SUMMER SURVIVAL GUIDE

How to Keep Kids Learning with 12 Projects!

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Books to Inspire Learning

Dear Parents and Educators,

It's summertime! Time to drink lemonade, eat popsicles, and lay around in a hammock. It's also time for summer reading programs, storytimes, and the seasonal quest to keep kids engaged in learning.

Researchers have found that kids typically lose two to three months of math and reading skills during the summer months, with low-income children experiencing the most loss. Most teachers spend the first four to six weeks of the new school year reviewing concepts that should have been retained from the previous year. The summer brain drain is a major problem for schools and students who already feel the pressure of keeping up in the race to the top.

We want to help! We've collected 12 projects that kids can do with very little help from adults, in the comfort of their own bedrooms, kitchens, yards, or cars. These projects are designed to nurture that curious spirit we all possess but that can be forgotten in the modern-day word of iPods, tablets, and instant-gratification video games.

They're also designed to be . . . fun! Because that's what summer vacation is all about.

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Dear Kids,

Every good scientist keeps a science journal! Scientists use the scientific method to keep their experiments organized. Choose a notebook to use as your science journal. As you read through this book and do the activities, keep track of your observations and record each step in a scientific method worksheet, like the one shown here:

Question: What problem are you trying to solve?	
Research: What do other people think?	
Hypothesis: What do you think the answer will be?	
Equipment: What supplies are you using?	
Method: What procedure are you following?	
Results: What happened and why?	

Satisfy your curiosity! The most important part of science is wanting to know more—that's how discoveries get made. If you're curious and want to learn more about the topics covered in these activities, head to the library and ask a librarian to help you find books on the subjects.

You can also use the Internet to do research, with an adult's permission. You might have a computer at home or you can use one at the library. Think of keywords for each activity. For example, for the activity on page 6 you might search "core sample geology kids" and find lots more information and projects about core samples. You might find vocabulary words you don't know. Try to figure out the meaning from the context, or look up the words at merriam-webster.com.

But the most important thing? Have fun using your brain!

IN THE KITCHEN

Food is probably the first thing that comes to mind when you think about your kitchen, but there's also lots of science that can happen there!

Chemistry is the study of matter, and chemical reactions are what happens when different substances are combined. Many of those substances can be found in the kitchen. For example, have you ever mixed baking soda and vinegar together? What happens?

Even if you're not mixing different substances together, there's plenty of discovery in the kitchen. Another great thing about doing science in the kitchen? Snacks aren't far away!

Safety Tips

- **Only use the oven with adult supervision.**
- **Never taste or smell anything unless you know what it is.**

Does Your Nose Know?

Play this funny game to see if your nose can tell you what to do!

SUPPLIES

- science journal
- pencil
- 5 or more matching small containers with lids
- 5 or more spices or other smelly powders
- shoe box

1 In your journal, make a list of your spices and smelly powders. Next to each one, write a funny action.

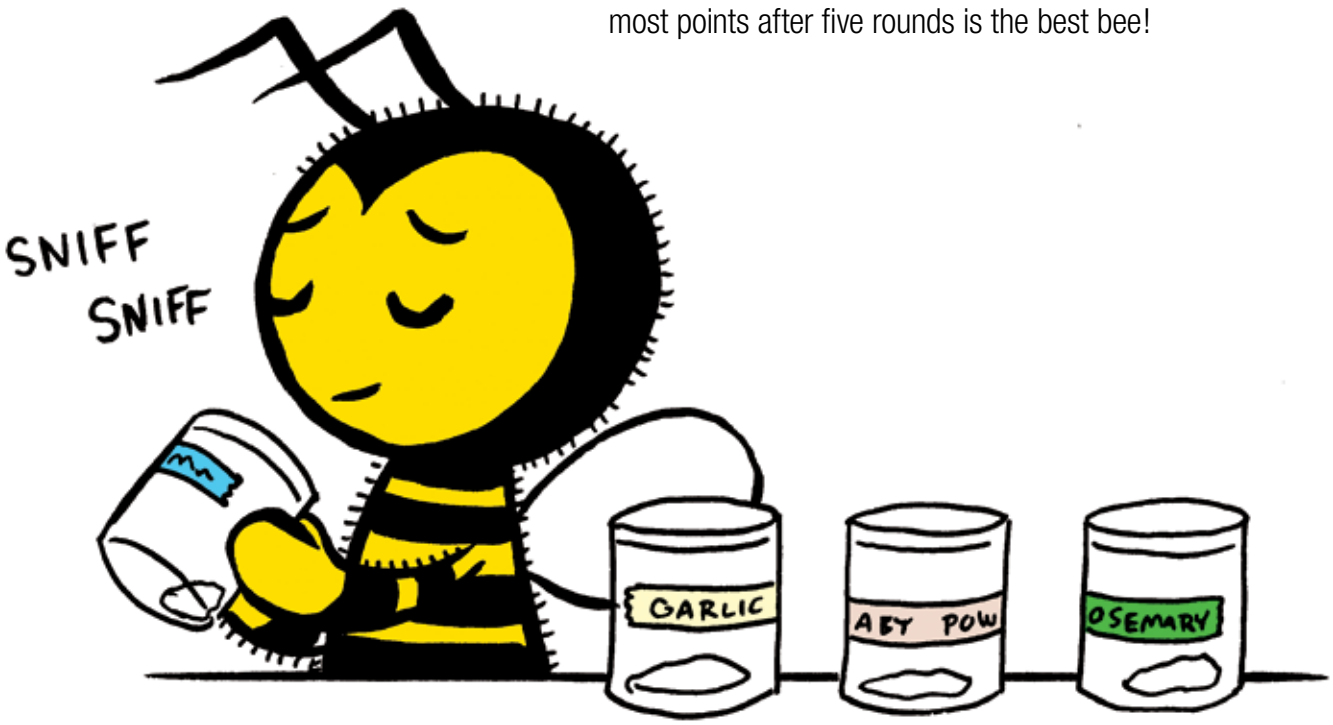
For example:

- "baby powder: crawl like a baby."
- "garlic: run around in circles."

2 Put a small amount of spice or other powder in each container. Cover each with a lid and put the containers in the box.

3 With your eyes closed, choose one cup, hold it away from your nose, and smell the powder inside. Don't sniff too hard! Perform the action you paired with that smell. Do you remember what it was?

Try This! With a friend, take turns picking a cup for the other person to smell. If you get the action right, you get a point. The person with the most points after five rounds is the best bee!



Core Sampling

Scientists use core sampling to study what lies beneath the surface of ice, coral, trees, mud, and rock. They drill a small tube into the center of one of these materials and take a long, thin sample to bring back to their labs. In this lab, you will extract and examine core samples from food.

SUPPLY IDEAS

- cupcake supplies
- food coloring
- clear plastic straws
- drawing materials
- science journal
- pencil

1 With a friend or parent, prepare vanilla cupcakes according to the package directions—only with a twist. Mix up the batter and divide it between three or more bowls. Use food coloring to make a different color of batter in each of the bowls.

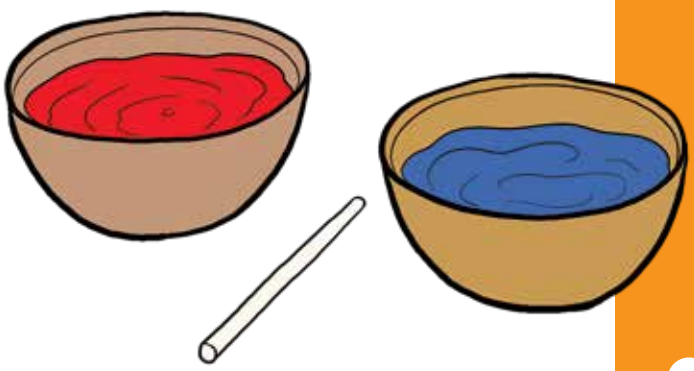
2 Layer the batter of different colors in the muffin cups. If possible, layer in different thicknesses, varying the order and thicknesses in each cupcake. Bake the cupcakes according to the instructions.

3 While you wait, write down in your journal your predictions for what your core samples will look like. Which colors will be thicker and which will be thinner?

4 Once your cupcakes are out of the oven and cool, push a clear plastic straw into a cupcake. Rotate the straw through the cupcake as you push down. This will help you pull out the core sample.

5 What colors are in your core sample? Was it hard to pull out your core? Make a drawing of what your sample actually looks like. Take a sample from each cupcake and observe the differences.

Try This! Are there other foods that you can take core samples from? Do you need to use a different tool or technique? What kinds of problems do you encounter when taking a core sample? Think about how hard it might be to pull a core from the ice. What instruments might scientists need to use? How do scientists preserve ice cores to keep them from melting?



Make a Can Crusher

Is an empty soda can really empty? It might not have any soda in it, but it is full of air. The earth's atmophere pushes in all directions–it's inside the can pushing out and it's outside the can pushing in. The pressure pushing out is in balance with the pressure pushing in. What happens if we create a vacuum inside the can, making the pressure on the outside greater than the pressure on the inside? Start a scientific method worksheet in your science journal.

CAUTION: Have an adult help you with the hot can

SUPPLIES

- ice water
- empty soda can
- saucepan
- oven mitts
- cooking tongs
- science journal
- pencil

1 Fill a saucepan with ice water and set it inside.

2 Pour 1 tablespoon of water into an empty soda can. Use oven mitts and cooking tongs to heat the can on the stove. Boil the water until a cloud of steam escapes from the opening in the can.

3 Quickly flip the can upside down into the ice water saucepan. What happens?

Think About It! Why is compacting recyclables and other waste a good idea?

IN THE YARD

Ah, the great outdoors! Whether you live in the country or the city, outdoors is the natural place to be during the summer.

When you step outside your home, you enter into a community where different rules might apply, different things might happen, and different people might say hello. This is exciting! This is also a perfect opportunity to see things in different ways.

The outside world is great for observing things. Science is all about observation. When you do an experiment, you have to observe what happens in order to know what works and what doesn't. You can learn a lot about the world and about yourself by observing other people, animals, behaviors, machines at work, traffic, buildings being built, and the natural world.

You know what else the outside is good for? Moving! Ride a bike, run a mile, do cartwheels, play basketball, throw a Frisbee! Moving your body is healthy for both bodies and brains.

Try these projects outside and observe the world!

How Powerful Is Sunlight?

We know sunlight helps plants grow, evaporates water, and can burn our skin. We can even generate renewable energy from the sun using solar panels and other technologies. What else can sunlight do? You need a sunny day to do this activity!

SUPPLIES

- dark-colored construction paper
- various small toys or objects
- science journal
- pencil

1 Put two pieces of paper directly in the sun, at or around noon. Keep another piece inside.

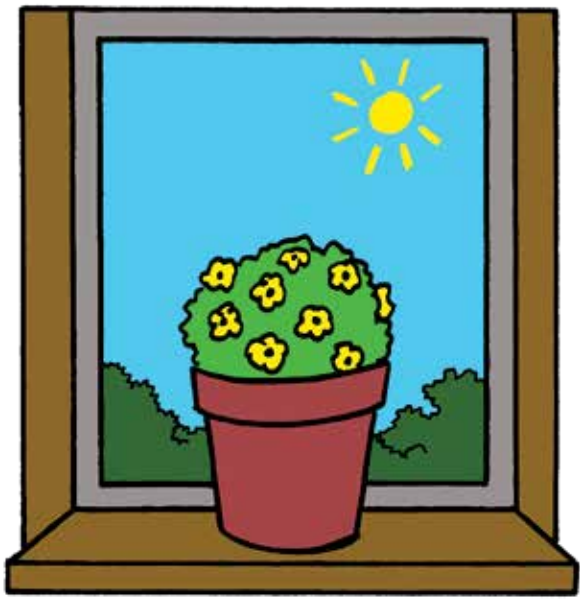
2 Place some toys on one of the pieces of paper in the sun and trace them with a pencil.

3 What do you think will happen to the paper? To the objects? Think about the heat and the light from the sun. Organize your predictions in your science journal using a chart such as the one below.

	Prediction	Observation After 45 Minutes
Paper in the sun		
Paper in the sun with toys		
Paper out of the sun		

4 After 45 minutes, compare the three pieces of construction paper. How are they different? How are they similar? What caused the differences? On a cloudy day, would it take longer to see any changes?

Try This! Draw two pictures on two pieces of construction paper using ice cubes. Set one picture in the sun and the other inside for 30 minutes. What happens to the pictures? Why?



Root Window

Have you ever wondered what it looks like when the roots start to push down from a sprouting seed? With this project, you'll be able to sneak a peek!

SUPPLIES

- paper towel
- clear plastic bag
- radish or sunflower seeds
- water dropper
- tape
- science journal
- pencil

1 Carefully wet a paper towel, squeeze out the excess water, and flatten it into a square that fits in the plastic bag. You want the paper towel wet, but not dripping.

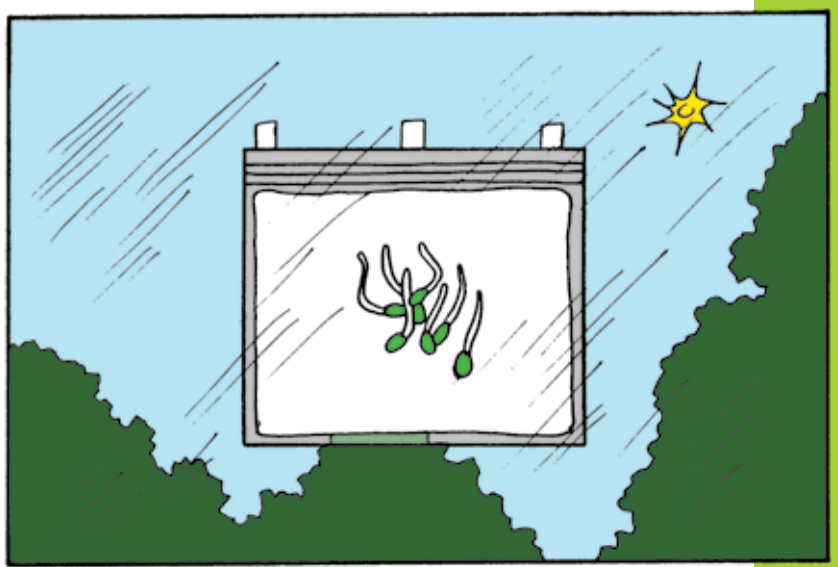
2 Put the wet paper towel into your plastic bag, keeping it flat. Carefully place several seeds on the middle between the plastic and paper towel. Using the water dropper, add a couple more drops of water to the paper towel near the seeds. You don't need to close the bag.

3 Tape the bag to a sunny window so the seeds face the glass.

4 In two days, check on your seeds. If the paper towel is drying out, add some drops of water. What do you see? Check on your seeds every day. What's happening? Record your observations in your science journal. Make sure the paper towel stays damp.

5 When the roots are long, you can transplant them into soil.

Think About It! Why can seeds sprout without soil? How long can a plant grow without soil?



Erosion Study

In nature, wind and rain contribute to erosion. Even the ice in glaciers push the earth around, too! With this experiment, you can see for yourself the impact of the weather on erosion.

SUPPLIES

- 3 shallow pans or trays
- books or floded towels
- soil
- spray bottle with water
- straw
- ice cube
- science journal
- pencil

1 Prop one end of each tray up slightly with the books or folded towels. Pile some slightly damp soil at the end of each tray. Form each pile into a little mound, making sure they're all the same height.

2 Use the spray bottle to squirt one pile with water five times. Using the straw, blow puffs of air on the second pile five times. Slide the ice cube down the third pile five times using a pencil or your finger.

3 What happens to each pile? Is one more affected by "erosion?" Repeat all the steps again and record the results in your science journal. Does one erosion method work faster than another?

4 Keep repeating the steps until you've eroded most of the soil in the pans. Notice which pan eroded fastest and which the slowest.

Try This! Find places in your own community that have been impacted by soil erosion. What are people doing to try to stop erosion? Sometimes little walls or barriers can help keep soil in place, or planting trees or bushes can help keep the soil from eroding.

IN YOUR ROOM

What does your room look like? What's in there? A bed, a dresser, bookshelves? Do you share your room with someone?

Your room isn't just a place to sleep, read, draw, and dream. It's also a place to be creative. You can make puzzles, do crosswords and Sudoku, build with Legos, try tying different kinds of knots, and design buildings out of stuff you have lying around. Or you can try some of these projects.

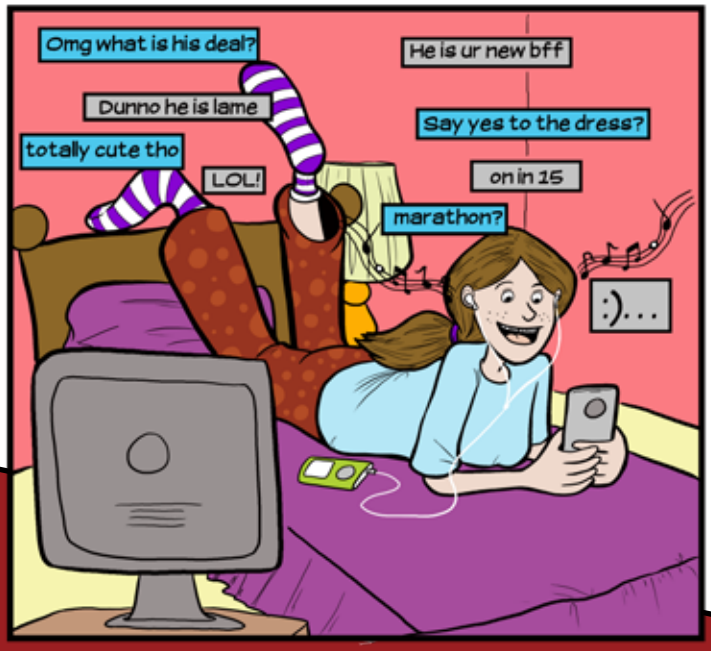
Another great thing to do in your room is learn an instrument. Don't have an instrument? Try making new sounds at these websites. Can you create something you've never heard before? Can you recreate your favorite song? This might be harder!

incredibox.com

classicsforkids.com

tony-b.org

The one thing you can always do in your room is have fun. It's your space!



Jumbo Flower Model

Most flowers only bloom for a short time each year. Some flowers, such as amaryllis, have big parts that are easy to see. Other plants, such as dandelions and clover, have much smaller parts. You can make a flower with large parts to model the process of pollination.

SUPPLIES

- paper lunch bag
- juice
- small, narrow-necked bottle
- small Post-it notes
- clay
- 4 bamboo skewers
- 4 Cheetos

1 Cut the paper lunch bag about halfway down each corner. Fold out the four pieces and color them. These are the flower petals.

2 Pour juice into the bottle. The liquid should be about 1 inch deep. This is the nectar inside the ovary at the base of the style. Place the bottle inside the bag.

3 Cut out the sticky parts of the Post-it notes. Stick them around the opening of the bottle, with the sticky side facing out and up. These make the stigma. You now have the female part of the flower, called the pistil.

4 Take four small pieces of clay. Roll the pieces into balls and then flatten each ball. Stick the blunt end of one skewer into each piece of clay. The skewers are the filaments, one of the male parts of the flower. Place the skewers in the bag, standing on their clay ends. Each filament should be along a different side, so they are surrounding the pistil.

5 Stick a cheeto on the top of each skewer for the anthers with their pollen. Together, the filaments with their anthers make the stamens, the male parts of the flower.

Try This! To see a diagram of a flower, go to ducksters.com/science/biology/flowering_plants.php

See Like a Bee

Honey bees have lots of facets in each compound eye. Each facet sees things just a little bit differently. In this activity, you'll make a set of glasses that will let you see how a honey bee sees!

SUPPLIES

- 15 thin drinking straws
- scissors
- 2 rubber bands
- 3 pipe cleaners

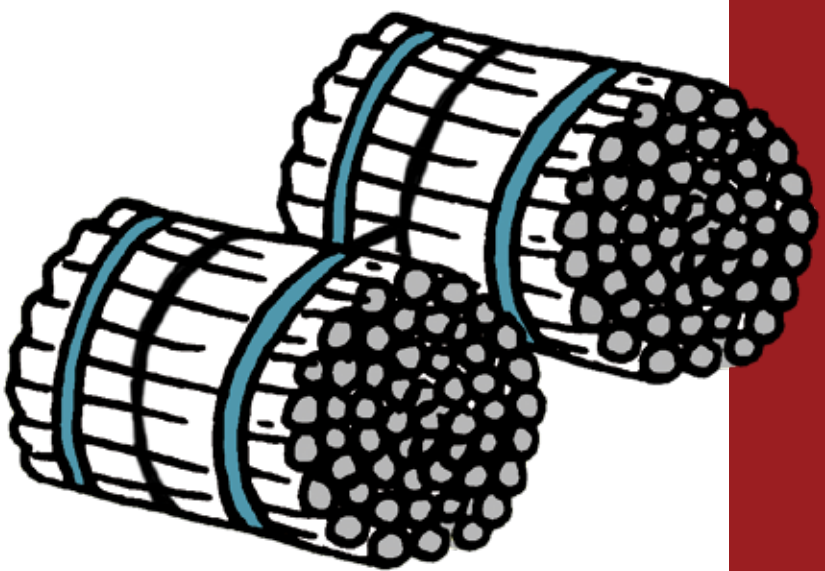
1 Cut each straw in half. Divide the straws into two equal parts.

2 Wrap a rubber band around each bundle to hold the straws together.

3 Wrap one end of a pipe cleaner around one bundle and the other end around the other bundle, leaving a 1- or 2-inch space between bundles. This space will sit on top of your nose.

4 To attach your honey bee eye glasses to your face, wrap one end of a pipe cleaner around each bundle. When both bundles are ready, lift them up to your eyes and wrap the free end of each pipe cleaner over an ear. Now you can see like a bee!

Try This! Because of their compund eyes, honey bees see in a mosaic. A mosiac is a picture made up of lots of pieces of color that look separate when you're close to them but blend to show an image when you move back. Make your own mosaic picture by putting a dot of color in each square on a piece of graph paper. How does it look up close? How does it look far away? How does it look through your bee eyes?



Build Your Own Mancala Board

Strategy games such as chess and backgammon use math and logic to help players figure out their next move. That's why they're simple to learn but become more challenging as your skill increases. One of the oldest strategy games is mancala, which means "to move" in Arabic. Mancala is believed to have been created in Egypt more than 3,000 years ago and it is still popular throughout the Middle East, Africa, Asia, and the Caribbean today.

SUPPLIES

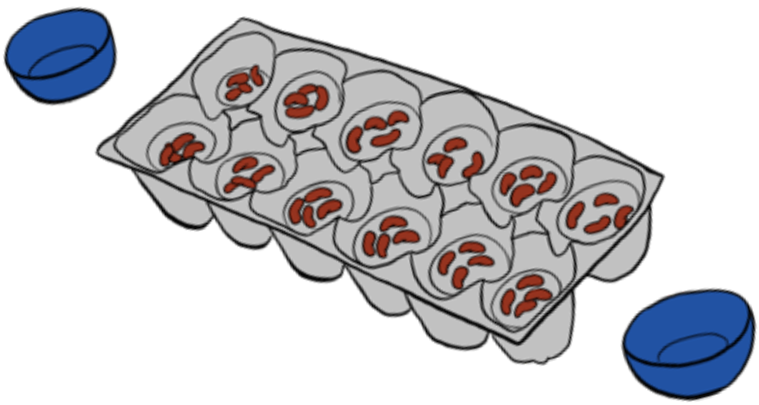
- egg carton (1 dozen size)
- 2 small plastic cups
- cardboard toilet paper tubes (optional)
- masking tape
- decorating supplies
- 48 playing pieces (pebbles, large beans, etc)

1 Cut the cover off the egg carton. The bottom part is your playing board. Tape cups to the ends to make the stores that hold captured game pieces.

2 If you want your board to have legs, attach cardboard tubes to the bottom with tape. When finished, smooth out the surface with extra layers of tape.

3 Paint your board, including inside the cups. When it's dry, decorate it!

Think About It! A mancala board has two or more rows of holes, and a cup or "store" at each end. The boards range from very plain to very decorative. Fancier boards were sometimes carved from wood in the shape of boats, fish, or crocodiles. Some had legs or human figures to hold them up. You can learn to play Mancala and play a digital version online with snails! Go to rocketsnail.com/mancala.



ON THE ROAD

Is your family planning any trips this summer? Whether you're going across the country, around the world, to the next state, or to a local museum or lake, traveling can be the best experience you'll have this summer.

Make it even more fun by doing things to make it memorable: take pictures, write notes, and collect artifacts from your travels. And you don't have to buy souvenirs. Pick up a rock from the beach that just feels right, keep a map of where you went, or take home a menu or coaster from a restaurant where you ate. There are lots of ways to remember a journey.

Long ago, people used stars and other astronomical objects to find their way across the land and sea. Now we often use GPS systems, which are just as fascinating! But try something different by turning off your GPS and finding your way by landmarks, paper maps, and directions. You might find new places, new vistas, and new friends.

Embark on a great expedition with these projects!

Modify a Game

Do you remember learning to play Tic Tac Toe? The first time you tried it was probably difficult! But it didn't take you long to figure out a few key moves that would let you win—or at least tie—every time. You can modify a game to increase the difficulty and bring it up to an achievable challenge. In this activity, you'll mod a non-electronic game to make it harder.

SUPPLIES

- easy game you already know how to play (Tic-Tac-Toe, Go Fish, etc)

1 Choose a travel game that's become boring for you and think about ways you can make it harder. The following ideas might help:

- If it's a guessing game such as *What am I?*, try to get people to guess things like emotions or scenerios or flavors.
- Set a timer for turns or rounds so people have to play faster.
- If it's a seeking game, such as *Alphabet License Plates*, try to spell out words instead of just the alphabet.

2 Try out your new version of the game and take notes on what works and what doesn't. Is your game still too easy, or is it now too hard? Is the harder version more fun or is it just frustrating?

3 Come up with ways to make the game harder for some players but not others so that beginners and experts can play together.

Barter Chart

When you barter, you have to decide if one thing is worth as much as another thing. Think of six different kinds of candy. Are they all the same size? Do you like them all equally? What would it take for you to trade them?

SUPPLIES

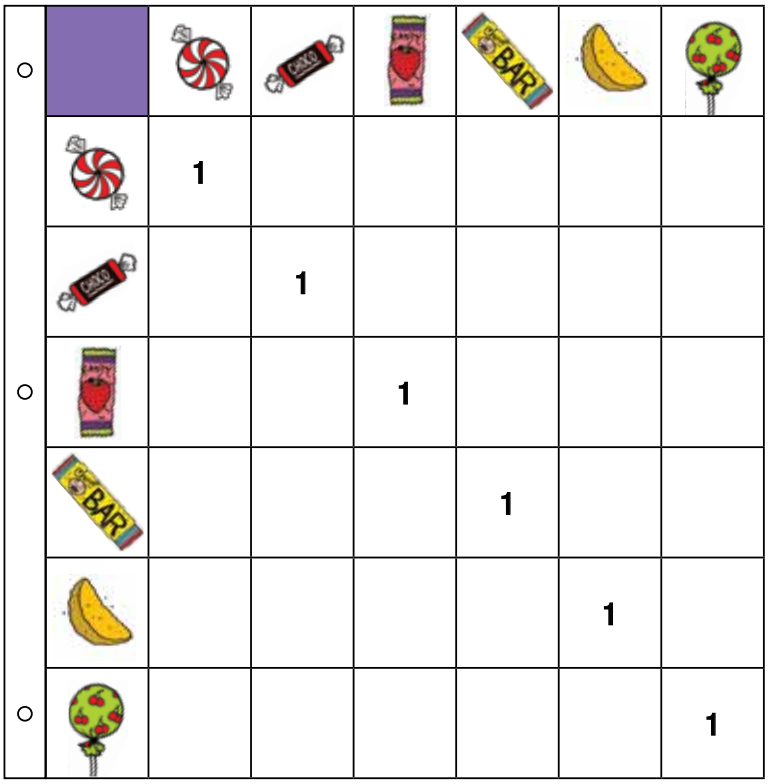
- copy paper
- ruler
- pencil
- pictures or wrappers of 6 different candies (2 each)
- glue

1 Use the ruler and pencil to draw a grid that has seven rows and seven columns.

2 Leave the box in the top left corner empty. Draw or glue the wrappers from the different kinds of candy in every box along the top row.

3 Draw or glue each second candy wrapper in every box in the far left column. They should be in the same order that they appear in the top row.

4 Figure out the trading value of each type of candy. For example, would you trade four hard candies for one candy bar? Two Tootsie Roles for a Blow Pop? Write these values in the correct boxes.



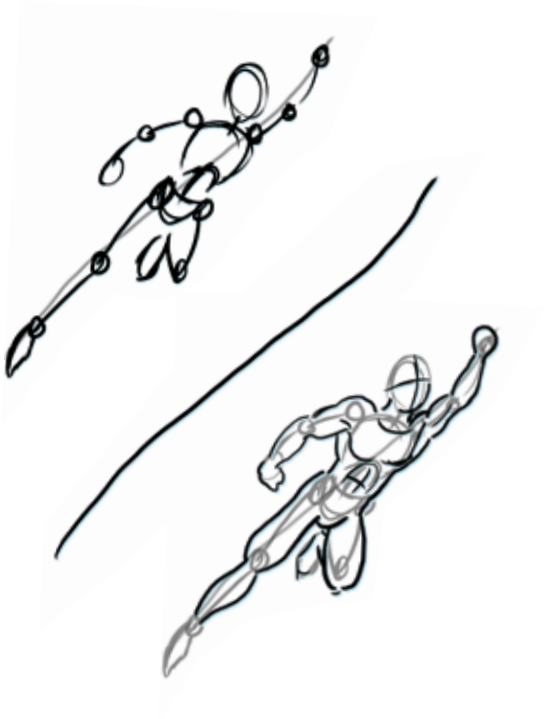
Try This! Try making a barter chart for other things, such as books, baseball cards, or band bracelets. How do your charts compare with charts made by a friend? Do you agree on the values? What would happen if you tried to trade items you disagree on?

Draw a Superhero

Heroes are larger than life, and the same thing is true with drawing them! Use your travel time to create a new superhero.

SUPPLIES
- paper
- pencil
- colored pencils

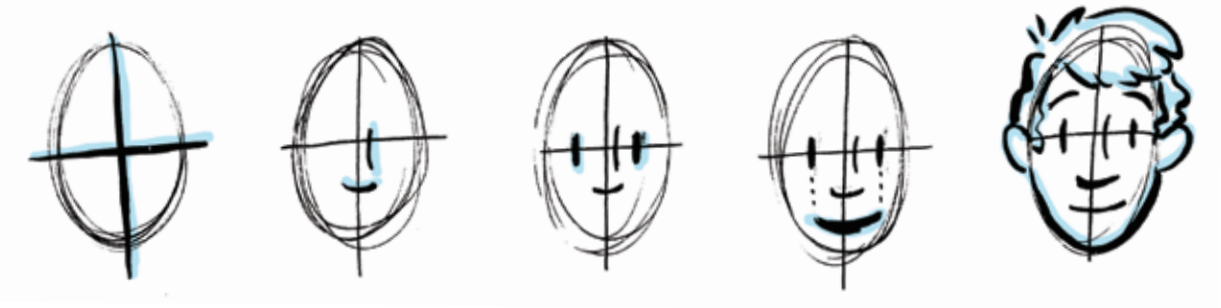
1 Start with an action line. If you want your hero to be flying, draw a big swoosh instead of a straight action line you'd use for standing still. If your superhero is going to be bigger than regular characters, make your action line longer. Draw the head shape at the top of the action line.



2 Skip a little down the action line to allow room for the neck, and then draw a large triangle for the upper body. If you are drawing a male hero, make it big. If it's a female hero, draw a slightly smaller triangle. Draw an oval where the hips will be, then add the socket circles for the shoulders and legs. Complete the skeleton arms and legs.

3 Superheroes are also bulkier than regular characters. Add muscles to arms, shoulders, and legs. Go ahead and make them look exaggerated. Muscles make your character super!

4 To draw the face, look at your favorite superheroes' faces for ideas and try to make your superhero strong and expressive. Giving your superhero a mask or hood will make drawing his or her face easier. Here is a sequence to follow to draw a face.



Websites for Learning

- **Khan Academy:** Free academic lessons that move at your own pace. www.khanacademy.org
- **Hour of Code:** Learn to code and have fun! www.hourofcode.com/us
- **Biblionasium:** A social site for kids who love to read. www.biblionasium.com
- **EdTed:** Free lessons on just about anything! ed.ted.com
- **Digital Public Library of America:** A terrific site for browsing primary sources. dp.la
- **BrainPop:** Animated movies about lots of different subjects. www.brainpop.com
- **How Stuff Works:** Short articles about... everything. www.howstuffworks.com
- **Out of Eden:** Follow Paul Salopek as he takes seven years to walk across the world. outofedenwalk.nationalgeographic.com
- **Wonderopolis:** A new question answered every day! wonderopolis.org

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