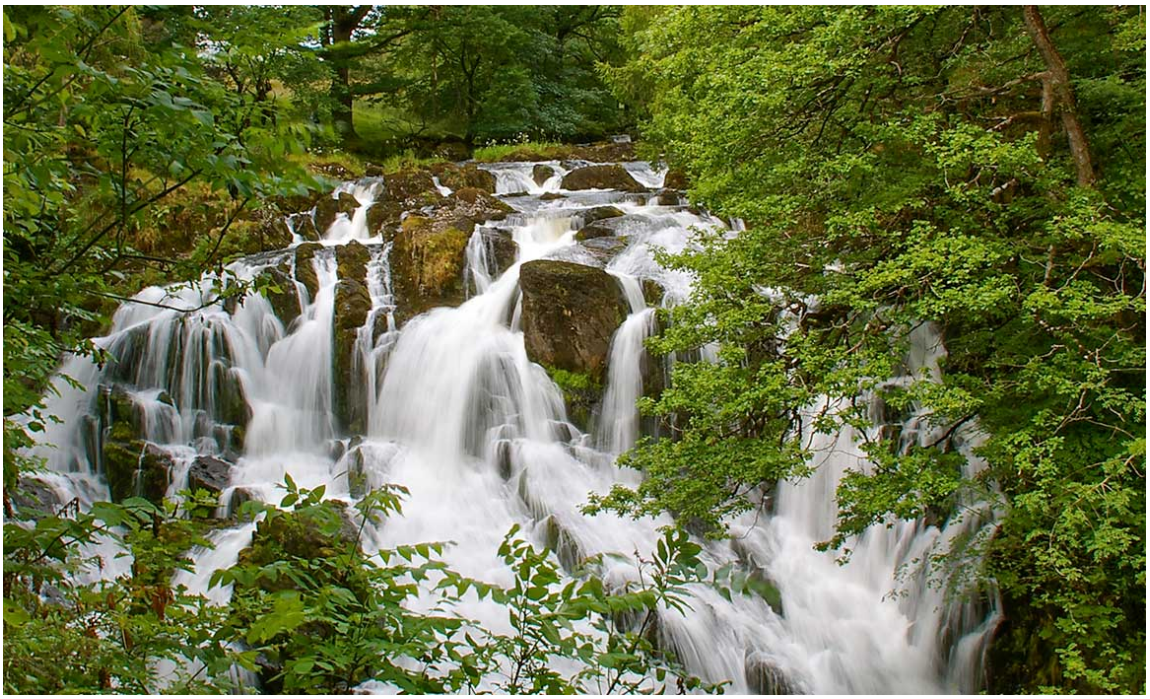
Waterworks

Primary Science

Study of Engineering Science (Physics & Chemistry)
& Measurement Mathematics

(Grades 1 & 2)

LEARNING LOG



http://www.ctckingshurst.academy/wp-content/uploads/2017/03/betws-y-coed-river-study-view-of-swallow-falls.jpg

Name: _____

Waterworks Learning Log

First Edition, July 2017
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This document edition will be used as a pilot resource to support innovative schools. The intent of sharing this first version with students, staff and families, is so we can gather further input for future revisions of this living curriculum.

All we ask is that if you use these materials that you give credit to and the author(s) of this initial work, in your introduction.

PURPOSE of LEARNING LOG RESOURCE:

1. To support the Ontario Science and Mathematics Curriculum
2. To support independent and paired study during station work or during home study (holiday or at-home interest/extended homework activities)
3. To add support as an enrichment or remedial resource (students can work at their own pace)
4. To provide a learning log (evidence of learning) built in to student resources

Table of Contents

S = Ontario Science Standards; M = Ontario Math Standards

NGSS- Next Generation Science Standard http://ngss.nsta.org/AccessStandardsByTopic.aspx

Surface Check

What are the parts of an experiment?

What is water filtration?

What is aquaponics?

What is buoyancy?

Bonus ☺
What are the four parts of the water cycle?

http://www.mortgagecalculator.org/images/safety.jpg

- Read this Safety Contract with your teacher and then sign it ☺

Safety Contract

Follow the teacher's instructions carefully. Ask questions if you do not understand what to do.

1. Do not taste, eat, drink, or inhale anything used in science activities unless the teacher tells you to do so.
2. Look for symbols on liquid products. (Some may be dangerous).
3. Be careful AND KEEP A SAFE DISTANCE around hot or boiling liquids.
4. Clean up spills as soon as they happen and return materials in their proper places after science activities.
5. Keep your hands away from your face, eyes, and mouth during science activities. Wash your hands after science activities.
6. Always wear goggles when chemicals, glass, or heat are being used and when there is a risk of eye injury from flying objects.
7. Tell the teacher if you see something/someone being unsafe.
8. Notify the teacher immediately if you have an accident or an injury.

I have reviewed these safety rules with my teacher.

_____ _____
Student's Signature Date

_____ _____
Teacher's Signature Date

- Read the following with your teacher and fill in together:

Hazard symbols

Use the words: burn, corrosive, explosive, flammable, care, death, caution, bone, toxic, blistered, ill, attack.

This symbol means _____. Chemicals with this symbol can cause red or _____ skin or rashes.

This symbol means _____. Chemicals with this symbol _____ and destroy living tissue, such as skin and _____.

This is the symbol for _____. This symbol is used for chemicals which are poisonous and can cause _____ if they enter the body.

This is the symbol for _____. Chemicals with this symbol _____ or ignite easily. They must be stored safely and used with care.

This symbol means _____. Chemicals with this symbol are unstable and can detonate under the right conditions. Therefore they must be stored safely and handled with _____.

Q1. Which symbol would a dilute acid be? _____.

Q2. What symbol a concentrated acid be? _____.

https://d1uvxqwmcz8fl1.cloudfront.net/tes/resources/6295638/8ce0c105-6cd9-409a-a77a-52a7619f7677/image?width=500&height=500&version=1448458623610

- Measure each side of the triangles in cm and mm.
- Try to put lines of symmetry on one of these symbols.

https://s-media-cache-ak0.pinimg.com/236x/1b/59/03/1b59039504bb7d98b05cb5cf2addab50--hazard-symbol-hazard-sign.jpg

1. Humans Need Water to Survive

Water is a clear, colourless, odourless (no smell), tasteless liquid. It can be a liquid, a solid (ice) or gas (steam).
All animals and plants need water to survive.

People have four needs that protect us from physical harm, and many "wants".

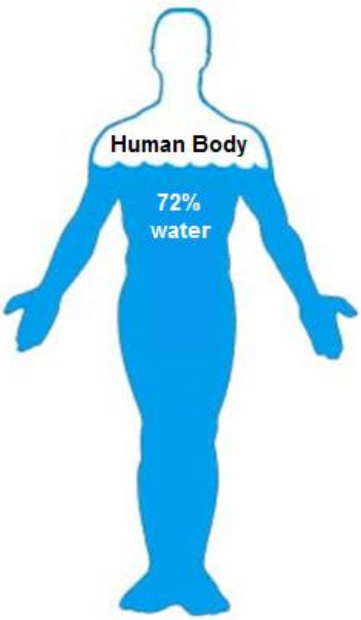
- Take a look at the posters below and talk about how we use money to pay for our "needs" and "wants":

https://s-media-cache-ak0.pinimg.com/736x/1c/03/6c/1c036cd9d0402550aba538a01cf06ee1--kindergarten-social-studies-social-studies-first-grade.jpg

https://s-media-cache-ak0.pinimg.com/236x/f9/1b/dd/f91bdd5dd6a9d52837a28e6fc6c44946.jpg

- Talk about where you think the word, 'fitness', should go on these posters

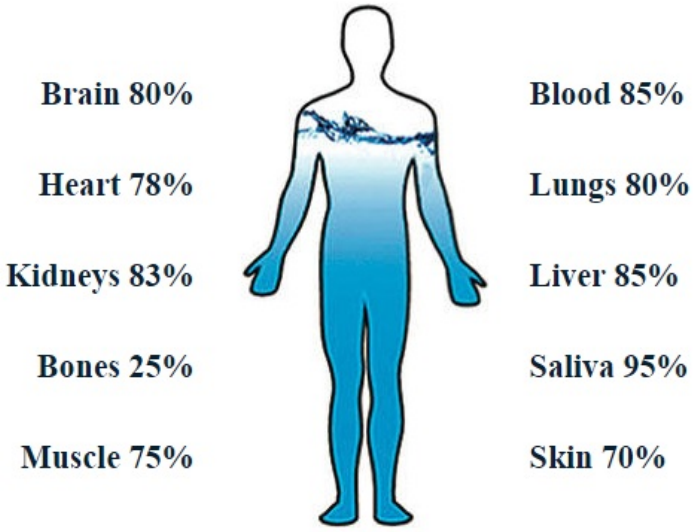
Experts agree our bodies are made up of mostly water!
Depending on our age, we need different amounts of water.
Our bodies can be made of 60-75% water.



http://www.healthyandnaturallife.com/wp-content/uploads/2015/07/human-body.jpg

Different parts of our bodies need water to work well.

- Take a look at this image and circle how much water can help us think!



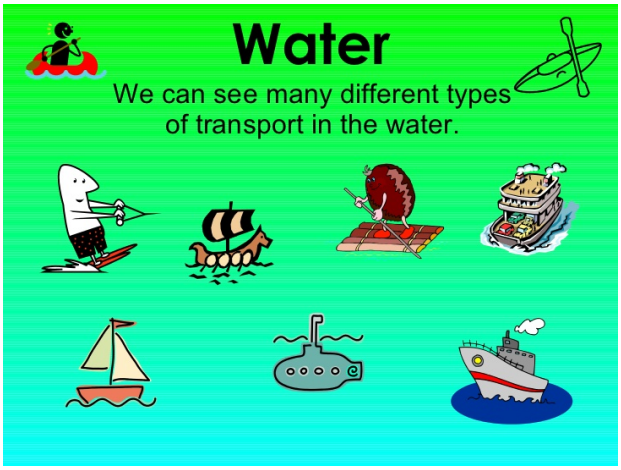
http://www.glacierclear.com/images/humanbody.jpg

We use water in many ways!
We use water to wash and bath to stay clean and protect us from disease.

http://www.gphealthsmart.com/~/media/CPG/GPProMarketing/HealthSmart/feature-hand-washing-prevents-spread-of-infection.jpg

Proper hand washing with soap should be something we do often to prevent us from getting and spreading illness.

We use water for transportation.



https://image.slidesharecdn.com/typesoftransport-110515072357-phpapp01/95/types-of-transport-5-728.jpg?cb=1305446148

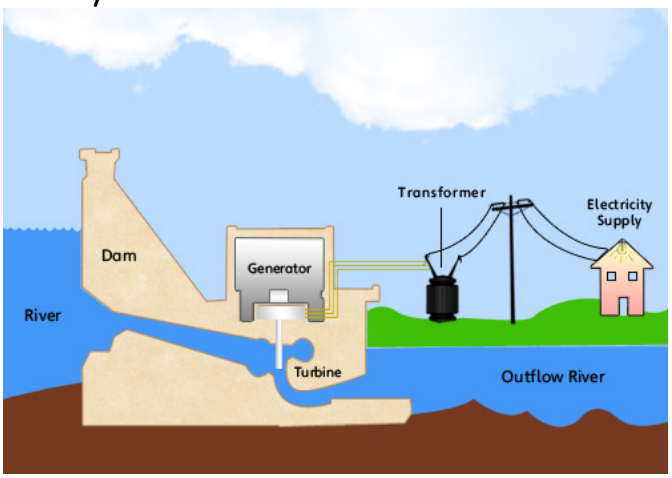
We use water to make energy.

http://www.wholesem.ac.uk/images/water-energy

Waterfalls can be an incredible source of power. Niagara Falls pours over 620,000 tons of water over its edge each minute. The American Falls are higher (just over 50m) than the Canadian Falls (48m), but the Canadian Falls are twice as wide. In both cases the rush of water is eroding the land under the falls.

Extension

- Take a look at how a hydroelectric dam works:



http://www.myteamexplore.com/scgtest/team-explore/uploads/images/energy-hydro-electricity-team-explore.jpg

2. We will not waste water!

School Water Audit:

- Find out where we use water in the school.
- Keep track of the time and the number of times we use water in a day.
- Put this information on a large chart paper.
- Talk about it the next day in the morning during a classroom circle chat.
- Check off the ways your family uses water at home:

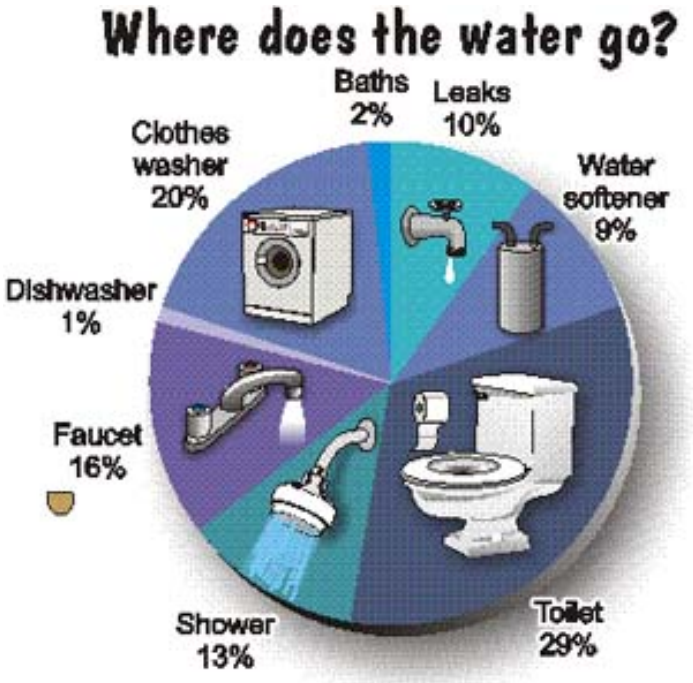
making food	
drinking	
bathing	
flushing the toilet	
washing dishes	
doing laundry	
watering plants or the lawn	

Many people do not realize how much water they use, because it seems so easy to get water. We shouldn't waste water, for the same reasons that we shouldn't waste food. We sometimes think water is free, but it isn't.

- Work with a partner and draw a picture and label the different costs associated with having clean water.

How well did I complete the tasks?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a Rookie (not yet, need more help)

- Look at the graphs below and talk about more and less with your teacher.



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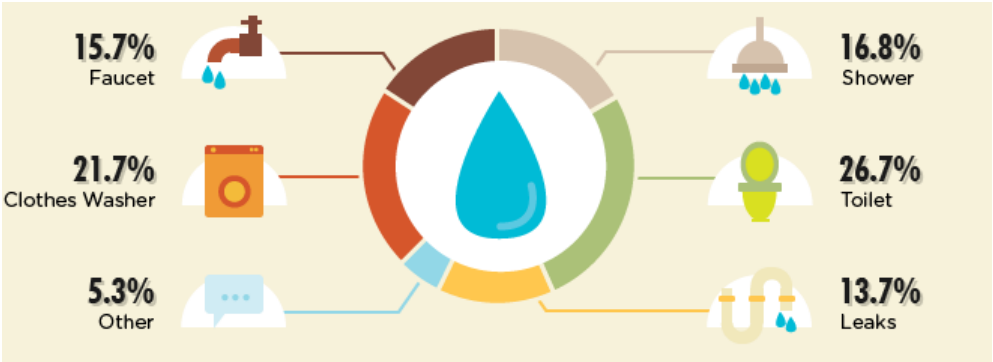


http://www.sodgod.com/wp-content/featured-content/water-cycle/images/per-map.png

How well did you identify patterns in data?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a rookie (need more help & practice)

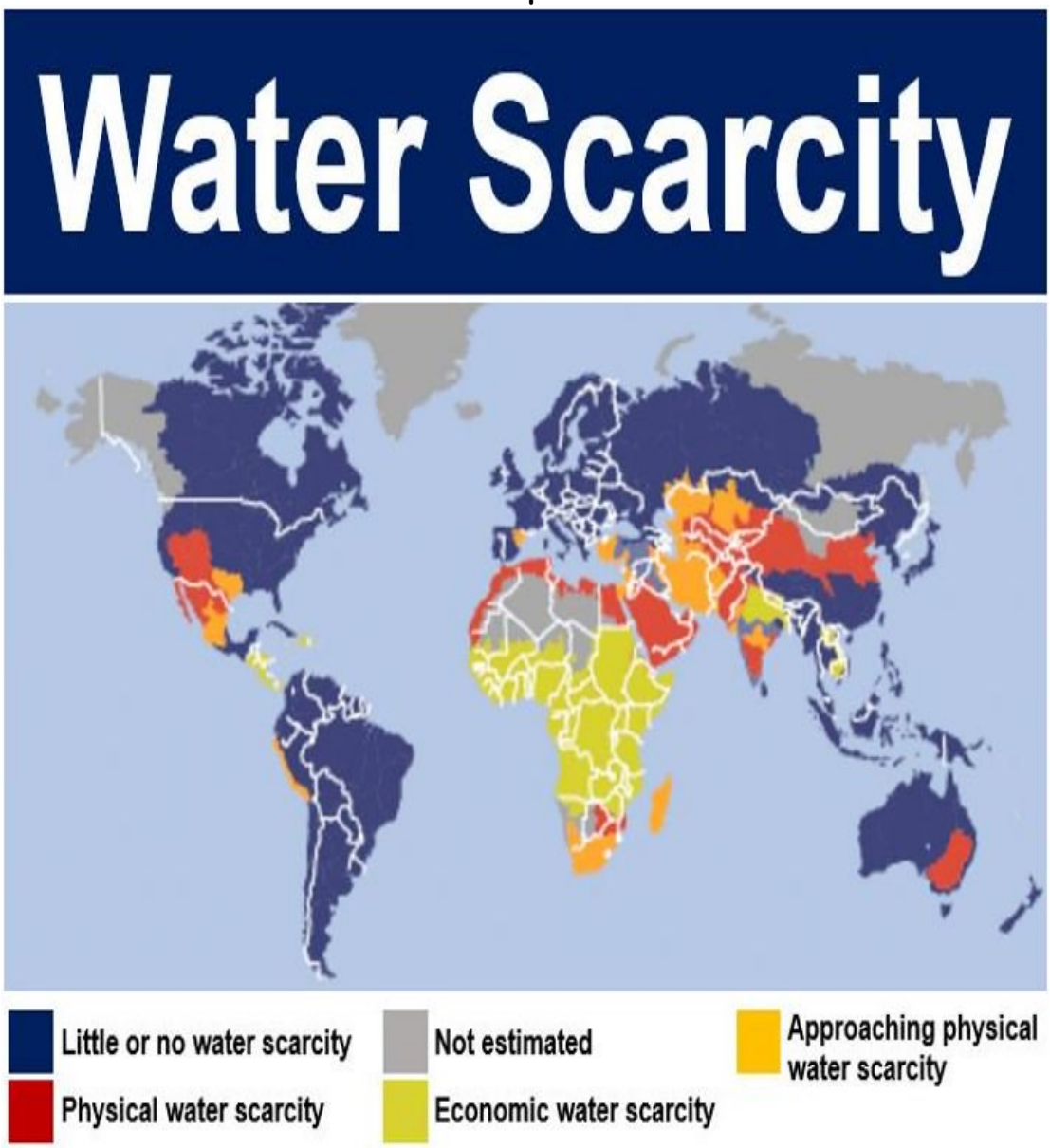
Water Care Plan

- Work with a partner to make a plan to use less water at school and at home.
- Draw a picture and label your plans.

Reduce Water Use at School	Reduce Water Use at Home

How well did I complete the tasks?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a Rookie (not yet, need more help)

- How might your use of water change if you had to carry it to your house or apartment?
- There are many places in the world where clean water has to be transported by foot to the home.
- Take a look at this map of the world and talk about what continents need the most help to find clean water.



http://marketbusinessnews.com/wp-content/uploads/2017/03/Physical-and-economic-water-scarcity-by-country.jpg

Responsible/efficient water-use practices at home:

- ✓ fixing leaky faucets or toilets quickly
- ✓ turning off the water while you brush your teeth or soap up your hands and face; watering the lawn early in the morning to reduce evaporation;
- ✓ running the dishwasher only with a full load
- ✓ installing low-flow shower heads and a water-saver flush kit in the toilet
- ✓ not splashing lots of water out of swimming pools
- ✓ keeping a bottle of drinking water in the refrigerator rather than letting your tap run to get cold water when you want a drink
- ✓ Take speed showers (https://ecokids.ca/blog/take-action/take-speed-showers)
- ✓ Low-flow and auto-flush toilet fixtures.

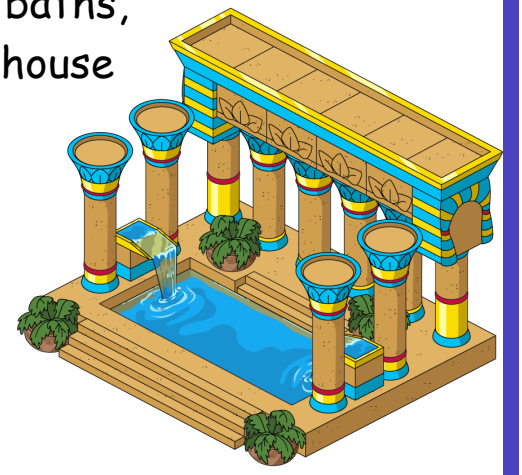
https://www.theweeklyobserver.com/wp-content/uploads/2017/04/4201135.jpg

We do not need to use water 'excessively'.

- Talk with your classmates about what you think it means to use water excessively.

History of the Bathtub

Long ago, in Ancient times, the Greeks and Romans built huge public bathhouses – hot and cold baths, gyms, theatres and gardens. One bathhouse was so big it could hold 3200 bathers at one time! The walls of baths were made of marble, and water taps with silver. Water was heated by fires in the basement. Later people made wooden tubs. Sometimes people in the 600's spent hundreds of hours in a tub to treat their aches, pains and illnesses.



https://familyguyaddicts.files.wordpress.com/2014/06/building_egyptianbathhouse_v24x.png

The Invention of the Toilet

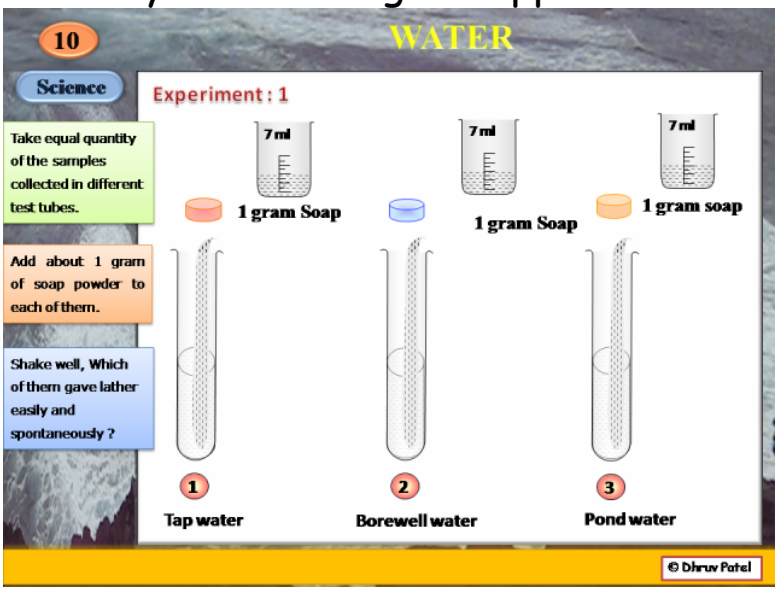
The flush toilet, that cleans the bowl with water after it is used, is about 4000 years old. Latrines were built where water was delivered to the bowls through pipes in Crete (Greece) around 2000 BC. Homes in Pakistan and in Italy had flush toilets, too. In 1775 in England, a chain was used to open a valve to deliver water to a toilet bowl.

Hard and Soft Water

When tap water doesn't lather or allow soap to foam, the water is called "hard water". Hard water has so many minerals in it, that people need water softeners (chemicals) added to water, so we can use soap for bathing and laundry. You can also boil water to try and breakdown the hard minerals.

STEP OUTSIDE:

- If there is a pond close by, gather some pond water.
- Describe what it looks like.
- Your teacher can place equal amounts of pond water, tap water and well water into three cyclinders.
- Then we can add the same amount of soap in each one.
- Talk about what you think might happen.



http://1.bp.blogspot.com/-7IxIU156Cvg/UZN-vMRHYeI/AAAAAAAAABU/CFlex2CUgOw/s1600/exp+1+types+of+water.png

- Circle the water that made the most foam and put an X through the picture of water that did not foam much at all.

- Explain how we can waste water when we:
  - turn on fans and air conditioners when it's hot
  - turn on pool heaters when it's cold
  - wash cars
  - water gardens parks and lawns
  - have a bath
  - run the water to get a cold glass of water

An Up Close Look at Water

- Look at each kind of water using a magnifying glass, a microscope or magnification from your teacher's phone.
- Draw and label the images below:

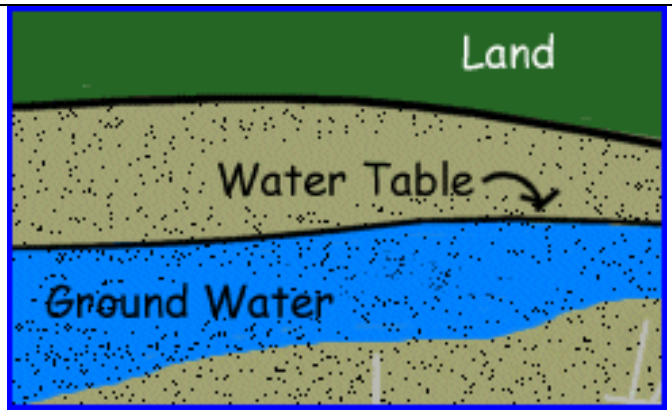
Well Water	
Pond Water	
Tap Water	

How well did I complete the tasks?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a Rookie (not yet, need more help)

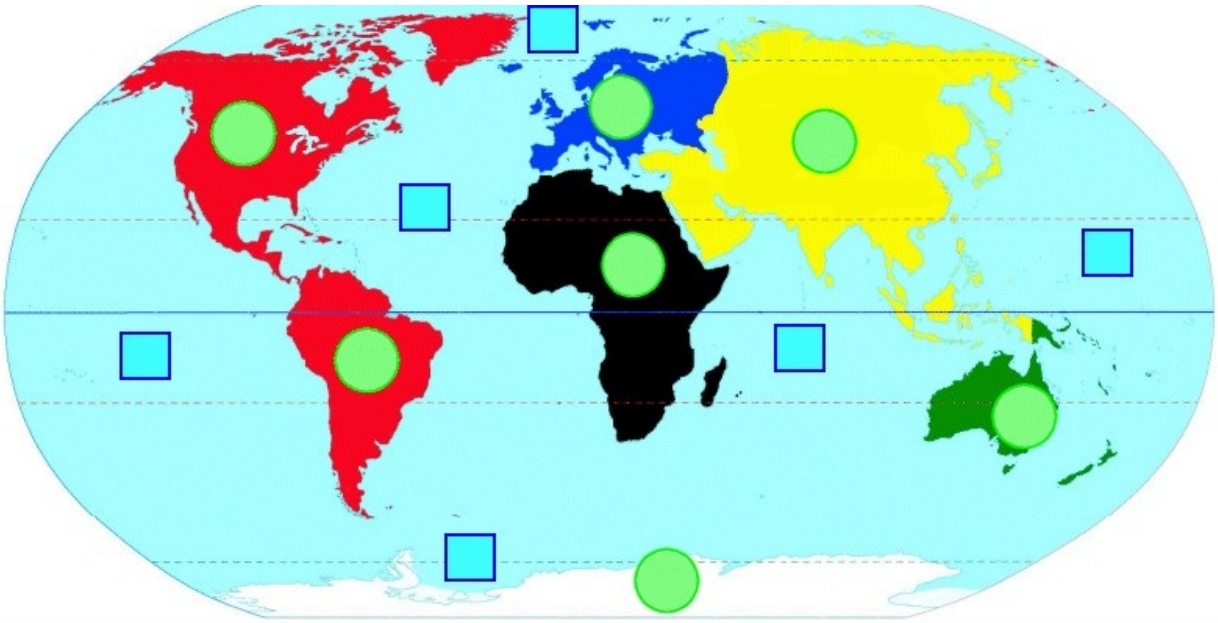
ET - Identify patterns in data.

3. **Keeping Water Clean**

- Draw these natural sources of water (other than weather).

Ocean	
Lake	
Pond	
Stream	
Spring	
water table	

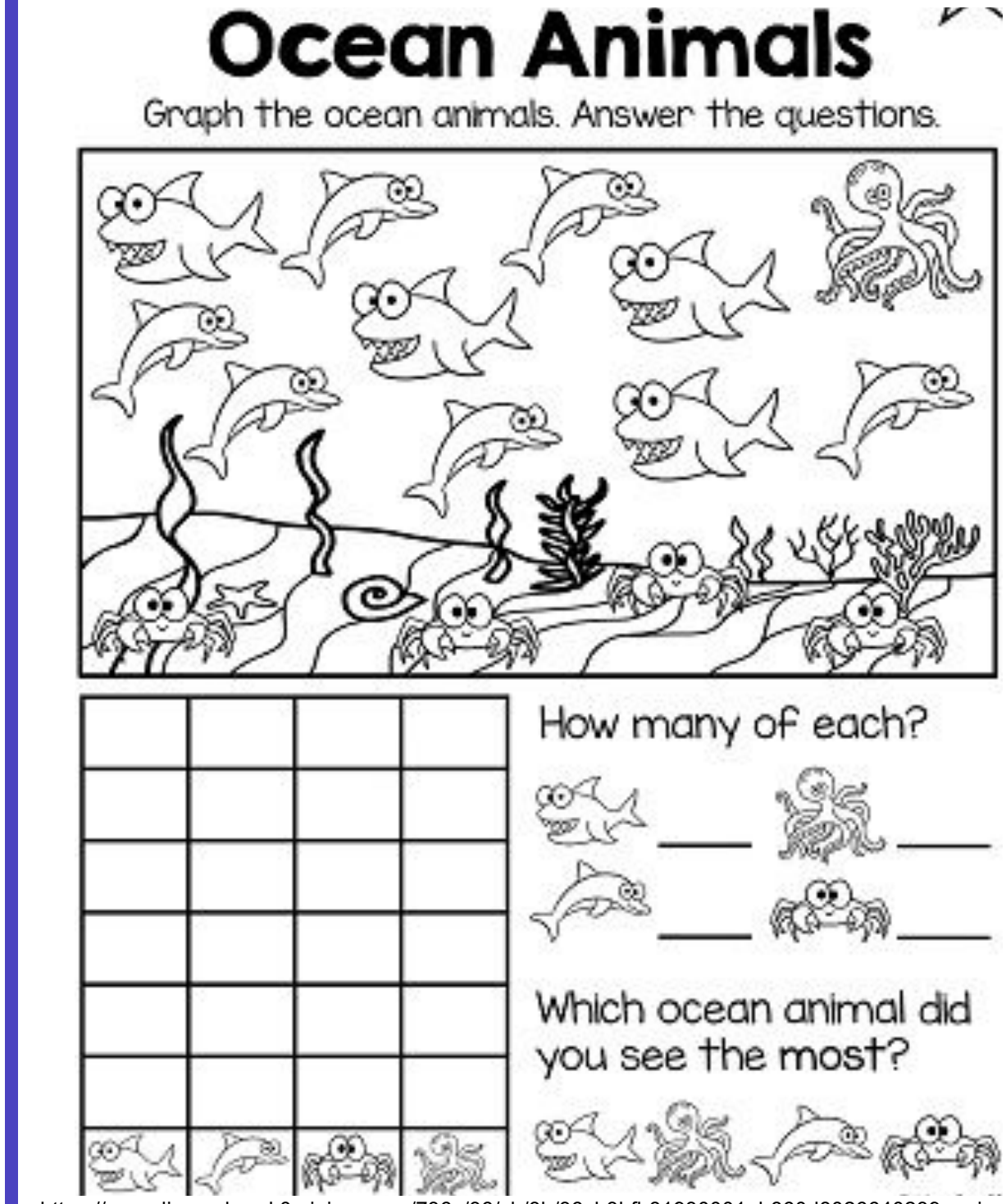
Oceans surround our continents.



http://img.over-blog-kiwi.com/0/74/28/93/201309/phpbLZ2MY

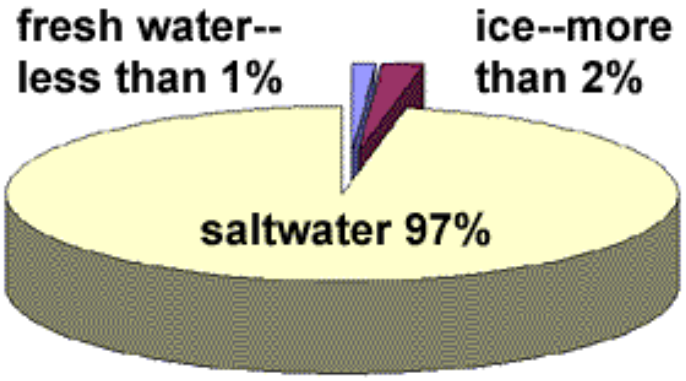
Check out an atlas to figure out what numbers go inside which oceans (boxes) and continents (circles).

Continents (circles)		**Oceans (square boxes)**	
North America		Atlantic	
South America		Pacific	
Europe		Arctic	
Asia		Antarctic	
Africa		Indian	
Australia			
Antarctica			

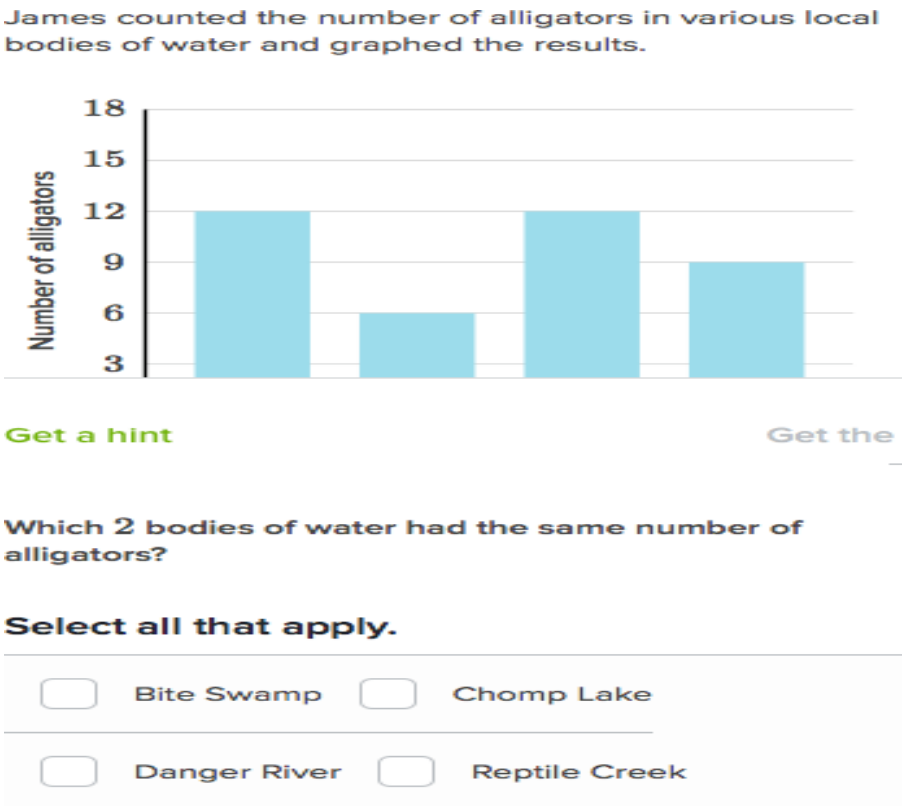


https://s-media-cache-ak0.pinimg.com/736x/36/cb/3b/36cb3bfb81930001eb860d8026640239--science-worksheets-for-first-grade-ocean-activities-for-first-grade.jpg

- Read the graph below to explain what kind of water is more and less:



http://consuegrascience.weebly.com/uploads/8/6/5/9/86593338/water-graphs-2_orig.png



https://cdn.kastatic.org/ka-exercise-screenshots/solving-problems-with-bar-graphs-3.png

How well did you identify patterns in data?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a rookie (need more help & practice)

- Read what Dr. Universe says about salt in the ocean:

Why is the ocean salty? -Alysin, Age 10

Dear Alysin,
…it turns out the source of our salty seas is actually on land. My friend, Professor Steve Katz, and I took a walk along the shore of a nearby river to investigate.

Katz is an environmental scientist…at Washington State University. He pointed out some big rocks along the river. That's where the salt comes from, he explained. Yep, it all starts with rocks and dirt.

Rocks contain minerals, such as salts…<like> the same kind…you might sprinkle on food…And water is really great at dissolving <salt>. Add a little salt to a cup of water and mixing it with a spoon…The reaction in the water has pulled the different parts of salt away from each other.

Likewise, the water in streams and rivers is really good at helping dissolve the salts from rocks, too. The salt travels through the streams and rivers into the oceans. When the water from our ocean evaporates to become clouds, the salt is left behind….

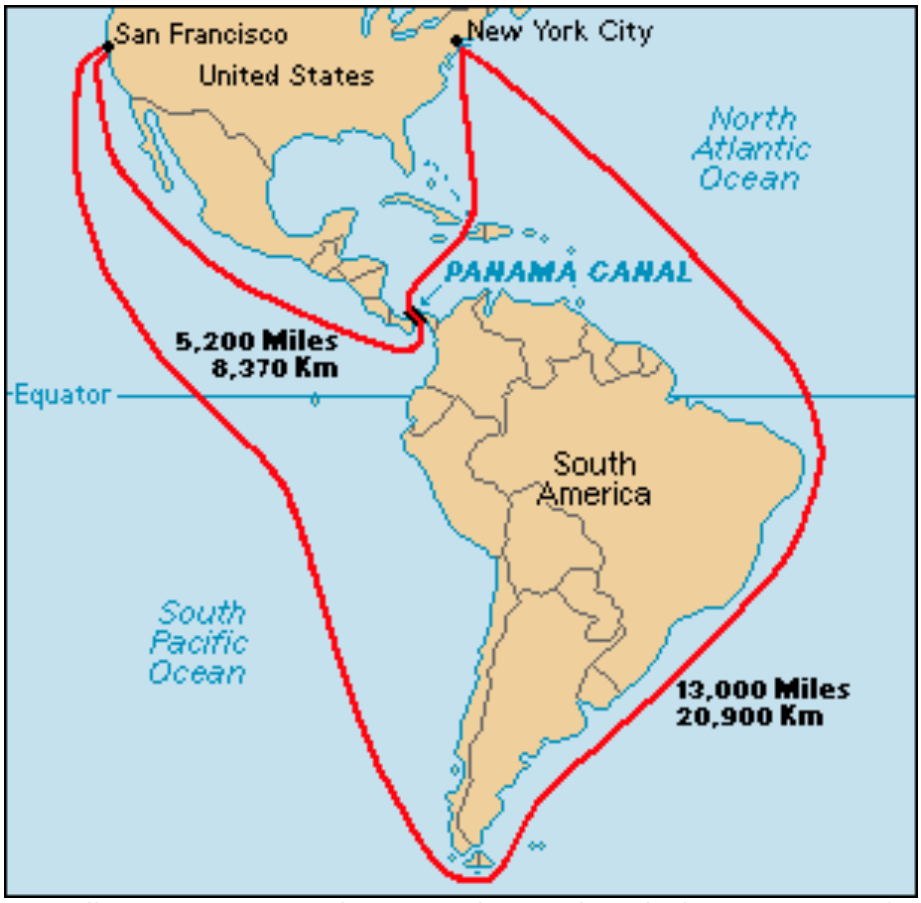
According to the National Ocean Service, if we took all the salt from the oceans and spread it around the Earth's surface, it would form a pile nearly 500 feet <over 150m> high. Katz explained that oceans weren't quite as salty in their early days as they are today. But once the oceans got saltier they stayed that way…for nearly 4 billion years.

But no matter where the salt goes, one thing is for sure: We can count on the ocean to be just about as salty tomorrow as it was today.
Sincerely,
Dr. Universe
(https://askdruniverse.wsu.edu/2016/04/18/oceans-why-are-they-salty/)

Canals Made By Man

The two biggest oceans (Atlantic and Pacific) are separated by 50 miles by the **Panama Canal**. There are no mountains in Panama but in Costa Rica there is a mountain you can climb to see both oceans (Mount Izaru).

The **Suez Canal** is the longest big ship canal in the world (over 160km). A French company started to build the canal in 1881 but gave up when 20,000 workers died of malaria. In 1907, an American company dug up 10 million tons of earth and finished the canal in 1914.



http://marinersgalaxy.com/wp-content/uploads/2015/06/panama-canal.gif

- Read and talk about the 'Fish-Friendly Car Wash'.

The Fish-Friendly Car Wash

Many fundraising groups like to do cars washes. Plenty of soap is used and it usually winds up in the storm drains. The water and soap from the storm drain goes directly into local water sources and is harmful to the living things in the water habitat. You can choose to have "Fish-Friendly" car wash instead. In Eugene, Oregon, they give out free "fish-friendly" car wash kits. The kits contain pumps that can be used to move wash water to sewers or grassy areas. The kit contains Fish-Friendly car wash signs, a hose, instructions and more. If you are planning a car wash fundraiser, plan ahead to make sure kits are available and will work at the site where you want to wash. To reserve a kit, call 541-682-4929. To see how our kit works, visit www.happyrivers.org and look for car wash information under our featured videos section. (CarWashFactsheet2013FINAL_20130627143404244.pdf)

Extension:

- Write a business letter to a politician in our local community to see if they might put some kits together for our area.

TECH CHECK:

- https://www.youtube.com/watch?v=cy7yYRlsmwA

- What things can we do to help keep our water clean?

- Talk about how doing these things would affect my classmates, my family and my community?

STEP OUTSIDE:

- See if you can visit a local well, a sewer, a reservoir and a local water tower
- Draw these man-made sources of water:

Well	
Sewer	
reservoir	
water tower	

Water Filtration

Your teacher will read the list of instructions for this experiment and then you can

- predict what you think might happen as you complete the experiment.

1. Stir some dirt in the glass of water to "pollute it".
2. Put a cloth or napkin over the empty glass.
3. Make sure the cloth dips into the glass so no water spills.
4. Slowly pour the "polluted" water into the cloth and show the results.

(adapted from https://www.ontarioecoschools.org/wp-content/uploads/2015/04/Waste-Grade-2-EN-FIN.pdf)

Water Filtration Experiment

Prediction

*I predict…*_____

_____

My Theory - *I think we can clean this water by….*

_____

Observe – *I observed…*(Draw and label pictures of what happened)

Findings – *I confirm or changed my first idea (theory) when I found out -*

_____

Doing Better – *My experiment would be better if….*

_____

How well did I complete the tasks?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a Rookie (not yet, need more help)

- Talk about how you felt about the idea of drinking the dirty looking water?

Filtration

Our drinking water at our community filtration plant is filtered and cleaned by different types of filters that separate the pollution from the water.

- Look at the word 'filtration'.
- What do you think is the root word in filtration?
- Why do we need giant filters in a water treatment plant?

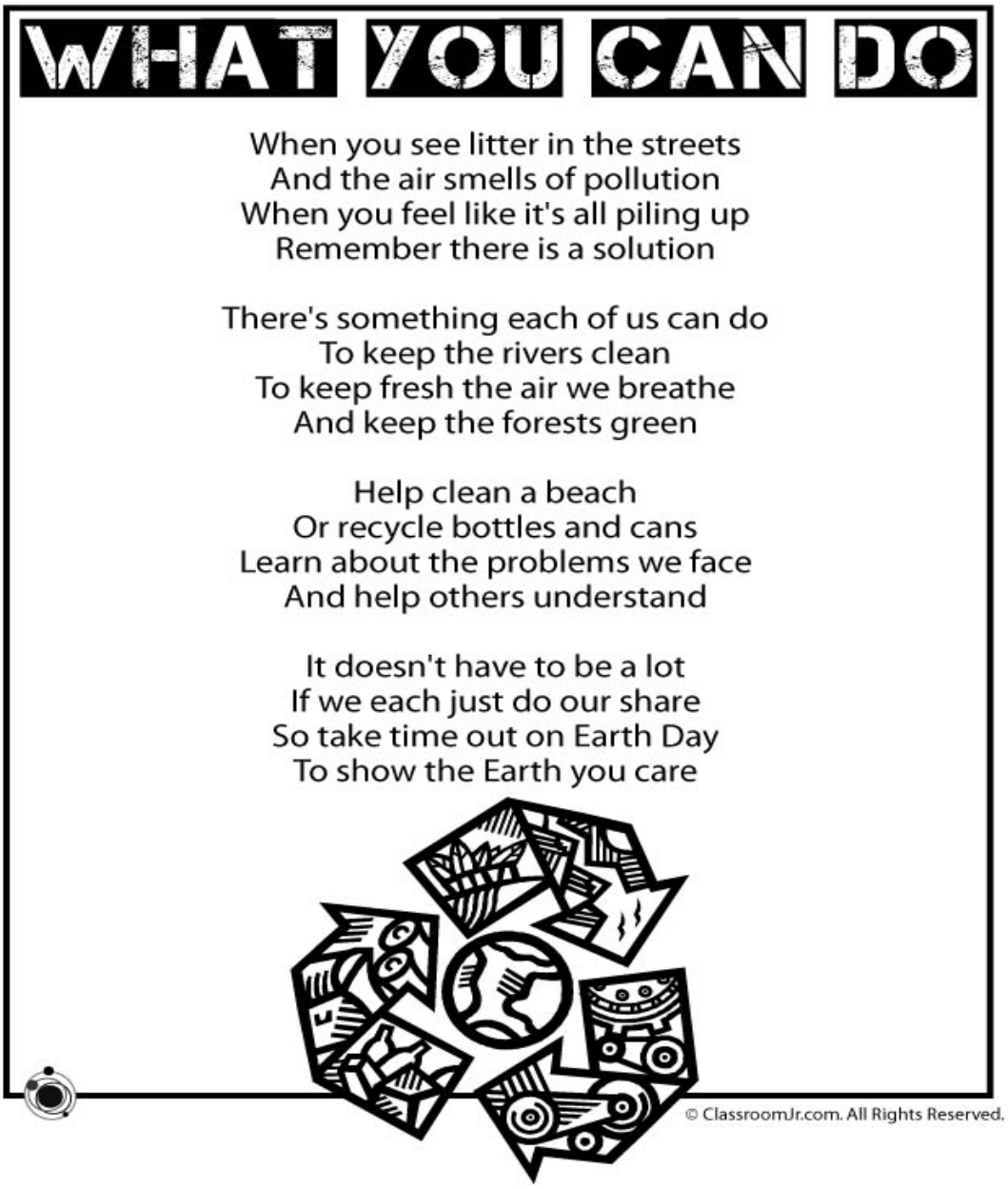
- In pairs, talk about one of the following questions.

1. How does a filter help us get orange juice without pulp in it?
2. How does a strainer work when we boil vegetables or eggs?
3. How can a fish net be a filter?
4. How is a strainer used to pan for gold?
5. How does a screen on a window or chimney act like a filter?

https://s-media-cache-ak0.pinimg.com/736x/c9/55/28/c955288e3ca5525960c3c46a8de65cee--nature-experiments-for-kids-soil-activities-for-kids.jpg

- Your teacher may contact someone from the local water treatment plant to see if we can interview/Skype or visit the facility to find out more about how we keep our local water clean.
- Talk about why you think clean water is difficult to find in many parts of the world?

- Read the poem 'What You Can Do' together



WHAT YOU CAN DO

When you see litter in the streets
And the air smells of pollution
When you feel like it's all piling up
Remember there is a solution

There's something each of us can do
To keep the rivers clean
To keep fresh the air we breathe
And keep the forests green

Help clean a beach
Or recycle bottles and cans
Learn about the problems we face
And help others understand

It doesn't have to be a lot
If we each just do our share
So take time out on Earth Day
To show the Earth you care

https://s-media-cache-ak0.pinimg.com/originals/08/8c/aa/088caa4a8cab651f809f1d57566480cd.jpg

- Listen to your teacher read this story.

All Bottled Up by Jodie Mangor
In 2007, people in the United States drank more than 8 billion gallons of bottled water…The United States only recycles about 23 percent. The rest are part of a growing solid waste problem.

Bottled Over Tap? Words like "pure," together with images of mountains or glaciers, are used to market bottled water. Many people believe that it must be cleaner and more healthful than tap water from public water systems. In developed nations such as the United States and in Europe, regulations… are often stricter for tap than for bottled water…It may come as a surprise that as much as 40 percent of the water bottled in the United States starts out as tap water. Before bottling, some companies filter it, and they might add minerals for taste.…bottled water can cost anywhere from 240 to 10,000 times more per gallon than tap water.

Is the Bottle Ever Better? At times, bottled water is the best available option. Hurricanes, other natural disasters, and emergency situations…can affect the safety of public water. Reliable water systems may not be in place in developing nations. In these cases, bottled water can provide an important source of clean, safe, drinking water.

Future Solutions - "Back to the tap" movements are cropping up around the world…To save money, use fewer resources, and create less waste, they advocate using tap water and reusable "sports" bottles rather than bottled water. San Francisco and other cities across the United States no longer allow their governmental departments to buy single-serve water bottles. Cities in Canada, Australia, and the United Kingdom are considering similar bans. Many bottled water companies are trying to do their part, too. They have reduced the amount of plastic in their bottles and bottle caps… <Some> use biodegradable plastic bottles derived from corn. Belu takes it a step further by donating some of its profits to clean water projects.

- Imagine what it would be like if you could only find a water bottle in a museum?

ET - Measure lines of symmetry in 2D figures using centimeters (cm).

4. Water Celebrations

- What will we plan for WORLD WATER DAY:

https://s-media-cache-ak0.pinimg.com/736x/84/08/13/840813431fb7795b2dfb340080dd1d59---quotes-day-quotes.jpg

https://www.askideas.com/media/33/World-Water-Day-March-22.jpg

Extension:

- Listen to or read this article by philanthropists, Craig & Marc Kielburger:

BEYOND WORLD WATER DAY
BY CRAIG AND MARC KIELBURGER (Volume 11; Issue 22)

Children collecting water in rural China. Photo source: WE Charity archives.

Tyler and Alex Mifflin spent summers in the water. Childhood memories of canoe trips and pristine waves contrast heavily with something they heard from adults time and again: "Don't swim in Lake Ontario. It's too polluted." That warning was the first drop in the bucket that's become a shared life goal.

Two decades later—after four seasons as hosts, directors and videographers of the award-winning eco-adventure series *The Water Brothers*—they've dipped their toes in bodies of water in over 35 countries, interviewed hundreds of leading scientists, and shot thousands of hours of footage. They travelled down the Mekong and Ganges rivers, went scuba diving with hammerhead sharks and sailed into the middle of the Great Pacific Garbage Patch.

Every episode is paired with interactive educational content that make water issues more accessible to remind people that water is more than a resource—it's a life source.

March 22 is World Water Day and we need the conversation to extend beyond the environment. So we spoke with the Mifflin brothers about the importance of water and how ordinary people can take action every day in unexpected ways.

"Water is connected to poverty, economic development, health," says Alex, the passion clear in his voice. "You can't have a functioning society or a functioning economy if you don't have clean water."

That applies to Sub-Saharan Africa as much as to Indigenous communities across Canada. We've seen climate-linked heat waves and food shortages impact millions around the globe. Droughts from Kenya to California and record-setting wildfires across Russia's bread basket have strained economies and aid systems. Research suggests that water shortages helped spark the Syrian Civil War when a 2006 draught forced farmers to migrate to urban centres as the economy crashed, creating a tinder box of unemployed, angry men.

Most of the political and social issues of our day come back to water—and protecting it requires a major change in lifestyle. Speaking at schools across the country, Tyler and Alex tell students that half measures are no longer enough. Shorter showers alone won't save us. Our well-known water conservation tactics need a boost from less obvious—and often more difficult—actions, like eating foods that require less water, Tyler says. One kilogram of beef takes just under 14,000 litres of water to produce while the same amount of chicken needs only 4,000 litres.

Our well-known water conservation tactics need a boost from less obvious—and often more difficult—actions, like eating foods that require less water, Tyler says. One kilogram of beef takes just under 14,000 litres of water to produce while the same amount of chicken needs only 4,000 litres. Beyond food, there is a hidden water price tag to almost everything we manufacture. Each plastic water bottle requires twice as much water to produce as the amount it holds. It takes 5,000 litres of water to make 500 sheets of paper and another 713 litres for one t-shirt.

Encouragingly, Tyler and Alex have seen students across the country petition their schools foe bottle refill stations and begin litterless lunch movements to reduce the amount of plastic they use litterless lunch movements to reduce the amount of plastic they use.

As people begin to understand the hidden impact of water, they'll see conservation as a way to help not just the environment but also the economy.

"Every day has to be World Water Day", says Tyler.

World Water Day Poster

- Make a poster for World Water Day.
- Use lines of symmetry to balance your picture in the middle of the page.
- Create a 2cm border all around your poster.
- Cut your poster in half and trade with a classmate.
- Make 2cm grid lines on separate paper and attach it to the ½ poster.
- Then draw the other half of the missing picture on a folded piece on the grid paper.

How well did you measure lines of symmetry in 2D figures using cm?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a rookie (need more help & practice)

ET - Compare millimeters (mm) & meters (m) to centimeters (cm) using <, >,=.

5. **Long Term Stream Study** (if stream is nearby)

- You and your partner will measure off a section of the bank of our stream to study.
- Your stream study will involve drawing and labelling pictures of what is happening in your stream at different times
- You will keep your observations and findings and compare them in different seasons and in different years as this is a long-term study of living things in and at the water's edge.

- Work with your Learning Buddy to make a model of a river:

1. Pack some dirt in a box with a cut-out at one end.
2. Measure the height of the dirt with a ruler in cm and mm at three different places in the box.
3. Put the box at a slight angle so that the notch is down.
4. Draw a picture of the box and label it:

Measure 1	Measure 2	Measure 3

- Tell your teacher which measurements are greater than (>), less than (<) and possibly equal to (=) others.

Observation:

_____cm is > than _____cm

_____mm is < than _____mm

_____mm is > than _____cm

5. Sprinkle water at the highest end of the box slowly and observe the results.
6. Catch the run-off in a plastic container under the notch.
7. Talk about what happens to the water when the slope is steeper.

8. Draw picture of the box after you sprinkle water in it:

Observation:

Findings:

- Talk about your responses with your teacher and classmates.
  - How does the water of a river change the soil along its path?
  - How did this experiment demonstrate erosion (the wearing away of soil by water) ?
  - Why did the clean water that you poured down the slope come out dirty?
  - Does this happen in an actual river? What happens to rocks in and along the river over longer periods of time?
  - Do you think erosion of dirt and soil from water occur with rocks as well?

Stream Study 101

- Go visit the nearby stream with our learning buddies who are studying habitats.
- Talk about the important parts of the stream: living things (plants/animals/insects) riverbed, the rocks, and the soil
- Talk about what we see, hear, smell and touch (without harming living things)
- Think about the ways we can study the stream and at the same time be careful about not harming the habitat.

Prediction

*We predict…*_____

_____

How well did I complete the tasks?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a Rookie (not yet, need more help)

Let's brainstorm how:

- we can mark off our space for study.
- we should walk to the river in winter, spring and fall.
- we can reduce how much we move or touch living things.
- we should collect trash if we see any.

http://static.wixstatic.com/media/1e506fe02e855fa59194ccf0a26fc9c9.wix_mp_1024

TECH CHECK:

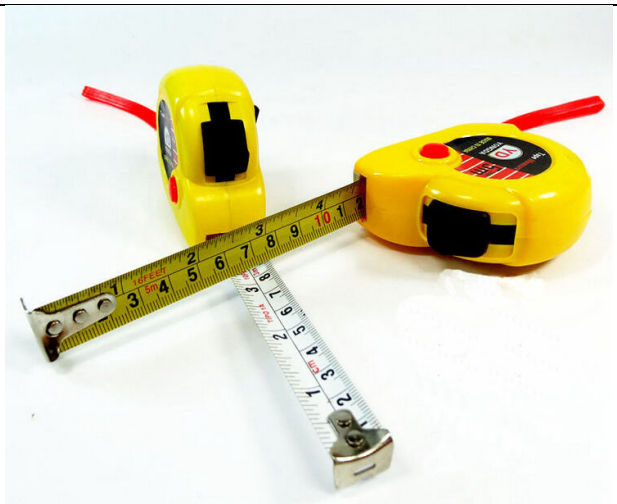
- https://learning-in-action.williams.edu/opportunities/elementary-outreach/science-lessons/2nd-grade-river-science-unit/

- Measure off a 2-meter distance along the riverbank for your study.
- Measure 2 meters from the water's edge to mark your width.

How many cm in 2 meters? _____cm.

How many mm in 2 meters? _____mm.

- Mark the 4 corners of your space with stone markers with you and your partner's initials.
- You can use a measuring tape or a measuring wheel if available to mark off your space.
- You may also measure a 2-meter string in advance – and use this to mark your location as well.
- Measure the width and depth of the stream/creek.
- Use a measuring tape or string to record the width of the creek at the location of the riverbank you will studying.



https://ae01.alicdn.com/kf/HTB1SDSnKpXXXXa.XXXXq6xXFXXX2/-font-b-3M-b-font-Retractable-Steel-font-b-Tape-b-font-Measures-font-b.jpg

https://www.vpcivil.co.in/wp-content/uploads/2011/09/Measuring-Wheel.png

REVIEW:

- How many cm in a meter? _____ cm.

- How many mm in a cm? _____ mm.

Draw a picture of the riverbank space 2m long and 2m wide. Make a grid by dividing it into 4 squares (2cm long and 2cm, wide) below:

How well did you compare millimeters (mm) & meters (m) to centimeters (cm) using <, >,= ?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a rookie (need more help & practice)

http://www.manchesterhigh.co.uk/_site/data/images/news/172/main-P1000074.JPG

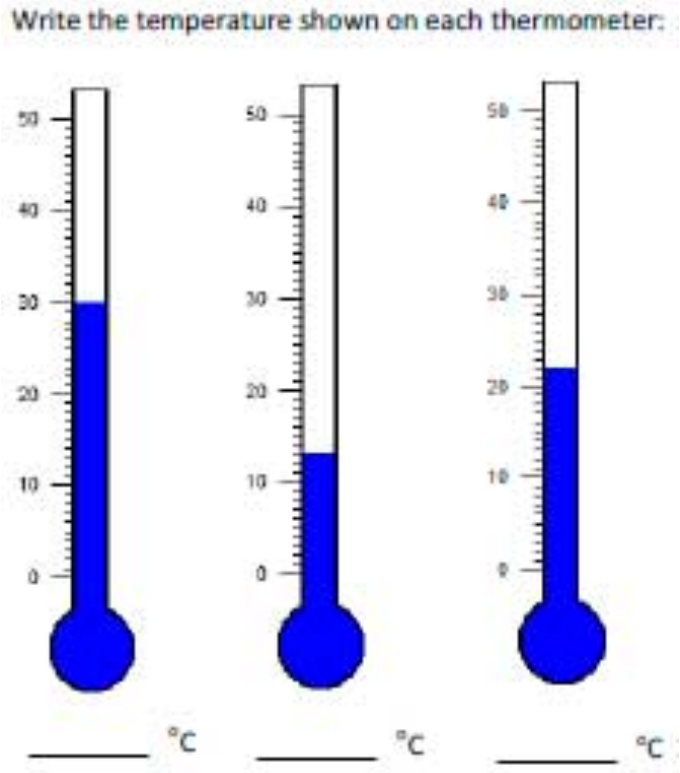
- Make a stick measure to keep track of the depth of the water at the deepest part of the stream at the location of the riverbank you will be studying.

- Find a stick long enough to measure the depth of the stream when you stick it in the middle.
- Put markings on the stick like a meter stick. Be sure to mark the point of one meter, as well as cm markings.

Taking Temperature

When you take the temperature of the air and water, you use a thermometer. To read a thermometer you just read the number where the liquid (mercury) stops.

- Practice reading these thermometers:



https://www.mathworksheets4kids.com/temperature/temperature-worksheets.jpg

- Use greater than (>), less than (<) to describe the temperatures above:

_____ degrees C is < than _____ degrees C.

_____ degrees C is > than _____degrees C.

What do you think -5 degrees C. means?

Hot or Cold

- Look at the following temperatures for the town of Thornbury for each month in the year.
- How could we use this information for a pond study near Thornbury?

Months	Normal	Warmest	Coldest
January	-7.1°C	-3.1°C	-11.1°C
February	-7.4°C	-2.9°C	-12.0°C
March	-2.5°C	2.1°C	-7.1°C
April	4.7°C	9.6°C	-0.2°C
May	10.5°C	16.2°C	4.7°C
June	15.3°C	21.2°C	9.4°C
July	18.6°C	24.2°C	13.0°C
August	17.9°C	23.1°C	12.7°C
September	14.2°C	19.1°C	9.2°C
October	8.7°C	13.1°C	4.2°C
November	2.9°C	6.3°C	-0.6°C
December	-3.7°C	-0.3°C	-7.2°C

https://www.yr.no/place/Canada/Ontario/Thornbury/statistics.html

- Let's put temperature data in a chart for the next 3 days:

Date	Air Temperature	Water Temperature

How well did I complete the tasks?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a Rookie (not yet, need more help)

- Let's mark off on our calendar the days we make observations
- Don't forget to circle Water Day on March 22, 2018!

DATA SHEETS(These sheets are kept on your clip board.)

STREAM STUDY RESEARCH TEAM: (Names)	
Date: Weather: sunny, cloudy, rainy, windy, snowy, foggy	Air Temperature: Water Temperature (when not frozen over):
LENGTH OF BANK: WIDTH OF BANK:	*when safe to walk in/on it - teacher will let you know when to measure WIDTH OF STREAM: DEPTH OF STREAM:
Notes about rocks on riverbank	What colour is the water?
Notes about soil on bank: Wet dry rocky sandy, muddy, hard	Water moving? fast slow same direction not sure
Nearby trees near/on your part of the riverbed. (draw and label on back)	What does the water sound like? loud calm
Do you see things living in/on the riverbank? (draw on back of page)	Do you see things living in the water
Predict what you might see next in/on the riverbank	Predict what you might see next in water
Question:	

Water and Soil

Water can affect rocks and soil over long periods of time. Erosion is the wearing away of land or soil due to water, ice and wind. As rocks are exposed to water and wind, they are slowly broken down into sediments and this process is called **weathering**. Given a mixture of sediments (pieces of weathered rock and dead plants and animals) and water, the sediments will settle into layers, depending on weight. Over time, the weight of sediments on top of sediments causes the bottom layers to form solid rock.

Mixing Water and Dirt

- Read the experiment and predict what you think will happen:

1. Mix some dirt with water in a jar.
2. Shake the jar for 10 seconds.
3. Let the jar sit for 5 minutes and observe again.

Mixing Water and Dirt Experiment

Prediction

*I predict…*_____

_____

My Theory - *I think this will happen because….*

_____

Observe – *I observed…*(Draw and label pictures of what happened)

Before shaking	Just after Shaking
After 5 minutes	

Findings – *I confirm or changed my first idea (theory) when I found out -*

_____

Doing Better – *My experiment would be better if….*

_____

How well did I complete the tasks?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a Rookie (not yet, need more help)

When the snow is gone….

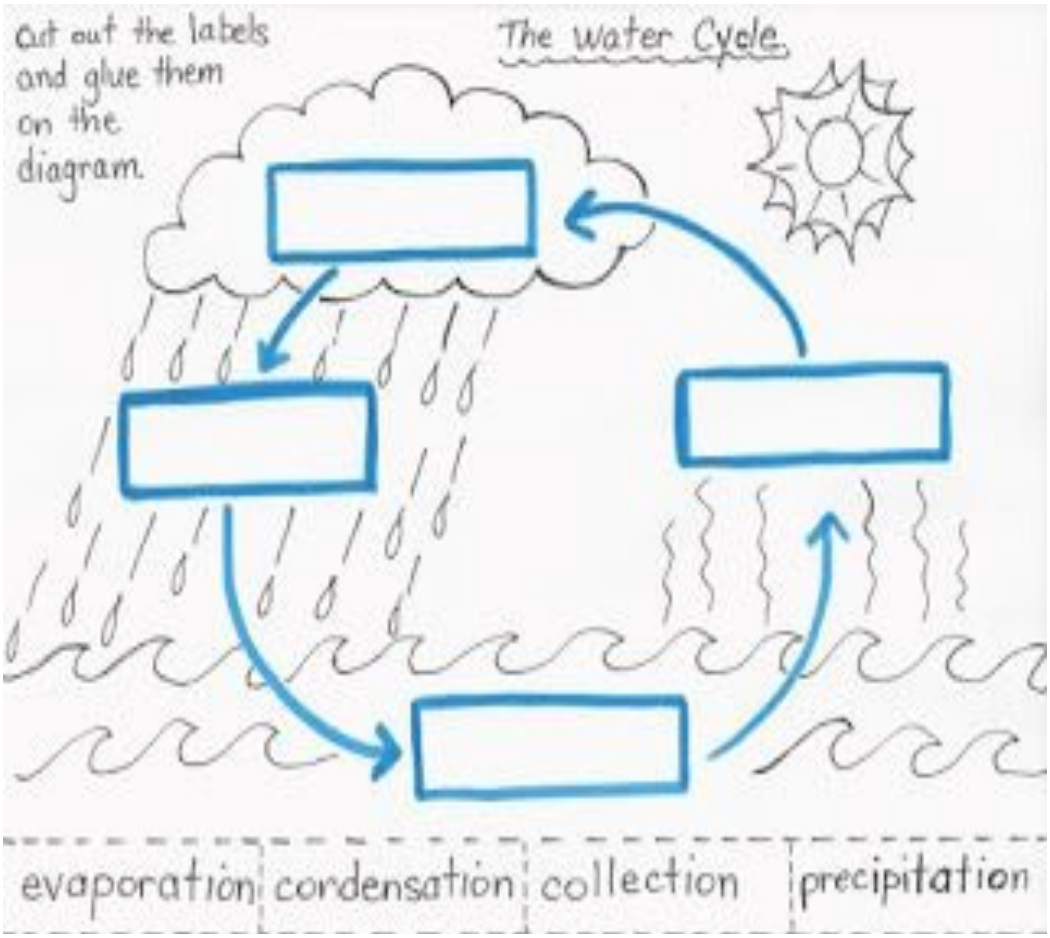
You will see many more living things when the snow is gone.

- In the spring talk about:
    - How can the river environment support so many different types of animals?
    - Which animals had similar habitats?
    - Which animals had different habitats?
    - What might happen to the other animals if one type of animal dies?
    - What might happen to the river animals if the river became polluted with a dangerous chemical?

6. **Water Cycle and Weather**

Water can journey through many different states.

- Take a look at this image and see if you can guess where the words: evaporation, condensation, collection and precipitation, go on the diagram.



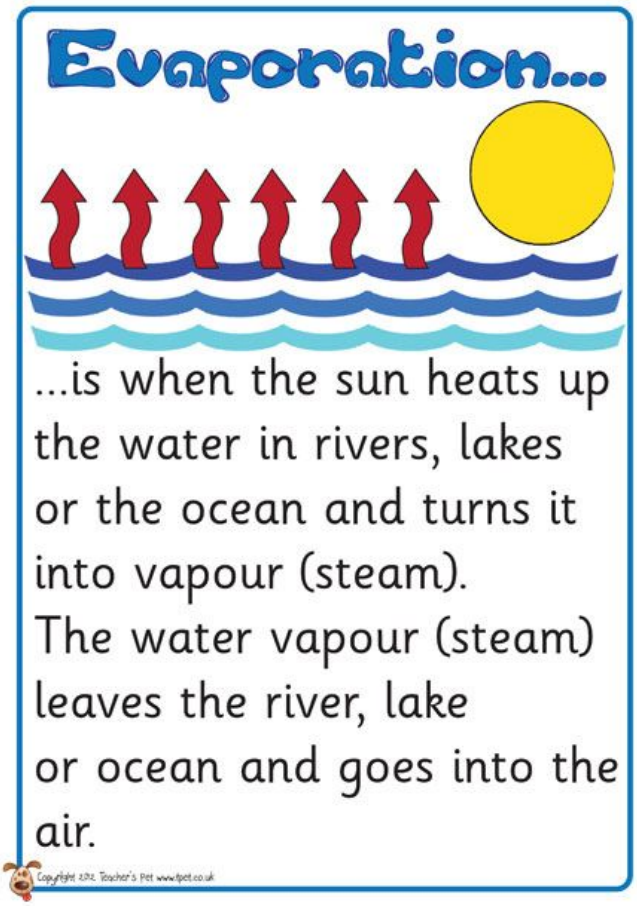
https://s-media-cache-ak0.pinimg.com/736x/d4/92/7f/d4927f611c5cf830f73e7d1e7c90ce86--water-cycle-craft-water-cycle-lesson-plan.jpg

- Let's look at one word or 'state' at a time.

Evaporation

- Let's build a fire and boil water in a pot if you are near a campsite.
- Measure the height of the water in the pot before it is placed on the fire.
- After the water boils for 5 minutes, measure the amount of water still in the pot.

The water didn't disappear, it <u>evaporated</u> into the air.



https://s-media-cache-ak0.pinimg.com/736x/50/fa/11/50fa1187131fc0e80a04d2a7d629636a--water-cycle-free-science-photos.jpg

Condensation

- Talk about condensation and think of what rooms in your home might have more condensation that others…

Water vapor in the air gets cold and changes back into liquid, forming clouds. This is called condensation.

https://keurstudents.wikispaces.com/file/view/condensation%202.gif/376773712/555x737/condensation%202.gif

What do you think it means to condense something?

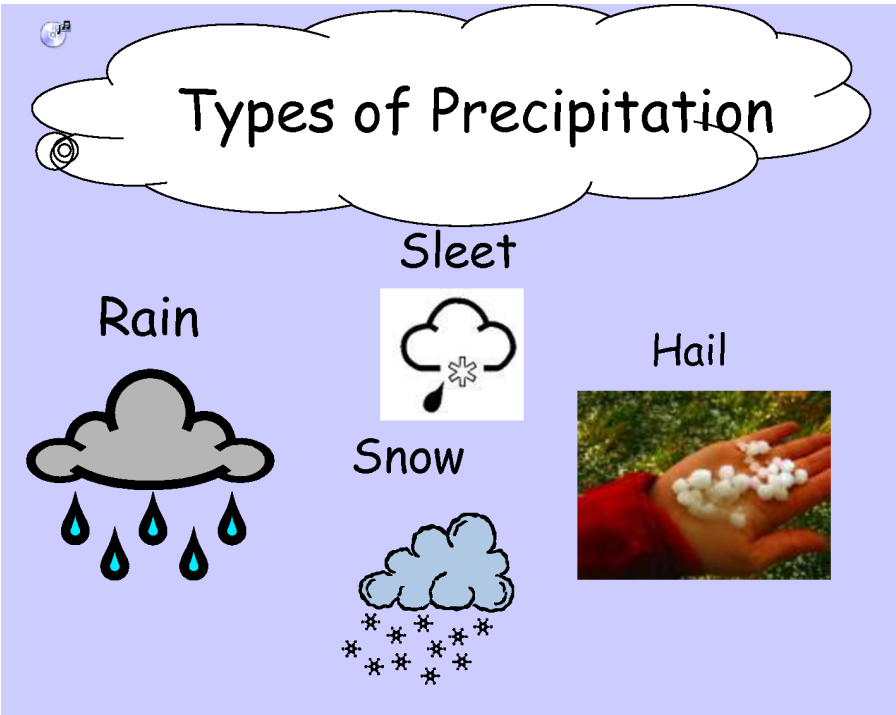
- When you condense something you make it:

_____ _____ _____ _____ **E R**

In hot air the water droplets expand and get bigger, but when you cool air, the water droplets gets smaller and form droplets in clouds, mirrors or other surfaces. The cooled water droplets are called 'condensation'.

Precipitation

- What do you think is the cause of these different kinds of precipitation?



http://itecideas.pbworks.com/f/1386215018/types%20of%20precip.png

Rain turns to sleet or freezing rain when the temperature near the ground is cold enough. Freezing rain makes walking and driving dangerous. If layers of ice build-up on power lines, the lines can fall, leaving people without power to their homes. Tree branches coated with this ice can also fall.

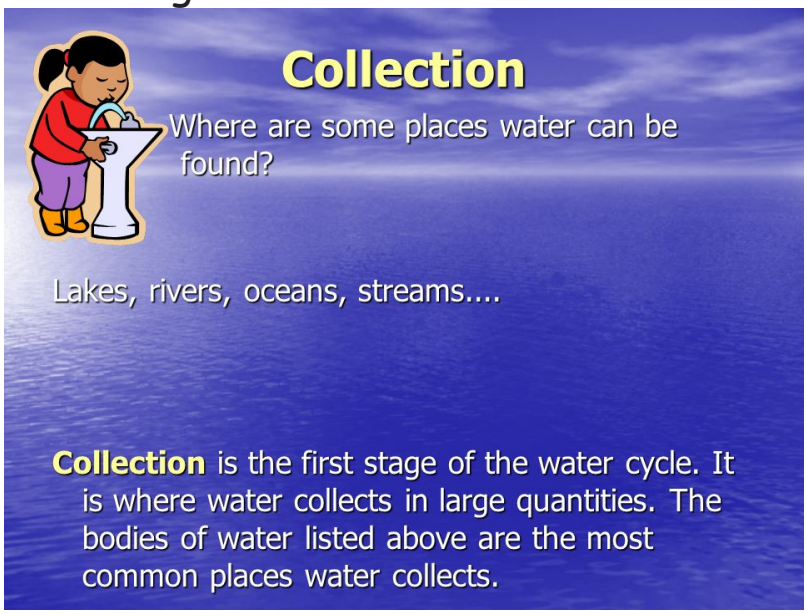
STEP OUTSIDE: (when it's snowy):

- Let's try and make snowman for 3 days in a row so we can make a recipe for a snowman.
- What kinds of conditions make for the best snowman?

http://i1.kym-cdn.com/entries/icons/original/000/012/707/snowman1b.png

Collection

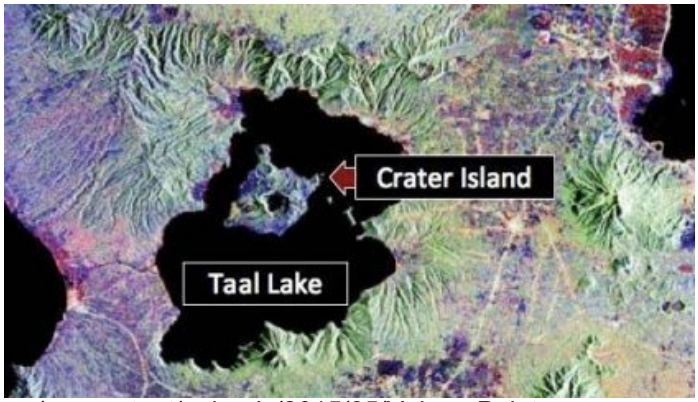
After the rain in the water cycle comes the 'collection' stage. **Collection** happens when **water** that falls from the clouds as rain, snow, hail or sleet, collects in the oceans, rivers, lakes, and streams. Most will infiltrate (soak into) the ground and will collect as underground **water**.



http://images.slideplayer.com/26/8575729/slides/slide_4.jpg

Lake within Lake (Collection within a Collection)

Vulcan Point (Philippines) is the world's largest island within a lake (Main Crater Lake), that is on Volcano Island (Taal Island), located in Lake Taal within the island, Luzon. It also is an active volcano, so Vulcan Point is also the world's largest volcano in a lake.



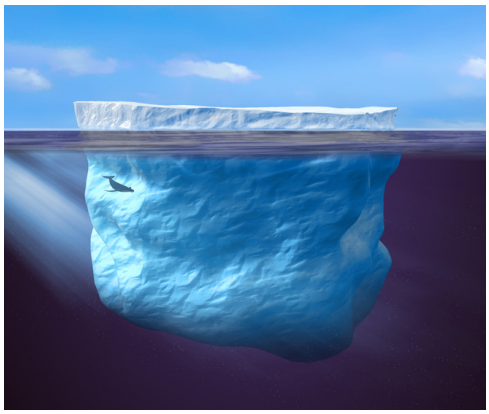
https://i2.wp.com/pranish.com.np/wp-content/uploads/2015/05/Vulcan-Point-420x239.jpg?resize=420%2C239

Manitoulin Island in Lake Huron (Lake Manitou on island) – lake within a lake. Over 65 square kilometers – average depth of over 3535 meters.

http://www.blacksbay.com/TravelPckg/Snowtrail_large.jpg

- Talk about why a lake within a lake is a collection within a collection?

Iceberg Collections *(point form)*



- thousands drift from north to south each year
- tallest is over 165 meters (above surface) and over 1500 m below surface
- area of continent of Antarctica is estimated to be 14 million sq km; Canada's area is only 9,984,670 square km.

https://www.wired.com/wp-content/uploads/images_blogs/wiredscience/2011/08/iceberg-towing-illustration-dassault-systemes.jpg

The earth collects lots of water. In fact, **70 percent of the planet is covered in water** – just over 225 million square km.

- Sing the water cycle songs and decide which one you like the best!

Tune – 'Comin 'Round the Mountain

Water travels in a cycle, yes it does!
Water travels in a cycle, yes it does!

It goes up as evaporation,
And forms clouds as condensation.
Then comes down as precipitation,
yes it does!

https://s-media-cache-ak0.pinimg.com/736x/a2/3a/14/a23a1473dd58ec443882009c20c06008.jpg

Tune – Farmer in the Dell

Our water is recycled
Our water is recycled
The water cycle is what it 's called
Our water is recycled

The sun dries up the water
The sun dries up the water
Evaporation is what it 's called
The sun dries up the water

The vapor forms a cloud
The vapor forms a cloud
Condensation is what it 's called
The vapor forms a cloud

It starts to rain or snow
It starts to rain or snow
Precipitation is what it 's called
It starts to rain or snow

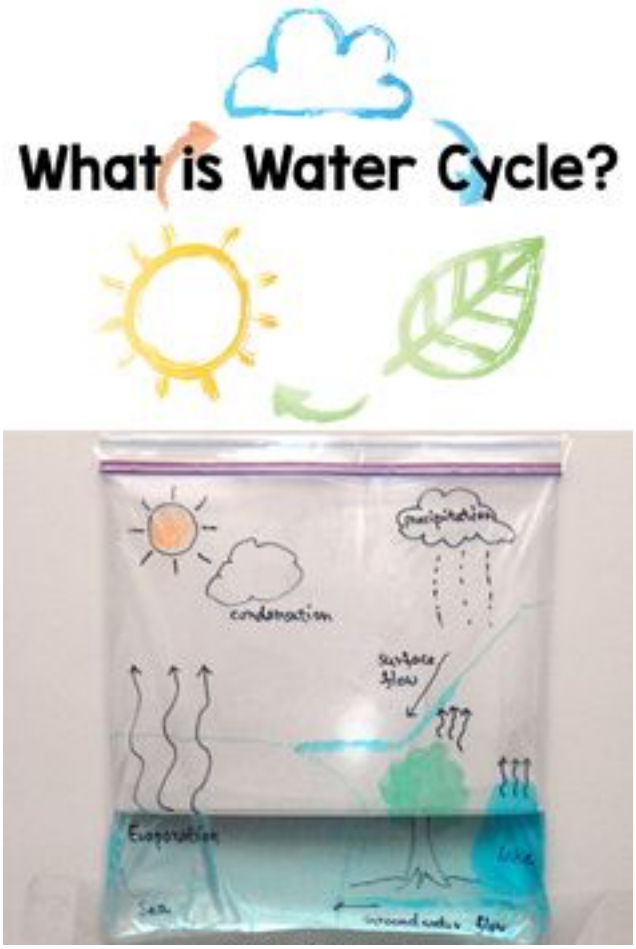
Our water is recycled
Our water is recycled
The water cycle is what it 's called
Our water is recycled

https://s-media-cache-ak0.pinimg.com/236x/29/71/9f/29719f9248925a40270eeb9476ab6b94.jpg

A cycle is a circular sequence of events.

- Tell your teacher what happens at the four main stops in the water cycle.

- Let's make our own water cycles in a bag!



How well did I complete the tasks?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a Rookie (not yet, need more help)

- Explain how greenhouses, ice rinks and indoor pools allow for farming, skating and swimming in all seasons in Canada.

Water can be a solid, a liquid and a gas.

- Try to explain this chart to your teachers:

Cycle	Solid	Liquid	Gas
Collection	ice, snow, sleet, hail, frost	Lakes, streams…	
Evaporation			water vapour
Condensation		dew	fog
Precipitation	ice, snow, sleet, hail, frost	rain, dew	fog

HEATING WATER = evaporation
COOLING WATER = condensation & precipitation

- How does this raincloud in a jar help explain condensation and precipitation?

RAIN CLOUD IN A JAR

TECH CHECK:

- video - https://www.youtube.com/watch?v=yYMIlzEQPf4

- Talk about the difference between thunder storms, hurricanes and sun showers.

Tidal Waves (tsunamis)

- Tidal waves are caused by underwater volcanoes, and earthquakes under or near the ocean. The quakes shift the ocean bed and send sharp vibrations through the water.
- Tidal waves are not a single wave - but a series of waves.
- At sea, waves can be only a few feet high, travelling about 400 miles/hour.
- Waves slow down closer to land and their height increases.
- Tidal waves can be over 30m high, moving at about 645 km/hour.
- A tsunami hit Alaska after an earthquake in 1964 where waves were close to 65m high.
- Tidal waves can cross an entire ocean and can cause great damage when it hits shore.
- In 1883, 36,000 people were killed in East Indies and in 1896, 27,000 people died in Japan from tsunamis.

7. **Comparing Liquids and Solids**

- Place the following words under the correct column.

  ice, rock, pond, water, table, walls, milk, door, book

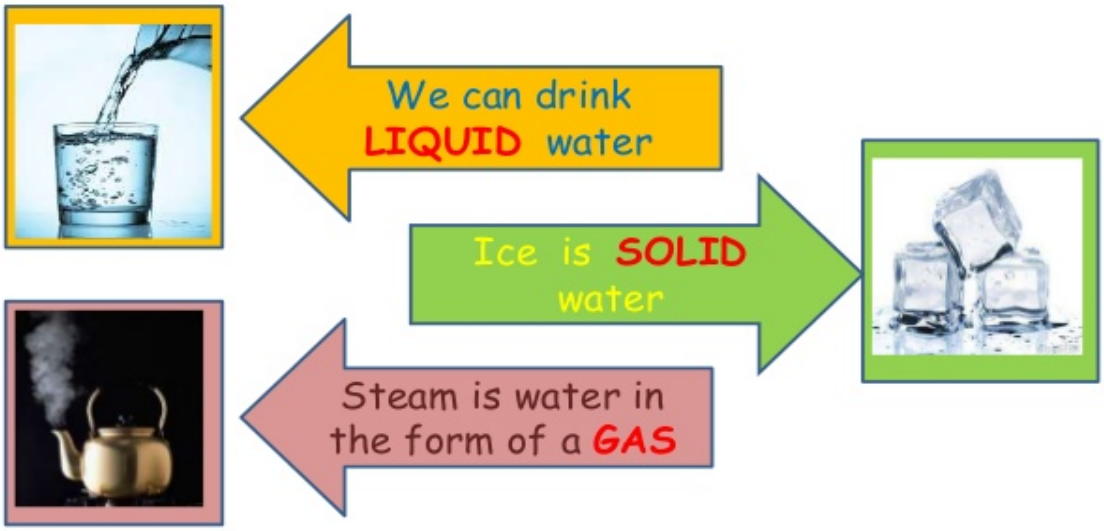
Liquid	Solid
Can change shape (can be poured)	Keep shape

How well did I complete the tasks?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a Rookie (not yet, need more help)

- Talk about honey. Is it a solid or a liquid?

STATES OF WATER

Water can have three different states:
SOLID, LIQUID AND GAS

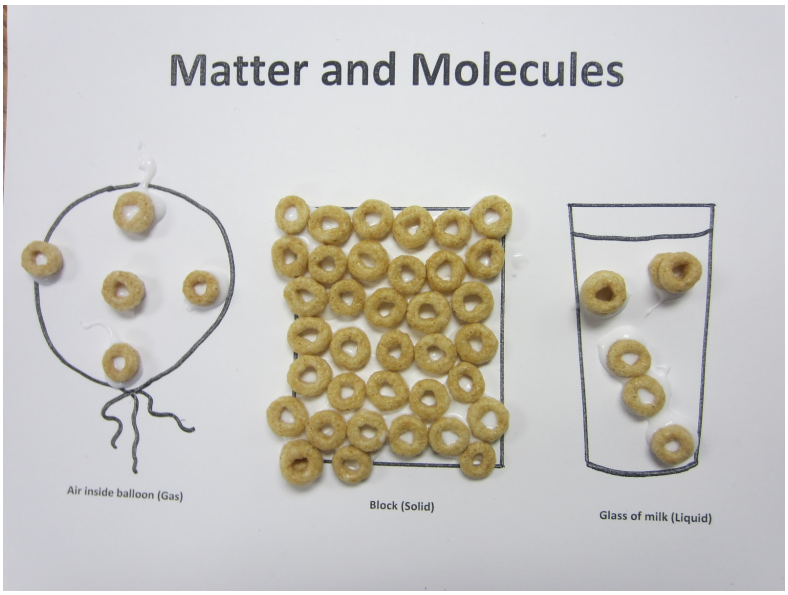


http://image.slidesharecdn.com/waterandairareimportant-150121131451-conversion-gate02/95/water-and-air-are-important-6-638.jpg?cb=1421846229

- What do you think causes water to change shape?

_____ E M _____ E R _____ _____ _____ R E

Extension:
Different forms of water spread our invisible molecules in different ways.
Ice has tightly packed molecules that help it to stay in one shape.
A glass of water has molecules that are spread out and without a glass the liquid would not keep its shape.
Water vapour (steam) spreads out its molecules in the air.



http://1.bp.blogspot.com/-7S7M0v2_TFk/TxjEBL_CmSI/AAAAAAAAEkc/4W4vWorg_s8/s1600/IMG_0429.JPG

Liquids may freeze when the temperature drops.
Solids may melt when heated.
Solids can dissolve in liquid solutions.
(i.e. sugar in tea/coffee)

Mixing Water and Sugar Experiment
Will it dissolve in warm or cold water faster?

<u>Prediction</u>
*I predict…*_____

_____

<u>My Theory</u> - *I think this will happen because….*

_____

Observe – *I observed*…(Record time in seconds until sugar dissolves)

Sugar & Water (cool temperature)	Sugar & Water (warm temperature)

Findings – *I confirm or changed my first idea (theory) when I found out -*

_____

Doing Better – *My experiment would be better if….*

_____

How well did I complete the tasks?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a Rookie (not yet, need more help)

Try out some more experiments:

- What happens when you try to dissolve salt in water?

- What happens when you try to dissolve sand in water?
- Does it help to heat up the water?

- What happens when you try to dissolve oil in water?

- What happens when you put salt with sand?

- Can you still see the different solids or do they mix?

Mixtures, Suspensions and Solutions

When the mixture is **a solid in a liquid,** it will either produce a **solution** or a **suspension.**

***A* liquid solution** is clear and will never settle out.

***A* liquid suspension** is cloudy and will eventually settle out.

If the solid dissolves in the liquid, a solution is formed.

Variables that affect dissolving:

- stirring
- temperature
- time
- amount of solid
- amount of liquid

There is a limit to how much a solution can absorb a solid. This is called the **saturation point**.

- Create your own experiment to discover more about combining solids and liquids.

How well did you show you have a solid understanding of liquids and solids?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a rookie (need more help & practice)

Mixing _____ and _____ Experiment

Prediction

*I predict…*_____

_____

My Theory - *I think this will happen because….*

_____

Observe – *I observed…*

Findings – *I confirm or changed my first idea (theory) when I found out -*

_____

Doing Better – *My experiment would be better if….*

_____

How well did I complete the tasks?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a Rookie (not yet, need more help)

When Solids and Liquids Combine

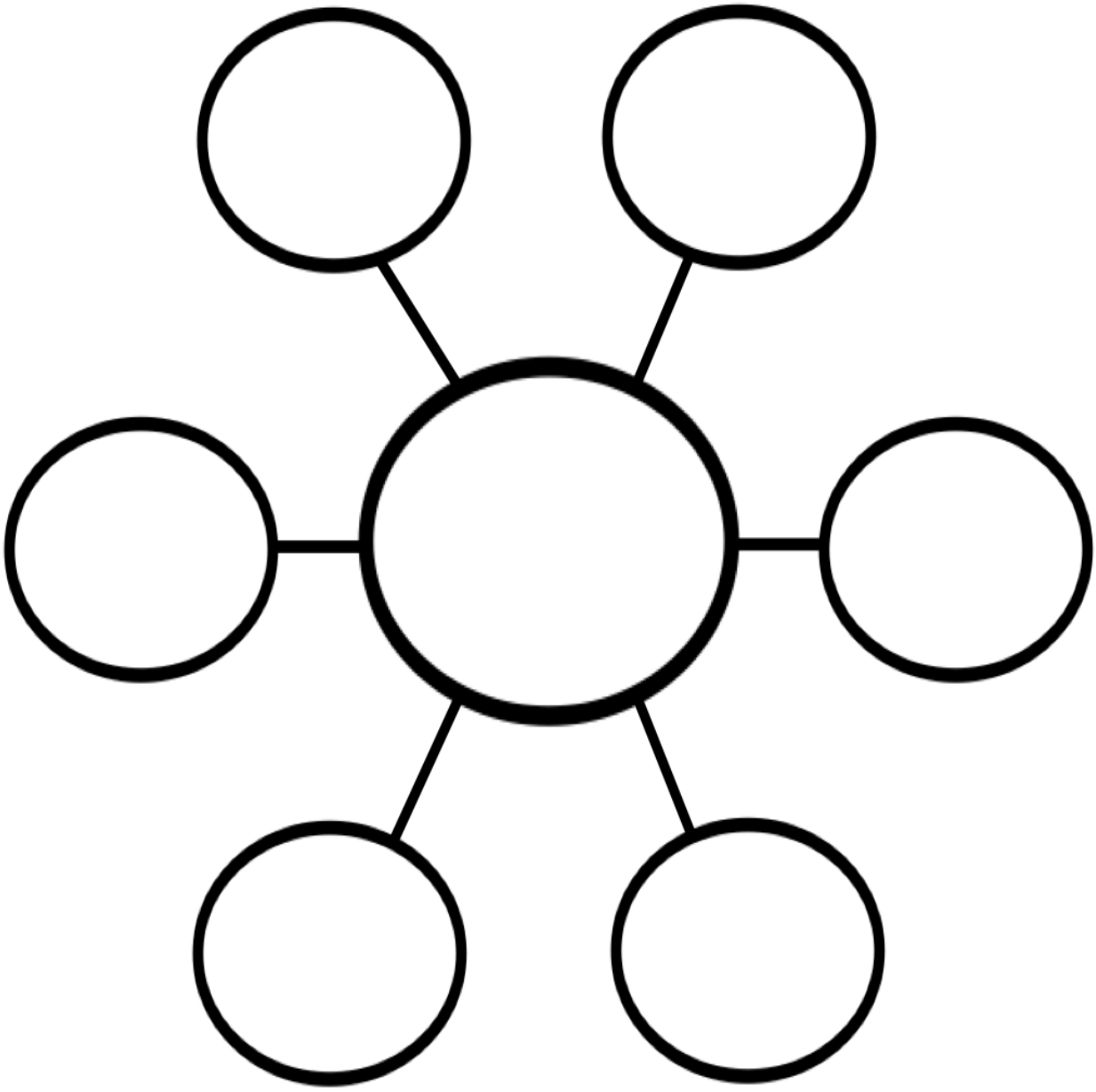
- Milk and chocolate powder make chocolate milk.
- Cake mix and eggs and water when heated make a cake.
- Frozen fruit and spinach and water and a banana make a smoothie.

- How are liquids used in the home?
- Use the following action words and draw images of each in the space below:

    - Cooking
    - Drinking
    - Washing
    - Mixing
    - Lubricating
    - Gardening

- Make a web of pictures of foods and drinks that fall into the following headings:

clear, opaque, runny, hard, greasy, and granular,



http://www.educationandbehavior.com/wp-content/uploads/2014/02/Web-Graphic-Organizer.png

- Talk about how liquids should be safely stored in the home.
- Talk about how to dispose of liquids.
- How can people use liquids and solids more safely?
    - Cleaning products should be stored in the original container and kept out of reach of young children.
    - Old paint and pesticides should be taken to an appropriate waste disposal depot.

We sometimes have liquid and solid forms of medicines.

- Medicine should be stored in a safe cabinet (out of the reach of small children)
- Medicines should be used only by the person for whom they are prescribed.
- Make a list of things you can buy at a pharmacy in the following chart:

Things to help you feel better	Other Things

8. The Weight and Amount of Liquids

Meet the Rain Gauge:
The **rain** gauge was created at the start of the 20th century. It is about 50cm tall with a funnel that empties into a cylinder which fits inside a larger container.

Extension:
Measuring rainfall is easy and has an international standard because it is very easy to convert depth to volume; in fact, the main conversion factor is 1 mm of rainfall = 1 Liter of water/m^2 (or 0.001 m^3 of water/m^2); (https://qph.ec.quoracdn.net/main-qimg-447481c0b8248dd254c704ee2143cfcf-c)

- Let's make our own rain gauge and keep track of the amount of rain in cm for 3 days.

	Day 1	Day 2	Day 3
Amount of Rain			

Volume and Capacity

How would you measure water? Scientists measure liquids using **volume**, or the amount of space they take up.

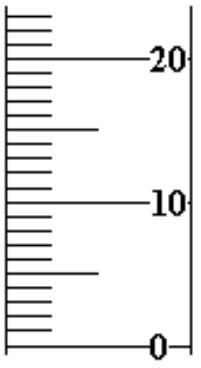
You may have measured the volume of a liquid in the kitchen. You probably used cups, tablespoons, and teaspoons. Scientists usually use **metric** units such as liters and milliliters. These units stay the same all over the world.

Extension:

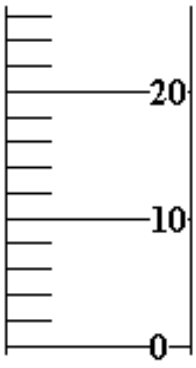
The surface of a liquid often curves up near the edges. This curve is called a **meniscus**. To get the best measurement, read the marking at the very bottom of the meniscus.

Scientists use special tools to measure volume. One common tool is a **graduated cylinder**. It is a clear tube with a flat bottom and markings on the side. To use a graduated cylinder, set it on a flat surface and pour the liquid in. Then, read the markings at the top of the liquid. Look at the markings straight from the side.

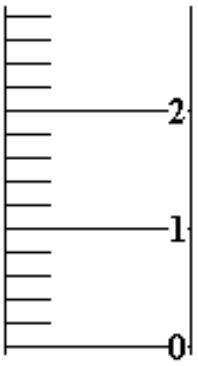
- What is the amount that each graduation stands for? Each tool measures in mL.



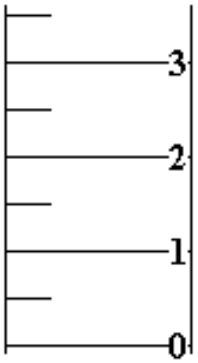
1._____



2._____

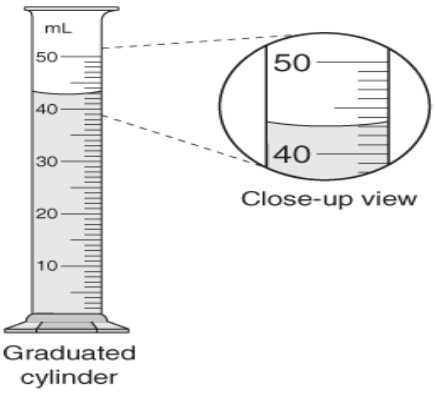


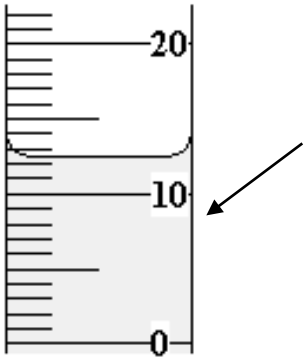
3._____



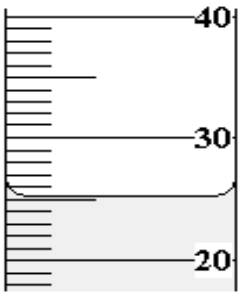
4. _____

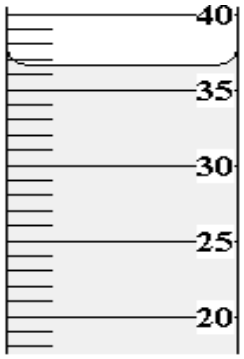
When reading a graduated cylinder, you need to keep the graduated cylinder on the desk and lower your eyes to the level of the meniscus. You read where the bottom of the meniscus is.

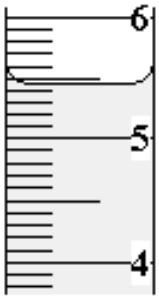


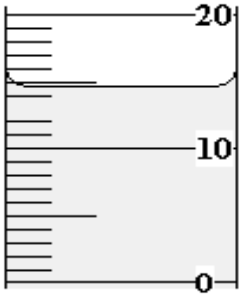


Determine the volume of the liquids in the following graduated cylinders.
Each tool measures mL.









1._____ 2._____ 3._____ 4._____

- Now let's try to pour accurate measurements!
- Pour the liquid in the graduated cylinder to the amount below and show your teacher how well you can measure.

1. 15 ml
2. 7 ml
3. 10 ml
4. 20 ml

Extension:

- Look at the following data from a Collingwood water bill and a Toronto water bill:

COLLINGWOOD:

- $0.635 per cubic metre (water consumption)
- $0.722 per cubic metre (sewer consumption charge)
  (http://www.collingwood.ca/files/photos/Rates%20%20Understanding%20Your%20Bill.pdf)

TORONTO:

- Water rates $3.6225/cubic meter

(https://www1.toronto.ca/wps/portal/contentonly?vgnextoid=1eb4ad7efc232510VgnVCM10000071d60f89RCRD)

- If cubic meters measure volume (the space of container) and liters measure the amount of liquid, what are the volume measures in liters?

Create a chart that lists the amounts of 5 different liquids.

- Read the label.

http://www.consolidatedlabel.com/label-samples/wp-content/uploads/2014/08/rinse-agent-label-sample.jpg

Item	Amount in mL (milliliters)

Weight of Water

If you could weigh all the water that fell on a single acre of land during a one inch rainfall, it would weigh 113 tons or 226,000 pounds.

mass - There are 1,000 grams in a kilogram.

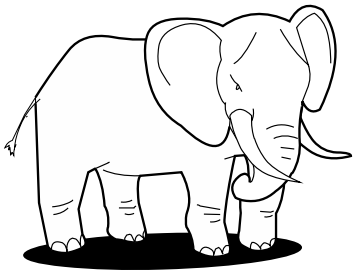
Using a Balance

- Place the object you are measuring in a pan.
- Place one object you are weighing in one side in the pan.
- On the other side drop one gram cube in at a time.
- Continue until the scale is balanced.
- Count the number of cubes. This is the mass in grams.

- Rank the following objects in order of smallest to largest amount of mass (1-5)

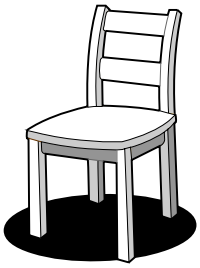
_____ car _____ book _____desk

_____ ant _____ cruise ship



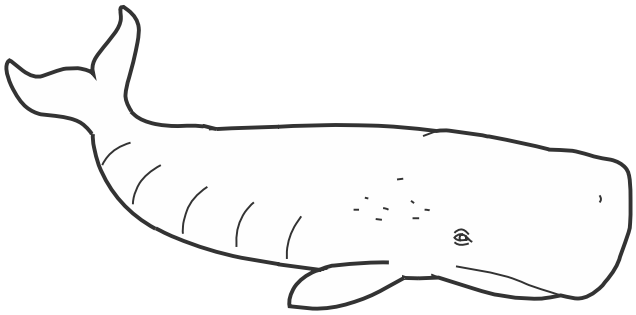
6,000 g or 6,000 kg

25 g or 25 kg



30 g or 30 kg

1 g or 1 kg



30,000 g or 30,000 kg

1 g or 1 kg

10 g or 10 kg

- Measure items from the classroom.
- First predict what you think the items might weigh?

Object	Predicted Mass	Actual Mass	Difference

- **C**ompare two objects by recording the length, height, width, and mass.
- Indicate which item is greater than or less than the other item by using: taller, heavier or bigger.

Example: "If I put an eraser, a pencil, and a metre stick beside each other, I can see that the eraser is shortest and the meter stick is longest."

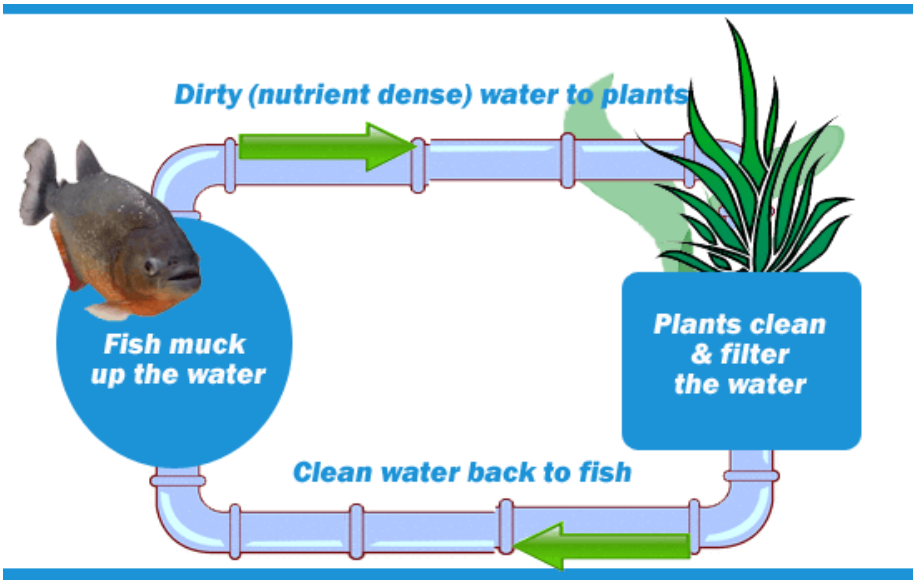
Things to Measure	Item 1 –	Item 2 -
Length		
Width		
Height		
Mass		

- Draw and label each item.

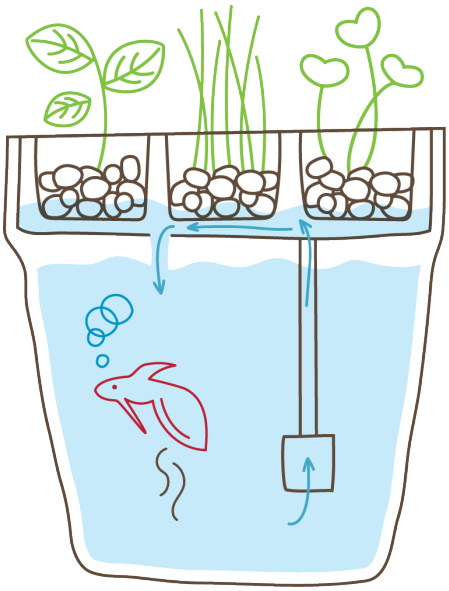
How well did you organize data in charts?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a rookie (need more help & practice)

9. Beginning Aquaponics

- Discuss the idea of building an aquaponics system.
- List the materials we would need to make one.



https://ccresaquaponics.files.wordpress.com/2011/10/ccres2baquaponics-system2bbasics.png

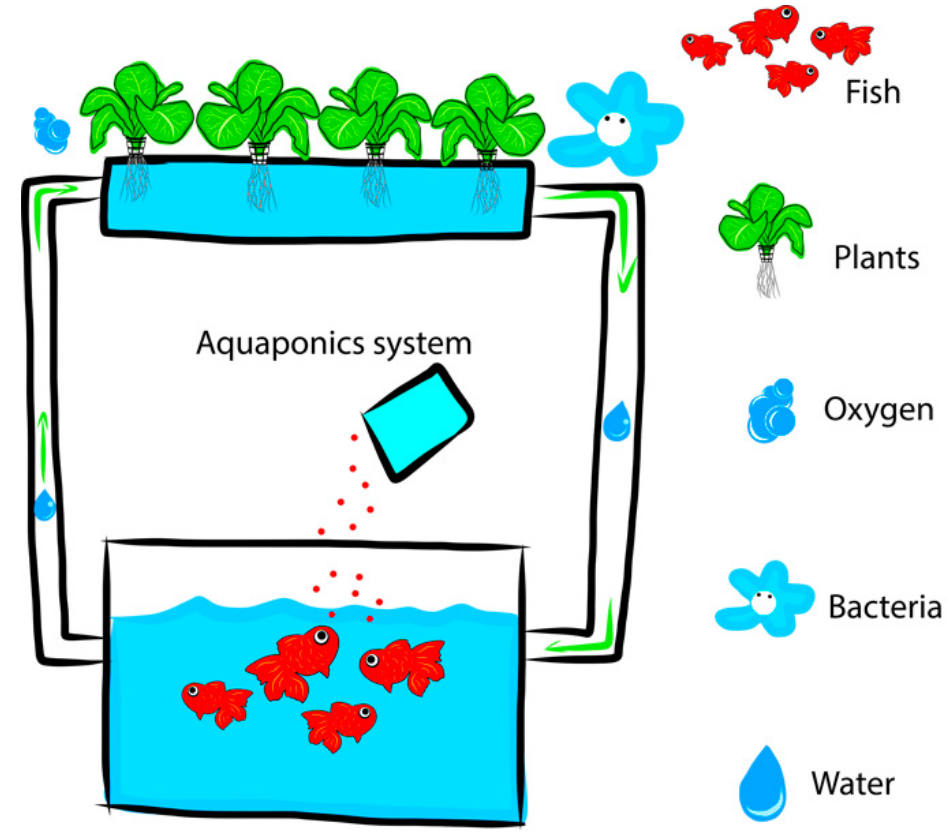


THE SELF-CLEANING CYCLE

Aquaponic ecosystem — no weekly water changes needed!

1. Your fish produces nutrient-rich waste.
2. In regular aquariums, the nutrient-rich waste builds up and becomes harmful to your fish. In this Water Garden, the plants are continually taking up these nutrients as food to grow.
3. The clean filtered water drops back down to your fish!

https://cdn.shopify.com/s/files/1/0941/8606/files/WGv2SelfCleaningCycle.png?615161407524383719



http://assets.inhabitat.com/wp-content/blogs.dir/1/files/2014/07/aquaponics-diagram.jpg

10. **Floating World**

Buoyancy is something's ability to float.

- Talk about what you think of these floating places:

https://i.ytimg.com/vi/K0kilCnHksQ/maxresdefault.jpg

https://amsterdamian.com/wp-content/uploads/2013/07/SAM_7357.jpg

- Sing "I saw a ship a-sailing..." by Mother Goose

I saw a ship a-sailing,
A-sailing on the sea;
And oh, it was all laden
With pretty things for thee!
There were comfits in the cabin,
And apples in the hold;
The sails were made of silk,
And the masts were made of gold.
The four and twenty sailors,
That stood between the decks,
Were four and twenty white mice,
With chains about their necks.
The captain was a duck,
With a packet on his back;
And when the ship began to move,
The captain said, "Quack, Quack!"

https://www3.amherst.edu/%7Erjyanco94/literature/mothergoose/rhymes/isawashipasailing.html

- What do you think floats and what do you think does not float? (wood, metal, plastic, coin, paper, pumpkin)

Buoyancy Experiment

Prediction - *I predict*

	wood	metal	plastic	Coin	paper
Float					
Sink					

My Theory - *I think ....*

Observe – *I observed…*

	wood	Metal	plastic	Coin	paper
Float					
Sink					

Findings – *I confirm or changed my first idea (theory) when I found out -*

_____

Doing Better – *My experiment would be better if….*

_____

- Talk about how might someone use the information that you gathered from your experiment

How well did I complete the tasks?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a Rookie (not yet, need more help)

- Which paper towel absorbs water the best?

Paper Towel Absorption Experiment

Prediction - *I predict*

My Theory - *I think ….*

Observe – *I observed…*

	Paper Towel A	Paper Towel B	Paper Towel C
#1 most			
#2			
#3 - least			

Findings – *I confirm or changed my first idea (theory) when I found out -*

Doing Better – *My experiment would be better if….*

How well did I complete the tasks?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a Rookie (not yet, need more help)

Design a Floating Object

- How many ways can you make a Boat?
- Investigate different ways you can make a boat that floats.
- Work with a partner to design your own boat.

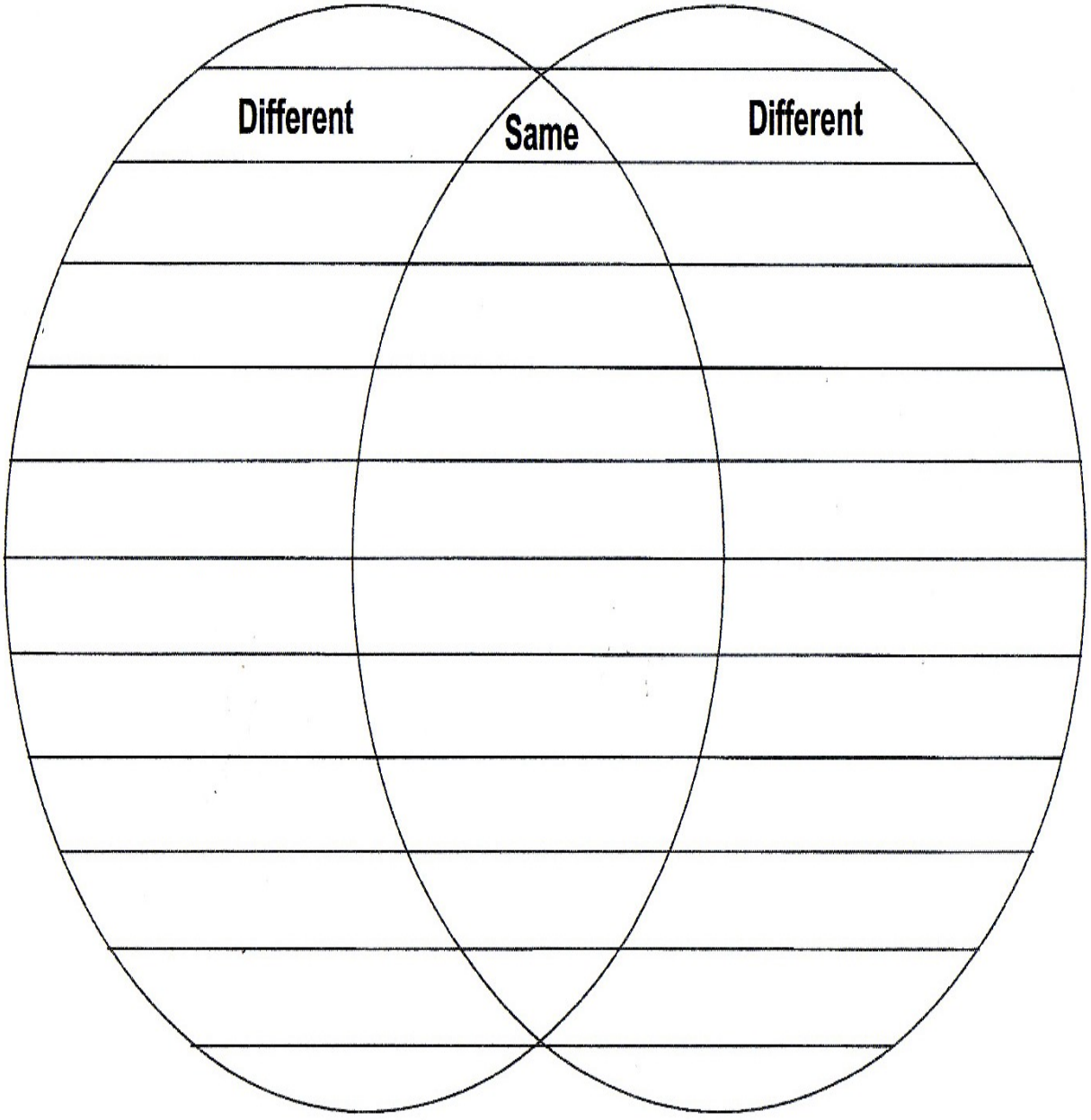
TECH CHECK:

- http://www.primaryscience.ie/media/pdfs/col/design_a_boat.pdf
- http://www.msichicago.org/experiment/hands-on-science/design-a-submarine/

When you make your boat think about:

- How does it use what you know about liquids and solids?
  - water takes up space
  - flows or moves when not contained
  - objects have mass
  - water makes things move
  - water can spin a water wheel
  - water keeps a raft afloat
- What changes might you make based on the testing that you did on your object?
- Who might find this information useful?

- Compare liquids and solids.



https://adventureclubinteractive.files.wordpress.com/2013/02/venn-diagram.jpg

How well did I complete the tasks?	Like a Trailblazer (expert)	Like a Pathfinder (apprentice)	Like a Rookie (not yet, need more help)

Extension:

- Read about submarines

SAMPLE A:
The first submarine was made in 1620. A Dutchman named Cornelis von Drebbel had an idea. He took a rowboat and covered it with oil-soaked leather. Twelve men sat inside the boat. They moved the boat under the water with oars that stuck out the sides. It couldn't go far, but it was still considered a success.

SAMPLE B:
sub-ma-rine (suhb-muh-reen): Noun; A ship that can travel both on the surface and under the water. Submarines are able to operate at various depths and over considerable distances. "Sub" means under. "Marine" means water. Often called a "sub" and used in the navy.

SAMPLE C: [student report]
Submarines are underwater boats. They are best known as part of the navy's fleet. Submarines, however, have many different uses. They help put in pipelines and cables for oil rigs. They also help scientific researchers learn what life is like underwater. Sometimes submarines even help people explore shipwrecks like the Titanic.

How will submarines be used in the future? There is enough food in the sea to feed much of the world. Scientists believe that someday submarines will be used on underwater farms. The crops on these farms may be seafood and plants like oysters, clams, and seaweed. Another future possibility is creating a submarine train. Cargo tanks could be transported underwater instead of on railroad tracks. Tourist submarines are another possibility. People could travel by submarine to see the wonders that live under the sea.

Resources: Carlisle, Norman and Madelyn Carlisle. About Submarines. Chicago: Melmont Publishers, 1969. Norman, C.J. Submarines. London: Franklin Watts Ltd., 1986.

SAMPLE D:
Submersibles are miniature submarines. Some carry a crew of up to four people. Others are "robots" controlled by a larger ship on the surface of the water. Submersibles have a variety of uses. Some check oil pipelines and cables. Others are used for scientific research. Submersibles often have grab arms. These arms are used for taking samples, or they can carry special lights and cameras for exploring.

SAMPLE E:
The root word in subterranean is terra, which in Latin means "earth" or "ground."

- Now complete this quiz about submarines.

Subterranean must be something:
A. made out of dirt or soil.
B. planted in the ground.
C. under the earth or ground.
D. on a beach or riverbank.

One difference between submarines and submersibles is that:
A. submarines are able to move underwater.
B. submersibles are able to carry people inside.
C. submersibles are able to do work underwater.
D. submarines are larger than submersibles.

Read this sentence from Sample D: 'Some check oil pipelines and cables'. As used in Sample D, the word check means:
A. to stop or hold something back.
B. a bill at a restaurant.
C. to inspect.
D. a form of payment.

Deeper Check

What are the parts of an experiment?

What is water filtration?

What is aquaponics?

What is buoyancy?

Bonus ☺
What are the four parts of the water cycle?

Appendix A:
Ontario Ministry of Education Science Expectations

S1D.1.1 assess the impact of daily and seasonal changes on human outdoor activities and identify innovations that allow for some of these activities to take place indoors out of season

S1D.1.2 assess ways in which daily and seasonal changes have an impact on society and the environment

S2C.2.1 follow established safety procedures during science and technology investigations

S1D.3.2 define a cycle as a circular sequence of events

S1D.3.6 describe how humans prepare for and/or respond to daily and seasonal changes

2B.2.1 follow established safety procedures during science and technology investigations

2C.1.1 assess the ways in which liquids and solids in the home are used, stored, and disposed of in terms of the effect on personal safety and the health of the environment, and suggest responsible actions to replace inappropriate practices

2C.1.2 assess the impacts of changes in state of solids and liquids on individuals and society

S2C.2.1 follow established safety procedures during science and technology investigations

2C.2.2 investigate the properties of liquids and solids

2C.2.3 investigate, through experimentation, interactions that occur as a result of mixing and/or dissolving liquids and solids, liquids and liquids, and solids and solids

2C.2.4 use scientific inquiry/experimentation skills to investigate liquids and solids in terms of their capacity for buoyancy and/or absorption

2C.2.5 use technological problem-solving skills, and knowledge acquired from previous investigations, to design, build, and test a structure that involves interactions between liquids and solids

2C.2.6 use appropriate science and technology vocabulary, including clear, opaque, runny, hard, greasy, and granular, in oral and written communication

2C.2.7 use a variety of forms to communicate with different audiences and for a variety of purposes

2C.3.1 identify objects in the natural and built environment as solids or liquids

2C.3.2 describe the properties of solids and liquids

2C.3.3 describe the characteristics of liquid water and solid water, and identify the conditions that cause changes from one to the other

2C.3.4 identify conditions in which the states of liquids and solids remain constant and conditions that can cause their states to change

2C.3.5 describe some ways in which solids and liquids can be combined to make useful substances

2C.3.6 explain the meaning of international symbols that give us information on the safety of substances

2D.1.1 assess the impact of human activities on air and water in the environment, taking different points of view into consideration, and plan a course of action to help keep the air and water in the local community clean

2D.1.2 assess personal and family uses of water as responsible/efficient or wasteful, and create a plan to reduce the amount of water used, where possible

2D.2.1 follow established safety procedures during science and technology investigations

2D.2.3 investigate, through experimentation, the characteristics of water and its uses

2D.2.4 investigate the stages of the water cycle, including evaporation, condensation), precipitation, and collection

2D.2.5 investigate water in the natural environment

2D.2.6 use appropriate science and technology vocabulary, including solid, liquid, vapour, evaporation, condensation, and precipitation, in oral and written communication

2D.2.7 use a variety of forms to communicate with different audiences and for a variety of purposes

2D.3.2 identify water as a clear, colourless, odourless, tasteless liquid that exists in three states and that is necessary for the life of most animals and plants

2D.3.3 describe ways in which living things, including humans, depend on air and water

2D.3.4 identify sources of water in the natural and built environment
2D.3.5 identify the three states of water in the environment, give examples of each and show how they fit into the water cycle when the temperature of the surrounding environment changes

2D.3.6 state reasons why clean water is an increasingly scarce resource in many parts of the world

Appendix B:
Ontario Ministry of Education and Training MATHEMATICS Expectations

M1B.2.1 compare two or three objects using measurable attributes, and describe the objects using relative terms

M2B.2.2 compare and order a collection of objects by mass and/or capacity, using non-standard units