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Science.gc.ca Activity Book

Canada

Welcome to the Science.gc.ca Activity Book!

Here you can find a mix of science games, experiments and activities aimed to highlight the fun side of science! ...all while learning a little something too.

This Activity Book was put together by the team at Science.gc.ca – the official Government of Canada website for Science and Technology (S&T) information and resources. Just as our website gathers the best S&T content from within government, so too does this Activity Book contain the highest quality resources as provided by our 12 funding partners.

Have a look through our Activity Book to find some fun experiments to do at home, school, camp, alone or with friends. Once you're done, go online to Science.gc.ca to share your experiences, results and to connect with fellow science enthusiasts from across the country! And while you're there, don't forget to check out our Videos, Games, Educational Resources and all kinds of other compelling things to engage your inner scientist.

Science.gc.ca would like to thank the following government departments for their ongoing enthusiasm and support:

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- Health Canada
- Industry Canada
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- Natural Resources Canada
- Parks Canada
- Public Health Agency
- Statistics Canada
- Transport Canada

Sincerely,

The Science.gc.ca Team

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1 Planisphere

The night sky is an exciting place!

Construct your own Planisphere and use it to map the sky above you.

The planisphere oval represents a 'window' of the night sky for most Canadians¹. For each day of the year, the position of the stars and constellations is shown for Midnight, not taking into consideration Daylight Saving Time, which varies from province to province. Therefore, you may notice slight adjustments in the exact position of the stars in Canadian night skies.

The constellations close to the Southern Horizon will be in front of you when you look southward. Similarly, the stars close to the Northern Horizon will be in front of you when you look northward². The same rule applies for constellations close to the Eastern and Western Horizons. The stars in the middle of the oval will be directly over your head.

¹Canadians living between 45° and 55° latitude

²Don't know how to locate North, South, East and West? Have a look for the "Locating Magnetic North" activity in this book to help you find them!

Materials

- Scissors
- Planisphere

What to do

1. Cut out the Planisphere from your booklet.
2. Follow the instructions on the Planisphere tabs to put yours together.
3. Go outside on a clear night. Use the Planisphere to help you find constellations!

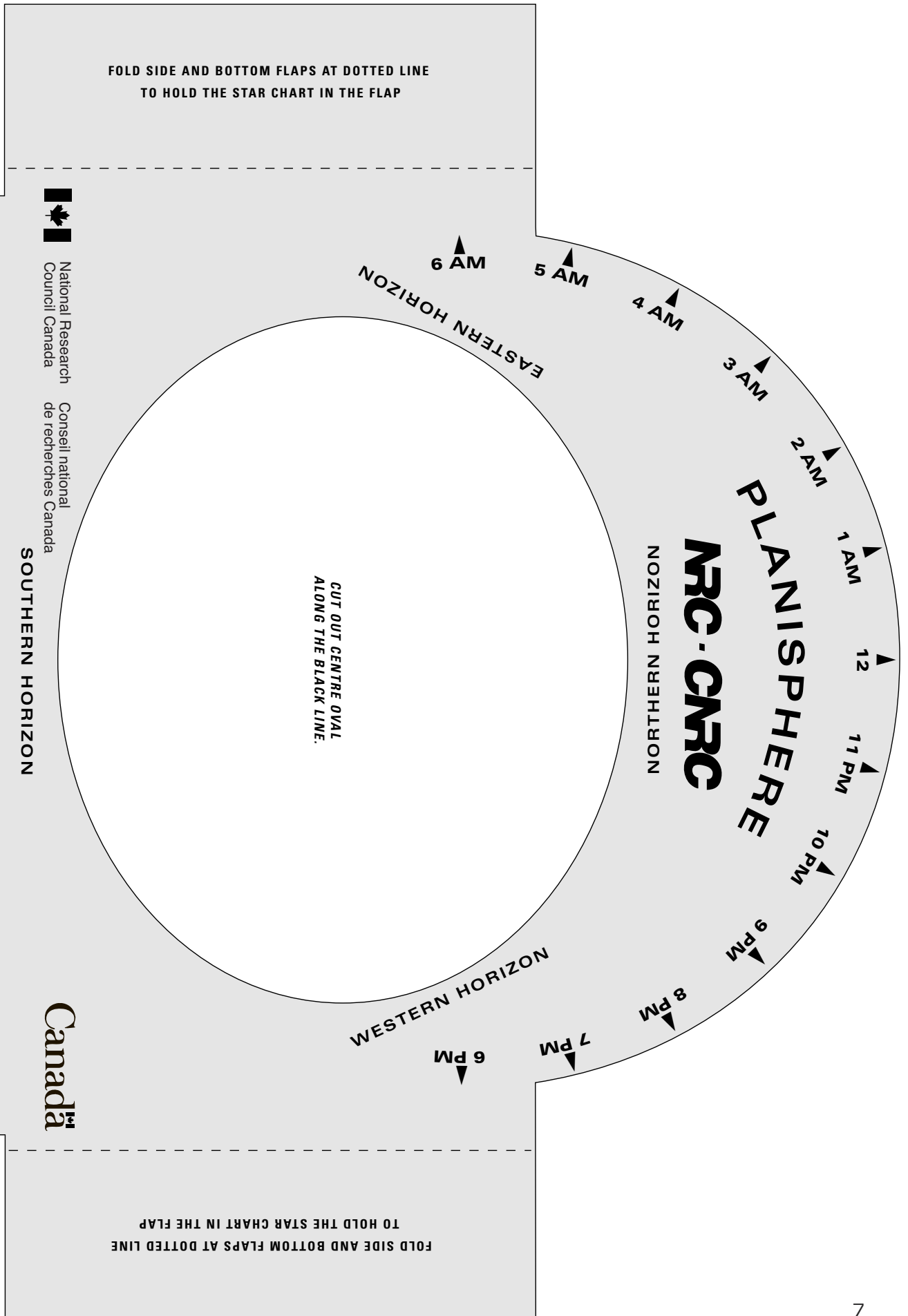
Discussion

Once you've found the constellations, see how much you know about them. What do their shapes represent? Where do their names come from? Have your group do some research and share the stories of the night sky!



WHAT TO DO

1. See Figures A and B. Photocopy each. Figure A is a replica of the star chart on the front of the poster. You may, if you wish, cut out a piece of cardboard and glue the star chart to it. Figure B represents the guide that will enable you to view the stars and constellations in the sky based on the time of day. Make sure to cut out the oval where indicated and fold the flaps (also indicated) down. Slide the star chart into the flaps. To determine which constellations and stars are visible on any given day or month, simply rotate the star chart disc. What appears in the oval is what you will see.



2 Build Your Own Water Filter

Since water is a rare commodity in space, astronauts on the International Space Station recycle all the water they use. This includes sweat, shower and shaving water, even urine! This wastewater is purified and then recycled for drinking and other uses.

To understand how water filtration works, try this activity. (**Note:** This experiment only demonstrates a type of water filtration. The experiment will not purify water for drinking purposes.)

Materials

- Clear plastic pop bottle (2 litres)
- Aquarium gravel
- Sand
- Aquarium charcoal (activated)
- Cheesecloth (a nylon stocking can also be used)
- Muddy water
- Rubber bands



What to do

1. Cut the bottom off the pop bottle. Cover the mouth of the bottle with several layers of cheesecloth and secure the cloth with a rubber band. Suspend the bottle upside down with its mouth over a container to catch the filtered water.
2. Using the hole cut in the bottom, fill the bottle with charcoal to a depth of 5-8 cm.
3. Place 8 – 10 cm of sand on top of the charcoal.
4. Add another 5 – 8 cm of gravel on top of the sand.
5. Stir the muddy water and pour it into the filter. Watch closely as the water seeps down through the three filtering layers of gravel, sand, and charcoal.

Discussion

What happened to the water while it passed through the different layers of the filter?
Compare the muddy water to the filtered water. Is there a difference?
Would it make a difference if one of the layers had been left out?

*★ Luminous Water

Water and glass can act as obstacles, causing light to deviate or change direction. This experiment is a good way to demonstrate what happens.

Materials

- Scissors
- Clear plastic bottle
- Water
- Flat dish
- Small flashlight



What to do

1. Use the scissors to poke a small hole in the bottom third on the side of the bottle. With your finger on the hole, fill the bottle with water. Place the bottle on the dish and turn off the lights in the room.
2. Let the water trickle out of the hole into the dish. Shine the beam of the flashlight around the bottle, level with the hole. If the beam is properly positioned, the water trickling from the bottle should become luminous. Even the water in the dish should emit light.

*★ The Colour Spectrum

Light may look transparent, but it actually consists of many colours - red, orange, yellow, green, blue, indigo and purple. These different colours are called the Colour Spectrum and were first understood by Isaac Newton. Here's an experiment that demonstrates the colour spectrum.

Materials

- Black paper
- Scissors
- Tape
- Flashlight
- Clear plastic box (a Tupperware container works)
- Mirror
- Thick white paper



What to do

1. Make a small notch in the black paper and tape it to the glass part of the flashlight.
2. Pour water into the box to the halfway point. Stand the mirror up in the water against one side of the box.
3. Turn off the lights and focus the beam of the flashlight on the part of the mirror that's submerged.
4. Hold a sheet of white paper so that it reflects the light. The colours of the rainbow will appear on the sheet of paper.

☆☆ Locating Magnetic North

The Earth is like a great big magnet that forces all the other magnets to point to magnetic north at the top of the world. Here are a couple of experiments that involve locating magnetic north.

1. Observing Shadows

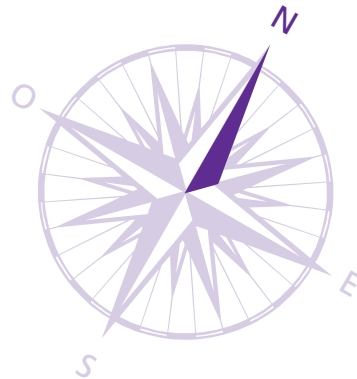
Go outside on a sunny day, around noon, and observe which way your shadow is pointing. Shadows point northward because Canada is located in the Northern Hemisphere. If we lived in the Southern Hemisphere, our shadows would point southward.

2. Making a Compass

Step A

Materials

- Bar-shaped magnet
- Tape
- Small plastic container
- Bowl
- Water
- Stick-on labels



What to do

1. Tape the magnet flat in the middle of the small plastic container.
2. Fill the bowl with water and float the container in the bowl.
3. Once the container stops moving, mark the edge of the bowl with two labels opposite either end of the magnet – one for north and one for south.

Proceed to step B to see which is north.

Step B

Materials

- Piece of cardboard
- Pen
- Scissors

What to do

1. Cut out a circle of cardboard the same size as the opening of the small plastic container.
2. Draw a cross on the cardboard. At each of the four points, moving clockwise, write the first letter of the cardinal points - N (north), E (east), S (south), W (west).
3. Place the cardboard on the container so that the N is opposite one of the labels. As you turn the container slightly, you can see that the magnet keeps turning back to face north. Place the N at that mark. Once the magnet stops moving, the compass will show the cardinal points.



3 Build your own Volcano

Step A - Salt dough

Materials

- 6 cups of flour
- 2 cups of salt
- 4 tablespoons of cooking oil
- 2 cups of water

What to do

1. Mix the ingredients together with your hands until the dough is smooth and firm.
Feel free to add a little more water to the mixture if needed.

Step B - Volcano

Materials

- 2 litre pop bottle
- 1 tablespoon of liquid detergent
- Red food colouring
- 1 cup of vinegar
- Warm tap water
- 2 tablespoons of baking soda
- Baking sheet
- Funnel

What to do

1. Stand the clean soda bottle in the middle of the baking sheet. Mould the salt dough around the bottle, making sure that you don't cover up the bottle mouth (the hole at the top) or drop any dough into the bottle. Take your time and build the volcano of your dreams.
2. Once you are done the exterior of your volcano you can begin to mix your lava!
Start by filling the bottle most of the way with warm water. Make sure to leave enough room for the rest of your ingredients!

3. Next, use the funnel to add 1 tablespoon of liquid detergent into the bottle.
4. Add a couple drops of red food colouring.
5. Add 2 tablespoons of baking soda to the water/detergent mixture in the bottle.
6. Slowly pour 1 cup of vinegar into the bottle and jump back!

Discussion

When baking soda is mixed with vinegar a chemical reaction takes place and carbon dioxide is produced – the same gas that bubbles in a real volcano! Since carbon dioxide gas is heavier than air it pushes the air out of the bottle. The detergent in the bottle creates bubbles and the food colouring adds colour to the "eruption". Although real volcanoes don't have the same ingredients as this activity, their behaviour is somewhat similar.

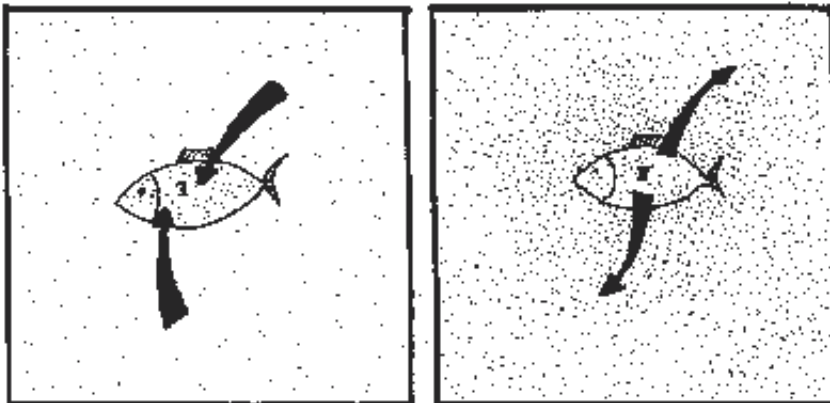
★ ★ Do Fish Drink Water?

In saltwater, salt moves from areas of high concentration to areas of low concentration. Similarly, if something blocks the salt from moving (but not the water) the water moves from the low salt areas to the high salt areas. This is osmosis.

All creatures living in water are adapted to the effects of osmosis. Seawater has a higher salt concentration than the body fluids of fish. Therefore, the water in seawater fish is constantly being lost to the sea. These fish have to drink continually to replenish their water supply, urinate very little, and push salt out through their gills.

Freshwater has a lower salt concentration than the body fluids of fish. Fish living in freshwater never drink. Therefore, freshwater tends to flow into their bodies, in an attempt to increase its salt concentrations. Consequently, freshwater fish never drink; if they drank even a little, they would swell up.

Fish in freshwater (water flows in) Fish in saltwater (water flows out)



Materials

- 2 glass jars
- Raisins
- Salt
- Teaspoon
- Measuring cup
- Label (paper or tape)
- Pencil
- Knife (optional)

What to do

1. Fill two glass jars with water and label one saltwater and the other one freshwater.
2. Add salt to one jar and stir until dissolved - a teaspoonful of salt to 250 ml of water.
3. Add a handful of raisins to each jar. Keep a handful of raisins dry for comparison.
4. Let stand for an hour.
5. Observe the raisins.

Discussion

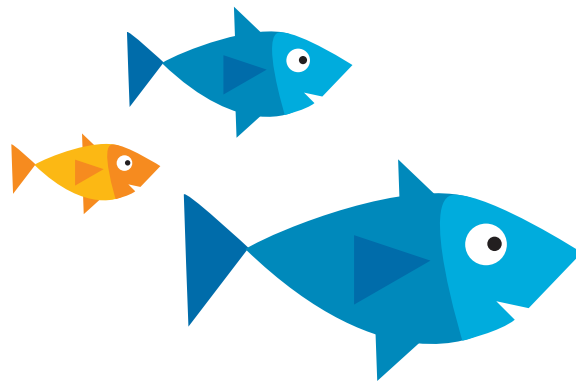
What happens to the raisins in the freshwater?

What would happen to freshwater fish if they drank water?

What happens to the raisins in the saltwater?

What would happen to fish in saltwater that did not drink a lot?

What would happen to you if you drank saltwater?



4 Water Pressure

How Great Is It?

Materials

- Hammer and nail
- Large empty juice can
- Container of water
- Dish pan to catch water
- Tape

What to do

1. Use the hammer and nail to make three holes in a straight vertical line at the top, middle and bottom of the can.
2. Place one piece of tape so it covers all three holes.
3. Discuss what you think will happen when you remove the tape from the can.
Will the water come out of each of the holes in the same way? Why/Why not?
4. Holding the can upright, pull the tape off. Observe the flow of the water streams coming out of the can. Is there a difference? Which hole makes the longest stream of water? Why?

Discussion

The bottom stream shoots out the farthest because it is being pushed down by the weight of the water above. The bottom stream is under the highest pressure, whereas the stream at the top is under the lowest pressure.

5 The Effect of Acid Rain on Green Plants

This activity requires a few special ingredients and weather (rain), so be sure to plan ahead!

Materials

- Two clear plastic or glass jars with wide mouths and screw-top covers (peanut butter or mason jars work well)
- Litmus paper
- Litmus paper colour-matching chart for determining acidity
- Two green plants



What to do

1. Label your jars "A" and "B".
2. In jar A collect rain water as it falls from the sky. Screw on the cover.
3. Fill jar B with regular tap water. Screw on the cover. (Jar B is a control)
4. Dip litmus paper into jar A. Use the colour chart to determine whether the rain water is acidic, alkaline or neutral (pH balanced).
5. Repeat step 3 for the tap water.
6. Take note of your results.
7. If the rain water is found to be acidic, place a few drops each day for five days on live plant leaves. Do the same with the pH balanced alkaline tap water on the leaves of the other plant. Compare the two plants.

Discussion

What might be the result of frequent acid rain falling on a forest?





6 Mystery phrase

How to play: In the following table, each symbol represents two letters. Use the following codes to find the mystery phrase.

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<	!	=	>	@	%	%	?	\$	%

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
=	@	O	%	@	?	#	=	#	=	%

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
&	@	^	#	O	@	@	=

!	@	#	\$	%	^	&	O	?	<	>	=	-
A	B	C	D	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

Jumble Words

Unscramble the following words and, using the highlighted letters, find the **SECRET WORD!**

Y G R E N C L C I
□ □ ■ □ □ □ □ □ □

I T A N - G D L N I I
□ □ □ □ □ □ □ ■ □ □ □

G G T H I L I N
□ □ □ □ □ ■ □ □

M S T C O P O
□ □ ■ □ □ □ □

R O T H S E T M T A
□ □ □ □ □ □ □ □ ■ □

R U N T F O F
■ □ □ □ □ □ □

Y E R E G N
□ □ ■ □ □ □



SECRET WORD:

■ □ □ □ □ □ □

Recipes

Note: be sure to check for allergies before making these recipes, some contain nuts!

We all know that eating well is an important part of keeping our bodies happy and healthy. Try these fun and delicious recipes for a great way to boost your energy!

★ ★ Ants on a Log

Ingredients

- Celery stalks
- Peanut butter
- Raisins
- Knife



What to do

1. Wash your celery in clean water.
2. Spread the peanut butter on the celery stalk.
3. Sprinkle with raisins.

Variation: Use sunflower seeds or currants instead of raisins.
Use cheese spread instead of peanut butter.

★ ★ Polar Bear Drink

Ingredients

- 250 ml Chocolate milk
- 1 Banana
- Strawberries
- Blender
- Wax paper
- Freezer
- Measuring cup



What to do

1. Half peel a banana. Put it on the waxed paper in a freezer for about 30 minutes.
2. Take the frozen banana out and peel completely. Mix it in the blender with the chocolate milk.
3. Place a strawberry on top!

★ ★ Over the Rockies Trail Mix

Ingredients

- Cheerios or Shreddies
- Dried apricots
- Dried bananas
- Dried pears
- Dried apples
- Raisins
- Bowl or bag
- Knife



What to do

1. Cut up the dried fruit into small pieces.
2. Mix all the ingredients together in a large bowl.

Variation: For those with a sweeter tooth, some chocolate covered peanuts make a tasty addition. Divide your Trail Mix into small baggies so everyone has their own easy-to-carry trail snack!

★ ★ Gone Fishing!

Ingredients

- 125 ml cream cheese
- 2 drops of blue food colouring
- 2 handfuls of pretzel sticks
- 2 handfuls of goldfish-shaped crackers



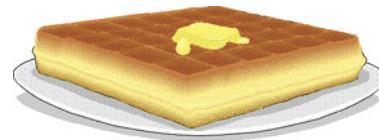
What to do

1. Put the cream cheese into the bowl
2. Using the spoon, mix in the food colouring. When it is mixed, spread it evenly around the bowl to create your pond.
3. Sprinkle the pond with your goldfish crackers
4. Now dip your fishing pole (pretzel) into the fishing pond and see what you get!

★ ★ Tic-Tac-Toast

Ingredients

- 1 slice of bread
- 1 "singles" slice of cheese
- 1 cheese string
- 1 black olive
- 1/4 red or green pepper
- knife
- toaster oven/oven
- plate



What to do

1. Put a slice of bread on a plate.
2. Cover the bread with the slice of cheese
3. Pull your cheese string into skinny strips and place them on the bread in a tic-tac-toe grid pattern.
4. Cut up the olive for your O's.
5. Cut up the green or red pepper into strips to make your X's.
6. Place your X's and O's on your bread.
7. Melt the cheese under the broiler and before you know it, you will have tic-tac-TOAST!



8 Word Searches

Take a break and relax with these transport-related word searches to learn about transport in Canada – by Air, Rail, Water and Road!

Air Transport

E G R G B S G S G O G T I L N
 O F E E A A T T G S U R N L I
 S M I F G R G R R R F O S C B
 E D E L O I A G B F F T P A A
 F T R P D C S U A L R C E R C
 Y P R I T L L T T G T E C R T
 S I J J B E I J R J E T T Y J
 A P J P N R M W E A E E O O L
 T V K C S T O L I P T D R N V
 G V E J P J G V S F G I S O S
 T H G I L F E R P G P V O L L
 I D E N T I F I C A T I O N L
 S E C U R I T Y O L R G T L Y
 M L J L F K L R P F M J L G E
 F L G P I R P T O L S F L V L

- AIRPORTS
- BAGGAGE
- BIRDS
- CABIN
- CARGO
- CARRY-ON
- DETECTOR
- INSPECTORS
- IDENTIFICATION
- PILOTS
- PRE-FLIGHT
- SAFETY
- SECURITY
- REGISTRATION
- TURBULENCE
- WILDLIFE

Rail Transport

T R A C K S Y C M L S Y T B E
H J G O L R A I U O T N L P F
S L E L T S I H W E E G A G H
N I M G E P R U F M A L N U T
O J N I T U N A L P M O H B S
I B E T A M S I E C T A I J L
T C T H E P A S S E N G E R S
C R P I S R E T A I R N A O P
E O L N E N M G T A O I C C S
P S G D C G U O I H L N J R T
S S J A R A E N D W G M S L H
N I S J T H S U A A T I N I G
I N F D T E M Y O L L G E L I
M G J L F J S R P F M J L R L
F S G P I R P T O L S F L V F

CROSSINGS
DERAILMENT
FREIGHT
GATES
GRAIN
INSPECTIONS
INTERMODAL
LIGHTS
PASSENGERS
RAILWAY
SAFETY
STEAM
TRACKS
WHISTLE

Marine Transport

Q G I F E D S H I P G R G F E
K H C N E S S T S O E L L K G
R P T O S R I K A P H G G S A
E F M F T P R U F O P L C K T
H L E I S U E I R K B O H R O
P I K S K T H C E C A R J J L
G F T H R R P E T S C C U C I
R E G I S T R A T I O N C O P
T J F N L S O G P N O C C C T
R A I G H G U B L U E N O S E
M C J L R A E N I R A M S L L
G K J A R E S U O H T H G I L
H E C D T S M K O L R G T L Y
M T J L F K L R P F M J L G E
F S G P I R P T O L S F L V L

BLUENOSE
CARGO
COAST GUARD
CRUISE
FERRIES
FISHING
INSPECTIONS
LIFEJACKETS
LIGHTHOUSE
MARINE
PILOTAGE
REGISTRATION
SHIP
TOUR BOATS

Road Transport

G P C A R S Y S M L M T G B E
A J G O L R G I S O E Y N P F
S Y T E F A S T P N E G I G H
O R M G B P L U V G B L L U T
L J E R S E L I B O M W O N S
I S I G B D R I V I N G O J L
N A E T N O F A Y H I O P G P
E S A G N E H S T A E S R A C
P E E M D R S I M V G U A T I
S J E S C I E S G O P N C R F
Y N J G U A R C A H J M N U F
T G S J R B S B A P W A N C A
A C C I D E N T S L B A F K R
M I J L F J Y R P R L J Y S T
F S G P I R P T U L S S L S F

ACCIDENTS
AIRBAGS
ATV
BRIDGES
BUSES
CAR-POOLING
CARS
CAR SEATS
DRIVING
ENVIRONMENT
GASOLINE
HIGHWAYS
PASSENGERS
RECALLS
SAFETY
SEATBELTS
SNOWMOBILES
TRAFFIC
TRUCKS
URBAN



9 Careers in Agriculture

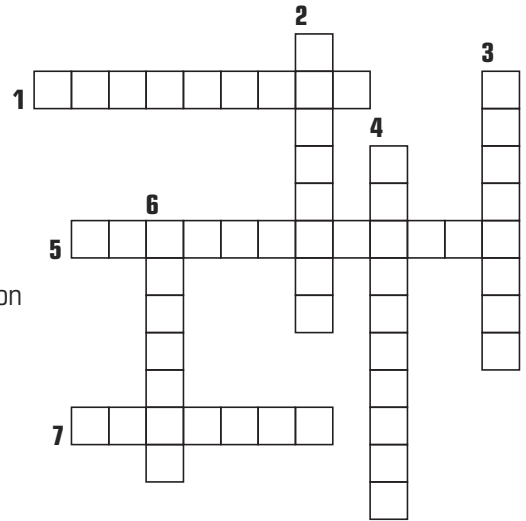
Crossword puzzle

Across

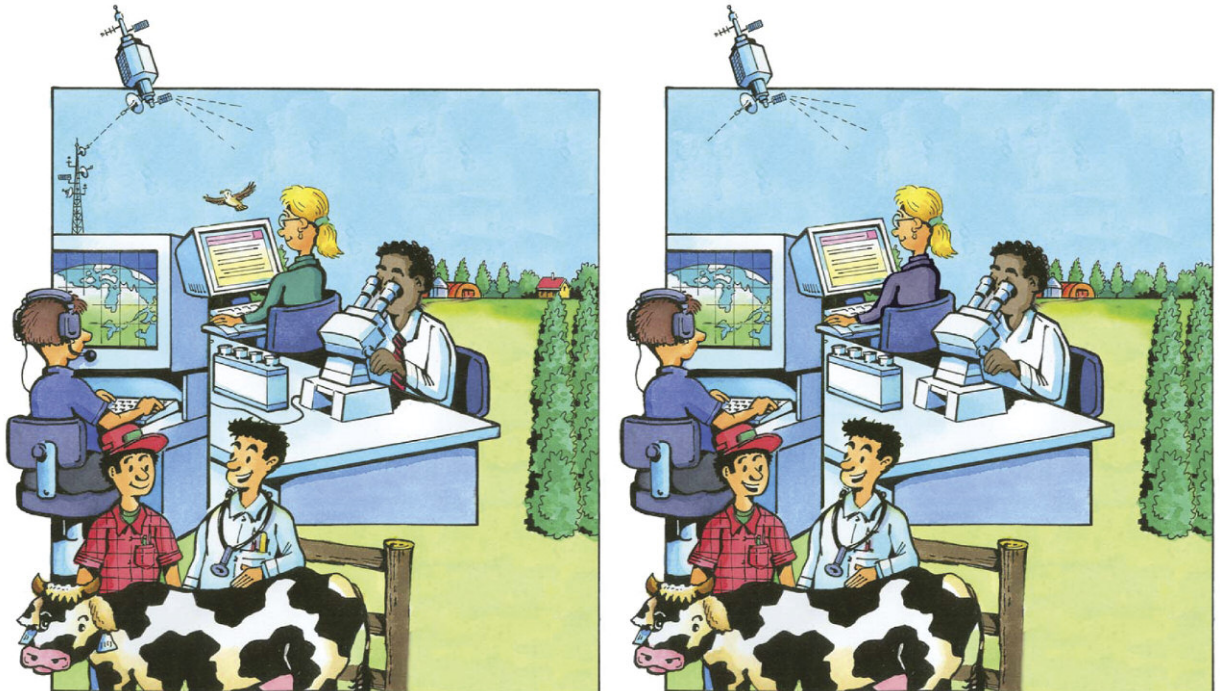
- 1. A person who raises bees
- 5. A doctor who looks after animals
- 7. A scientist who works with chemicals

Down

- 2. A person who keeps machines and vehicles in good condition
- 3. A person who designs farm machinery or farm structures
- 4. An expert on crops and soils
- 6. Someone who drives goods to the market



Find the differences (10)

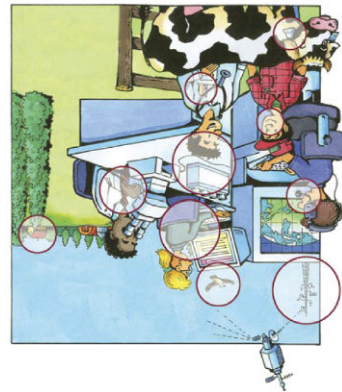


Did you know?

Farmers are multi-taskers and wear many hats — including mechanic, scientist, trucker, economist, veterinarian and engineer.

The world of agriculture offers many career opportunities — from food scientist, animal and plant researcher, and nutritionist, to agricultural journalist, banker, market analyst, sales professional, food processor, wildlife specialist and many more.

- Crossword puzzle**
- Across**
1. Beekeeper
 5. Veterinarian
 7. Chemist
- Down**
2. Mechanic
 3. Engineer
 4. Agronomist
 6. Trucker



Solutions

10 How dirty is the air

Try this experiment to find out about Particulate Matter. What is Particulate Matter? It's a fancy word for all the little things like dust, dirt, soot and smoke that surround us, but that are too small to see.

Materials

- Coloured markers
- White cardboard
- Magnifying glasses
- Labels (masking tape works as well)
- 5 jar lids



What to do

1. Write the numbers 1 through 5 on the labels, then attach a label to the top of each jar lid.
2. Place the jar lids on a piece of white cardboard. Carefully trace the lids, then number these circles to match the numbers on the lids.
3. Take the cardboard and lids outside. Place them flat in an open area.
(Rain or high winds will spoil the experiment, so keep an eye on the weather reports!)
4. At the end of the first day, remove one lid, starting with number one. For the next five days take away one lid each day. Are the circles different?
5. At the end of the fifth day, take away the last lid and look at the circles. If the air is dirty, the circles covered by the low-numbered lids will have more specks of dirt than the others. Use a magnifying glass to count the dirt specks.

Discussion

Is our air clean or dirty?



11 Price Game

This activity is designed to help you to determine the price of items you regularly use. It can be surprising to see how much some everyday items actually cost!

Materials

- Various store catalogues and flyers
- Pencils, pens or markers

What to do

1. Either individually or together, have your group put the price of the item, to the best of their knowledge, on the white price tags.
2. Using flyers, catalogues, the internet, or by looking through cupboards at home or school, find the actual price of the items.
3. Compare the results.

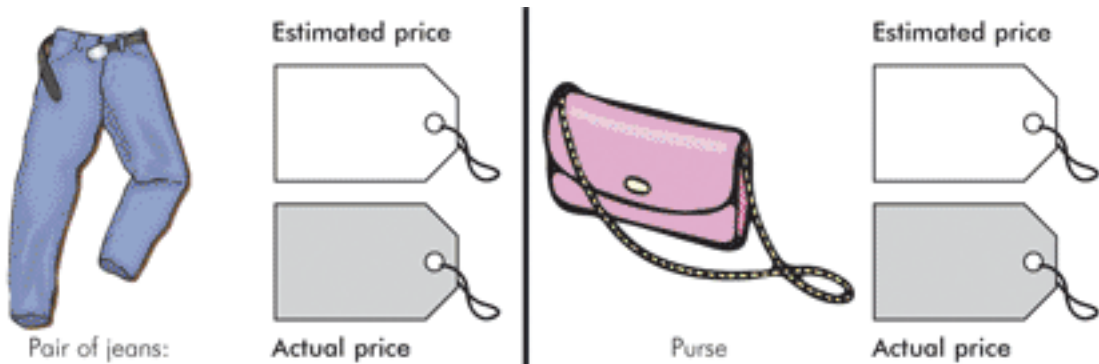
Discussion

Were items typically more or less expensive than the estimate price?

Discuss the differences between a “want” and a “need”.

Which items on the list are a “need”? Which are a “want”?

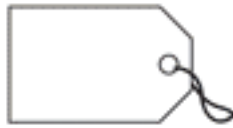
Talk about the importance of setting a budget with your group.





27-inch colour television

Estimated price



Actual price



Lawn Mower

Estimated price

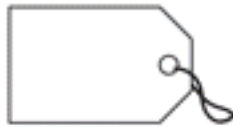


Actual price



Hair dryer

Estimated price



Actual price



Pizza delivery

Estimated price

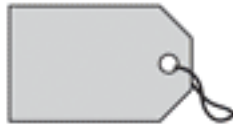
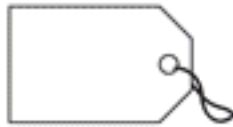


Actual price



Can of paint (3.7 litres)

Estimated price

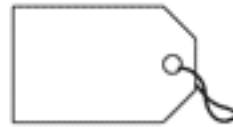


Actual price



Lamp

Estimated price



Actual price



Video game

Estimated price



Actual price



Watch

Estimated price



Actual price

12 Money Puzzle

Materials

- Scissors

What to do

1. Cut out the \$5 bills to use as the pieces of your puzzle.
2. Flip them over, and arrange them to make the image of a CD player

Discussion

The \$5 bills represent part of your weekly allowance. You have been depositing these \$5 bills in your bank account in order to buy a CD player that costs \$50.

On the back of each bill, you will find a piece of the CD player you want. If you deposit \$5 a week in your bank account, how many weeks will it take you to save the \$50 needed for the CD player? The puzzle will help you find the answer.



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