Energy Wise

Study of Engineering Science
(Physics & Chemistry) &
Measurement Mathematics
(Grades 1 & 2)

LEARNING LOG

http://kearneypublicschools.org/modules/groups/homepagefiles/cms/771435/Image/WEb%20Resources%20Images/science_labwork[1].gif

Name: _____

Energy Wise Learning Log

First Edition, March 2017
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This document will be used as a pilot resource to support innovative schools. The intent of sharing this first version with students, staff and families from different schools globally, 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 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 Standards http://ngss.nsta.org/AccessStandardsByTopic.aspx

Surface Check

What do scientists do?

What is an innovation?

What is an experiment?

What is an observation?

Bonus ☺
What is a source?

Draw and label what you think a scientist looks like.
(You can look through this booklet for clues if you are stuck ☺)

1. R & D Safety

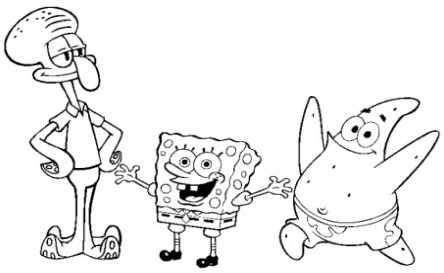
- Listen to the following story about Sponge Bob and friends.
- Ask the reader to stop every time a rule is broken.
- Highlight/underline the broken safety rules in this story (or ask for help to find these rules with a reading partner).

Sponge Bob's Safety Story

Sponge Bob, Patrick, and Gary were thrilled when Mr. Krabbs gave their teacher a chemistry set! Mr. Krabbs warned them to be careful and reminded them to follow the safety rules they had learned in science class. The teacher passed out the materials and provided each person with an experiment book.

Sponge Bob and Gary flipped through the book and decided to test the properties of a mystery substance. Since the teacher did not tell them to wear the safety goggles, they left them on the table. Sponge Bob lit the Bunsen burner and then reached across the flame to get a test tube from Gary. In the process, he knocked over a bottle of the mystery substance and a little bit splashed on Gary. SpongeBob poured some of the substance into a test tube and began to heat it.

When it started to bubble he looked into the test tube to see what was happening and pointed it towards Gary so he could see. Gary thought it smelled weird so he took a deep whiff of it. He didn't think it smelled poisonous and tasted a little bit of the substance. They were worried about running out of time, so they left the test tube and materials on the table and moved to a different station to try another experiment.



Patrick didn't want to waste any time reading the directions, so he put on some safety goggles and picked a couple different substances. He tested them with vinegar (a weak acid) to see what would happen even though he didn't have permission to experiment on his own. He noticed that one of the substances did not do anything, but the other one fizzed. He also mixed two substances together to see w hat would happen, but didn't notice anything. He saw SpongeBob and Gary heating something in a test tube and decided to do that test. He ran over to that station and knocked over a couple bottles that SpongeBob had left open. After cleaning up the spills, he read the directions and found the materials he needed. The only test tube he could find had a small crack in it, but he decided to use it anyway. He lit the Bunsen burner and used tongs to hold the test tube over the flame. He forgot to move his notebook away from the flame and almost caught it on fire.

Before they could do another experiment, the bell rang and they rushed to put everything away. Since they didn't have much time, Patrick didn't clean out his test tube before putting it in the cabinet. SpongeBob noticed that he had a small cut on his finger, but decided he didn't have time to tell the teacher about it. Since they were late, they skipped washing their hands and hurried to the next class.

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

- Sign the following R & D Safety Contract:

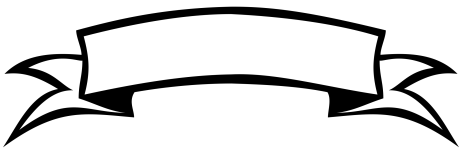
Safety Contract

1. Follow the teacher's instructions carefully. Ask questions if you do not understand what to do.
2. Do not taste, eat, drink, or inhale anything used in R & D activities unless the teacher tells you to do so.
3. Keep your hands away from your face, eyes, and mouth during R & D activities. Wash your hands after R & D activities.
4. Always wear goggles when chemicals, glass, or heat are being used and when there is a risk of eye injury from flying objects.
5. Tell the teacher if you see something/someone being unsafe.
6. 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



How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

2. Scientist Do Experiments

Scientists do or conduct experiments.
What do you think 'conduct' means?

To conduct an experiment is to _____ an experiment!

What is an experiment?

An experiment is what scientists do to find out if what they believe will happen, may actually happen.

An experiment involves 5 parts of an investigation. It is also called the Scientific Method:

1. Making a prediction.
2. Testing a theory.
3. Observing data.
4. Findings - Confirm or change first ideas.
5. Telling how an experiment could have been better.

Engineers and entrepreneurs work in Research and Development to make things work and make new things that people need.

Finally, scientists, engineers and entrepreneurs stay safe.

(a) Closer Look

- Why do you think scientists need to take a closer look at things?

- Many researchers use microscopes or magnifying glasses to take a closer look at an item.

Task (Method and Materials):

Create two different magnifying glasses.

(a) The Water Jar Magnifying Glass

- Fill a jar with water.
- Screw on the lid.

*The jar and water makes things bigger.

*It works better with flat objects.

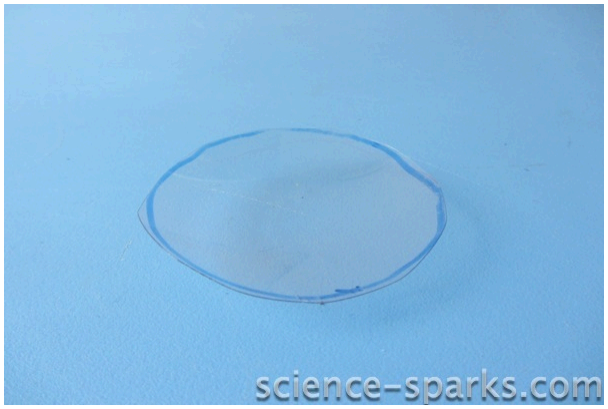
*Adapted from http://onetimethrough.com/how-to-make-a-magnifying-glass-for-outdoor-exploration/

(b) ***The Plastic Bottle Magnifying Glass***

*Adapted from http://www.science-sparks.com/2012/05/21/make-your-own-magnifying-glass/

- Need (materials):
  - a clear plastic bottle, dry marker pen, pair of scissors, water

- Draw a circle shape at the neck of the bottle. It needs to be here so you create a disc shape when you cut it out.



- Cut out the circle
- Pour a little water into the disc.

- Hold it over your book or paper to make the letters bigger.

*The disc shape you have cut out curves outwards. By adding the water the light is bent inwards, creating a lens effect that enlarges the size of the letters.

Magnifying Tools Experiment

Prediction – I think the _____ magnifying glass will make things bigger, smaller, clearer, or the same.

Theory – I think my _____ glass will

_____ because _____

_____.

Observe – I observed…(Draw and label pictures of each magnifying glass.)

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 do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

Q: Why do scientists need to look at the same things at least 3 times?

A: to make more precise observations

What does **precise** mean?

http://www.contentlead.com/wp-content/uploads/2014/03/target-accurate-precise-seo-small-business-SMB-300x225.jpg

3. Nature Collections

- Check out the names of Big Word Collectors by listening to the following video - http://www.oxforddictionaries.com/words/what-is-the-word-for-people-who-collect.

- Do you collect things at home?
- If you collect any of the following things, circle them.

Collectors of…	**Fancy Name**
stamps	Philatelist
teddy bears	Arctophile
dolls	doll collector ☺
coins and bills	Numismatist
postcards	Deltiologist
butterflies and moths	Lepidopterist
beetles	Coleopterist
flies	Dipterist
birds' eggs	Oologist

http://www.oxforddictionaries.com/words/what-is-the-word-for-people-who-collect

- After listening to the video, does every collector have a fancy name? Yes, No, Not sure

- Do you need to use the fancy name if you want to collect something? Yes, No, Not sure

- Take a look at things you might collect that you can find in the outdoors:

rocks sticks leaves soil cones

grass bark weeds flowers

recycled garbage

- Using a magnifying glass, go out and search for some items in the outdoors that you think you might want to collect throughout the school year.
- Place possible items in your Collection Box (shoe box).

http://3.bp.blogspot.com/_dq8dd2_NDUg/SX8kutEHgCI/AAAAAAAACQk/x-LxkLmqO28/s400/IMG_1153crop.jpg

Observations of Items in Collection

- Draw one item below and label it (You can ask for help with labeling) with some of the following words that fit:

smooth	rough, scratchy
rounded	sharp edges
Large	small
man-made	natural
colour(s),	smells like
furry	waterproof

- Look at items from your collection again with a magnifying glass and see if you can add more labels to your diagram.

How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

4. Pollinator Plants Experiment

Adapted from http://www.kidsgardening.org/article/planting-pollinator-garden

Task (Method and Materials):

- Make a garden space to plant pollinator plants.

Plants common in the area are:

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*Never dig plants from the wild?

(a) Plant flowers with a range of shapes and sizes.
Small bees and wasps, (with shorter tongues) feed off small flowers (milkweed, zinnia, phlox, and mint).

(b) Allow a section of your schoolyard to revert to wild grasses, weeds, and wildflowers (e.g., milkweed).

(c) Butterflies will gather and sip from shallow pools, mud puddles, and bird baths; bees and wasps use mud for home-building material.

(d) *Plan spaces for nesting.* Leave twigs and brush in small piles, create mud puddles, or put out pieces of string. Students can build nesting structures for certain types of bees and bats.

Pollinator Plants (Year Long Experiment)

Prediction – I think the seeds will GROW or NOT GROW.

Theory – I think the seeds will _____

because _____

_____

Observe – In the spring I observed (Draw and label picture):

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

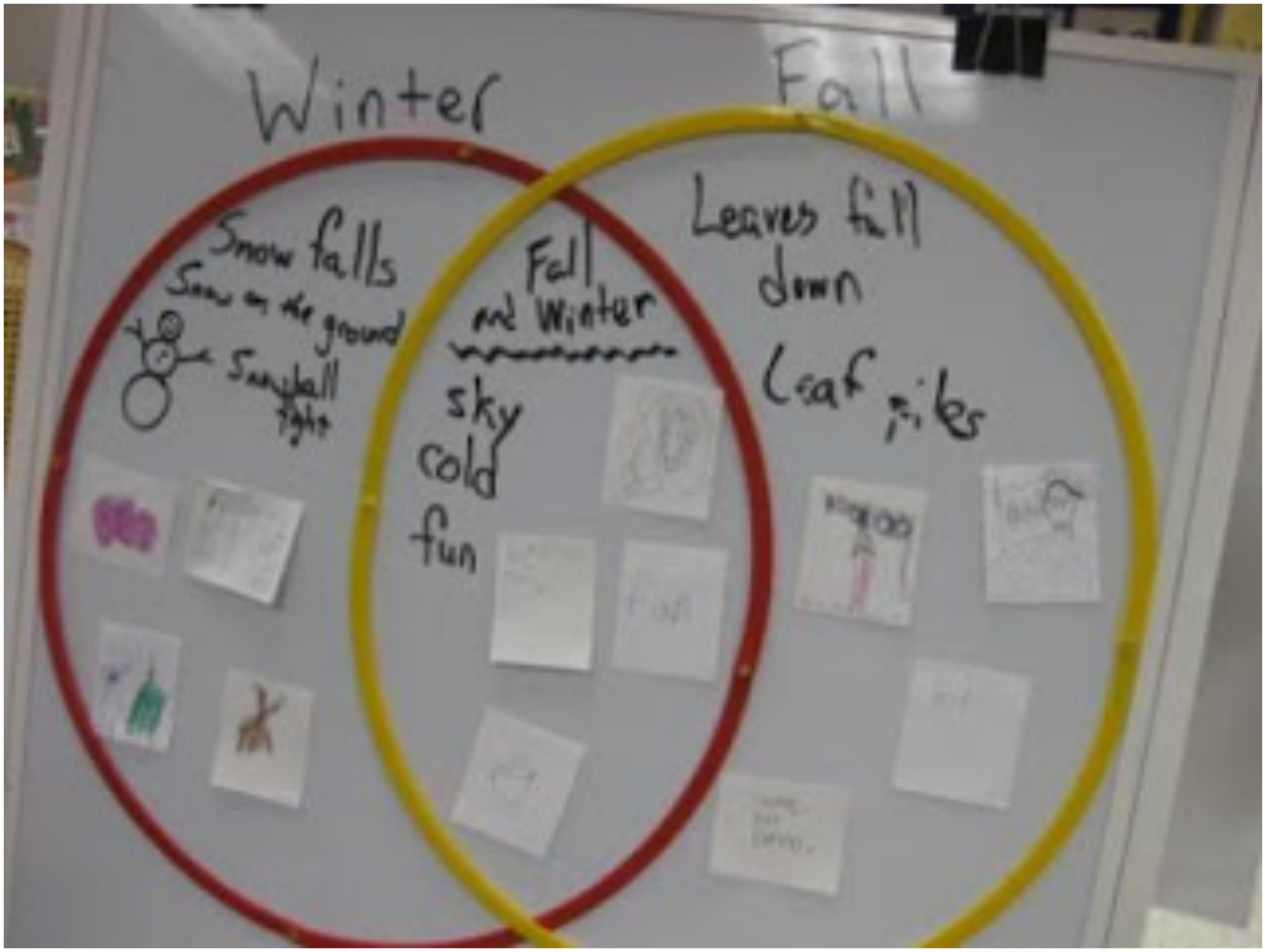
Doing Better – My experiment would be better if….

How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

5. Scientists Compare Stuff

- Look at the sample Venn diagram to see how it works.
- Draw an arrow from the words 'different' and 'same' to the part of the Venn diagram where you think these words should go.

Different Same Different



Collection Box Experiment (*Long Term – Beyond a Year)

Task and Materials:

- Choose two items in your collection box to compare using the Venn diagram below.
- Put words that are the same in the middle where the circles overlap.
- Put words that are different in each outside circle.

Prediction – I **predict** my collection will change by the time I go to high school.

Yes No (Circle one)

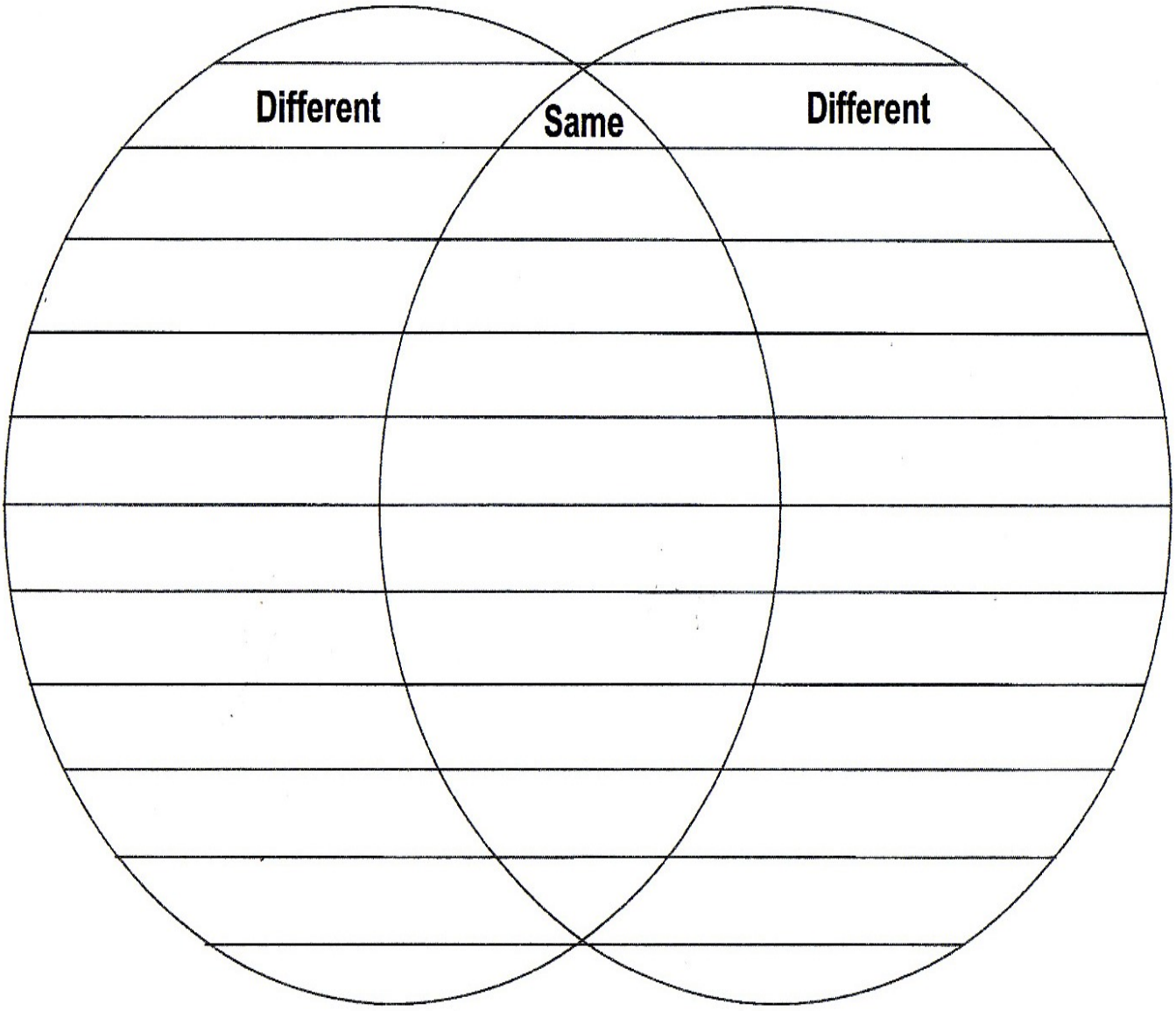
Theory – I think my collection **will** or **will not** change (circle one) because…._____

_____

Observe – When I first compared two items using the Venn Diagram I discovered (complete Venn Diagram):

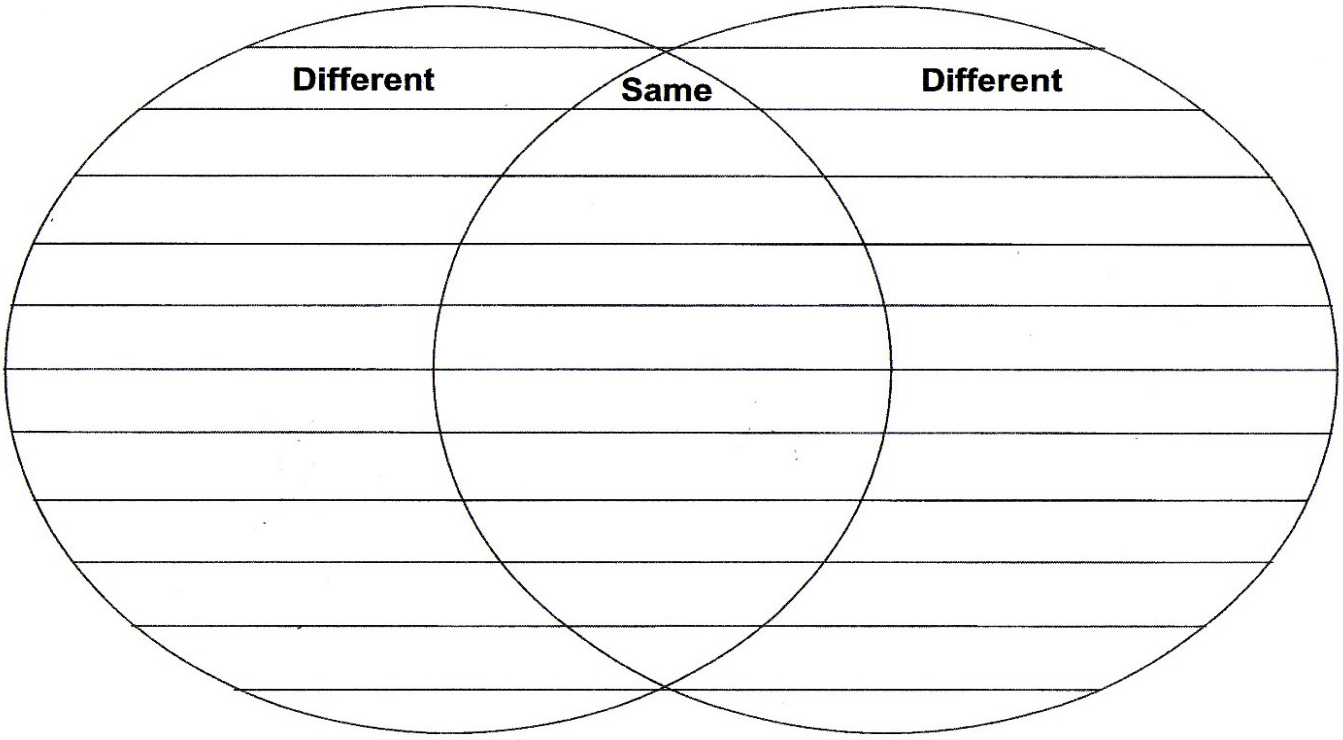
Venn Diagram

Topic: _____



Observation 2 – When I compared two items using the Venn Diagram at the END of this experiment, I discovered (complete Venn Diagram) *To GO BACK AND COMPLETE BEFORE HIGH SCHOOL ☺

Venn Diagram **Topic:** _____



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

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

Doing Better – My experiment would be better if….

Compare Winter and Summer

http://erispublishing.com/blog/wp-content/uploads/2013/07/summer-winter.jpg

- Create a Venn diagram for winter and summer using images from magazines (using a separate Venn diagram page or hula hoops like the picture below).

http://4.bp.blogspot.com/-FObI9pemFDY/U4034IkABBI/AAAAAAAAD8A/CG9Ilga0cac/s1600/Interactive+Venn+Diagram+Summer+v+Winter+Vocab+Cards+Clever+Classroom+blog.jpg

- Be careful when cutting/gluing each image, if you plan on posting your work in the school.

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

6. Scientists Measure Stuff

- Scientists use words to share how things are like other things.
- Take a look at the examples, and then draw your own pictures of two more things where one is different than the other (i.e. ways size, length, weight)

A refrigerator is bigger than a toaster.

A _____ is bigger than _____.

A lamp is smaller than a dishwasher.

A _____ is smaller than _____.

Night is darker than day.

A _____ is darker than _____.

A year is longer than a day.

A _____ is longer than _____.

A **bush** is shorter than a **tree**.

A _____ is shorter than a _____.

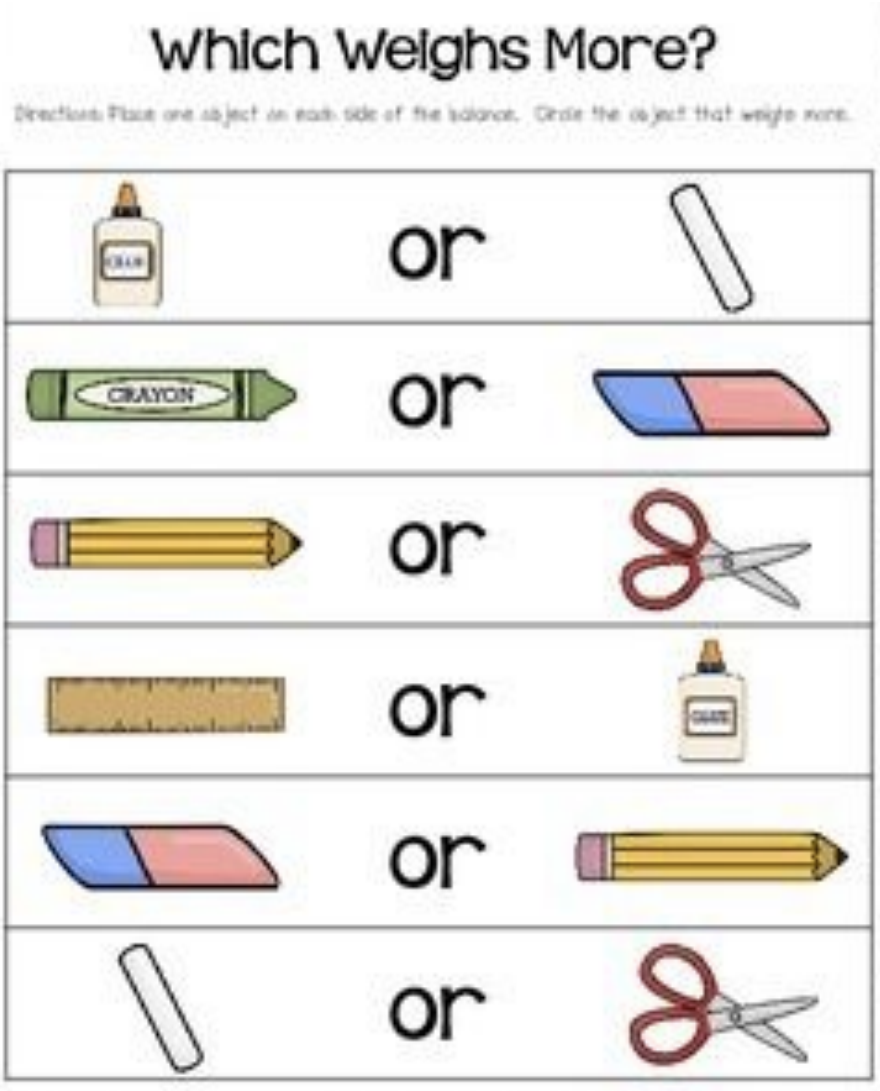
Spring is about the same amount of time as the fall.

_____ is about the same amount of time as _____.

A <u>snowmobile</u> is heavier than <u>snowshoes</u>.

_____ is heavier than _____.

How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)



- Some people use their hands, their feet, their arms or their body to measure things.
- Use our class arm spans to measure the size of the school.

We went outside and found out our school is _____ arms spans in total!

- Now create your own measuring tool for showing the length of something. You can call it the:

_____

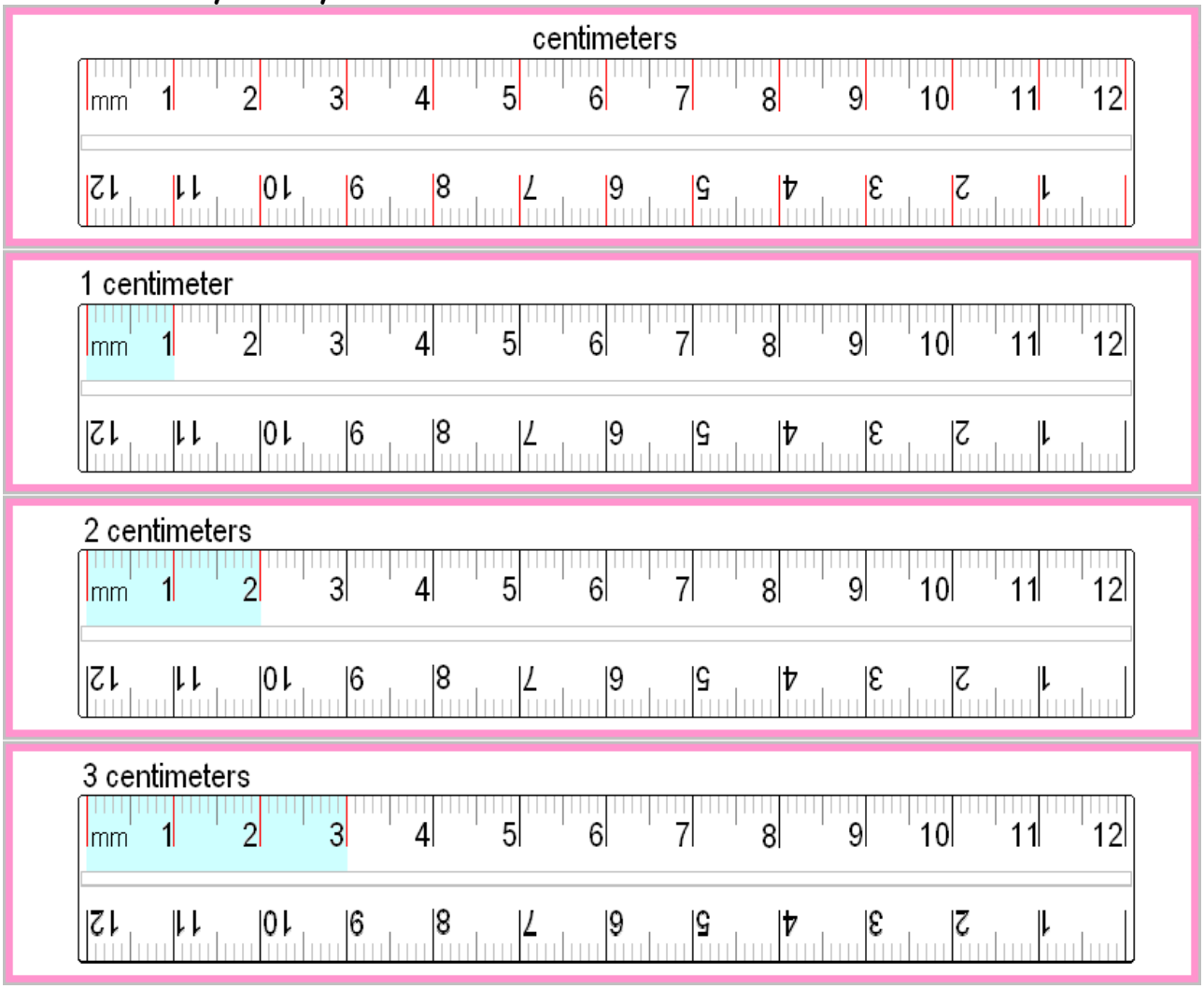
- Use your _____ to measure 3 items in the classroom.

Item	**Measurement**

How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

Measuring in cm – mm and meters

- The 12cm ruler below has many mm.
- How many can you count?

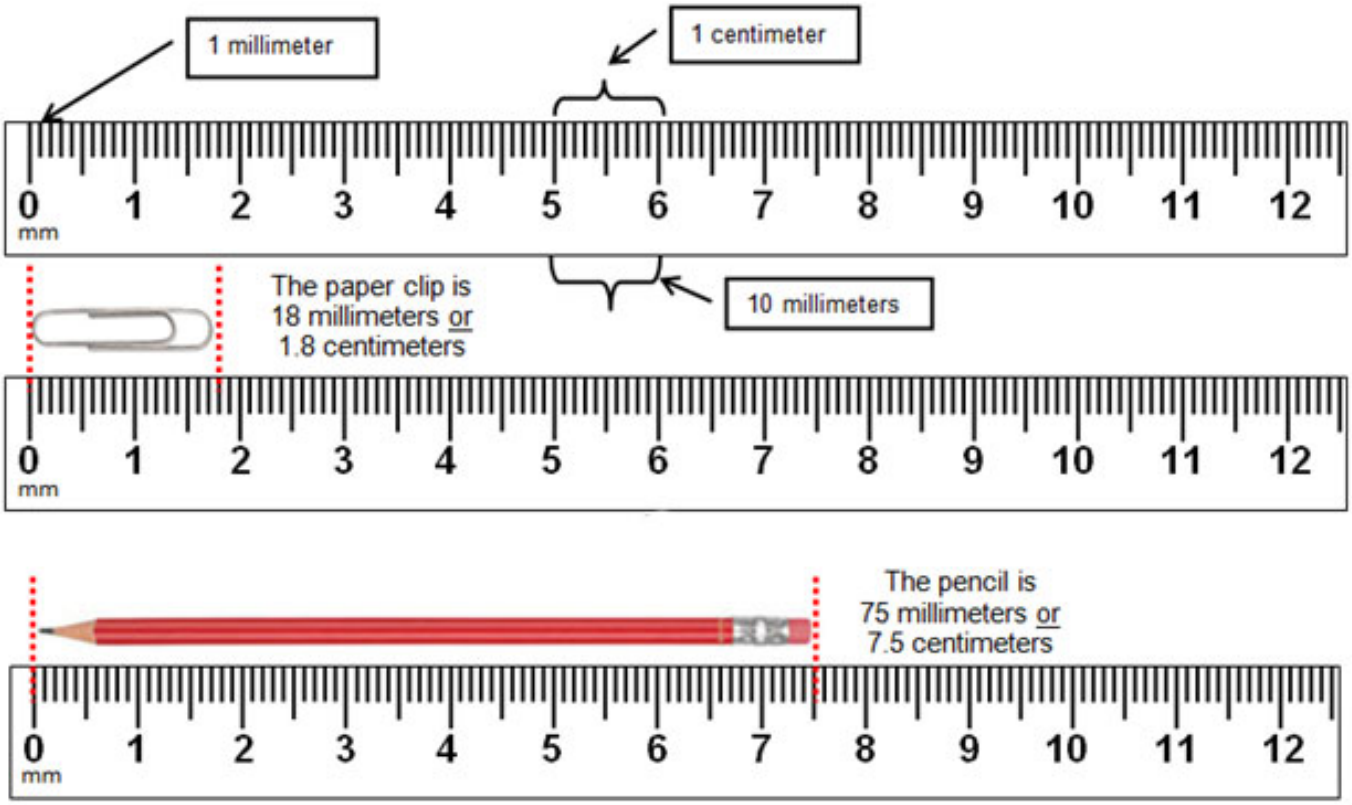


http://archive.jc-schools.net/dynamic/math/lessons/centimeterruler.PNG

- Measure a paper clip: _____cm or _____mm.

- Measure a pencil: _____cm or _____mm.

- Look at the rulers below and compare the length of long your paper and clip and pencil to the paper clip and pencil measured below:

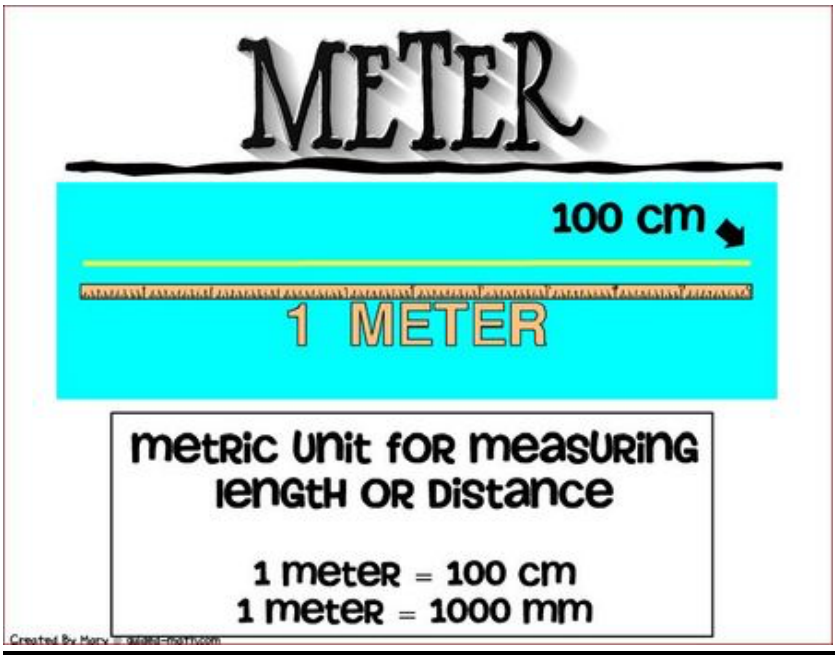


https://www.ontrack-media.net/science8/s8m0l7image6.jpg

- Using greater than (>), less than (<) or equal (=) to compare your findings.

How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

Meters are greater than cm and mm.
One meter has 100cm and 1000mm.



STEP OUTSIDE:

- Measure the length of the building in meters using your measuring tape.
- Our school is _____meters in length, and _____cm.

- We can also measure the distance around the school by adding up 2 lengths and 2 widths (all four sides).
- Work with a partner – to gather your data and do the math.

_____ + _____ + _____ + _____ = _____m _____cm.

- Choose 7 questions to do and then show your teacher your work.

Convert.

1 a. 7 cm = _____ mm

1 b. 50 mm = _____ cm

2 a. 400 cm = _____ m

2 b. 1 m = _____ cm

3 a. 1000 cm = _____ m

3 b. 700 cm = _____ m

4 a. 30 mm = _____ cm

4 b. 20 mm = _____ cm

5 a. 10 mm = _____ cm

5 b. 8 cm = _____ mm

6 a. 6 m = _____ cm

6 b. 5 m = _____ cm

7 a. 2 m = _____ cm

7 b. 800 cm = _____ m

8 a. 9 m = _____ cm

8 b. 3 m = _____ cm

9 a. 90 mm = _____ cm

9 b. 10 cm = _____ mm

10 a. 4 cm = _____ mm

10 b. 60 mm = _____ cm

http://www.homeschoolmath.net/worksheets/measurement/images/convert-m-cm-mm-easy.gif

How well did you compare millimeters (mm) & meters (m) to centimeters (cm) using <, >, =?	Trailblazer (Expert)	Pathfinder (Apprentice)	Rookie (Not Yet)

7. Scientists and Entrepreneurs Make Stuff

CREATE YOUR OWN APPLIANCE

Task and Materials:

- Your appliance will need to solve a problem.
- Will it work better than another appliance?
- Will it be a time savor?
- Will it cost less?
- Will it do several things at one time?
- Will your appliance make your bed?
- Will it make a healthy snack?
- Will it help you get from one spot to another?
- Will it help you improve at music or sports?
- Will it help people who need help?
- Will it use renewable/non renewable energy?
- Will it include a list of safety rules for use?
- What size can your appliance be to fit in our display area?

- At first you can go back and forth between designing blueprints of your ideas – and building samples.
- At the end of the semester everyone will talk about and share your appliance with classmates, teachers and family members.

Starter Materials: journal, pencil, duct tape, boxes (large and small), scissors, magnet strips, material, buttons, safety pins, crayons, newspapers, magazines.

- Use your *Learning Journal* to make and label diagrams.

NOTE: The journal can be just like Leonardo Da Vinci's 'Journal of Inventions'!

- List other things you might need for your appliance.

- At the end, your report should be labeled with details that include temperatures, costs, sizes, time of day it is used most often, and the season it is used more in.

- At the end of the semester, create an experiment report using these headings:
  - Prediction
  - Theory
  - Observations
  - Findings
  - Doing Better

- Start by recording your prediction and theory before you begin!

Prediction – I **predict** my appliance will be easy to make.

Yes No (Circle one)

Theory – I think my appliance **will** or **will not** be easy to make

because…._____

_____

How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

8. Scientists Use Time

A scientist needs to know:
(a) when to use different kinds of time, and
(b) how parts of time fit into each other.

Researchers can track short amounts of time (seconds) or can make observations over longer time periods (years)…

Work with a helper to complete the Time Puzzle below:

Time Period	(Matching letter goes here.)	**Mixed Up Answers**
Year		(a) 28, 30 or 31 days
Season		(b) 24 hours
Month		(c) Can be 12 hours of darkness
Week		(d) 60 minutes
Day		(e) 60 seconds
Night		(f) 7 days
Hour		(g) 365 days
Minute		(h) fall, winter, spring, summer (about 3 months)
Second		(i) Small unit time

Extension (Option):

Decade = _____ years

Century = _____ years

- Take the Time Quiz (when ready):

1. There are _____ days in a week.
2. There are _____ seasons in a year.
3. There are _____ months in a year.
4. There are _____ hours in a day.
5. There are _____ days in a year.
6. There are _____ days in September.
7. There are _____ days in October.
8. There are _____ days in November.
9. There are _____ days in December.
10. Leap years happen every _____ years.
11. February usually has _____ days except for a leap year.
12. There are _____minutes in an hour.
13. There are _____seconds in a minute.
14. There are _____ years in a decade.
15. There are _____ years in a century.

How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

- Create a big Time Calendar to learn more about the months of the year.

Month	**Time Message** (to cut and paste for calendar and say aloud)
September #9	30 days has September, April, June and November All the rest have 31 days, Except February which has 28 or 29 days.
October #10	12 months in a year a number for each one October is 10. A fall birth month
November #11	November 11th is Remembrance Day When soldiers lost their lives So we can live and play.
December #12	Toward the end of December Is our winter break New Years Eve Maybe snowfall with snowflakes.
January #1	January could be chilly With shorter daylight Many animals hibernating Or coats turning white.
February #2	February leap year adds a day Every four years. Check the calendar to see When the 29 days will appear.

March #3	March is when Willy Sees his shadow or not Will snow remain Or will spring bring on the hot!
April #4	Spring can bring showers But it also brings sun Planting gardens and changing snow tires. Time for a nice long run.
May #5	May is time for geometry And all things nature in bloom A time to try a new language And fine writers we will groom!
June #6	June is when its time To celebrate and cheer Summer fun to plan As school closing draws near.
July #7	July is your time To relax, read and play. To make your own experiments. Add to your collections any day.
August #8	August is just before A new school year, just ahead Get ready to be a science detective And share something science you have read.

- Make sure to draw images (or cut and paste magazine images) for a title page, and each for month.

- Using a calendar, mark:
  - when you were born
  - the birthdates of at least three scientists
  - some special dates of your choice

- Before taking the Time quiz, color:
  - the number of days in a week in yellow.
  - the number of months in a year green.
  - The number of days in a year in blue.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
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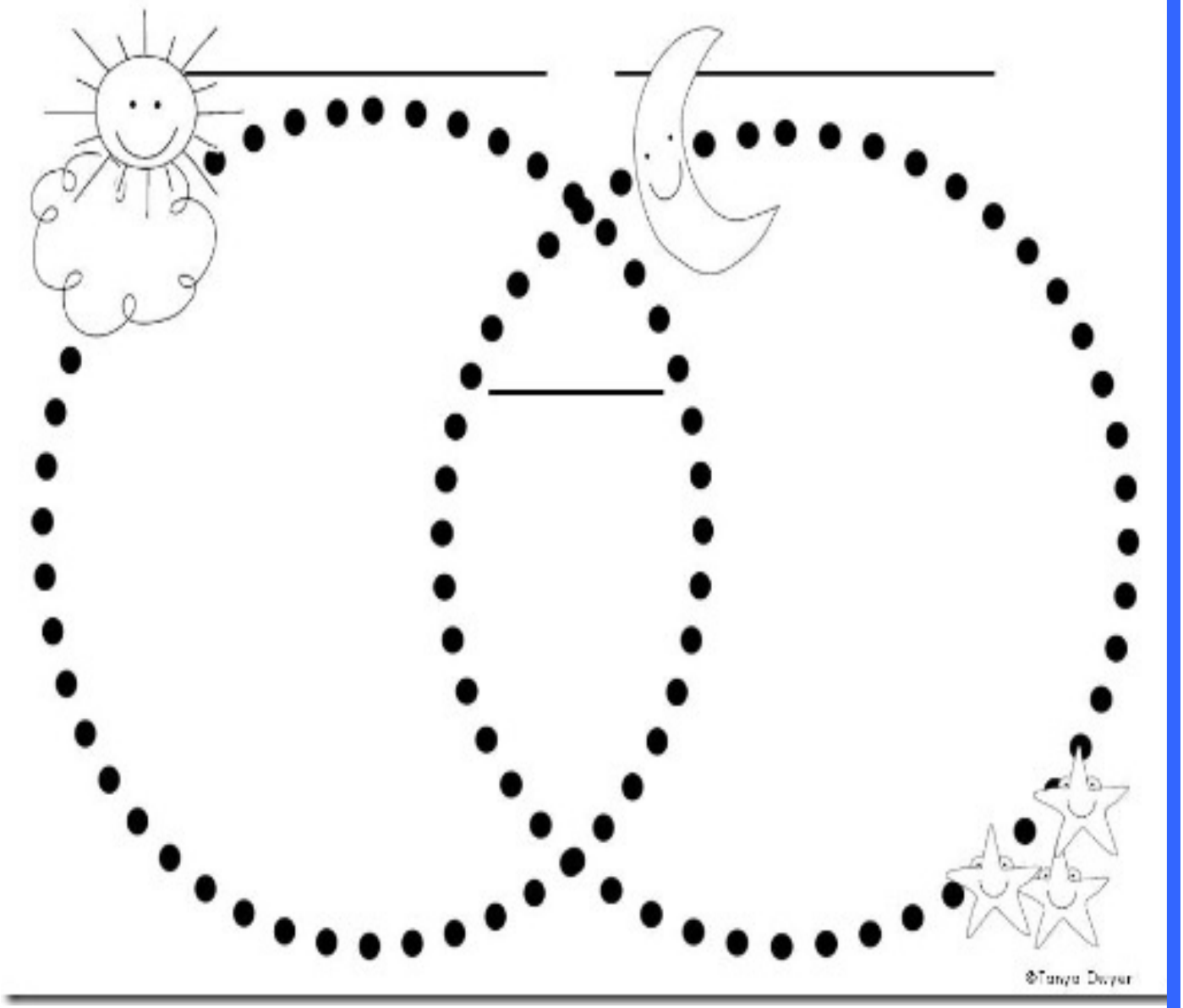
331	332	333	334	335	336	337	338	339	340	341	342	343	344	345
346	347	348	349	350	351	352	353	354	355	356	357	358	359	260
361	362	363	364	365	366	367	368	369	370	371	372	373	374	375

9. Scientists Can Compare Night and Day

Compete the following Venn diagram comparing day and night. Clues are on the next page…



https://s-media-cache-ak0.pinimg.com/736x/19/0d/a7/190da7a8d8b23fa3237cf3eb6abe36a8--kindergarten-science-teaching-science.jpg

Day	Same	Night
Light from sun	Light	Darkness (sun blocked); light from moon and stars
More sun in day in summer	About 12 hours in fall and spring	More darkness in winter
Warmer	Same temperature in places closer to the equator	Cooler
Can see sun	At dusk or dawn can see both	Can see moon and stars
People tend to be awake in daylight	Some animals, who hibernate, sleep for months during the day and night; nocturnal animals awake at night; people who work evenings awake at night	People tend to sleep at night
Rainbows on sunny day		Cannot view rainbows at night
Shadows on sunny day		Cannot view shadows at night

How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

10. Scientists Can Compare Weather

Sunny Day	Same/similar	Raining Day
Usually no rain	Can have sun showers	Showers
Warm	Can be warm on a rainy day	Cool
Can see well		Can be difficult to see; fog, rain
No thunderclouds	Tornadoes can sweep in on sunny days	Can be stormy with 'thunderclouds'
Sun's rays can lead to sunburn	Sun's rays can lead to sunburn on some rainy days.	Lack of sun tends not to lead to sunburn.

Complete the following sentences with pictures:

On a sunny day, I should wear…

On a rainy day, I should wear….

On a snowy day, I should wear…

- What season can you do these activities in the outdoors?
- Add 2 more outdoor activities.

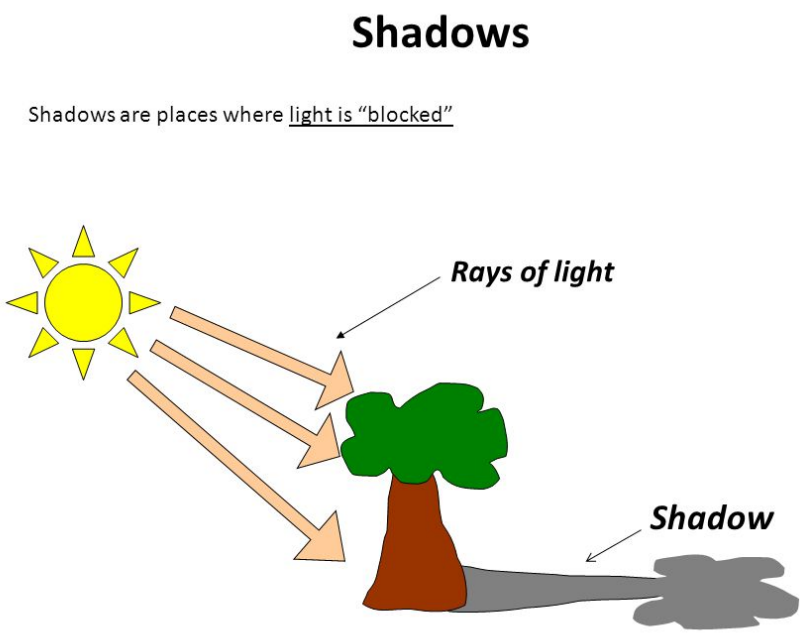
Outdoor Activity	Fall	Winter	Spring	Summer
swimming				
skating				
playing soccer/baseball				
gardening				
biking				

- Mix and Match Weather Challenges and Invention solutions:

Weather Challenge	**Letter Match**	**Invention Solutions**
want to ski on a warmer winter day		(a) greenhouse
heat wave		(b) ice machine
swimming lessons in winter		(c) snow machine
warm temperatures inside on a cold day		(d) air conditioner, fan
Blue Jays want to play baseball on a rainy day		(e) retractable ceiling
prevent frost for gardening or farming out-of-season		(f) furnace
skate/play hockey/or curl in warmer seasons		(g) heated pool pump

11. Shadow Dancing

- Look at the picture below and think about why shadows might change their size.



http://images.slideplayer.com/14/4495467/slides/slide_6.jpg

Shadow Tracking Experiment

Task (and Materials)

- Find a place outside where there is a shadow.
- Take temperature with a thermometer in the shadow and outside the shadow
- Measure the size of the shadow using your hand.
- Keep track of this data for 5 days over 5 weeks.
- Take a photo of shadow once a week from the same spot.
- Be sure to go out at different times to collect data.

Prediction - *I predict the temperature will be _____ in the shadow.*

warmer or cooler

I predict the shadow will:

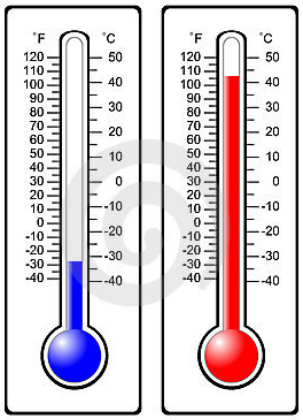
change size stay the same size

Theory – I think the shadow will have _____ temperatures because:

_____

I think the shadow will change or not change size because:

_____



Observation (data) – The following data was recorded over 5 weeks.

Date	Time	Size	Temperature in Shadow	Temperature outside of shadow

- Place a photo of your shadow here:

Findings – I confirm or changed my theories when I found out -

Doing Better – My experiment would be better if….

TECH TIME:

- Let's look at the video that talks about Planet Shadow
  https://www.learner.org/jnorth/tm/mclass/ReasonsBack.html

How well did you organize data in charts?	Trailblazer (Expert)	Pathfinder (Apprentice)	Rookie (Not Yet)

12. Source Detective

A source is where something begins.
Scientists try and find the source of things.

- Look at the following pictures and put an arrow where you think something started.

	I think the source of the water is….
	I think the source of the baby turtle is…

Extension

- Where do you think the source of this image is?

- Think about some items in your 'collection'.
- Describe the source or location where you found it.

I found _____ in _____

_____.

It was near _____.

http://www.kinvey.com/blog/images/2013/09/may-the-source-be-with-you_open-source.jpg

Classroom Source Detective

- Draw at least 3 items in the room and their sources.
- See sample below.

Item	Source
Sweater	Sheep

How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

13. Two Types of Energy

- What words are inside the word 'renewable':

RENEWABLE

Make as many words as you can, and print them in the chart below:

Re - NEW - a - ble

Able to be NEW again

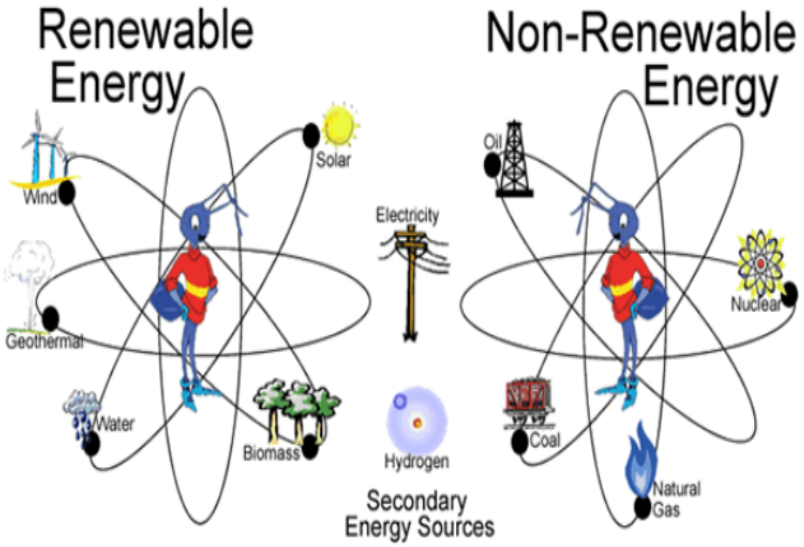
http://www.pres.org.pk/wp-content/uploads/2011/09/Rnewable.jpg

There are two types of Energy:

Renewable Energy and Nonrenewable Energy

(a) **Renewable** – energy renews itself in a short period of time

- Solar energy renews itself when the sun shines
- Wind energy renews itself when the wind blows.
- Plants that are grown for use for food can be renewed by replanting crops.
- Trees can be renewed though replanting after being harvested for wood products, paper or additional use to make fires for heat energy.
- Animals are renewed when livestock (like cows, pigs and chickens), and fish are farmed for production.
- Thermal energy is renewed from the heat deep inside the earth (heat from lava from volcanoes or geysers).
- Biofuels are renewed from living things (Ethanol comes from corn; biodiesel is vehicle fuel made from vegetable oil…)



http://2.bp.blogspot.com/-DiAmbRFGRwY/UQd8i5URpNI/AAAAAAAAAYk/9H3reI7Zd4U/s1600/renew+vs+non.PNG

Non-Renewable – energy that can run out

- Oil, gasoline, coal – heat our homes and fuel cars, boats, planes and trains
- Fresh Water – limited amount of fresh water on planet
- Electricity - is dependent on fresh water
- Endangered Species – not enough animals or other food sources to renew (overfishing or hunting)

- Look through magazines and see how many of the following images you can find that use energy:

car	boat
kite	television
hair dryer	lamp
sailboat	animal
tree	fire

- Sort them into RENEW, NOT, or ? piles. Make sure you have at least one item in all three columns.
- Tell your partner/buddy or teacher why you put each item in the chart below.

RENEW	NOT	?

- For the item(s) you placed under the "?", what did you learn about it, when talking about it with others? (Ask your buddy or teacher to scribe your response.)

  I learned…_____

  _____

- Now draw pictures of the following energy stories:

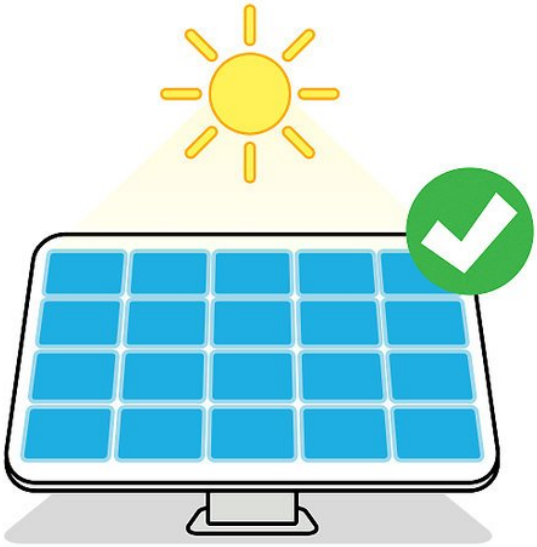
RENEWABLE STORIES
kite (wind)
dog (food)
tree (sun)
fire (wood)
sailboat (wind)

NONRENEWABLE STORIES
lamp (electricity)
car (gasoline)
television (electricity)

How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

TECH CHECK:

- https://www.youtube.com/watch?v=aUa7I7D_myU
- https://www.youtube.com/watch?v=wMOpMka6PJI



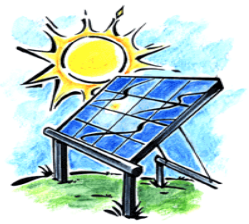
Roots of Energy Collage

- Search through magazines to find examples of the following roots or sources of energy:

RENEWABLE
sun, wind, fire, food, trees, water
NONRENEWABLE
coal, oil, gasoline, natural gas, candles, furnace, cars, coal

- Create a collage and label with masking tape the name of the energy source.
- Outline the tape with 'non-renewable' sources in red
- Take a picture of your collage and place here:

- Draw a sailboat, light bulb, tree and flat screen TV in the chart.
- Then match the source of energy with the picture you think it fits. Fill in the name of the energy source it uses from the following list: WOOD, FOOD, COAL, OIL, WATER, SUN, GASOLINE, WIND or ELECTRICITY

	Sun
Draw a sailboat	
	Electricity
Draw a light bulb	
	Gasoline
Draw a tree	
Food	
	Draw a flat screen TV

How well did you examine energy?	Trailblazer (Expert)	Pathfinder (Apprentice)	Rookie (Not Yet)

14. Energy from the Sun

The sun is the Earth's main source of heat!

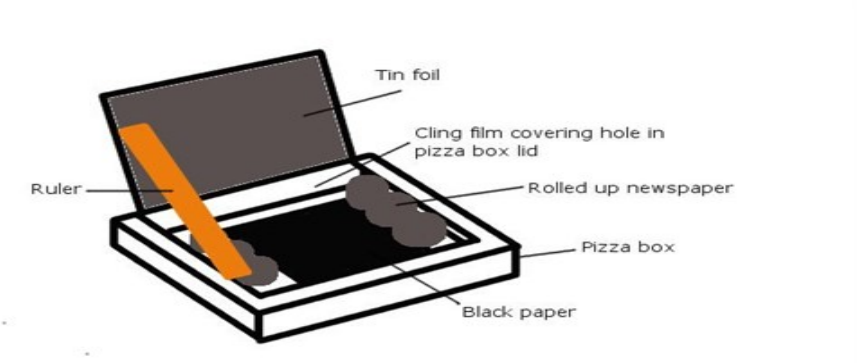
Video View

- Listen to the Heat Energy song on YouTube:
  - https://www.youtube.com/watch?v=khZrs-UBq28
  - http://www.sciencekids.co.nz/sciencefacts/energy/solarpower.html

Cool Facts:

- The sun can help us save fuel by giving off heat.
- One hour of sunlight can meet world energy demands **for an entire year!**
- Solar energy can also be used to create electricity.
- The largest solar power plant in the world is found in the Mojave Desert, USA.
- Spacecraft and space stations use solar energy.
- We can use the sun to cook food in a solar oven.

What is a solar oven? A solar oven uses the sun's rays to cook food. Astronomer John Herschel used one in 1830's to cook food during an African expedition.



http://www.planet-science.com/media/50971/build%20a%20solar%20oven_499x312.jpg

Making S'mores in a Solar Oven Experiment

Adapted from http://www.alliantenergykids.com/wcm/groups/wcm_internet/@int/@aekids/docume

Task and Materials:

A pizza box, aluminum foil, tape, black construction paper, newspaper, plastic wrap, ruler, chocolate, marshmallows, graham crackers

1. Draw a 22cm. x 28cm. rectangle on the lid of the pizza box.
2. Cut out 3 sides of the square, and fold flap back along uncut edge.
3. Cover the inside of this flap with aluminum foil, using tape to hold the edges down carefully.
4. Line inside bottom of box with black construction paper. Use tape to hold edges down.
5. Create insulation by rolling up some newspaper (about 1cm.
… thick) and fitting it around the inside edges of the box.
6. Tape one piece of plastic wrap (stretched tightly) to the underside of the lid opening, to cover.
7. Tape another piece on the top of the lid opening, to create a layer of insulation that will help hold the heat in the box.
8. Prop box at an angle facing the sun. Use a ruler to prop flap open.

On a hot day temperatures in the solar oven can reach 200°F.

Prediction – I think the solar oven will cook the 's'mores' well.

S'mores will cook. S'mores will not cook.

Theory – I think the s'more will _____

because _____

_____

Observe –I observed (Draw and label picture):

Findings – I confirm or changed my theory when I found out -

Doing Better – My experiment would be better if….

How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

15. Energy from Wind

Q: What is the source of energy to run a windmill?
A: Wind

- Wind is a renewable energy source.
- Wind is always present and is a daily weather phenomenon. We often notice it when we see leaves move, flags outstretched…
- Not only is wind a source of energy, it causes movement.

Make a Bubble Wind Toy Experiment

Task and Materials

- Make a toy to show how the energy in wind creates movement.
- Make a loop at the end of a pipe cleaner.
- Pour an inch of soap bubble solution into each pie tin.
- Dip the pipe cleaner in, shake off the excess, and blow gently to make a bubble.

Materials: 10 aluminum pans, 1 bottle of soap bubbles, pipe cleaner, cardstock, straight pins.

Prediction – I think the bubble wind toy

will work. will not work.

Theory – I think the bubble wind toy will _____

because _____

_____

Observe –I observed (Draw and label picture):

Findings – I confirm or changed my theory when I found out -

Doing Better – My experiment would be better if….

How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

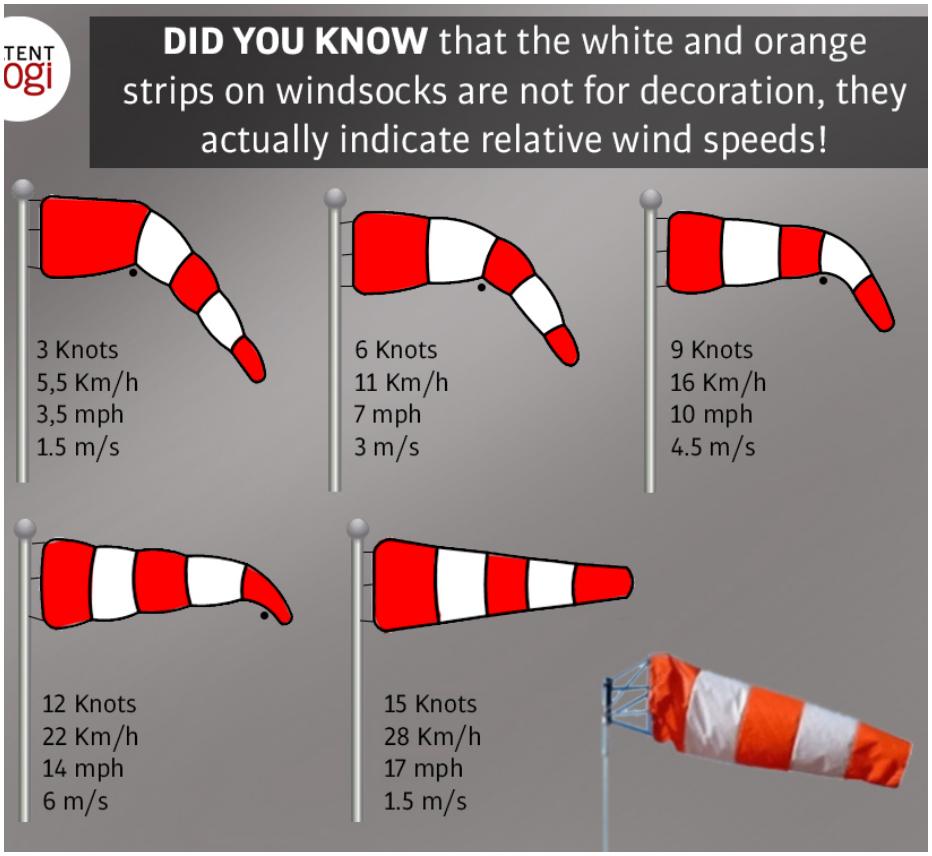
More Wind Tools to Make (option)

- Wind Wheel
- Ribbon Wind Sock

http://www.alliantenergykids.com/wcm/groups/wcm_internet/@int/@aekids/documents/document/mdaw/mdiz/~edisp/023062.pdf

- Wind Turbine

http://www.alliantenergykids.com/wcm/groups/wcm_internet/@int/@aekids/documents/document/mdaw/mdiy/~edisp/022820.pdf



https://patentyogi.com/american-inventor/did-you-know-that-the-white-and-orange-strips-on-windsocks-are-not-for-decoration-they-actually-indicate-relative-wind-speeds/

16. Energy from Food

Adapted from http://www.gofor2and5.com.au/
http://www.cyh.com/HealthTopics/HealthTopicDetailsKids.aspx?p=335&np=284&id=1431

We need to keep body supplied with good **fuel**.
Our bodies run on fuel we get from food.

- Read the responses to these questions below and circle at least 3 words you want to learn more about.

What fuel does the body need? (point form answers)

- Protein, carbohydrates, fat, vitamins, minerals and water

What does a protein do?

- builds up and repairs muscles and organs (heart, lungs…)
- helps cuts and grazes heal up.
- Sources: meat, chicken, fish, eggs, nuts, vegetables

What do carbohydrates do?

- gives energy
- Sources: apples, bananas, grapes, raisins, as well as low-fat ice cream and bread, cereals, pasta and veggies like corn, potatoes and carrots.

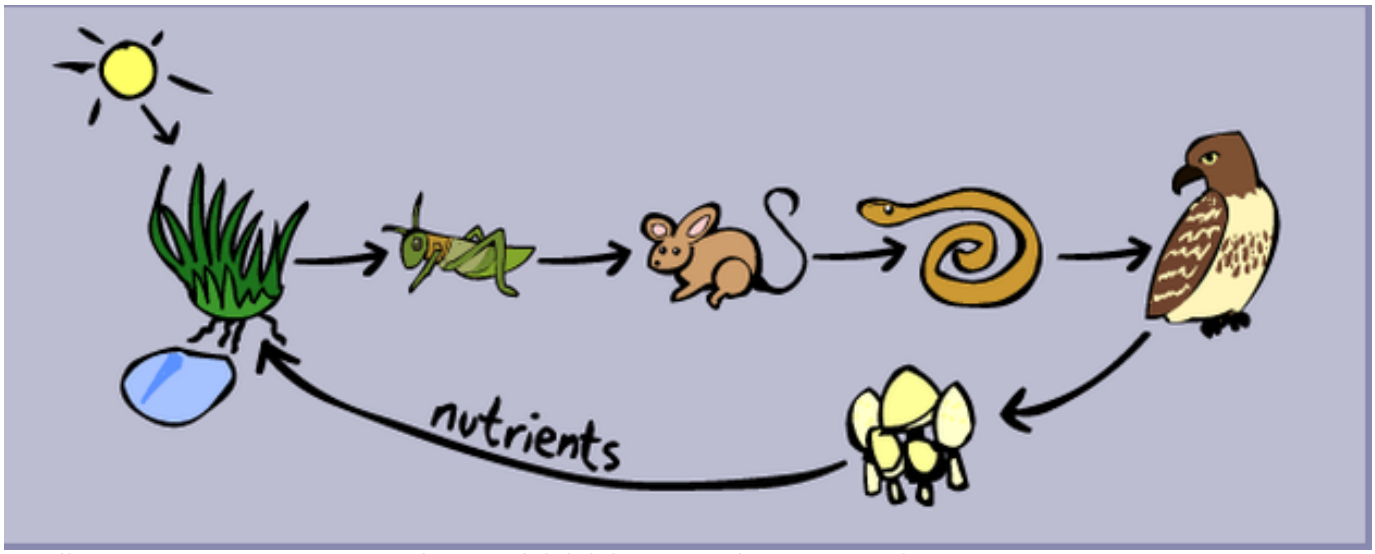
What does fat do?

- protects inner organs (heart, stomach, lungs…)
- helps body stay warm in cold weather
- keeps skin and hair healthy
- Sources: meat, eggs, cheese
- only need to eat some fatty foods
- can lead to obesity which can lead to heart disease
- Cut fat off meat before cooking/eating.
- Avoid fried food, chicken skin, and desserts

Cool Facts about Energy for Animals

Some living things like birds migrate to warmer weather in the winter. Other animals store food or overeat before hibernating during the winter. All living things need food for energy and survival. A cycle is a circular sequence of events. The picture below shows the cycle of life.

- Explain the cycle of life for each of the living things below:



http://gsatpreparations.weebly.com/uploads/1/6/9/3/16938630/1310666.png?630

Many animals need to adapt to survive.

- What's another word for adapt?

- What's another word for survive?

Animals ADAPT by:

- heading to warmer climates
- putting on a thick coat of fur

*some animals change colour

*some head underground for a long winter's nap (hibernation = deep sleep)

Hibernation (bears, skunks, raccoons, snakes, bats, squirrels)

- when day lengths are shorter, colder temperatures and food shortages
- to survive
- use less energy
- need to eat more fat to last throughout winter
- easily awakened
- breathe more slowly
- lower their body temperature a few degrees
- can wake up to go digging for more food
- hibernating animals can be attacked by predators and eaten!
- usually from October to April

What happens to Plants in Winter? Some plants die when summer is over, while others lie dormant (rest up) until spring. They may lose their leaves but when the ground is warmer, it's like they come back to life!

- What do you think 'dormant' means?

17. Energy for Transportation

- Do a class survey of how people get to school.

Means of Transportation	Number in class
1. walk to school	
2. take a car to school	
3. take a bus to school	
4. take a boat to school	
5. ride a bike to school	

What do you think is the best way to travel?

(a) to save time - by _____

(b) to save money – by _____

(c) to save energy – by _____

Compare two outdoor transportation inventions.

Most cars, trucks, buses, planes, boats, and ATV's need fuel to GO!

- Draw a picture of some of the advantages and disadvantages of different fuels:

Fuel		
Oil		
Gasoline		
Propane		
Electricity		
Biodiesel		

What is a biodiesel?

The fuel once came from living (or once-living) things.

Biodiesels:

- used oil from restaurants
- firewood
- animal dung and peat

Where do you think the term 'horse power' comes from?

- Do you think all cities/towns/rural roads should have bike lanes?

How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

Extension:

Create a Venn diagram to show your response to one or more of these challenges.

- What is the safest way to transport fuel to gas stations?
- Is fuel needed to make and transport electric cars?
- Is battery use good for the environment?

18. Do appliances save time?

Challenge: Do electric can openers and mixers save time?

Predict - "Which method do you think will take longer?"

I think

Because ***(theory)….***

Science can be exciting when experiments show us things we might not be able to predict. In science we may discover new things by finding out what is not expected!

Getting Stuff Ready for Muffin Making Experiment!
2 electric mixers, 4 bowls,
4 pudding packages,
8 cups milk, paper cups, plastic spoons, 1 wooden spoon,
can opener, electric can opener,
can of pineapple, spoon,
electric mixer.

https://cdnimg.webstaurantstore.com/images/products/extra_large/148303/589731.jpg

Observing Data – What you viewed… (using four senses: see, hear, smell, touch). No tasting until teacher gives everyone the "go ahead"!)

Time to complete task using electric can opener	Time to complete task using manual can opener
Time to complete mixing muffins mix using electronic mixer	Time to complete mixing muffin mix by hand.
How easy was it to use the electric can opener?	How easy was it to use the manual can opener?
How easy was it to use the electric mixer?	How easy was it to mix the muffin mix by hand?

Confirming or Changing First Ideas (theory):

Do Better - How can this experiment be improved?

Mini Clean-Up Experiment:

- Let's do a quick check of whether it is faster to wash and dry dishes by hand or use a dishwasher!

Time to complete washing dishes in dishwasher	Time to complete washing dishes by hand
How easy was it to use the dishwasher?	How easy was it to wash and dry dishes by hand?

Advantages and Disadvantages of Small and Large Appliances

Advantages	Appliance	Disadvantages
	electronic toothbrush/water pick	
	garage door opener	
	computer	
	refrigerator	
	oven and stove	
	washing machine and dryer	
	blender	
	furnace	

Compare two appliances using a Venn Diagram.

- Browse the appliance websites with your learning buddy.
- Fill this information in with words that describe how each appliance controls temperature and find out which appliances use the most energy *** and which appliances use the least amount of energy *.

Appliances/Utilities	How it uses temperature	Energy Use	PEAK Time of Day most used	PEAK Season used
Appliances				
refrigerator				
oven				
microwave oven				
dishwasher				
toaster				
coffee maker				
hair dryer				
Utilities				
furnace				
air conditioner				
water				
Electricity				

How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

19.Saving Energy

What time of day is Energy used the most?

- Morning – water for showers
- After Work – television
- Summer – increased air conditioning, fan use
- Winter – increase temperature
- Spring and fall – use of pool heaters
- Spring and summer – watering lawn and gardening

It's not easy saving energy. It starts with knowing how to save energy. And then you can act on what you know. What is saved today – can be there for tomorrow.

- Draw a picture of each of the following energy saving rules

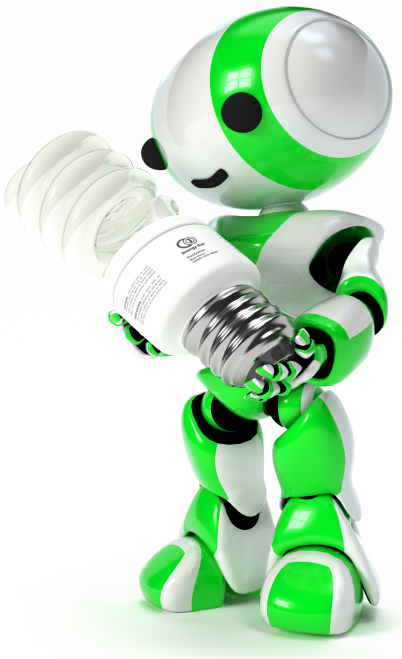
Turn off the radio and television when not in use.	
Turn off the lights when you are not using them.	
Use a solar powered calculator instead of a battery powered calculator.	
Ride the bus to Toronto to see a Raptors game instead of taking the car.	
Don't leave the refrigerator door open for a long time.	
Use a sweater to stay warm in the winter instead of turning up the thermostat.	
Recycle your pop cans, glass bottles and plastic containers.	
Use a fluorescent bulb instead of an incandescent one.	
Pass the clothes you've outgrown to someone who can use them.	

TECH CHECK:

https://www.youtube.com/watch?v=1-g73ty9v04
https://www.youtube.com/watch?v=q-zYcUPHpr4
https://www.youtube.com/watch?v=oKu6YZra5KQ (cost savings)

- Read the chart and put a check beside ways you are an 'energy saver' and an 'x' beside ways you are an 'energy waster'.

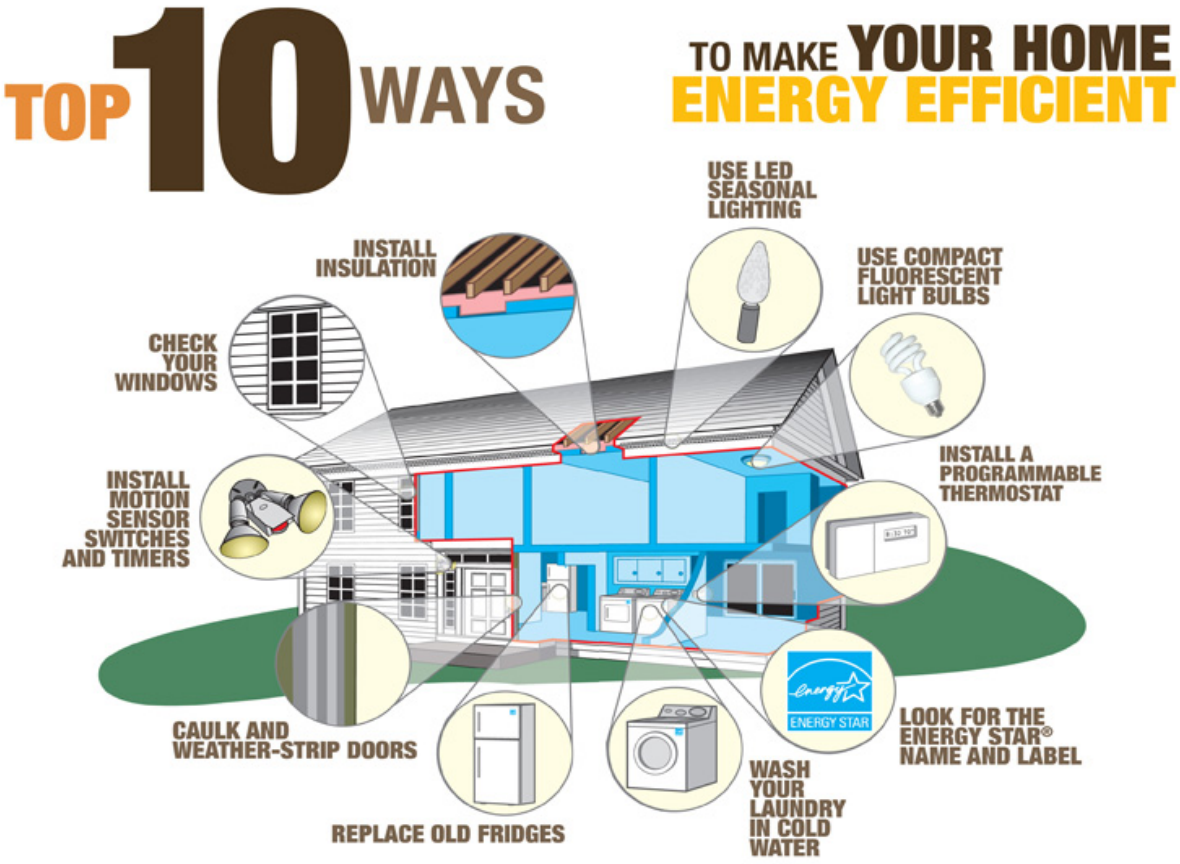
Energy Saver	**Energy Waster**
Candle	Electricity
Wear a sweater in winter	Wear a t-shirt and turn the heat up when cold
Lights turned off	Lights left on
Take a shower	Take a bath
Manual can opener	Electric can opener
Close windows/doors when air conditioner on	Leave windows/doors open when air conditioner on
Batteries taken out of object and stored in dry place	Batteries left in item in cool and damp conditions



http://www.clipartillustration.com/wp-content/uploads/2011/09/light-bulb.png

Energy Use at Home

- Take a look at the image below and circle the words that you have questions about.



What does 'efficient' mean?

- Record two more questions below:

1) _____

2) _____

- Draw and label what things use energy in each room in your home.
- Check off what energy forms are used in that room.

Room	Diagram	Form of Energy
KITCHEN		electricity radiant natural gas oil
BEDROOM		
BATHROOM		
LIVING ROOM		

- Look for patterns in the data.
- Which room uses the most energy?

The _____ seems to use the most energy.

- What form of energy is used the most?

Electricity Radiant Natural Gas Oil

- Is the energy use the same or different in a classmates' homes? (circle the word)

Same Similar Different

- Why do you think one room might use the most energy?

I think the _____ (room) uses the most energy because:

How well did you identify patterns in data?	Trailblazer (Expert)	Pathfinder (Apprentice)	Rookie (Not Yet)

- Create a mini poster to place near one spot in your home to remind everyone how to save energy. Take a look at the sample below from browsing images on the web:

http://www.billfrovichelectric.com/wp-content/uploads/Save-Energy.jpg

- How can energy be saved in all the rooms?

- Prepare a who, what, when, where, why and how speech on 'Saving Energy'.
- Organize your ideas in this chart.

Question Starters	
Who	
What	
When	
Where	
Why	
How	
(Option) if	

20. Energy Can Change

- Have a healthy snack.

View the video:

- https://www.youtube.com/watch?v=z1xFrYkQwik

Everyone in class is given one exercise and one of the 'energy facts' below. Create a poster that includes a picture of the exercise and the 'energy fact'. Circle your fact and your exercise below.

Energy Facts	**Exercise**
One form of energy can be changed into another form.	push ups
Appliances change energy from one kind to another	sit ups
A candle is a source of energy.	hold a plank
A candle can provide heat and light forms of energy.	wall sit
Wax is a fuel for energy.	stretching legs
Wax is a non-renewable fuel.	stretching arms
A battery is a source of energy.	bench stepping
A battery can provide 5 forms of energy: heat, light, mechanical, sound, electrical	Skipping
Exercise is mechanical exercise	power jumps

- Post the circuit and start at your own station.
- While doing the exercises, say the 'energy fact' out loud.

Think about the class from the beginning when eating a snack, to the end when you did your exercises.

Q: What forms of energy did your body use and change?

(a) changing motion energy to chemical energy OR
(b) changing chemical energy to motion energy

- Take apart a battery-operated toy.
- It changes chemical (battery) energy into:
  (a) motion or (b) heat or (c) light?

Draw a picture of the parts of the toy:

- Turn lights off and then on to change electricity into light.
- Teacher will strike a match to show how chemical energy changes into light energy and heat energy!
- The easiest way to save energy is to not use it. (Blow out the candle or turn off the flashlight.)

Longest Light Experiment

Task and Materials:

- Your teacher will light a candle at the same time as turning a flash light on.
- Time how long it will take for either the candle or the flashlight to burn out.
- Compare using the Observation Sense Chart what happens when the teacher strikes a match (which is an example of chemical energy), and lights the candle.
- Be careful when bringing hands near the flames (without touching them).

Prediction – I predict the _____ will go out first.

flashlight candle

Theory – I think the _____will go out first

because _____

_____

Observe – I observed… (Draw and label pictures of this experiment.)

Observation Sense Chart

Sense	Match	Candle
See		
Hear		
Smell		
Touch		

Findings – I confirmed or changed my first idea (theory) when I found out

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Why do you think a candle might burn out before a flashlight?

Doing Better – My experiment would be better if….

How well did I do this task?	Like a Trailblazer ☺ (Expert	Like a Pathfinder ☺ (Apprentice)	Like a Rookie ☺ (Novice)

Answer these questions by putting your ideas in words and images on a class mural:

- What are things at school we could turn off when not using?
- What are things at home we can turn off when not using?

Deeper Check

What do scientists do?

What is an innovation?

What is an experiment?

What is an observation?

Bonus ☺
What is a source?

Appendix A:
Cool Things to Make in Semester 1:

Collection	magnifying glass	measuring tool
****appliance**	calendar	energy collage
S'mores in a solar oven	bubble wind toy	energy fitness circuit
wind wheel (option)	wind sock (option)	wind turbine (option)

***Appliance (semester long task)

Appendix B:
Ontario Ministry of Education and Training SCIENCE Expectations in this unit

DAILY AND SEASONAL CHANGES

By the end of Grade 1, students will:

S1D.1.1 assess the impact of daily and seasonal changes on human outdoor activities (e.g., farming, gardening, swimming, skating, soccer) and identify innovations that allow for some of these activities to take place indoors out of season (e.g., greenhouses allow farming and gardening to happen in cold weather; arenas can make ice in all seasons for skating and hockey; community centres can provide warm places in all seasons for swimming)

S1D.1.2 assess ways in which daily and seasonal changes have an impact on society and the environment (e.g., In winter, some people suffer from seasonal disorders because there is less light from the sun than in summer. When the weather gets cold, people turn on heat in their homes; when the weather gets hotter they turn on fans, air conditioners, and pool heaters and pumps, all of which means that more energy is being used. At night in winter, when people get home from work and school, they all turn on appliances at around the same time [peak hours], which puts a strain on the power supplies. In summer, people increase their use of water to wash their cars and water their lawns and gardens; unless there is plenty of rain, this usage of water puts a strain on water supplies.

S1D.1.2 In winter, it is harder for birds that do not migrate and animals that do not hibernate to find food and water. Some plants die when summer is over; others undergo changes, such as losing their leaves and going dormant until spring.

S2C.2.1 follow established safety procedures during science and technology investigations (e.g., clean up spills as soon as they happen

S1D.2.4 use scientific inquiry/research skills…, including generating questions and knowledge acquired from previous investigations, to identify daily and/or seasonal changes and their effects (e.g., the sun shines during the day, and the moon and stars are visible at night; leaves change colour in the fall; there are fewer birds in winter; dogs' fur gets thicker in winter; trees and flowers bloom in spring) Sample guiding questions: What are some changes that take place between day and night? What changes in plants, animals, and the weather take place between summer and fall? Between fall and winter? Between winter and spring? How do these changes affect your activities and those of your family?

S1D.2.5 use appropriate science and technology vocabulary, including investigate, temperature, hibernate, dormant, energy, and survival, in oral and written communication

S1D.2.6 use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes (e.g., contribute to a class book about their observations of seasonal changes;

S1D.3.1 identify the sun as Earth's principal source of heat and light

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

S1D.3.3 describe changes in the amount of heat and light from the sun that occur throughout the day and the seasons

S1D.3.4 describe and compare the four seasons

S1D.3.5 describe changes in the appearance or behaviour of living things that are adaptations to seasonal changes (e.g., in fall, some plants shed their leaves and some birds migrate; in winter some animals change colour)

S1D.3.6 describe how humans prepare for and/or respond to daily and seasonal changes (e.g., by wearing appropriate clothing, carrying an umbrella, turning on an air conditioner or heater)

Appendix C:
Ontario Ministry of Education and Training MATHEMATICS Expectations in this unit

1.MEASUREMENT
By the end of Grade 1, students will:

M1B.1.1 demonstrate an understanding of the use of non-standard units of the same size (e.g., straws, index cards) for measuring (Sample problem: Measure the length of your desk in different ways; for example, by using several different non-standard units or by starting measurements from opposite ends of the desk. Discuss your findings.)

M1B.1.3 construct, using a variety of strategies, tools for measuring lengths, heights, and distances in non-standard units (e.g., footprints on cash register tape or on connecting cubes)

M1B.1.8 name the months of the year in order, and read the date on a calendar

M1B.2.2 compare and order objects by their linear measurements, using the same non-standard unit (Sample problem: Using a length of string equal to the length of your forearm, work with a partner to find other objects that are about the same length.);

Measurement Relationships
By the end of Grade 1, students will:

1B.2.1 compare two or three objects using measurable attributes (e.g., length, height, width, area, temperature, mass, capacity), and describe the objects using relative terms (e.g., taller, heavier, faster, bigger, warmer; “If I put an eraser, a pencil, and a metre stick beside each other, I can see that the eraser is shortest and the metre stick is longest.”)

M1B.2.4 describe, through investigation using concrete materials, the relationship between the size of a unit and the number of units needed to measure length (Sample problem: Compare the numbers of paper clips and pencils needed to measure the length of the same table.)

2. MEASUREMENT

M2B.1 Attributes, Units, and Measurement Sense
By the end of Grade 2, students will:

M2B.1.5 estimate, measure, and record the distance around objects, using non-standard units (Sample problem: Measure around several different doll beds using string, to see which bed is the longest around.)

M2B.1.10 describe how changes in temperature affect everyday experiences (e.g., the choice of clothing to wear)

M2B.2.2 compare and order a collection of objects by mass and/or capacity, using non-standard units (e.g.,"The coffee can holds more sand than the soup can, but the same amount as the small pail.")

M2B.2.3 determine, through investigation, the relationship between days and weeks and between months and years.