

CHALLENGE

Predict the weather with a homemade barometer.

Materials

- Glass jar or cup
- Balloon
- Elastic band
- Straw
- Tape
- Paper & Pen
- Scissors

Method

- Prepare your barometer on a sunny, clear day.
- Cut a balloon in half and pull it tight over a jar or glass.
- Secure the balloon with an elastic band.
- Tape the end of the straw to the center of the flat balloon.
- Tape the paper on the wall so that it is lined up against the straw. Draw a line write 'high pressure' or draw a sun, below this line write 'low pressure' or draw some rain.
- Note the pressure each day to see if you can notice a pattern between your air pressure readings and the weather outside.

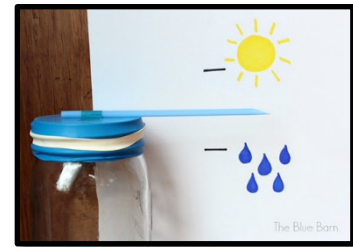


Image acquired from: housingaforest.com

Indigi-Tech

Looking at and understanding what different cloud shapes mean has been used traditionally by Indigenous people to help decide if certain activities, such as travel or hunting, should happen. If clouds look like fluffy cotton candy, or if they are way up high, the weather will be nice. Tall, dark, mushroom-shaped clouds mean thunderstorms are coming, so you should stay home. Low, grey clouds can mean rain, but activities can happen, as long as you don't mind getting wet. Sundogs (a rainbow ring around the sun) means extreme cold is on its way, so you need to bundle up, or stay home.



Sun Dog and Halo
Winnipeg, MB

How it Works

The air is sealed in the jar. Any changes to the air pressure outside of the jar will cause the air to either expand and push the balloon up, or force the balloon down into the jar. The straw will pivot upwards with high air pressure, and will pivot downwards with low air pressure.

Bio-Links

Just like your balloon, birds feel changes in air pressure. To stay safe, migrating birds make sure they don't get caught in stormy weather as they move between their summer and winter homes. When they feel air pressure changes, birds know if it's a good day to fly or not. On a bad day, they stay close to the ground and try to find food. On a good day, they take to the sky!

CHALLENGE

Create a 'one-minute water clock' that uses exactly $\frac{3}{4}$ cup of water.

Materials

- Large pieces of birch bark, pieces of hide, or paper cups
- Water
- Optional: Additional birch bark, hide or cups, string, straws, clay

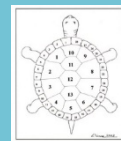
Method

- The simplest water clock consists of two water holders (pieces of hide, large pieces of birch bark, paper cups, etc.) fixed one above the other with a hole in the top water holder to allow water to pass. The bottom holder catches the water.
- Create a small hole in the top water holder. Place water in, and time how long it takes the water to drip through the hole.
- Adjust the size of the hole so that it takes exactly one minute for the water to drip through.
- Additional cups, string, straws, and clay can also be used to create more elaborate clock systems, or to help slow the water if needed.



Indigi-Tech

Indigenous people did not have or use clocks to tell time traditionally. Watching the environment and taking note of the regular cycles of nature tells you when to start different activities. The turtle shell is used to teach about different months. A 'moon month' starts when there is a full moon. A turtle shell has 28 pieces around the outside of the shell – the same number of days in a moon month. There are 13 pieces in the centre – the same number of moon months in a year! Each moon month is named after specific things that happen in nature at that time of year. In early spring, there is a moon called the 'sugar moon'. It means that it is time to harvest maple syrup – yum!



*Turtle Shell
Lunar Calendar*

How it Works

A water clock uses a flow of water to measure time. The water is drained slowly and evenly out of a container. The observer can see how much water leaves the container and how much time has passed.

Bio-Links

Most animal (even human) bodies tell time by an automatic daily cycle called a "circadian rhythm". In the far north, the sun stays up all summer long and it can be dark for many days in winter. Northern caribou don't follow a day and night schedule: they sleep and eat whenever they want and instead, have a seasonal rhythm of when to do things!

CHALLENGE

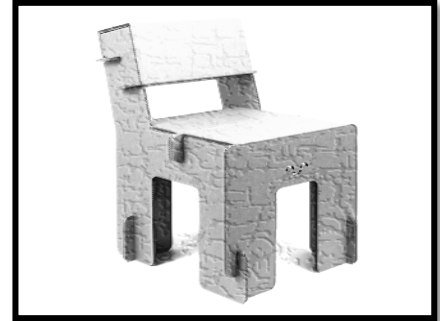
Construct and sit on a functional cardboard chair.

Materials


- Cardboard pieces
 - Sticks or branches (including some that can bend)
- **Note: No other materials may be used (including adhesives)*

Method

- Design your chair on paper, or discuss with a friend. Consider a few designs.
- Consider design techniques such as using cylinders or cones, interlocking sheets, tubes, weaving, and using strips of cardboard or bark like twine or string.
- The chair must support your weight fully. If the first design doesn't work, evaluate your design and try again!



Indigi-Tech



Indigenous people have been weaving baskets and other items from material found in nature for thousands of years on Turtle Island (North America). The material used needed to be both flexible and strong to be able to weave and then hold the shape. Weaving material could be spruce roots, honeysuckle vines, cedar strips, oak, grass, or reeds.




Ojibwe cedar wild rice basket

How it Works

The force of gravity pushing you down against your chair is balanced by the force of the chair pushing up against you. The force of your weight is distributed throughout the chair, which then creates a force onto the ground.

Bio-Links



Animal Engineers

Beavers are the most well-known animal builders: all without hammers, nail, or glue! Collect some natural building materials (twigs, stones, mud, leaves) and build a beaver dam across the middle of a pan or container. Pour water on one side and see how much water gets through your dam.

CHALLENGE


Build a geodesic dome.


Materials

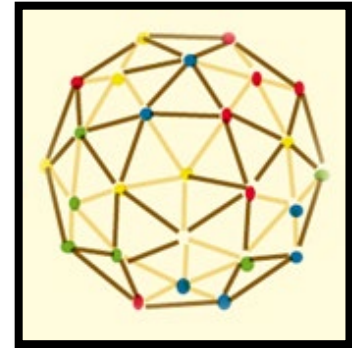
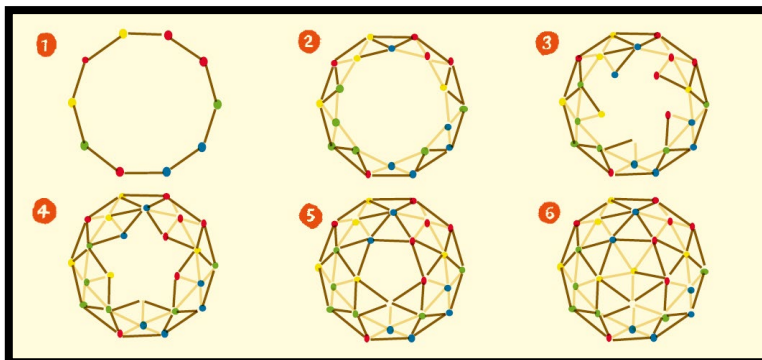
- 35 twigs or toothpicks that are 6.5 cm long
- 30 twigs or toothpicks that are 5 cm long
- Play-doh, clay, marshmallows, gumdrops, or other similar binding agent

Method

- Follow the steps in the diagram below.

 Brown lines in the diagram represent longer sticks

 Yellow lines in the diagram represent shorter sticks



Indigi-Tech

First Nations and Inuit have used dome shapes for different types of buildings. The dome was used because it is very strong, and can be built from materials found in nature, like wood or snow. Wood from an ash tree or willow tree can be bent easily to build a wigwam (Ojibway) or mikiwap (Cree) house. Inuit build igloos from snow that is hard-packed and place them in spirals to make the dome shape. Bull boats are an example of an upside-down dome that was used for crossing rivers.



*Bark covered
Mikiwap/Wigwam*

How it Works

Domes are very strong structures. Domes must be strong enough to withstand pressure from weight, wind, rain, and snow. The triangles in a geodesic dome are very stable. They help distribute any pressure throughout the dome.

Bio-Links

Spiders make strong and flexible webs with a different network shape: “radial” threads come out from the center, connected with “spiral” threads. This means that even if some threads break, the whole web stays together.



CHALLENGE

Design and create a water-tight boat.

Materials

- Sticks or twigs
- String or long grass (like sweetgrass)
- Clay or mud
- Birch bark piece
- Cardboard
- Wax paper
- Tinfoil
- Tape, glue, rubber bands, pipe cleaners
- Rocks for weight

Method

- Design your boat on paper, or discuss with a friend. Consider what shapes will be more stable. Remember, your boat needs to have walls.
- Connect the bottom of the boat and the walls with clay, glue, or tape.
- Make your boat waterproof with birch pieces, wax paper, tinfoil, or other material.
- Set your boat afloat! **Add rocks to see how much weight it will hold.**

How it Works

When a boat is placed in water, it displaces an amount of water equal to the boat's weight. As long as the boat's weight doesn't exceed the weight of the water displaced, it will float.



Indigi-Tech

Indigenous people have used natural materials to build different types of boats. The boats were able to move heavy loads easily and with low effort from place to place using rivers as water highways. All boats are built to be as light as possible. First Nations boat examples include birch bark canoes, moose skin boats, and dugout canoes. Inuit boat examples include umiaks and kayaks.



Birch Bark Canoe at the Abbe Museum, Bar Harbor, Maine

Bio-Links

Animals use many different ways to float in water. Many fish have a swim bladder which has oxygen or other gases inside to help them move up and down in water. Mammals like seals and polar bears have a thick layer of fat on their bodies: this helps them stay warm in cold Arctic waters but also helps them float while they swim.