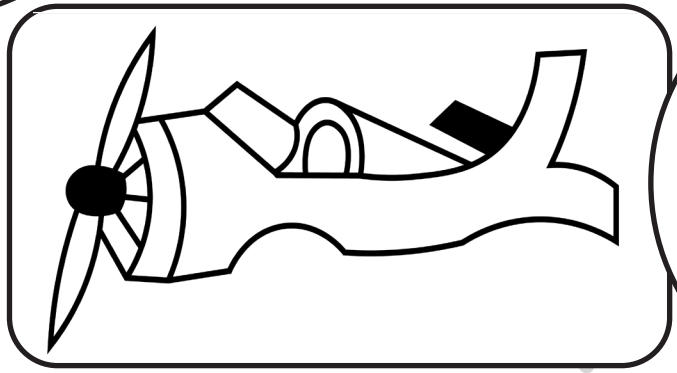
Draw the fluffy part of the dandelion, called the pappus. The pappus acts like a parachute that is raised into the air, creating a vortex letting the dandelion travel far.



Draw the back on this dolphin. The body of the dolphin is shaped to streamline the water around it and reduce the amount of drag and friction.

Draw a front wing on the front of the car (similar to a spoiler). This is an upside down wing, because instead of lifting the car up, it pushes it down closer to the ground, with a force called downforce, that allows the car to move faster.

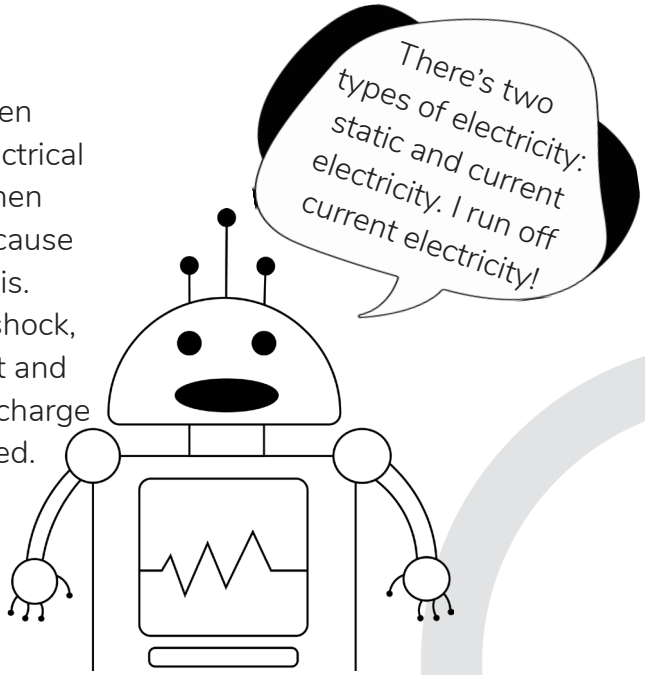




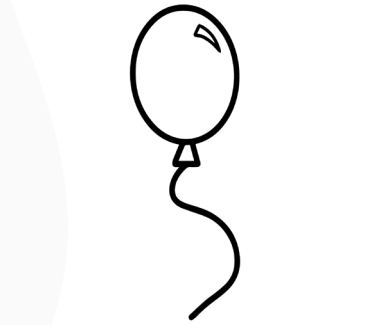
Draw wings on this plane. The wings create lift on the plane, which is how the plane flies and goes higher.

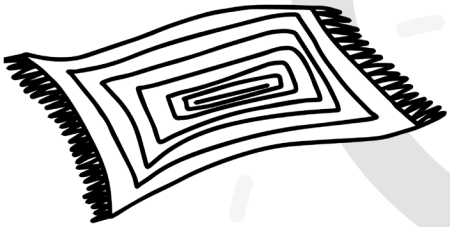
Flow Through

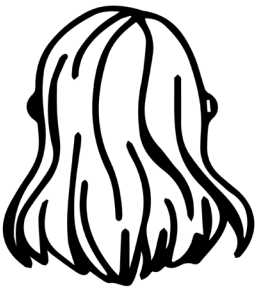
Static electricity is produced by the friction you get when you rub two items together. This friction creates an electrical charge. If you've tried rubbing a balloon on your hair, then you know that it sticks to you like a magnet. This is because you gain an opposite charge to the balloon by doing this. Sometimes static electricity can give you an electrical shock, like when you are moving around under a wool blanket and then touch someone. Your body builds up the electric charge and once you touch metal, the electric charge is released.

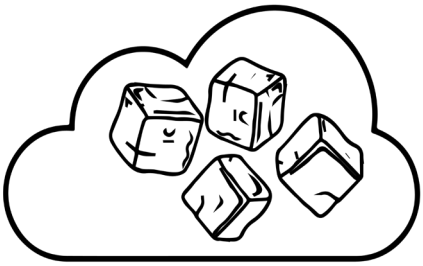


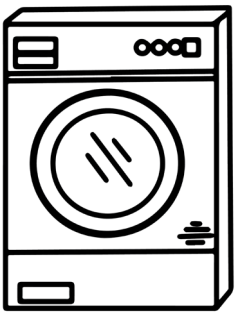
Draw a line between the items that cause friction together and create static electricity.











Let's Learn About Gravity and Mass

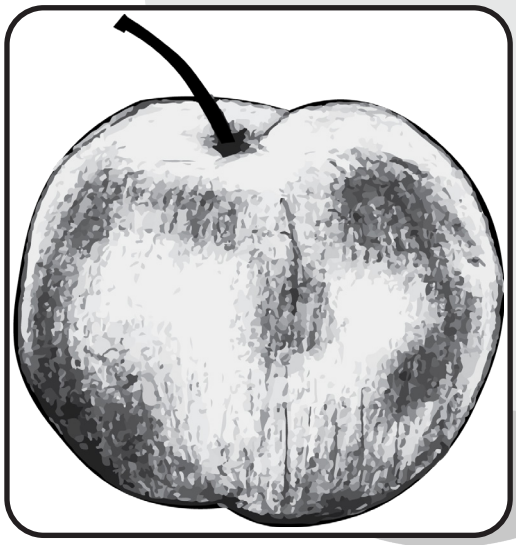
Did you know that weight and mass are not the exact same thing? Read the information below to learn more and answer the questions that go along with it.

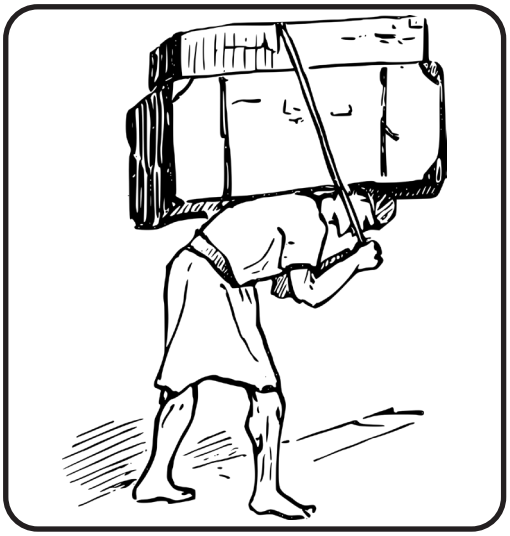
In 1687, Newton shared a revolutionary idea with the world! One day, Newton was sitting under an apple tree when an apple fell on him. This made him wonder why the apple fell down and not up or in any other direction!

Why do you think the apple fell down, not up?

GRAVITY is the force of attraction between two objects. Newton discovered that the strength of the gravitational force depends on the mass of the objects and the distance between them. Objects with a larger mass have a stronger gravitational pull. As the distance between objects decreases the gravitational pull between them gets stronger.

Why did the apple fall down?





On planets, this gravity is the downward ACCELERATION of an object (because the planet is the closest and biggest, in terms of mass, thing for all the objects on the planet). This is measured in Newtons.

MASS is the amount of matter in an object.

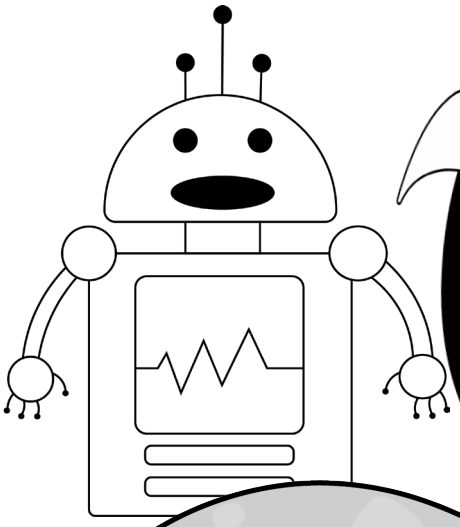
WEIGHT is the force of gravity on the mass of an object.

We can calculate weight using the equation :

Force = mass x acceleration

This activity continues on the next page! SLO : 6-4-11

Now that we know more about gravity, mass, weight and acceleration, let's see if we can figure out how weight varies between planets. Since the gravitational pull is different from planet to planet, the weight of the same object will vary on different planets.



Sounds like it is time for some math! I love math, it is such an important part of my coding and what makes me function! So let's calculate the weight of an apple on different planets. For these calculations, the mass of the apple stays the same no matter what (102g), so this is called a constant. The acceleration will change on each planet due to gravity, so this is called a variable.

For example acceleration from gravity, on earth is known to be 9.81m/s^2. So using the equation Force = mass x acceleration we can calculate that the force (aka the weight) will be 102g x 9.81m/s^2 = 1000.62 . And force is calculated in Newtons (N) so it will be 1000.62N.

EARTH's MOON
Acceleration : 1.62 m/s^2

Force =

SATURN
Acceleration : 11.08 m/s^2

Force =

JUPITER
Acceleration : 25.95 m/s^2

Force =

Coding Some Better Vision

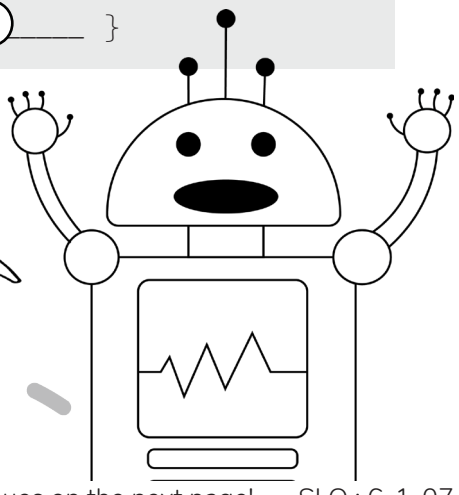
Our eyes are a very powerful organ in our body! We can use our eyes to look up at the night sky and see specks of stars that are trillions of kilometers away! However, our eyes do have limitations. There are all sorts of things that are all around us that we can't see with just our eyes, such as germs and bacteria. That's when certain magnification tools come to our aid! Magnification is the act of making something appear bigger without actually changing its physical size. Common examples of tools that magnify are telescopes, microscopes, binoculars and magnifying glasses. The science behind how they work is that these tools use a special lens, or a combination of multiple lenses, to bend light at an angle to increase the size of the image that is sent to your eye. This increase in size and allows you to see objects easier!

Now that we know how magnification works, let's code a better vision! We are going to be using Boolean Logic to create conditional statements. This might sound scary, but don't worry all of the options on are on page 13 for you to cut out and paste onto the next page.

1. To start you will be given a variable. For this activity, the variable will be what you are looking at.
    - E.g. `variable == pond water`
2. Next you will be given an "if" statement, this is where you will decide which magnification tool is going to help you get a better look at what you are looking at. You will cut out the code block from page 13 that has the tool you want to use and paste it in the line.
    - E.g. `if magnification_tool ==` `microscope` `{`
3. On the next line there is a boolean statement about whether or not this tool is helping us see better. Boolean means there is only two options: true or false. Hopefully we are able to find the right tool each time so that this statement is always true. Cut out the true or false coding block from page 13 and paste it at the end of the boolean statement.
    - E.g. `can_see_better =` `true` `;`
4. And on the last line we need to figure out what this tool is going to help us see better. So cut out the coding block on page 13 that is the object that you will see better using that tool in that environment (variable), and paste it at the end of the of statement.
    - E.g. `what_we_see_better =` `algae` `}`

So when we put this sample code together it looks like this:

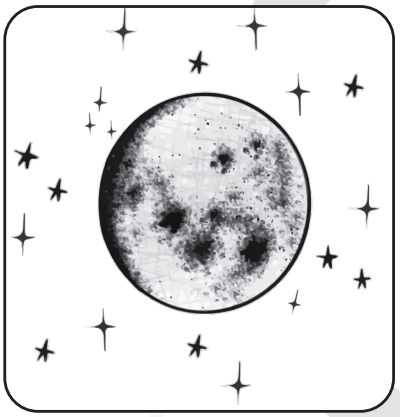
```
variable == pond water;
    if magnification tool == microscope {
        can_see_better = true;
        what_we_see_better = algae }
```



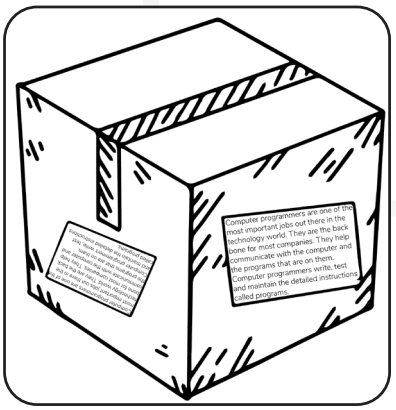
This activity continues on the next page!

```
variable == a forest;
if magnification_tool == _____{
    can_see_better = _____;
    what_we_see_better = _____}
```

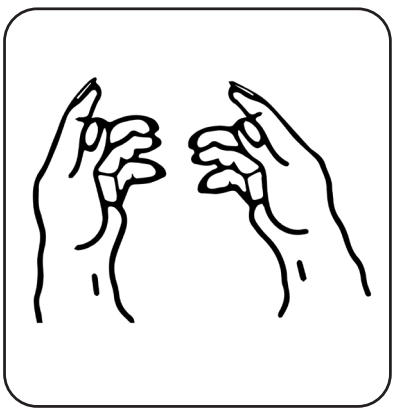
```
variable == the sky at night;
if magnification_tool == _____{
    can_see_better = _____;
    what_we_see_better = _____}
```



```
variable == small font written on a package;
if magnification_tool == _____{
    can_see_better = _____;
    what_we_see_better = _____}
```




```
variable == our hands;
if magnification_tool == _____{
    can_see_better = _____;
    what_we_see_better = _____}
```



microscope

true

octopus

false

false

true

swim goggles

telescope

false

wires

squirrels

bacteria

true

sun glasses

true

binoculars

false

magnfiying glass

words

stars

This page was intentionally left blank because
the other side is meant to be cut up.

Figure Out the Force of Flight

All living things and devices that fly must overcome the force of gravity. There is one force that they all need sufficient amounts of to overcome gravity!

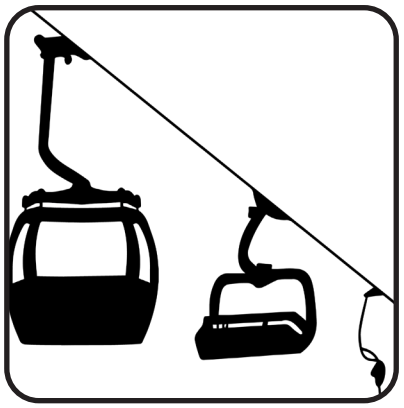
Go through the hints below and see if you can guess what this force is called!

HINT #1

Hmmm... What could it be? Do you have a first guess?

_____

HINT #2



Interesting... Do you still think it's the same thing or any new guesses?

_____

HINT #3

There are four letters in this word.

Well then.... Do you know what it is?

_____

HINT #4

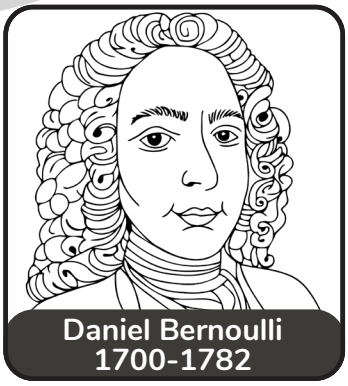
It starts with the 12th letter of the alphabet.

What's your final guess?

_____

SLO : 6-2-03, 6-2-04

Build an Airfoil



Have you ever wondered how an airplane manages to stay in the air? No, it's not magic! In 1738, a Swiss scientist named Daniel Bernoulli came up with something called Bernoulli's Principle. This principle is what explains what makes airplanes to fly!

What is Bernoulli's Principle?

Bernoulli discovered that fast moving air exerts less pressure than slow-moving air.

What is the shape of a wing called?

It is called an airfoil. They can have slight variations, but the basic design of them is that the top is much more curved than the bottom.

Seeing as an airplane is much heavier than air, how does it stay in the air?

This is where the Bernoulli's Principle comes into action. When the plane is in the air, the wing cuts through the air particles. Some particles are pushed to the bottom of the wing, and others to the top. The ones at the bottom travel a shorter distance, and the ones on top travel a longer distance. The particles going a longer distance move at a higher speed, therefore giving them a lower pressure on top. This difference in pressure between the top and bottom is what generates lift.

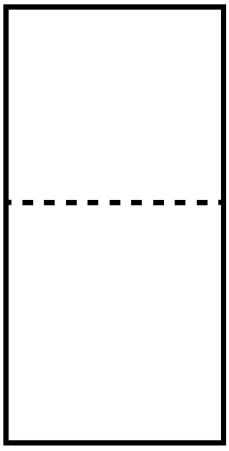
How can this be proven?

Great question! To demonstrate this, let's make our own airfoil!

Materials you will need: A piece of paper, a pair of scissors, a pencil, a straw, some tape and some string.

STEP 1

Cut out a strip of paper that is 18cm long and 9cm wide.



STEP 2

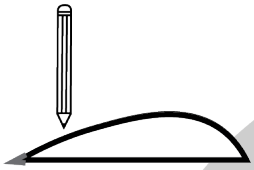
Make a fold 8cm in. You'll notice how one side is shorter than the other.

STEP 3

Tape the ends of the short side to the longer side so that the short side lies flat and the longer side arches up.

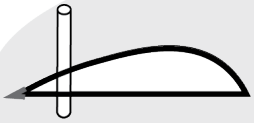
STEP 4

Use a pencil, or something sharp enough to make a hole 2cm into the side you just taped down. Poke straight through both papers.



STEP 5

Take the pencil out and put a straw through the holes and tape it to the top and bottom of the wing using small pieces of tape.

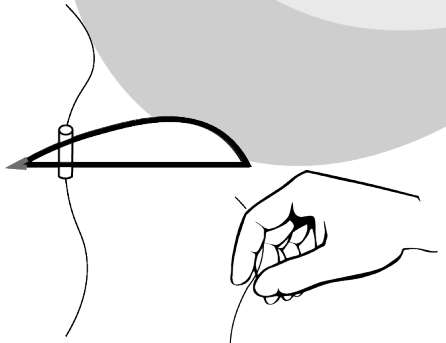


STEP 6

Cut the straw so as little of the straw is above and below the wing as possible.

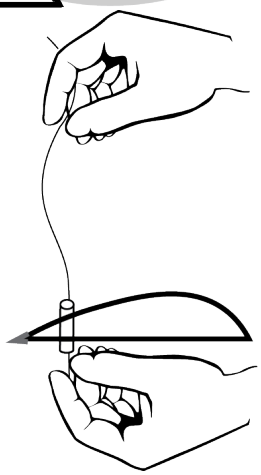
STEP 7

Grab some string, around 50cm, and feed it through the straw.



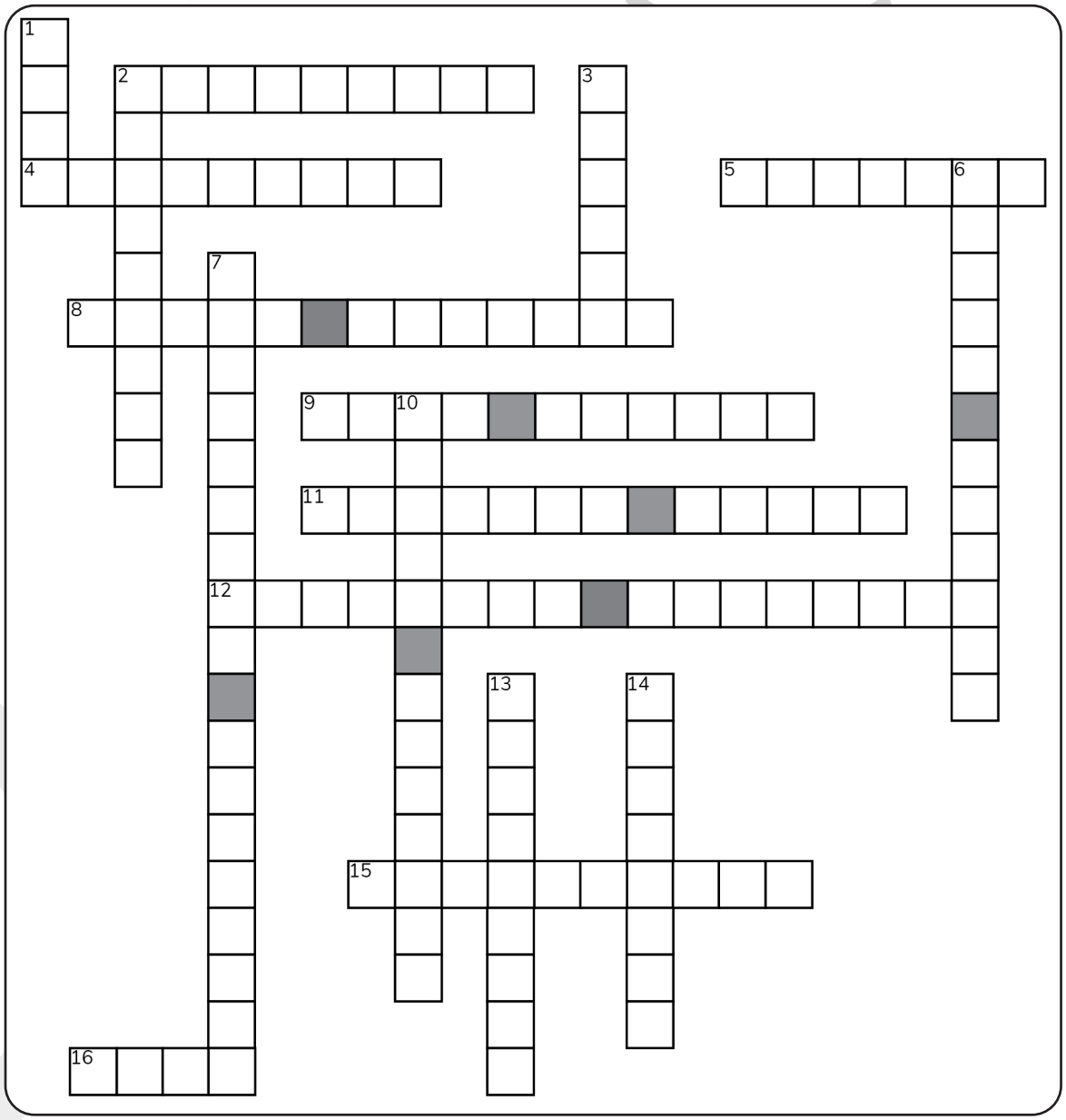
STEP 8

And now the fun part! Hold the top and bottom of the string tightly. Find an open space and start running! Your goal is to make your airfoil rise up the string!



Are there any changes you can think of that you could make to this airfoil to make it move up the string faster?

Exploring our Solar System Crossword



Across

2. Science that deals with the natural universe beyond the Earth's atmosphere.
4. An object that orbits another object.
5. Total or partial blocking of one celestial body by another.
8. Planets that lie inside the asteroid belt.
9. Shape of the sunlit portion of the moon.
11. Region of space between Mars and Jupiter where most asteroids are located.
12. Seeing movement when nothing actually moves.
15. Turning or rotating on an axis.
16. The amount of matter something is made of.

Down

1. An imaginary line through the center rotation of an object.
2. The crew member of a space craft.
3. The amount or quantity of mass.
6. A set that includes a star and all of the matter that orbits it.
7. Naturally occurring thing that exists in the observable universe.
10. Planets that lie outside the asteroid belt.
13. When the positions of celestial bodies is interpreted to explain human personalities.
14. The spin of body about its axis.

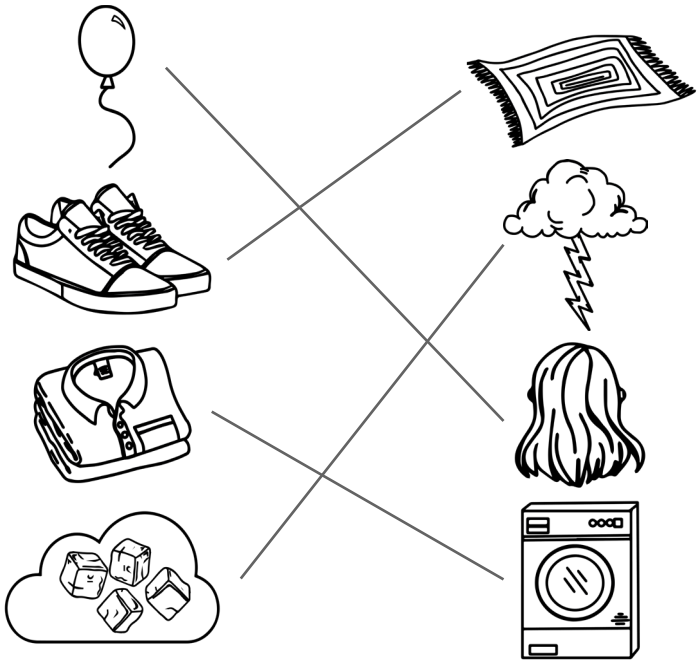
SLO : 6-4-01

Answer Keys

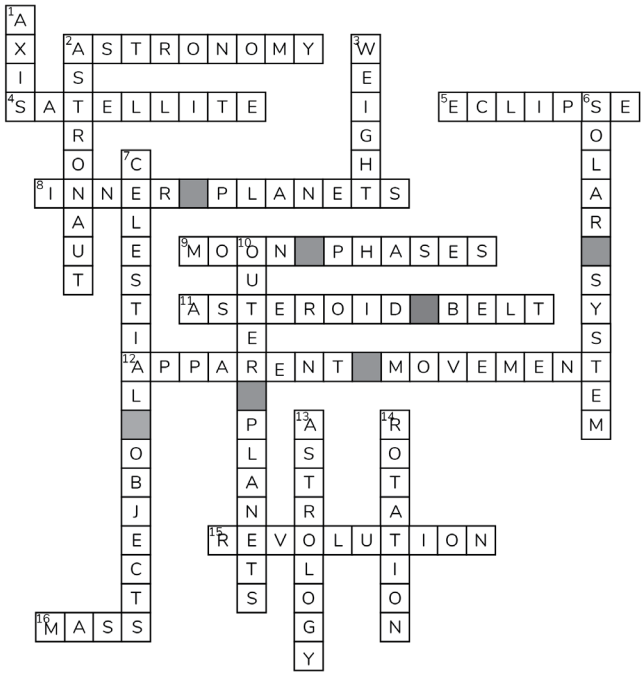
Classification Station (page 4-5)

Classification System 1: box 2, because it has 4 sides and the rest have 3.
Classification System 2: box 1, because it is cone shaped and the rest are cylinders.
Classification System 3: box 4, because 93 is not a multiple of 7, whereas the rest are.
Classification System 4: box 3, because it is not a grain and the rest are.
Classification System 5: box 2, it is the only one that doesn't end in 1, which in binary means it is an even number. These are all binary numbers, 11 is binary for 3, 1110 is binary for 14, 1101 is binary for 13, 10011 is binary for 19.

Flow Through (page 8)



Solar System Crossword (page 18)



Coding Some Better Vision (page 11-12)

Variable == a forest; if magnification_tool == BINOCULARS { can_see_better = TRUE; what_we_see_better = SQUIRRELS}
Variable == a sky at night; if magnification_tool == TELESCOPE { can_see_better = TRUE; what_we_see_better = STARS}
Variable == small font on a package; if magnification_tool == MAGNIFYING GLASS { can_see_better = TRUE; what_we_see_better = WORDS}
Variable == our hands; if magnification_tool == microscope { can_see_better = TRUE; what_we_see_better = BACTERIA}

Figure out the Force of Flight (page 15)

Answer = Lift

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