



# SUMMER SCIENCE STEM Pack

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LITTLE BINS FOR LITTLE  HANDS

# SUMMER SCIENCE & STEM PACK



## INTRODUCTION:

Welcome to your Summer Theme STEM Pack filled with great science activities and STEM projects every junior scientist should try! I hope it sparks creativity and curiosity within your young scientists, inventors, and engineers.

In this pack, find a fun selection of my son's favorite, summer theme experiments and activities. I have added supplies, setup instructions, and simple science information for each activity or experiment. The pack also includes STEM projects and many fun extras to share with your kids. Perfect for early finishers! A new STEM story also awaits your budding readers!

Feel free to use this pack with one junior scientist or a whole group of junior engineers. You may copy activities as many times as you like for your class, but please send your friends to grab their pack instead of sharing files.

~ Thank you!

# SUMMER STEM PACK EXTRAS



## SPINNING COLOR WHEEL

Spinning Color Wheel: version 1



# STEM: STORY CHALLENGE

Go on a STEM filled adventure with this pack! Read the story and solve the challenges.



## What's Included:

- Engaging STEM Story
- STEM Challenges
- STEM Journal Pages
- STEM Supply List
- STEM Drawing Page

# SUMMER ENGINEERS PACK

Design a solar oven for s'mores, build a boat, or help with a new roller coaster model for the local amusement park with problem-based STEM challenges!



## What's Included:

- 4 Summer STEM Challenges
- STEM Journal Pages
- STEM Supply List
- Design Process Poster

# NATURE ACTIVITIES PACK

Get outside and explore with a nature activities pack!



## What's Included:

- Backyard Jungle STEM Project
- 3 Different Scavenger Hunt Options (make sure to keep a copy in your car or backpack)
- Bird Watching Observations Sheet (make sure to pair with a local bird book)
- Parts of a flower coloring activity (perfect for observing flowers)

## Backyard Jungle How To:

**SUPPLIES:** Measuring Tape, String, Craft Sticks or Wooden Skewers, Colored Pencils and Pens, Magnifying Glass (optional)

**INSTRUCTIONS:** Head outside and pick a favorite spot to set up the backyard jungle. Measure out a 12" square and rope it off with string. Place the string directly on the ground or insert craft sticks or skewers to tie the string to. Get down on the ground and examine the living and non-living items in the square. Record and draw what you find. If time allows, move the square to a completely different area and start over!

# SUMMER CODING ACTIVITIES

Explore and learn about binary code and algorithms with screen-free activities!



## What's Included:

Printable Algorithm Game

Printable Binary Code Craft

Both activities have their own instructional pages as part of the packs!

# SUMMER SCIENCE PACK:



## What's Included:

- Handy science process pack posters to guide kids through the scientific process for different science experiments and activities
- Summer science journal pages
- 15 Summer science experiments and activities with supply lists, process steps, and basic science information

# SCIENCE: ROCK CANDY CRYSTALS



## SUPPLIES:

Water, sugar, mason jars, string, food coloring, straws, edible glitter (optional)

## PROCESS:

The day before starting your sugar crystal experiment, your project cut a piece of string a little longer than your jars. Tie one end of the string to a straw. Tie a knot in the other end. Get the strings wet and coat them in sugar. Let dry overnight.

Add four cups of sugar and one cup of water to a saucepan and heat until boiling. Stir until the sugar is dissolved but be careful not to heat the sugar so much that it starts to turn into candy. Keep the temperature right at 210 degrees.

Remove the sugar from the heat.

Pour your sugar mixture into the jars. Dye each jar your chosen color and add some edible glitter if desired.

Lower the string into the jar and place the jars in a safe place. Let the sugar crystals form for at least a week.

# SCIENCE: ROCK CANDY CRYSTALS



## SUGAR CRYSTALS: DAY 8

Once the sugar crystals are as big as you want them, remove them from the sugar solution. Lay them on a paper towel or plate and let them dry for several hours.

## QUICK SCIENCE:

Sugar crystals are formed as a result of a supersaturated solution.

In a saturated solution, the sugar molecules have a higher chance of bumping into one another because there is less space to move around. When this happens, the particles start sticking together.

When you give the molecules something to cling too (in this case the string), they form into crystals faster. The more molecules bump into each other, the bigger the sugar crystals get. The bigger the crystals are, the more they pull other sugar molecules toward them, making even bigger crystals.

Molecules bind together following orderly and repetitive patterns, so eventually, you're left with visible sugar crystal patterns in your jar.

# SCIENCE: LEAKPROOF BAG

## SUPPLIES:

Sharpened Pencils  
Zip Top Plastic Gallon Bag  
Water

## PROCESS:

Note: This activity might be best for a warm day outside! If not, make sure you are over a sink or tub and have some towels handy.

Make sure to start with freshly sharpened pencils if you can!

Fill your plastic bag with water and seal tightly.

Take a sharpened pencil and poke through the bag! Don't hesitate or you may find it will leak a bit.

Try it again! How many pencils can you put through the bag? Make a guess and see what happens!

## QUICK SCIENCE:

This leakproof pencil bag science experiment may look a lot like magic, but it's also cool chemistry! What's going on between the water, the plastic bag, and the sharpened pencils. The plastic bag is made up of polymers which are long strands or chains of molecules. When the sharpened pencil pushes through the plastic bag, it's actually pushing through the polymer chains.

The chains or strands are pushed aside by the pointy pencil but then re-seal themselves around the pencil preventing water from leaking out. See what happens when you try to push a dull or unsharpened pencil through!



# SCIENCE: BURSTING BAGS

## SUPPLIES:

Sandwich baggies  
1/2 cup vinegar  
1/4 cup water  
3 Tablespoons baking soda  
Tissue  
Food coloring (optional)  
Measuring cups and spoons

## PROCESS:

**STEP 1:** Fill the bag with 1/2 cup vinegar, 1/4 cup water, and a drop of food coloring if desired.

**STEP 2:** Open a tissue and add 3 tablespoons of baking soda to the center and fold the tissue back up.

**STEP 3:** Go outside and quickly drop the baking soda filled tissue in the water/vinegar mix and toss.

**STEP 4:** Back up and watch it explode!

## QUICK SCIENCE:

The bursting bag is a classic baking soda and science experiment that uses a chemical reaction to burst the bag! When the baking soda (a base) mixes with the vinegar in the bag (acid), a chemical reaction occurs that produces a gas called carbon dioxide.

As the gas fills the space of the sealed bag, it has nowhere to go but push on the sides of the bag, causing it to burst.

The tissue paper slows the reaction time. Experiment with baking soda amounts if desired.



# SCIENCE: ICE CREAM IN A BAG



## SUPPLIES:

$\frac{1}{2}$  cup half and half

$\frac{1}{4}$  tsp vanilla

1 TBSP sugar

3 cups ice

$\frac{1}{3}$  cup kosher or rock salt

Gallon size zip top bag(s)

Quart size zip top bag(s)

Sprinkles, chocolate sauce, fruit (optional but really "the best part" ingredients!)

## PROCESS:

**STEP 1:** In a gallon size bag place ice and salt; set aside.

**STEP 2:** In a smaller bag mix together half and half, vanilla and sugar, close tightly.

**STEP 3:** Place smaller bag inside gallon size bag.

**STEP 4:** Shake for about 5 minutes.

Make sure to use gloves as the bag gets very cold!

# SCIENCE: ICE CREAM IN A BAG



## QUICK SCIENCE:

Why does the bag get so cold? What's the chemistry behind ice cream because it's pretty sweet!

The magic is in the salt and ice mixture! The ingredients need to get extremely cold to make ice cream.

When you mix the salt and ice, you are making a solution. Adding salt to the ice lowers the temperature at which water freezes. You will actually notice your ice melting as your ice cream ingredients start to freeze.

Shaking the bag allows the warm cream mixture to move around to allow for better freezing. Plus it also creates a little air that makes the ice cream a bit fluffier.

Is ice cream a liquid or a solid? Homemade ice cream changes states of matter, also more chemistry! It starts out as a liquid, but changes to a solid in its frozen form, but it can go back to a liquid when it melts. This is an excellent example of reversible change as it's not permanent.

You will definitely notice that the bag becomes much too cold to handle without gloves, so please make sure you have a good pair of gloves to shake with.

# SCIENCE: WHAT MELTS IN THE SUN

## SUPPLIES:

Muffin tin (dollar store)  
Variety of objects to test  
Hot and sunny day



## PROCESS:

**STEP 1:** Have the kids gather the objects they want to test! Make sure to include some items that will actually melt for comparisons such as chocolate, hard candy, crayons, ice, butter, and even Jello! Other useful things to test are rocks, blocks, coins, and small plastic toys.

**STEP 2:** Place one item in each muffin tin section.

**STEP 3:** Place the muffin tin in the sun! Note the time and temperature of desired.

Make sure to have kids make guesses beforehand as to what will melt and what will not. This way, they can compare their answers to the final results. Check on the items periodically and note any changes in the items! You can set an end time limit as well.

## QUICK SCIENCE:

This simple summer science is all about the melting point or the temperature at which something will melt and become liquid. However, some melting points are more extreme than others, so we don't quite get to witness this transformation with our muffin tin set up. Though I imagine the guesses made will be quite fun!

All solids have a melting point. Water or ice is a common one we can think of and see easily. The melting point of water/ice is 32 degrees Fahrenheit.

The melting point of chocolate is between 86 and 90 degrees Fahrenheit. Although it doesn't feel cold when you touch it, technically it's frozen!

The melting point of a penny is over 1,000 degrees Fahrenheit! Kids will love that!

# SCIENCE: STRAWBERRY DNA



## SUPPLIES:

Coffee filters

Pipette

Test tube

Strawberries

Dish Soap

Salt

Plastic Zipper Baggies

Rubbing Alcohol

## PROCESS:

STEP 1: Chill the alcohol in the freezer.

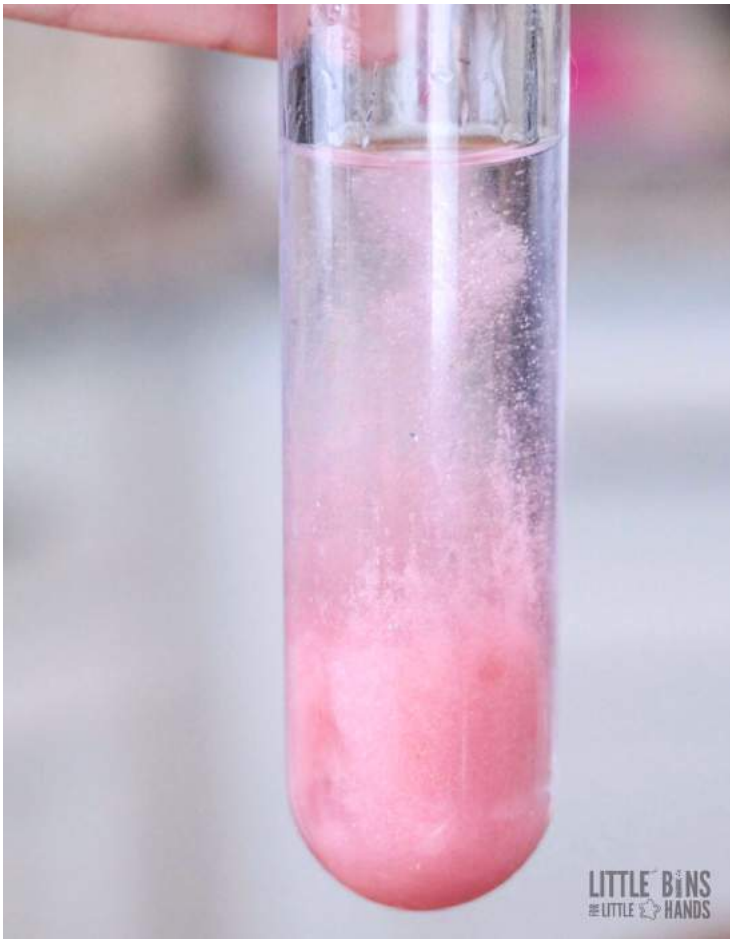
STEP 2: Remove the green stems from the strawberries and add to the bag. Squish the strawberries into a pulp.

STEP 3: Add 1 tablespoon of dish soap, a teaspoon of salt, and 1/3 of a cup of water to the bag. Mix.

STEP 4: Line the test tube with the coffee filter. Pour the strawberry liquid into the test tube. Wait for the liquid to filter into the test tube. Add an inch layer of cold alcohol to the test tube.

Watch as a clear, viscous material rises to the top of the alcohol. This is the strawberry DNA!

# SCIENCE: STRAWBERRY DNA



## QUICK SCIENCE:

Each individual cell in an organism has a copy of the DNA pattern used to reproduce that cell. Usually, the DNA is combined within the cell, so you can't see it. But when you create a mixture of dish soap and salt and mix it with the strawberry pulp, it helps break down the strawberry cells into individual parts.

Once the alcohol is added to the pulp, it encourages the DNA strands to rise to the top and bind together, where you can see them together in one long, clear strand. It's fascinating to see the DNA strands up close and personal!

## WHAT EXACTLY IS DNA?

DNA is what makes you! It's your genetic makeup. DNA is a molecule that is like a little recipe for life and holds all the information your body needs to function. Pretty crazy! Plus, it's just a teeny, tiny percent of our DNA that actually makes us all unique from one another.

Our bodies are made up of a couple of hundred cells, and the cells all contain these DNA molecules filled with information. DNA looks like a long thin molecule, but if you were to study it under a microscope, you would actually see the classic twist or double helix shape.

# SCIENCE: FIREWORKS IN A JAR

## SUPPLIES:

Clean jar such as mason jar or pickle jar

Food coloring

Cooking oil

Warm water (cold water for re-testing)

Small cups or ramekins (dollar store)



## PROCESS:

STEP 1: Fill the jar about 3/4 full with warm water.

STEP 2: Add a couple of tablespoons of cooking oil to a cup or ramekin, and add several drops of food color. You can also set up several cups for different colors, or add a couple colors to one container.

STEP 3: Mix the oil gently to disperse the color droplets throughout. Note, the food coloring doesn't mix with the oil.

STEP 4: Carefully pour the oil and food coloring into the jar of warm water.

Watch what happens!

## QUICK SCIENCE:

As you can see, oil and water do not mix because water is denser or heavier than the oil. All liquids are not created equal in density because they are made up of different amounts of molecules.

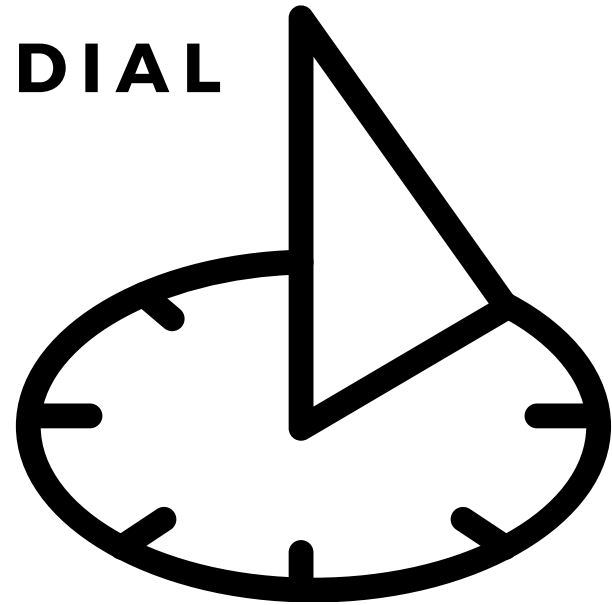
Although the color droplets are denser than the oil, the oil still slows the release of the food coloring into the water. When the droplets of color reach the water and start to mix, it looks like tiny fireworks of color!

Set up the experiment again with cold water to see if the fireworks in the jar look any different.

# BUILD A SIMPLE SUNDIAL

## SUPPLIES:

Crayons or Markers  
Paper plate  
Pencil  
Ruler  
Plastic straw  
Playdough



## PROCESS:

Notes: This is an all day activity as you will want to check on the sundial every hour and add a new marker to the paper plate. You can approximate the position of the markers if necessary and see what happens! You will want to make sure to start your project before noon and on a sunny day.

**STEP 1:** Get your paper plate ready! Make sure to write in a number 12 on the edge of the plate with a marker. (Feel free to decorate the plate too).

**STEP 2:** Poke a hole through the center of the plate. Using a ruler, draw a line from the hole in the center to the number.

**STEP 3:** When it's noon, head outside with the sundial plate and a straw. Place the plate on the ground and insert the straw into the hole. You may want to secure the plate to the ground. Try to position the straw so that it slants toward the line.

**STEP 4:** Find the best position of the plate so that a shadow is cast over your first mark. This is the start of your sun dial!

Where do you think the shadow will be at 1pm. Have the kids predict where they think the shadow will fall. Make sure to check the shadow position each hour and make a new marking for the hour. Continue this process throughout the day.

## QUICK SCIENCE:

As the sun moves across the sky, another part of the sundial casts a different shadow on the dial's markings. Every hour the shadow shifts to hit a new marking or the hour of the day.

A sundial is the oldest instrument for telling time. They can also be made from a variety of materials such as wood and stone. Can you come up with another style of a sundial!

# SUMMER STEAM: FIZZY PAINT



## SUPPLIES:

Baking Soda	Cups
vinegar	Pipettes
Water	Brushes
Food Coloring	Heavyweight Paper

## PROCESS:

**STEP 1:** You will want equal parts of baking soda and water. Measure baking soda into cups.

**STEP 2:** Next measure out the same amount of water into a separate cup and color with food coloring.

**STEP 3:** Pour colored water into the baking soda and gently stir to combine. The mixture shouldn't be too soupy or too thick.

**STEP 4:** Use a brush to paint a picture with the baking soda and water mixture.

**STEP 5:** Set out a small bowl of vinegar and pipette for kids to gently squirt vinegar onto the picture. Watch your picture bubble and fizz!

## QUICK SCIENCE:

The science behind this summer STEAM project is the chemical reaction that occurs between the baking soda and the vinegar!

Baking soda is a base, and vinegar is an acid. When the two combine, they make a gas called carbon dioxide. You can hear the fizz, see the bubbles, and even feel the fizz if you hold your hand close to the surface of the paper.

# SUMMER STEAM: PAPER TOWEL ART



## SUPPLIES:

Paper Towels  
Water Soluble Markers (not permanent)  
Water  
Spray Bottle (pipettes optional)  
Tray

## PROCESS:

**STEP 1:** Place sheets of paper towels on your tray in one layer.

**STEP 2:** Using washable markers, create a design or picture. Try to cover the area as much as possible with color!

**STEP 3:** Fill a squirt bottle with water and lightly spray the paper towel. Watch the colors come alive as the colors spread through the paper towel.

Continue wetting the paper towel until you are satisfied! Set aside to dry and then you can hang up the masterpiece!

## QUICK SCIENCE:

**Soluble vs. insoluble!** If something is soluble, that means it will dissolve in that liquid. The ink used in these washable markers dissolves in what? The water, of course!

When you added drops of water to the designs on the paper, the ink should spread out and run along the fibers in the paper with the water.

# SUMMER STEAM: SPIN ART



## SUPPLIES:

Salad Spinner, Paint, Paper Plates

## PROCESS:

**STEP 1:** Place the salad spinner on a flat surface and put a paper plate in the bottom of it. Alternatively, you can cut a piece of paper to fit in the bottom.

**STEP 2:** Time for the paint! Add drips and drops of paint all around the surface of the paper plate.

**STEP 3:** When you are satisfied with the amount of paint, close up the salad spinner tightly. Get spinning!

You can check on your masterpiece and see if you need to add more paint. What happens if you thin the paint first with a bit of water. Does changing the viscosity or thickness of the paint have a different effect?

## QUICK SCIENCE:

Let's apply Newton's Laws of Motion to this summer STEAM project with a salad spinner. An object in motion stays in motion unless a force is acted upon it. This is an excellent example of inertia. You might be tempted to say that this is an art project in centrifugal force, but it's not quite! A salad spinner does use centrifugal force to separate water from the leaves of lettuce. But this STEAM project doesn't use wet lettuce!

Centrifugal force describes the tendency of an object following a curved path to fly away from the center point. Here the colors on the paper plate are pushed outward when the salad spinner turns, causing the colors to mix together.

# SUMMER STEAM: SUN PRINTS



**SUPPLIES:** There are many possibilities!

Natural objects

Small Toys

Cookie Cutters

Paper

Trays

**PROCESS:**

**STEP 1:** Place a sheet of dark-colored construction paper on a tray. Heavyweight, card stock is better, but good old construction paper works too. A tray helps transport the art.

**STEP 2:** Place chosen objects on the paper! Encourage kids to use their creativity and imagination. Make a self-portrait or an abstract masterpiece.

**STEP 3:** Place in a very sunny spot and wait! We set ours up in the morning and checked on them mid-afternoon.

**QUICK SCIENCE:**

The sun is made up of ultraviolet rays. These ultraviolet rays can break down the chemical bonds in different materials and some much more so than others. Our construction paper was high on the list. A fun experiment would be to try different types of paper and compare the results. Some paper might reflect rather than absorb some of the sun's rays, making it less likely to fade as much.



# SUMMER STEAM: SHADOW DRAWING

## SUPPLIES:

Objects such as blocks, bricks, and small plastic figures.

Paper

Drawing tools

Sunlight

## PROCESS:

**STEP 1:** Find a sunny place and firm surface to set up your paper and objects!

**STEP 2:** Build a sculpture or set up your objects, so they cast a shadow on your paper.

**STEP 3:** Draw the shadows! You can go through and add extra details after.

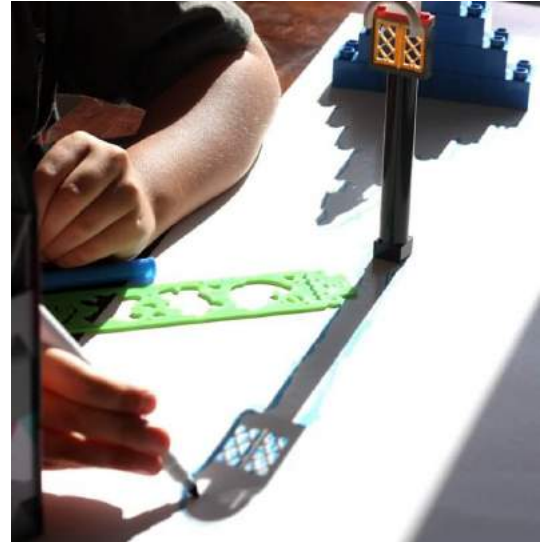
## QUICK SCIENCE:

This shadow drawing activity is a fun way to combine art and science for STEAM!

Shadows are all about physics and light. You need a source of light for there to be a shadow.

Here, we are using the sun as our light source. When an object is in front of the light source, it blocks the light and creates the shadow. Since the light can't pass through a solid object, it creates a shadow on the wall.

If the objects were transparent; however, the light would pass through, and there would NOT be a shadow!



# SCIENCE: FIZZY LEMONADE



**SUPPLIES:** Baking Soda, Lemons, Sugar

**PROCESS:**

First, you will need to boil a couple of cups of water on the stove. Adult supervision required!

Next, add two tablespoons of sugar per glass of lemonade and stir to dissolve. Right here is excellent simple science making a sugar solution!

Let the mixture cool once the sugar dissolves.

Squeeze the lemon juice into the cup (it takes about one lemon per glass).

Get your glasses ready, add ice to your freezer glass. No ice in the other glass.

Next, add the sugar water to the glass. Now for the fun part! Have the kids go ahead and add  $\frac{1}{4}$  of a teaspoon of baking soda to each glass.

Go ahead and explore the 5 senses with the kids! Can they see the fizz? How about feeling the fizz? Listen quietly for the sound for the fizz? Smell the lemons! What does the fizzy lemonade taste like?

# SCIENCE: FIZZY LEMONADE



## QUICK SCIENCE:

Does a cold glass fizz more than a warm glass? This is a great way to give your simple fizzing lemonade science project a twist and turn it into an experiment.

Make it an experiment and grab two glasses. Pop one glass in the freezer to make it icy cold and leave the other one room temperature (add a 3rd where you keep it filled with warm water until you are ready).

The warmer glass will fizz right away, while the icy glass will take longer to fizz. Lemons are highly acidic. Baking soda is an alkaline substance.

When the two ingredients combine, they create a chemical reaction that gives off carbon dioxide gas (which is entirely harmless!).

By adding just a small bit of baking soda to lemonade, it starts to bubble and fizz, without making the lemonade taste gross!

In fact, you can't even tell the baking soda is added, but the fizzing and popping make it extra fun to drink!

# SCIENCE: SANDBOX VOLCANO

## SUPPLIES:

Sandbox  
Empty water bottle  
Baking Soda  
Vinegar  
Food Coloring (optional)  
Dish soap (optional)

## PROCESS:

STEP 1: Get outside and into the sandbox!

STEP 2: Fill the water bottle about a third full (mix in optional food coloring). Add about 5 teaspoons of baking soda. Add a drop or two of dish soap if desired. Put the cap on until you are ready.

STEP 3: Build a volcano base around the bottle. Make a big one or little one depending on the size of the bottle.

STEP 4: Uncap the bottle, and pour a decent amount, up to a cup of vinegar into the bottle!

## QUICK SCIENCE:

When the baking soda and the vinegar mix, they form a gas called carbon dioxide, which then produces the fizzing eruption.

The shape of the container helps to shoot the eruption up higher because the gas is quickly forced out and up due to the narrow opening.

This chemical reaction occurs because of an acid (the vinegar) mixing with a base (baking soda). When the two combine (mixture) a reaction takes place, and the gas is created.

Explore all three states of matter: liquid, solid, and gas!

If you added dish soap, you would notice a foamier eruption.



# SCIENCE: BUBBLE SCIENCE

## SUPPLIES:

Pipe cleaners  
Bubble solution  
Shallow Pan

## HOMEMADE BUBBLE SOLUTION

1/2 cup of Light Corn Syrup  
1 cup of Dawn Dish Soap  
3 cups of water

## PROCESS:

**STEP 1:** Whip up a homemade bubble solution or use a store bought solution. Or, compare the two!

**STEP 2:** Bend pipe cleaners into different shapes for bubble wands. You can add pony beads on the handles for decoration too!

Can you blow a bubble the shape of the wand? Make sure to ask the kids!

## QUICK SCIENCE:

Why can't bubbles be other shapes? It's all due to surface tension.

A bubble is formed when air gets trapped inside the bubble solution. The air tries to push its way out of the bubble, but the liquid in the bubble solution wants to have the least amount of surface area, due to the clinging properties of liquid molecules.

Water molecules prefer bonding with other water molecules, which is why water gathers in drops instead of just spreading out.

A sphere is the least amount of surface area for the volume of what is contained inside the sphere (in this case, air). So bubbles will always form circles no matter the shape of the bubble wand.

Can you blow geometric shape bubbles?

Use your pipe cleaners to form different shapes from bubbles. You can either make your shapes 2D or 3D.

If you make your shapes 3D, you'll be able to use them as a structure for making shaped bubbles. Otherwise the bubbles will come out round no matter what shape the wand is.



# GROW GRASS HEADS



## SUPPLIES:

Plastic cups

Soil or dirt from your yard

Grass seeds

Construction paper

Water

Scissors

Adhesive

## PROCESS:

STEP 1: Fill the cups about 3/4 way with soil.

STEP 2: Sprinkle enough seeds on top to cover the soil (do not cover the seeds with more soil).

STEP 3: Place in a sunny window inside your house.

STEP 4: Water the grass seed cups morning and night.

STEP 5: The seeds will take about 7-10 days to start growing.

STEP 6: Once you have long grass, you can cut out a nose, mouth, and eyes from the colored construction paper.

STEP 7: Glue the nose, mouth, and eyes onto the front of the cups, and the grass will act as hair.

STEP 8: Once the grass is overgrown, give them a "haircut."



PRINTABLE



# SUMMER ALGORITHM CODING GAME



FOR KIDS

3 LEVELS OF DIFFICULTY





## Screen-free coding with a summer theme! Learn about algorithms as you play games.



### SET UP & PLAY

Print out one of the sets of grids to set up your board. Choose a blank grid with either the sun or the sandcastle. Cut out the corresponding trees, summer items, and arrows for your pieces.

Place the trees and summer items on the board in some of the blank spaces (not every space). You can play where the trees are obstacles to move around and the summer items need to be collected.

Your arrows are your direction cards and how you write the code to solve the puzzle (around the trees and collect the summer items). Included are left, right, and straight arrow pieces. You can use and re-use the grids over and over again and even laminate the sheets.

Use a small figure as an object to move through the board to get to the sun or sandcastle or vice versa.

Use the directional cards to create an algorithm to reach the desired object. You can change the obstacle cards to create a new board each time. Use either the trees or summer items, or both, on the same board! Start simple using just a few and work your way up!

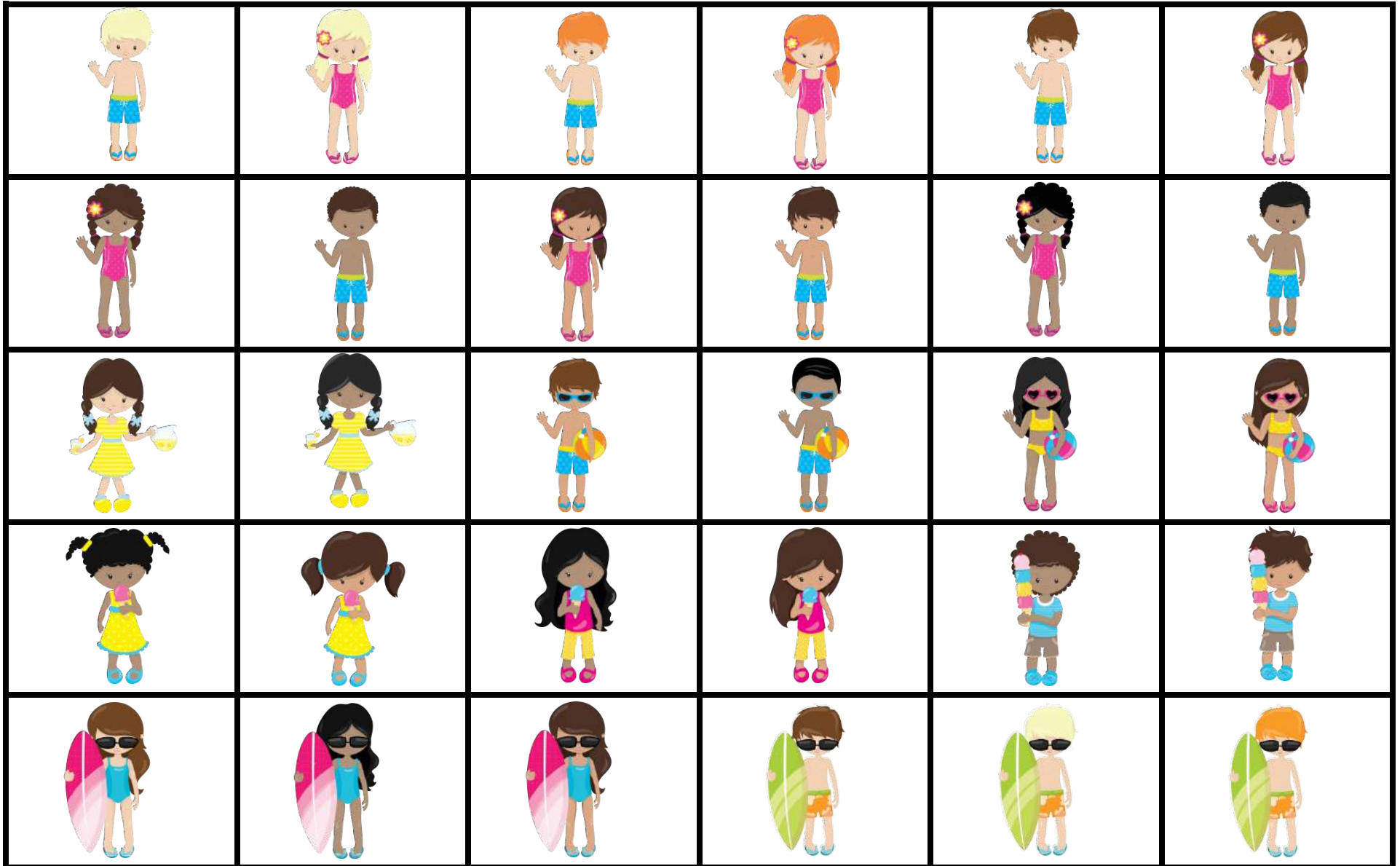


**Easier version:** Place out one directional card at a time as you move the object one square at a time with or without obstacles to go around.


**Harder version:** Think out the sequence of actions ahead of time and place out a string of directional cards to show your program. Run your program (move your piece) according to your directions. Check your results. Did you make it? Do you need to fix a card?

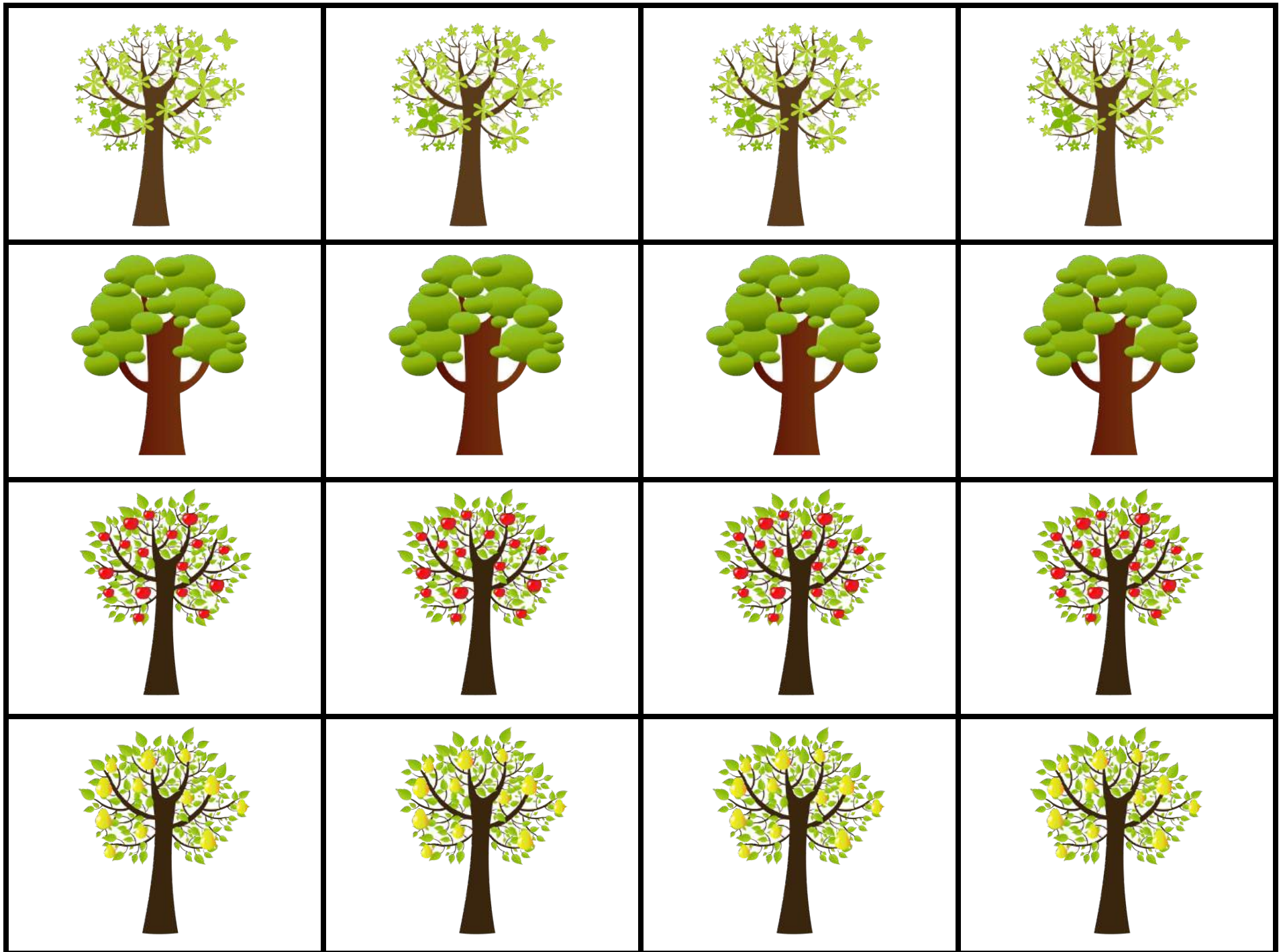
### QUICK STEM

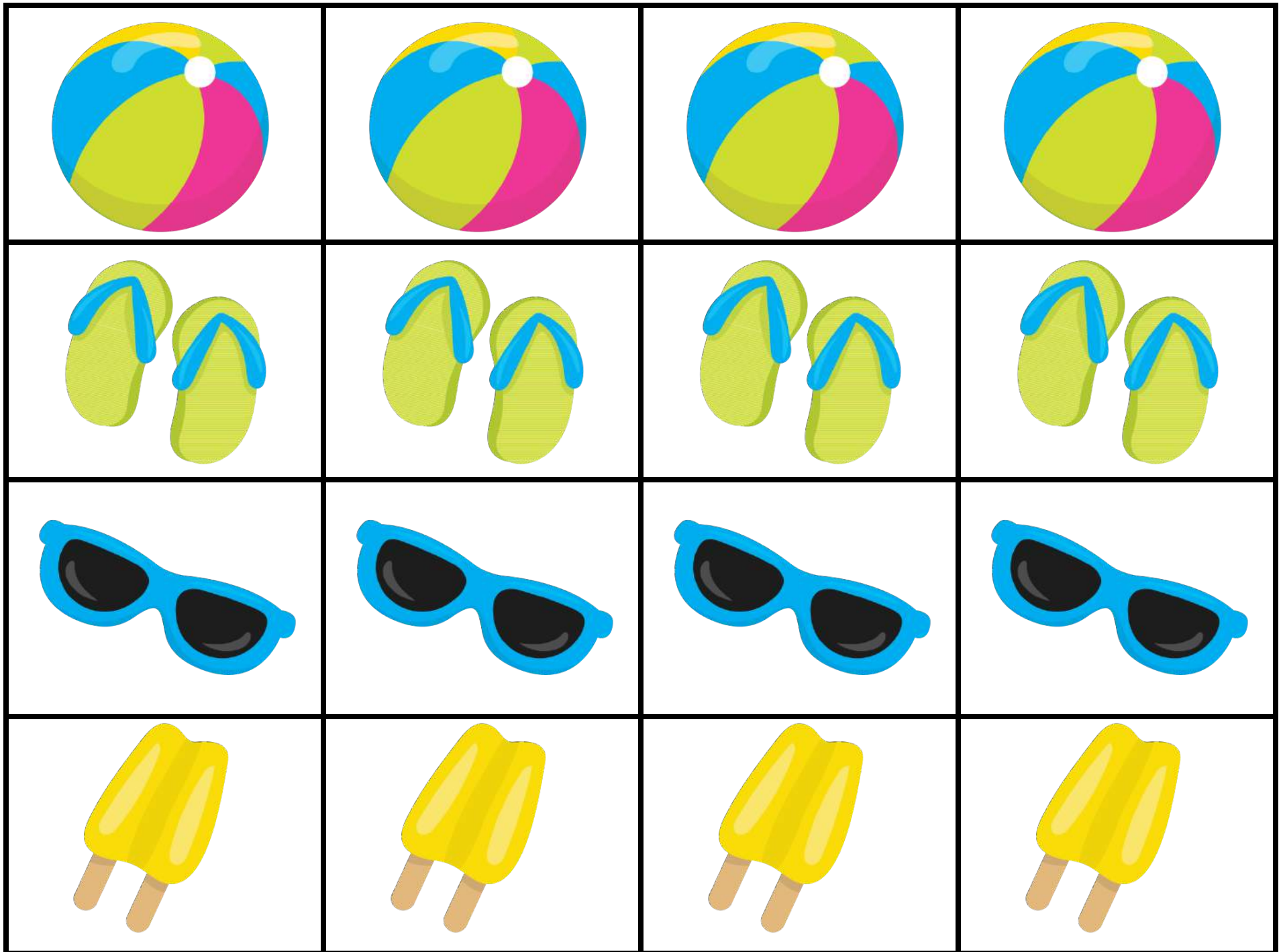
Coding is its own language. For programmers, it's like learning a new language when they write code for a new program. An algorithm is a series of actions that are strung together to solve a problem or tell something what it should do. Our printable algorithm coding game is perfect for learning how these actions string together to create a program through hands-on play!

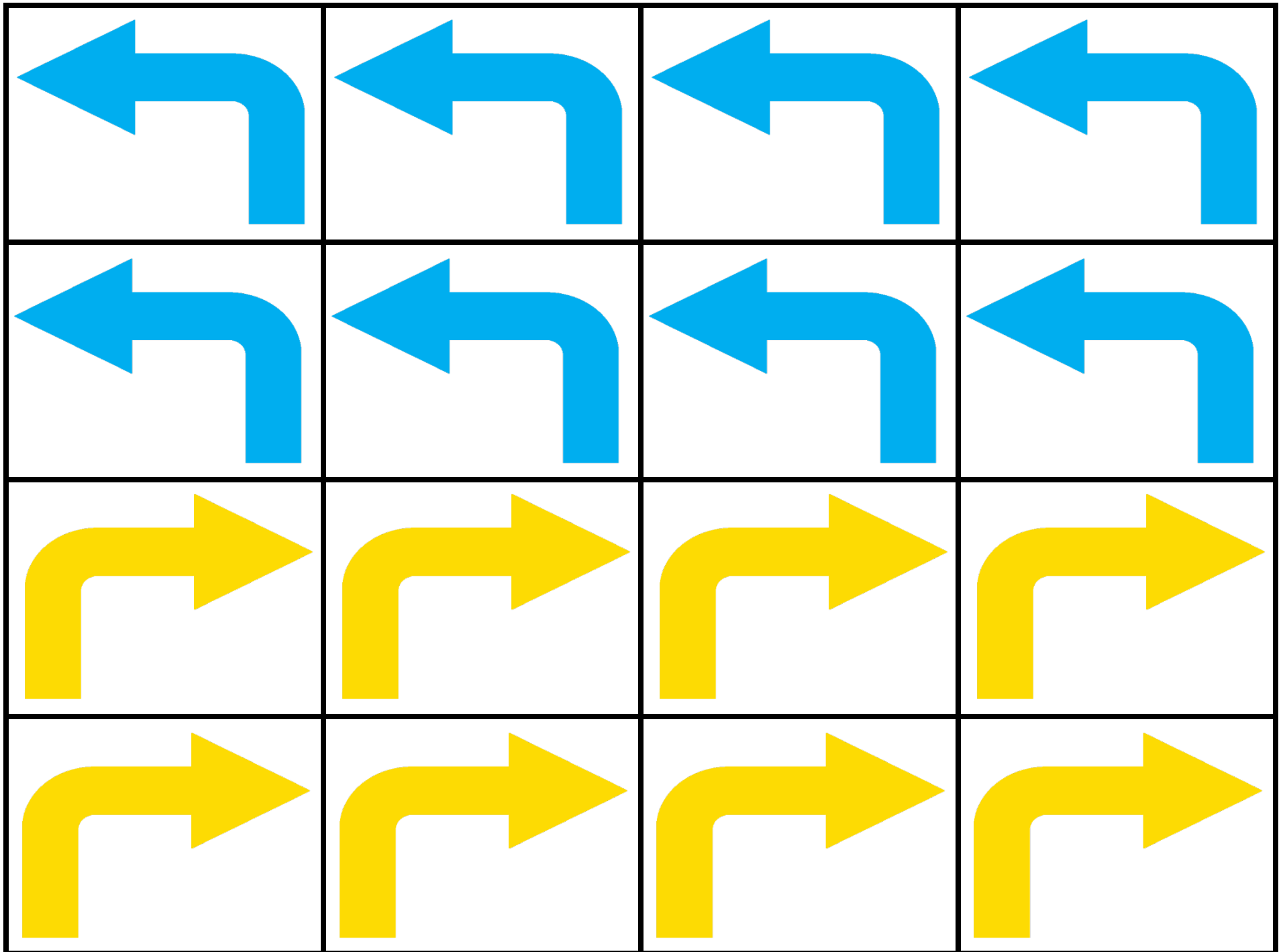


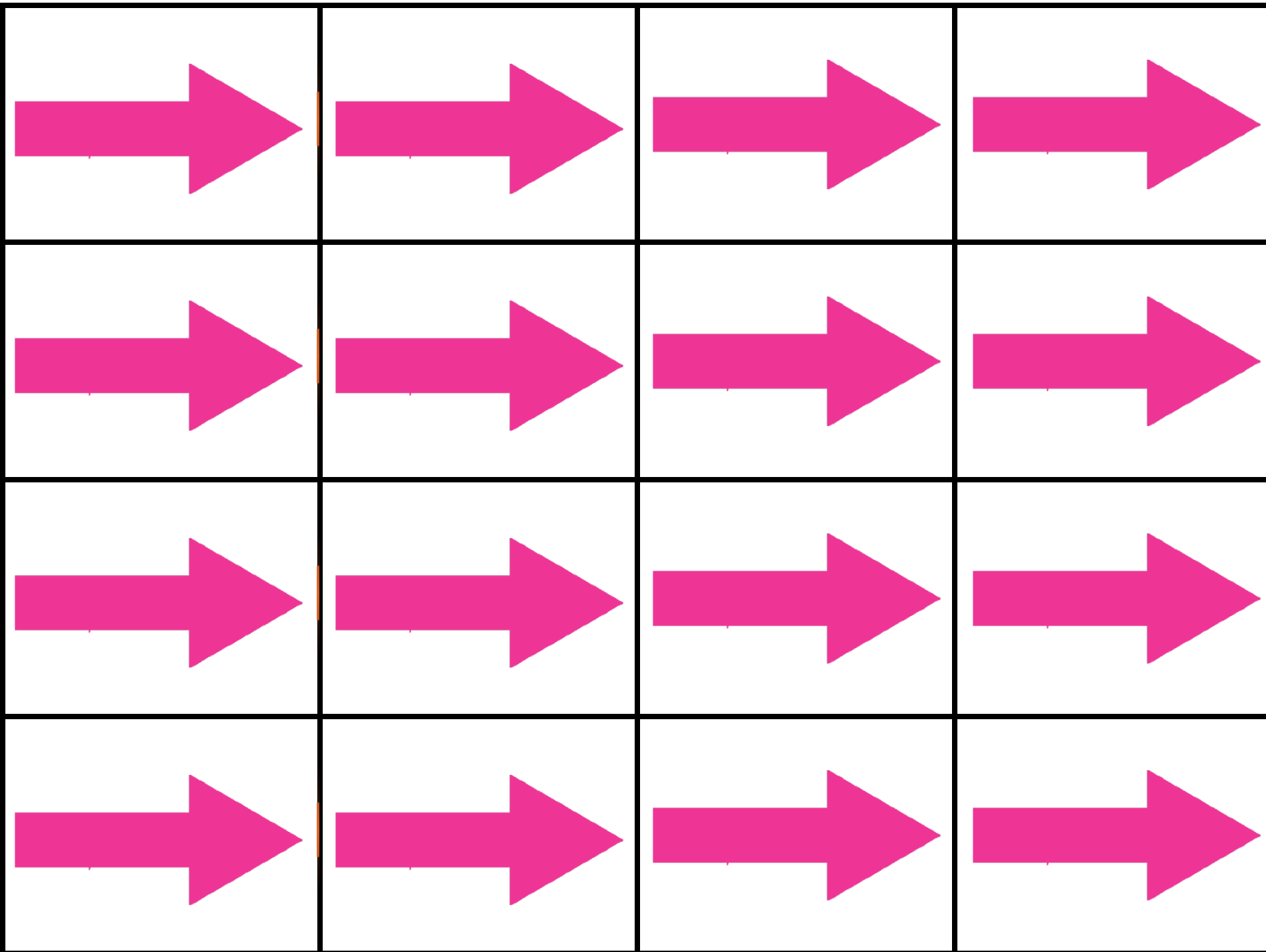
			


			




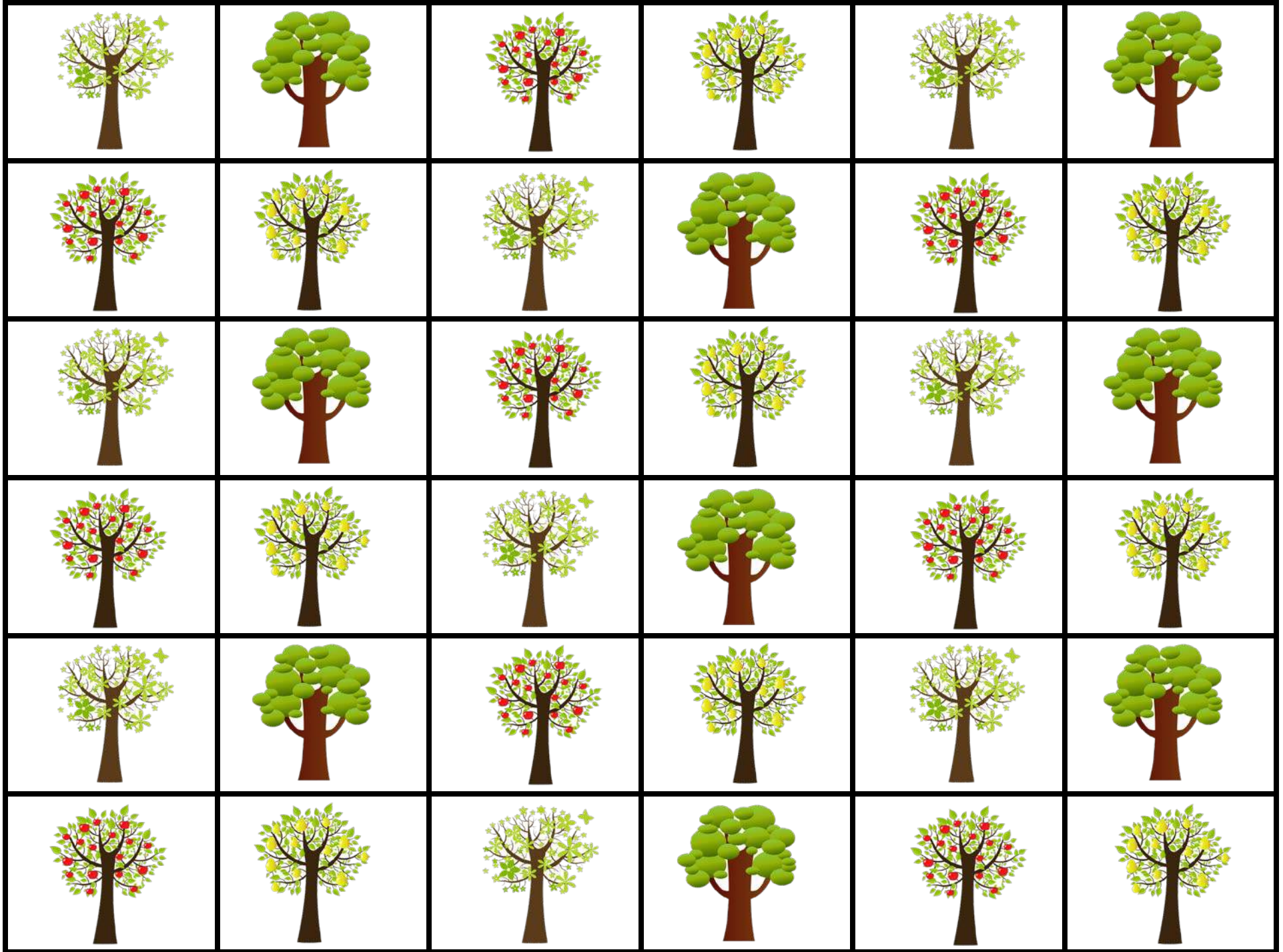


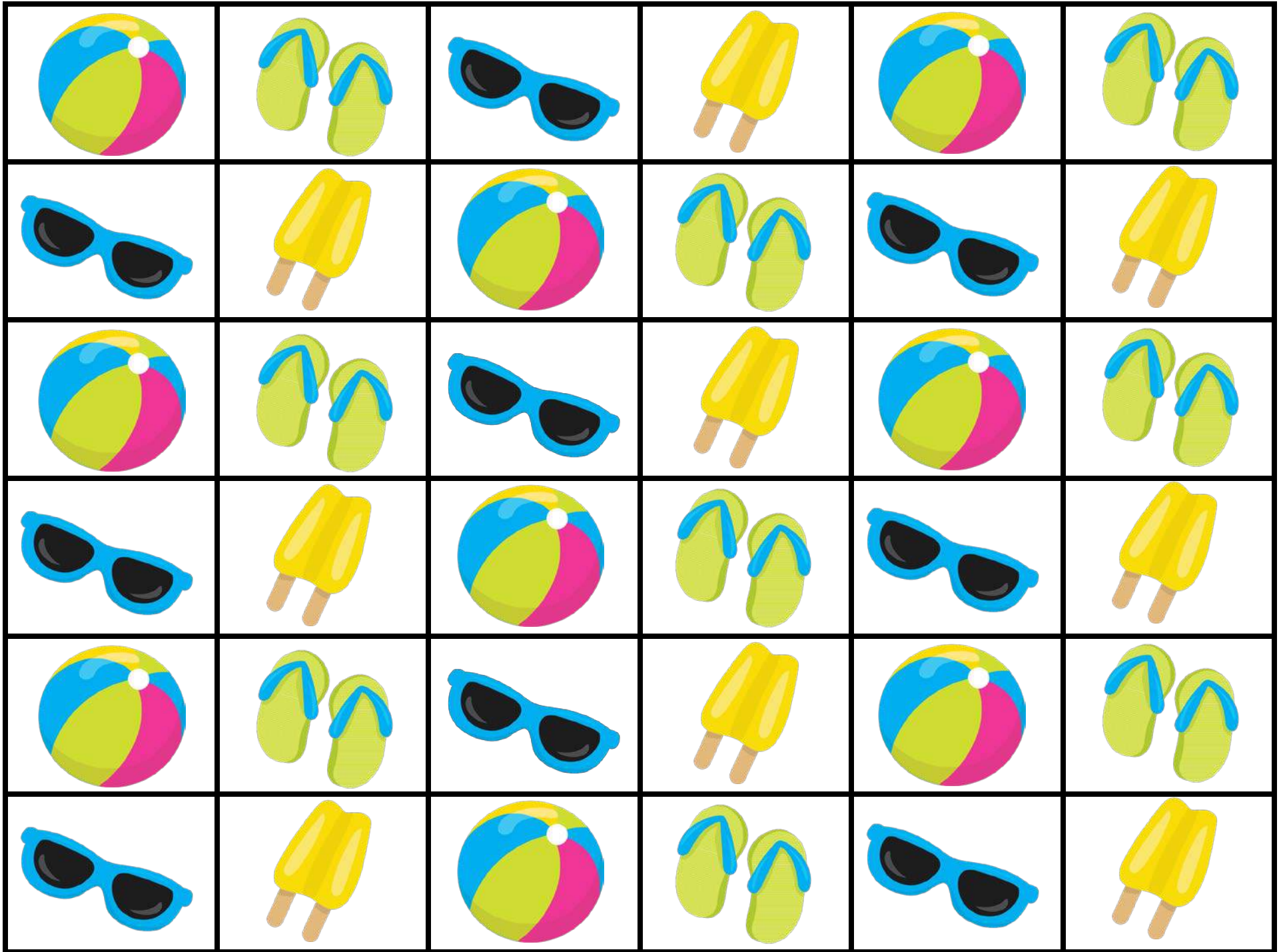


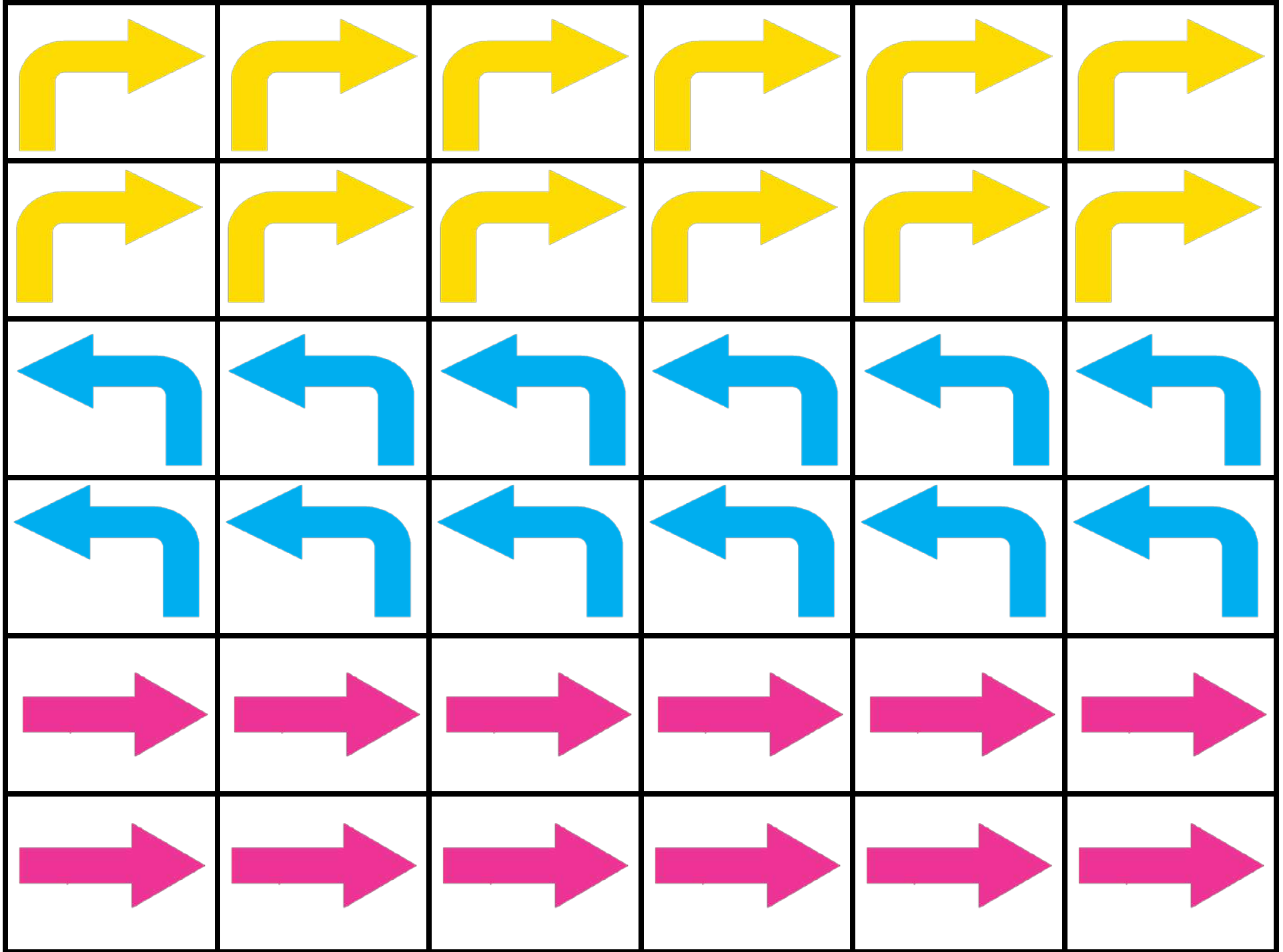


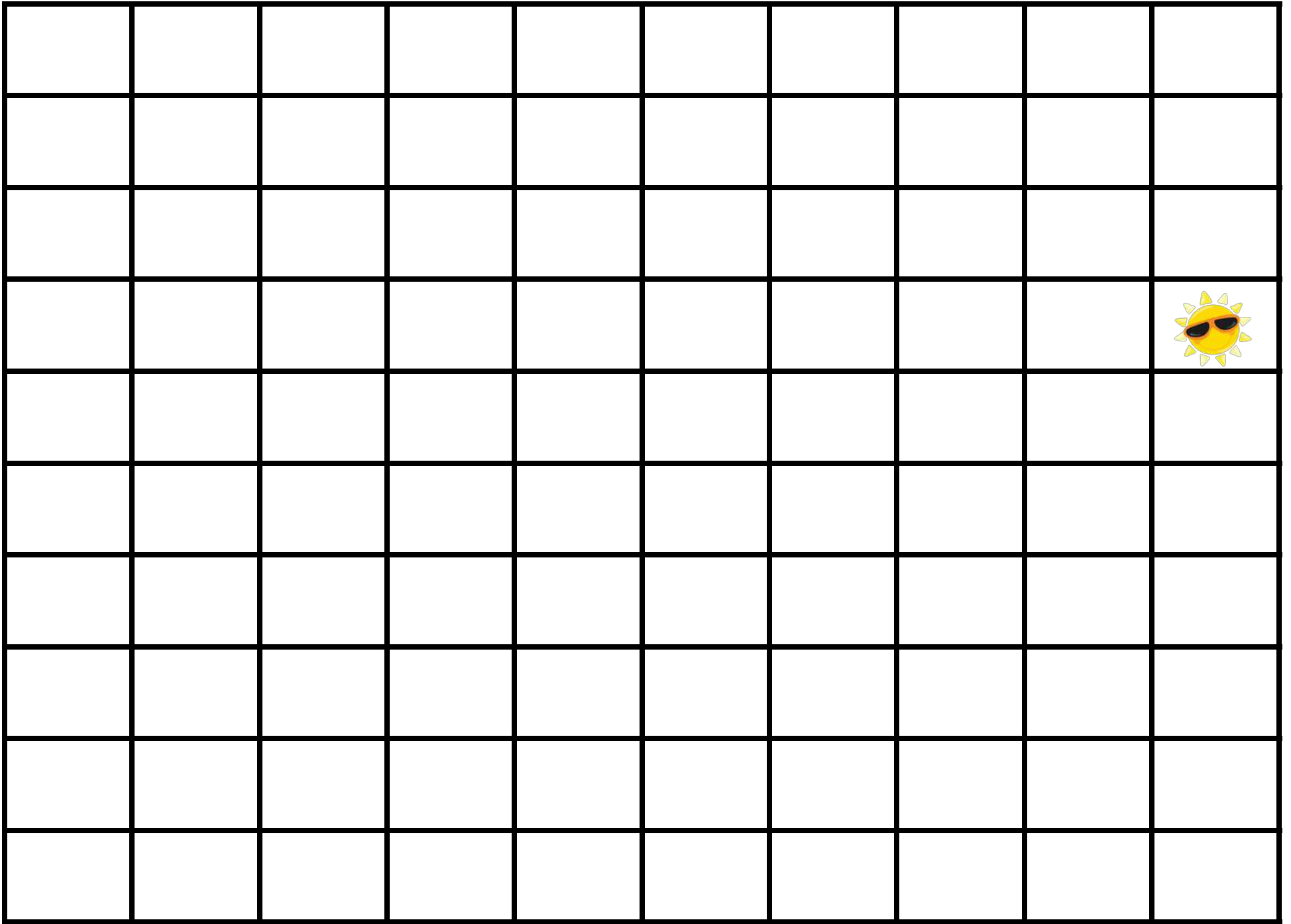
					

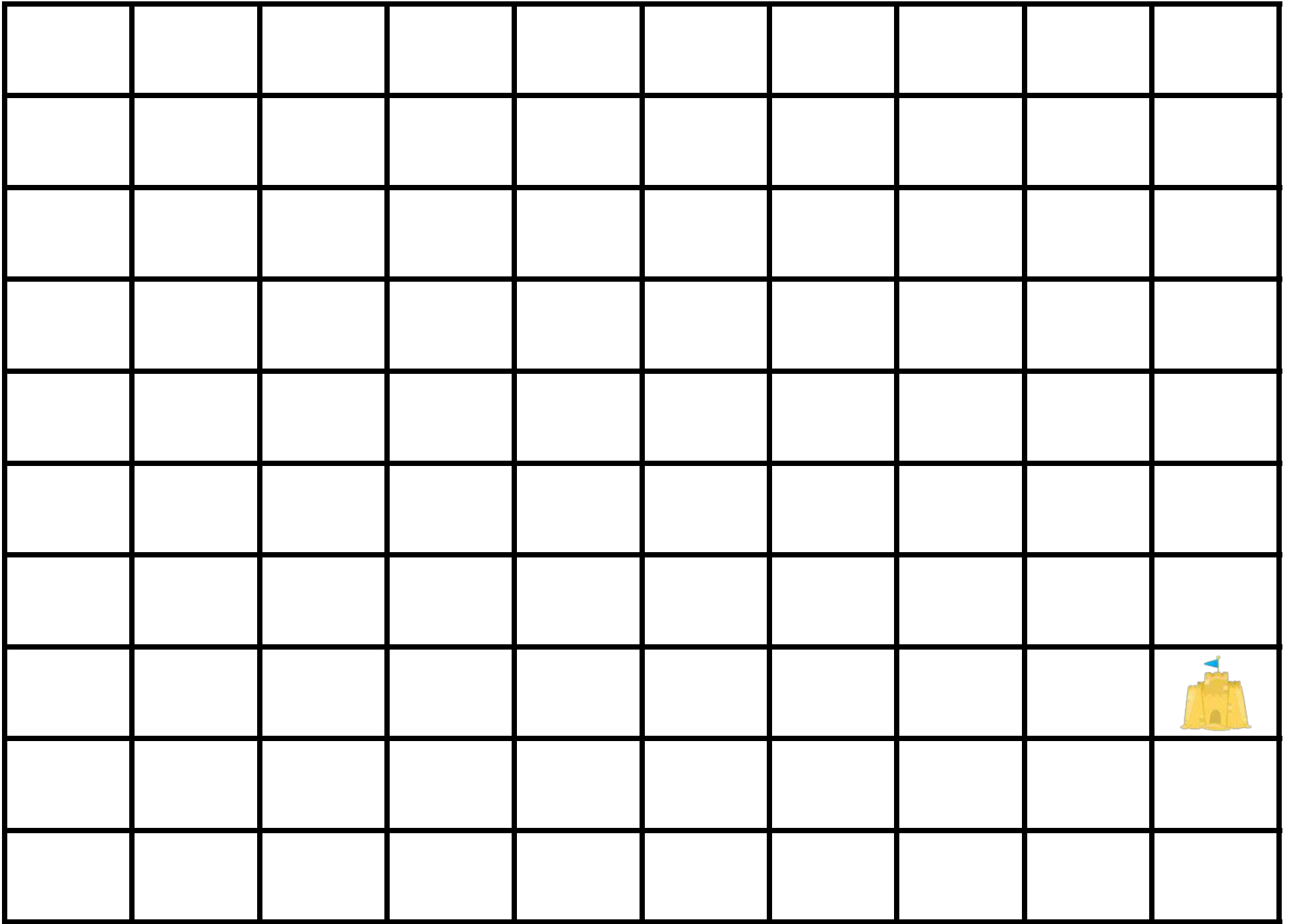
					

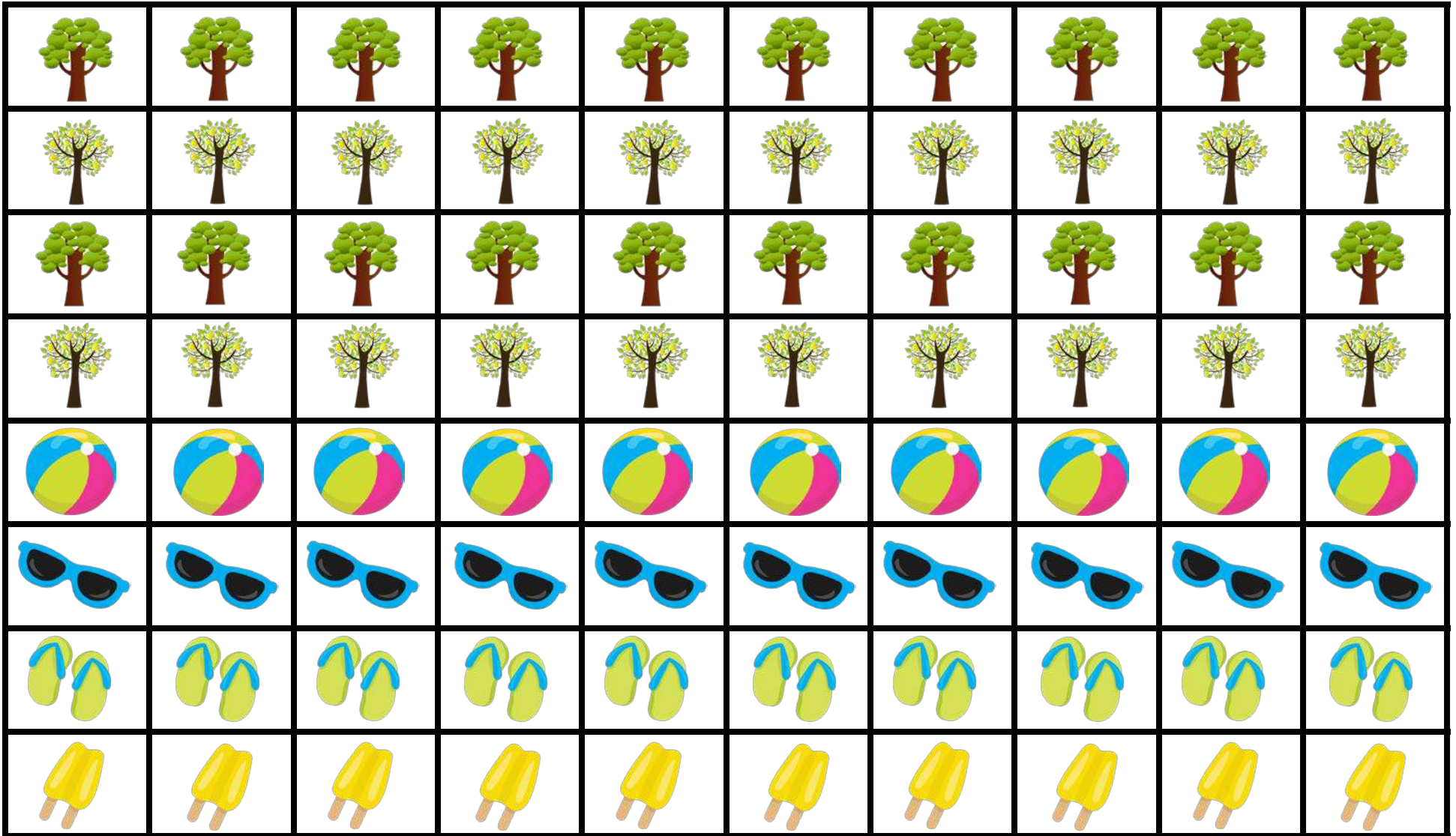


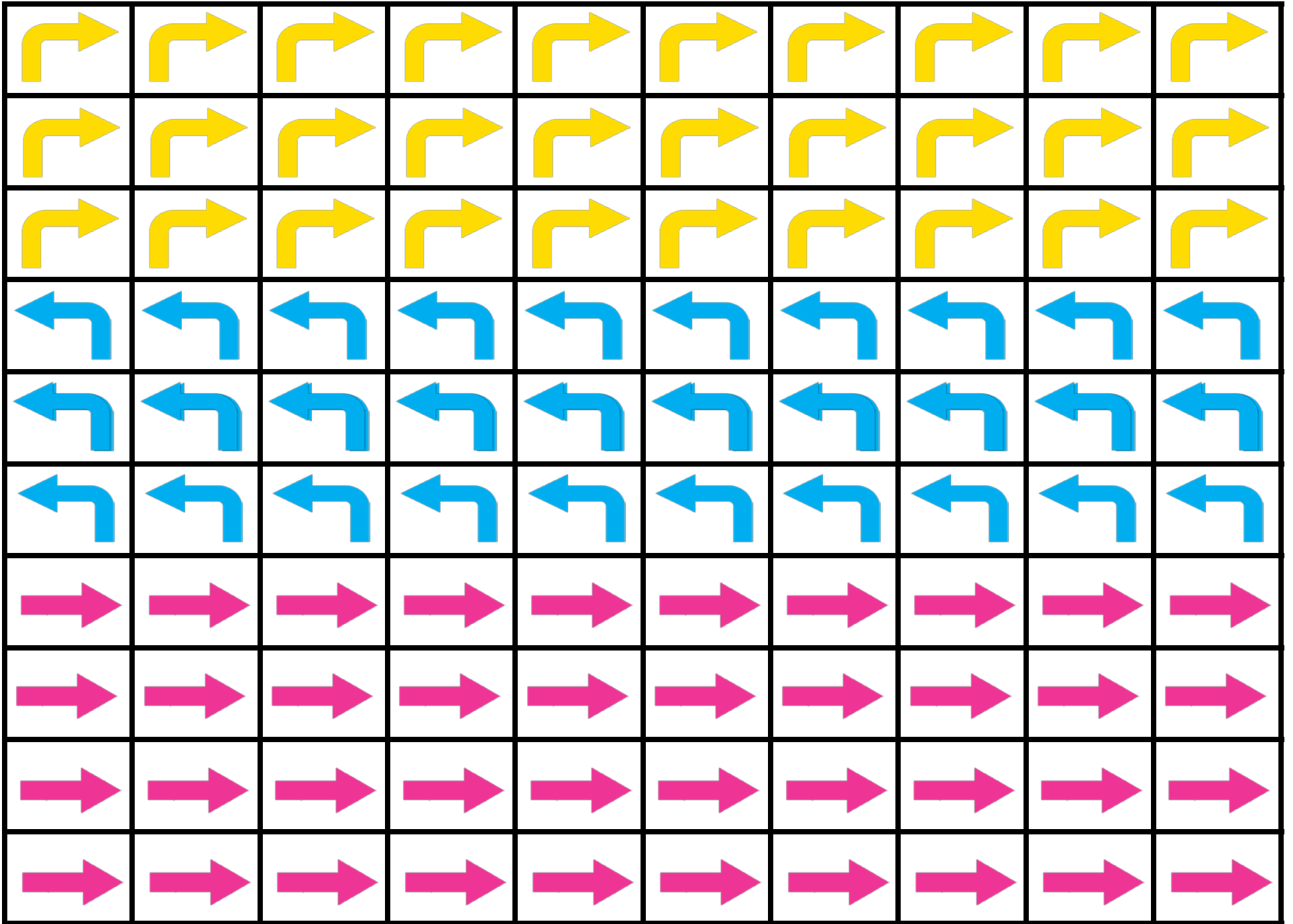












# BINARY CODE

Coding ornaments are the perfect craft activity for the kid who doesn't care too much for crafts! Screen-free coding and ornament making as you explore the binary code.

## SUPPLIES

- 3 Colors of Beads
- Pipe Cleaners
- Printable Binary Code Sheet

Choose one color bead for the number 1 and another color bead for the number 0. Choose a 3rd color bead to use as a spacer between letters.

Bend your pipe cleaner into any whimsical shape.

Choose a word or your name to be represented with the binary code. Use the printable sheet to write down the code.

If your word is too long for one pipe cleaner, simply attach another! Use ribbon or another type of fastener to hang in your window or tune into a keychain!

The computer doesn't read the letter A like we read the letter A. It reads it in a series of 1's and 0's. Each letter has its own code of 1's and 0's. This code is called the ASCII Binary Alphabet.

The binary number system is a base-2 number system. This means it only has two numbers: 0 and 1. The number system that we normally use is the decimal number system. It has 10 numbers: 0-9.

Computers work best with an "on" and "off" system and that is just what the binary code is all about. 1 is "on" and 0 is "off".

# ALPHABET IN BINARY CODE

<b>A</b>	<b>01000001</b>	<b>J</b>	<b>01001010</b>	<b>S</b>	<b>01010011</b>
<b>B</b>	<b>01000010</b>	<b>K</b>	<b>01001011</b>	<b>T</b>	<b>01010100</b>
<b>C</b>	<b>01000011</b>	<b>L</b>	<b>01001100</b>	<b>U</b>	<b>01010101</b>
<b>D</b>	<b>01000100</b>	<b>M</b>	<b>01001101</b>	<b>V</b>	<b>01010110</b>
<b>E</b>	<b>01000101</b>	<b>N</b>	<b>01001110</b>	<b>W</b>	<b>01010111</b>
<b>F</b>	<b>01000110</b>	<b>O</b>	<b>01001111</b>	<b>X</b>	<b>01011000</b>
<b>G</b>	<b>01000111</b>	<b>P</b>	<b>01010000</b>	<b>Y</b>	<b>01011001</b>
<b>H</b>	<b>01001000</b>	<b>Q</b>	<b>01010001</b>	<b>Z</b>	<b>01011010</b>
<b>I</b>	<b>01001001</b>	<b>R</b>	<b>01010010</b>		

## WRITE YOUR NAME IN CODE

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

**WRITE SUMMER  
IN BINARY CODE**

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**WRITE POOL IN  
BINARY CODE**

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**WRITE PICNIC IN  
BINARY CODE**

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**WRITE SUNSHINE  
IN BINARY CODE**

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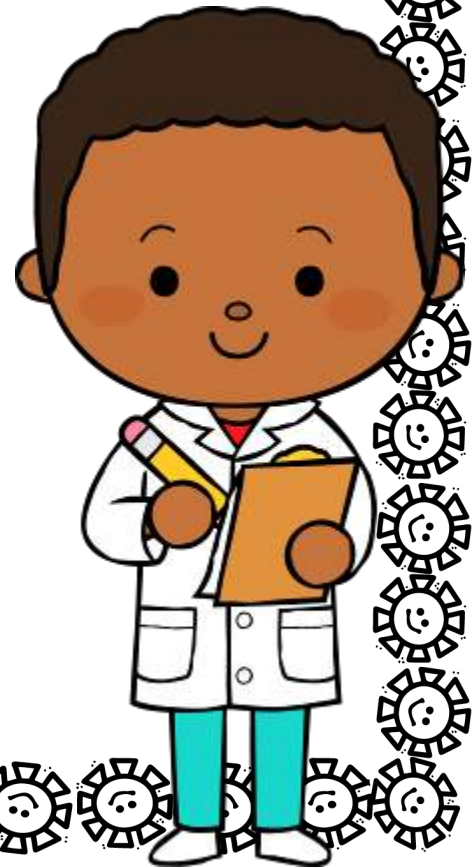
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# Scientific Process



# Ask a Question

What do you want  
to learn or test?



# Do Some Research

Gather information  
about what you  
want to learn.



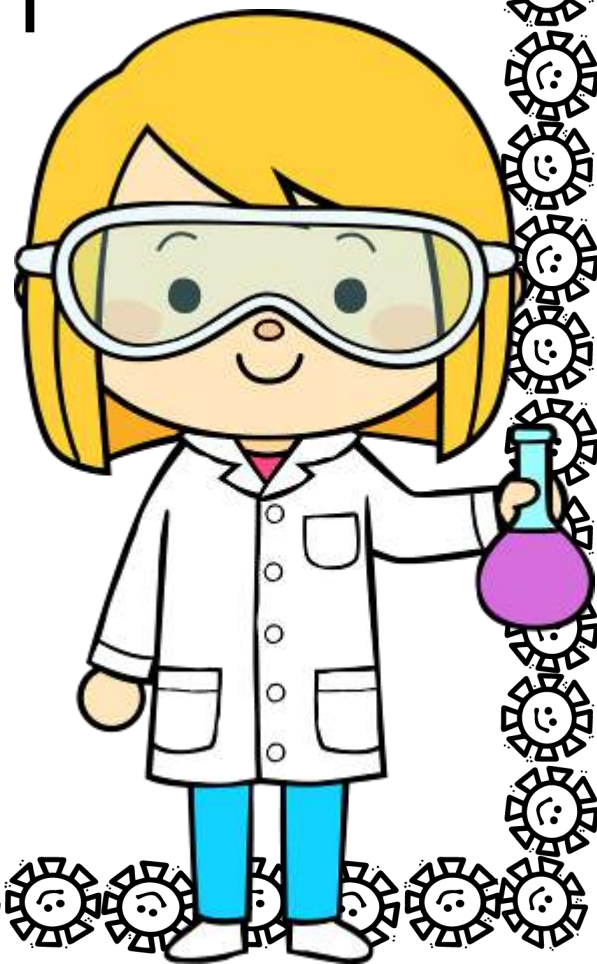
# Make a Hypothesis

Try to predict the answer!  
A hypothesis sounds like an  
*If I do this, then this will happen.*  
This being your experiment  
and outcome.



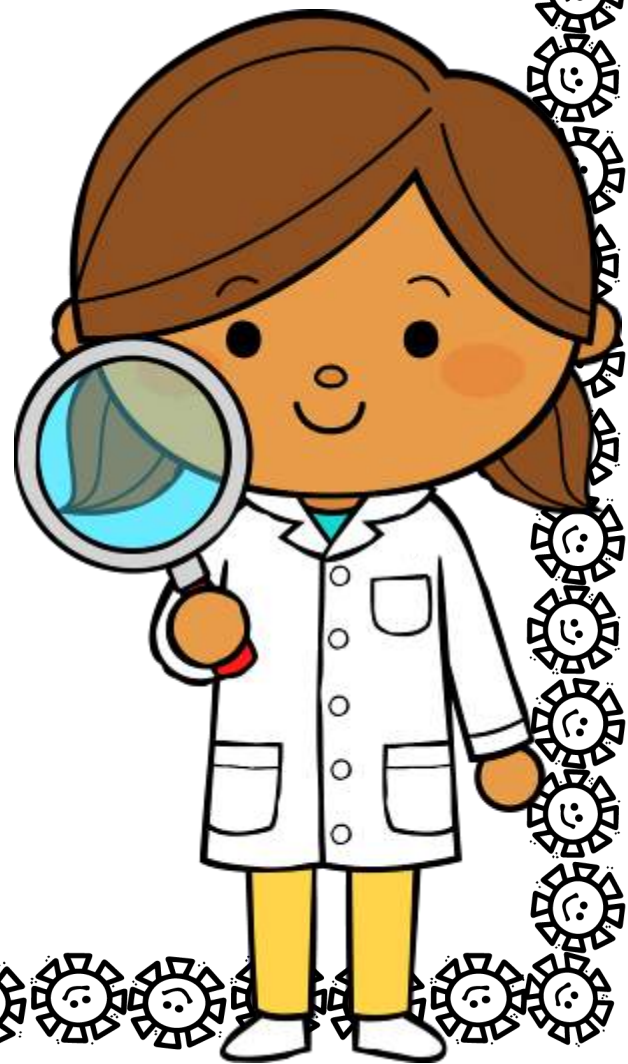
# Set Up An Experiment

Design a test or experiment to see if your hypothesis is correct!



# Record Data

Record what  
happens  
during the  
test or  
experiment.



# Conclusions

Analyze or review  
your data to see if  
your hypothesis  
was correct!



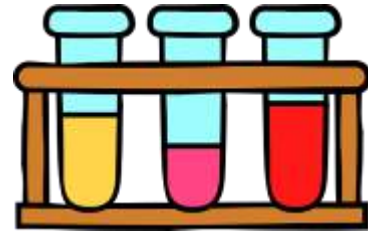
# SCIENTIFIC METHOD



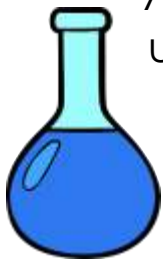
A method or procedure that uses an organized approach to solving a problem or answering a question through the use of a hypothesis, experimentation, observation, and data analysis.

# HYPOTHESIS

An educated guess or simple explanation made as a starting point for further investigation or experimentation.



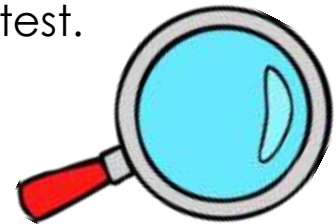
# EXPERIMENT



A scientific procedure set up to test a hypothesis or make a discovery. It usually involves a dependent variable, independent variable, and a control. The outcome is not necessarily known.

# INDEPENDENT VARIABLE

The independent variable is the part of your experiment that you want to test.



# DEPENDENT VARIABLE

The dependent variable is the outcome that occurs in your experiment and a response to the changing independent variable.



# CONTROL

The control is the neither the independent nor the dependent variable. The control is what you will compare the results in your experiment.



# My Science Investigation

My Question

My Hypothesis

Research Notes



Supplies

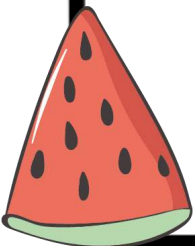
Experiment



Observations

draw or write

Conclusions



# My Science Investigation

My Question

Hypothesis



Supplies Needed



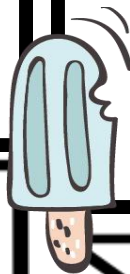
What is the Control?

What is the Dependent Variable?



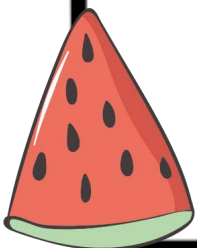
Experiment

What is the Independent Variable?



Observations

Conclusions



Graphics provided by [LittleRedsTreehouse.com](http://LittleRedsTreehouse.com)

# FIZZY LEMONADE

Materials I Used:



What I think will happen:

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What I did:

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What I Saw:

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What Happened:

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Draw it:

A large, empty rounded rectangle intended for a child to draw their experiment.

# BURSTING BAGS

Materials I Used:

What I think will happen:

What I did:

What I Saw:

Draw it:

What Happened:

# FIREWORKS IN A JAR

Materials I Used:



What I think will happen:

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What I did:

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What I Saw:

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What Happened:

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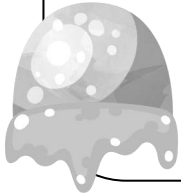
---

Draw it:

A large, empty rounded rectangle with a thin black border, intended for the student to draw their firework.

# WHAT MELTS IN THE SUN?

Materials I Used:



What I think will happen:

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What I did:

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What I Saw:

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What Happened:

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Draw it:

A large, empty rounded rectangular box intended for a drawing.



# ROCK CANDY CRYSTALS

Materials I Used:



What I think will happen:

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What I did:

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What I Saw:

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What Happened:

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Draw it:

A large, empty rectangular area with rounded corners, intended for a child to draw their rock candy crystal.

# BUBBLE SCIENCE

Materials I Used:

What I think will happen:

What I did:

What I Saw:

Draw it:

What Happened:

# ICE CREAM IN A BAG

Materials I Used:



What I think will happen:

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What I did:

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What I Saw:

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What Happened:

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Draw it:

A large, empty rounded rectangle with a thin black border, intended for a child to draw their experiment.

# SUN PRINTS

Materials I Used:



What I think will happen:

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What I did:

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What I Saw:

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What Happened:

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Draw it:

# STEAM ART PROJECT

Materials I Used:



What I think will happen:

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What I did:

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What I Saw:

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What Happened:

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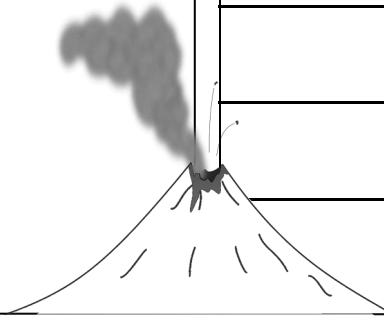
Draw it:

A large, empty rounded rectangle intended for drawing the project.

# SANDBOX VOLCANO

Materials I Used:

What I think will happen:



What I did:

What I Saw:

Draw it:

What Happened:

# STEAM SHADOW PROJECT

Materials I Used:



What I think will happen:

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What I did:

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What I Saw:

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What Happened:

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Draw it:

A large empty rounded rectangular box for drawing. It occupies the right side of the page, below the 'What I think will happen' section and to the right of the 'What I Saw' and 'What Happened' sections.

# GROW GRASS HEADS

Materials I Used:



What I think will happen:

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What I did:

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What I Saw:

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What Happened:

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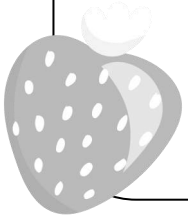
---

Draw it:

A large, empty rounded rectangle intended for a drawing.

# EXTRACTING STRAWBERRY DNA

Materials I Used:



What I think will happen:

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What I did:

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What I Saw:

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What Happened:

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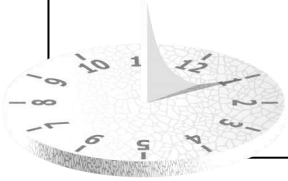
---

Draw it:

A large, empty rounded rectangle intended for a drawing.

# DIY SUNDIAL

Materials I Used:



What I think will happen:

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What I did:

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What I Saw:

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What Happened:

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Draw it:

A large, empty rounded rectangle intended for drawing the sundial.

# LEAK PROOF BAG

Materials I Used:



What I think will happen:

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What I did:

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What I Saw:

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What Happened:

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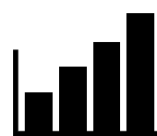
Draw it:

A large, empty rounded rectangular box intended for a drawing.



# SUMMER STEM

## Challenges & Engineer's Notebook



You can use this notebook for all the Sprint time STEM activities found in the pack.

LITTLE BINS FOR LITTLE  HANDS

# SUMMER STEM CHALLENGE SUPPLY LIST

Acrylic paint

Aluminum foil

Aluminum trays

Baking soda

Baggies

Beads

Cardboard

Cardboard boxes

Chocolate

Clothes pins

Coffee filters

Coins (Pennies)

Cotton balls

Cotton swabs

Craft foam

Craft paper

Craft sticks

Dowel rods

Duct tape

Fabric

Feathers

Felt

Flat marbles

Food coloring

Funnel

Gears

Gems

Glitter (gold)

Glitter glue

Glow stars

Glow sticks

Glue

Golf tees

Google eyes

Graham Crackers

Gumdrops

Hammer

Hand saw

LEGO® bricks

Magnets

Marshmallows

Measuring cups

Nails

Paint

Paper

Paper cups

Paper clips

Pencil

Pinecones

Pipe cleaners

Plastic bags

Pom-poms

Pool noodles

Raffia

Ribbon

Rubber Bands

Scissors

Scrap wood

Shells

Shredded paper

Skewers

Sponges

Stapler

Sticks

Straws

String

Styrofoam

Styrofoam balls

Sugar cubes

Tape

Tape measure

Tea lights

Tin can

Toilet paper rolls

Toothpicks

Trash bags

Twine

Twist ties

Washi Tape

Water

Water beads

White vinegar

Wire

Wooden planks

Yarn

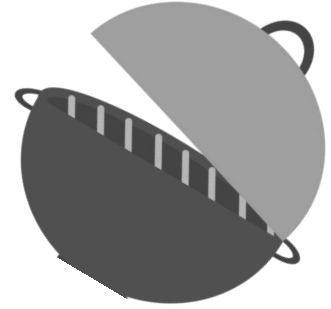
Zip ties



## BUILD A SOLAR OVEN

**Challenge:** Using only bricks build a free-standing tower that is as tall as you are.

**Possible Supplies:** Cardboard boxes, clear plastic wrap, tin foil, marshmallows, graham crackers, and chocolate.



## BUILD A BOAT

**Challenge:** A heavy load is going to need to be transported across the river, can you design and build a tin foil boat with one 8" inch square of tin foil and test how much weight it can hold with pennies.

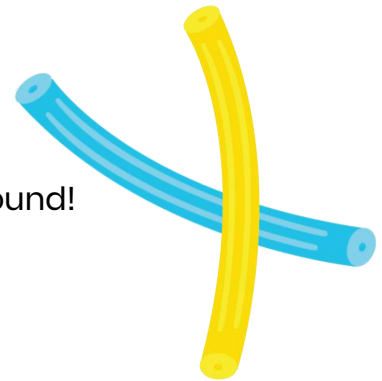
**Possible Supplies:** Tin foil, pennies.



## DESIGN A ROLLER COASTER

**Challenge:** You've been asked to help with the design for the amusement park's new roller coaster. Design and build a roller coaster that will send a marble looping around!

**Possible Supplies:** Pool noodles, paper plates, pipe insulation, and cardboard.



## BUILD A STRUCTURE

**Challenge:** With no clouds in the sky, the sun is beating down and you can't find a shady tree. Looks like you are going to need to design and build a structure that provides some shade for you and your friends or family!

**Possible Supplies:** Use found materials around the house or classroom and recycling bin or head outside and use natural materials!



## My STEM Challenge:

### ? ASK

What is the problem?



### Collect Information

What information & resources will I need?

### Imagine

How can I solve the problem?



### Plan



What materials do I have/need?  
What steps do I take?



### Create

I will test my solution,  
and take or draw notes.



### Improve

What changes can I make  
to improve my plan?





## My Research Notes



## Draw It



## Draw It



## My Next Plan



# SUMMER ADVENTURES AT STEM PARK



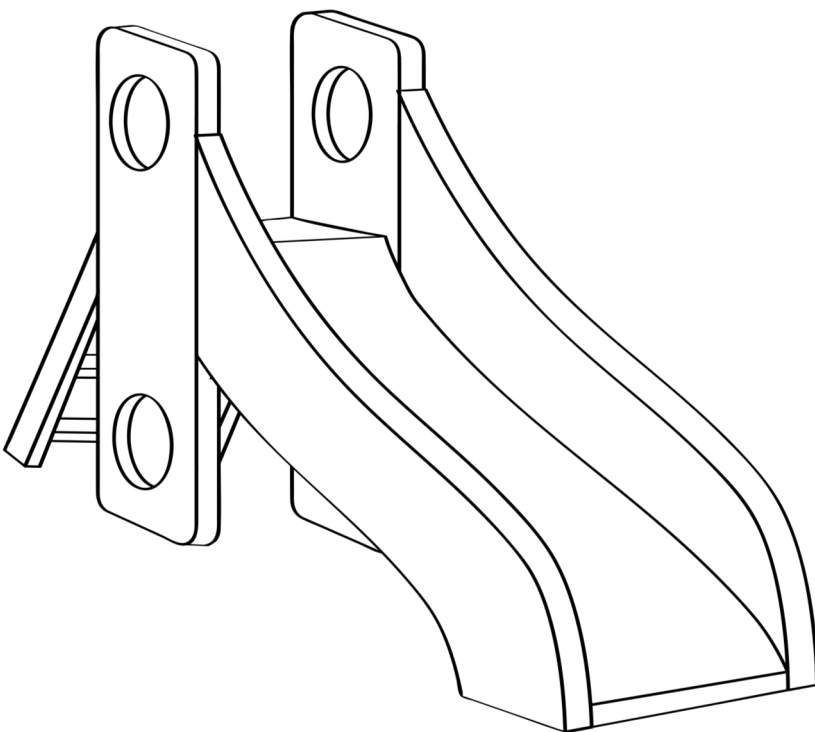
# SUMMER ADVENTURES AT STEM PARK

Summer Adventures at STEM Park is a story STEM adventure. The goal is for the story to serve as the spine for the STEM study. The story prompts the student to help the characters solve problems. Using information within the story students can brainstorm ways to resolve the problems. Using the STEM challenge cards (cut these out) students are given a challenge related to the story.

They will need to brainstorm resources available to them. Make decisions on how to best utilize those materials to resolve the problems. Then through experimentation they will work through their ideas to see what works and what doesn't work.

## NOTE:

The story booklet is designed to print on 8.5x11 pages and is designed in booklet format. Which means you will need to print double sided. Then stack your pages according to page number, fold the booklet in half, and staple together.



# MY STEM PARK ADVENTURE CHALLENGES

## DESIGN PLAYGROUND EQUIPMENT

The children need to design new playground equipment for STEM Park.

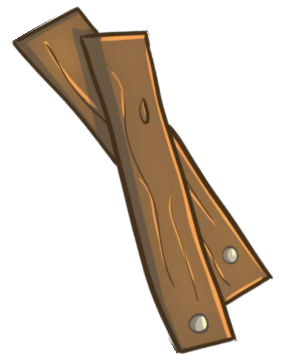


What building materials might be available?


## FIX A BROKEN BRIDGE

Determine what you need to fix the broken bridge.

What building materials might be available?

## BEGIN A RECYCLING PROGRAM

Plan a recycling program to implement at STEM Park.



What building materials might be available?


## PLAN AND BUILD GARDEN LANDSCAPING

Plan new landscaping for STEM Park. What kinds of plants would you include? How would you lay it out?

What building materials might be available?




# SUMMER ADVENTURES AT STEM PARK SUPPLY LIST

Revitalizing STEM Park is going to take a lot of resourceful thinking. Use this page to brainstorm what you will need, who you might need to speak with, where you might need to go to get proper approval. How can you get the community involved? What other things might need to be addressed in the planning stages?

Draw Your Garden Landscape Ideas


Draw Your Playground Ideas


Draw Your Garden Landscape Ideas


Plan Your Recycling Program


# My STEM Island Adventure Challenge:

## ? ASK

What is the problem?



## Collect Information

What information & resources will I need?

## Imagine

How can I solve the problem?



## Plan

What materials do I have/need?



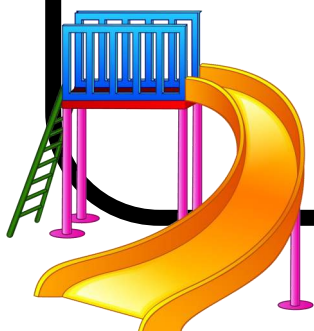
## Create

I will test my solution,



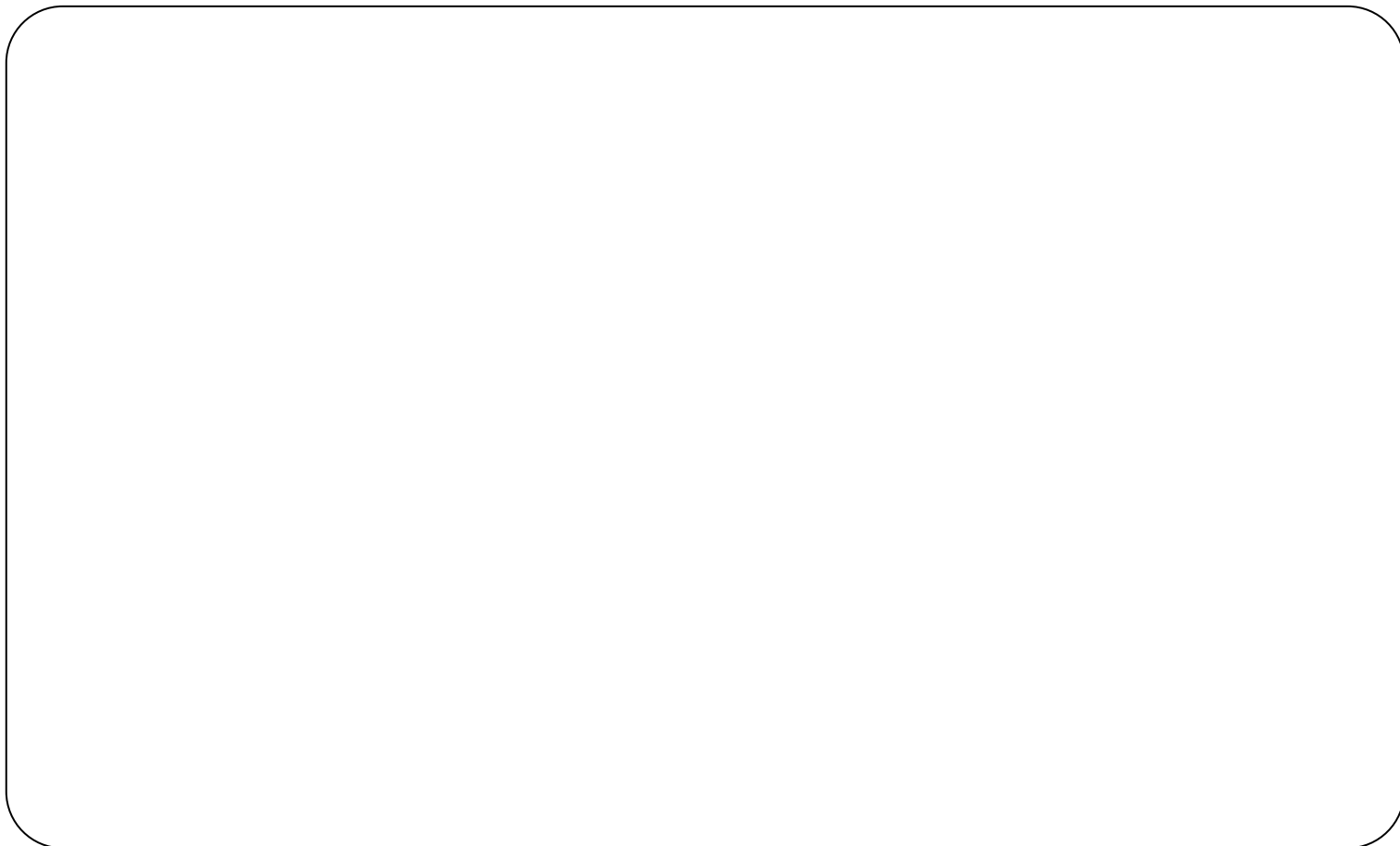
## Improve

What changes can I make



# MY DRAW & TELL STEM PARK ADVENTURE

Draw a picture of the deserted STEM Island, and then tell what you think it would be like to be on the island.



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# THE GREAT BOAT FLOAT CHALLENGE



# THE GREAT BOAT FLOAT STEM CHALLENGE SUPPLY LIST

Acrylic paint	LEGO® bricks	Springs
Aluminum foil	Needle and thread	Stapler
Baggies	Nuts and bolts	Straws
Bowl for water	Paper	Styrofoam balls
Cardboard	Paper cups	Tape
Clothes pins	Pencil	Tape measure
Coffee filters	Pipe cleaners	Toothpicks
Coins (Pennies)	Plastic spoons	Twine
Craft paper	Raffia	Twist ties
Craft sticks	Ribbon	Washi Tape
Dryer tubing	Rubber Bands	Water
Duct tape	Scissors	Wooden planks
Fabric	Screws	Yarn
Felt	Shells	
Foam board	Shredded paper	
Gears	Skewers	
Glue	Sponges	



# THE GREAT BOAT FLOAT

## Challenge Goals

**Challenge:** The Great Boat Float Challenge. Build the strongest boat to sail the ocean blue.

**Objective:** Design, engineer, and build a boat.

**Supplies:** Kids can either build their own boat design out of a variety of recycled materials or you can give each kid the same size square of tin foil!

**Test:** How much weight will your boat hold?

Make a prediction! How many pennies do you think your boat will hold?

Build your boat!

**Collect Data:** Continue adding pennies until your boat takes on water.

**Record:** How many pennies did it take to sink your boat?

**Conclusion:** What changes can be made to make your boat stronger?

Name: \_\_\_\_\_

# The Great Boat Float Challenge

How many pennies do you think your boat will hold?

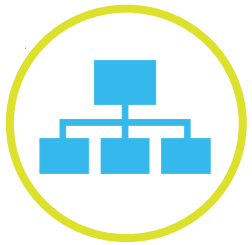
Try your experiment multiple times.	Number of pennies
Trial #1	
Trial #2	
Trial #3	
Trial #4	
Trial #5	
Trial #6	

# STEM Steps to Success



**ASK**

What is the problem?



**Collect**

What information will I need?



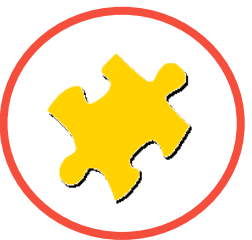
**Imagine**

How can I solve the problem?



**Plan**

What things do I need to use?



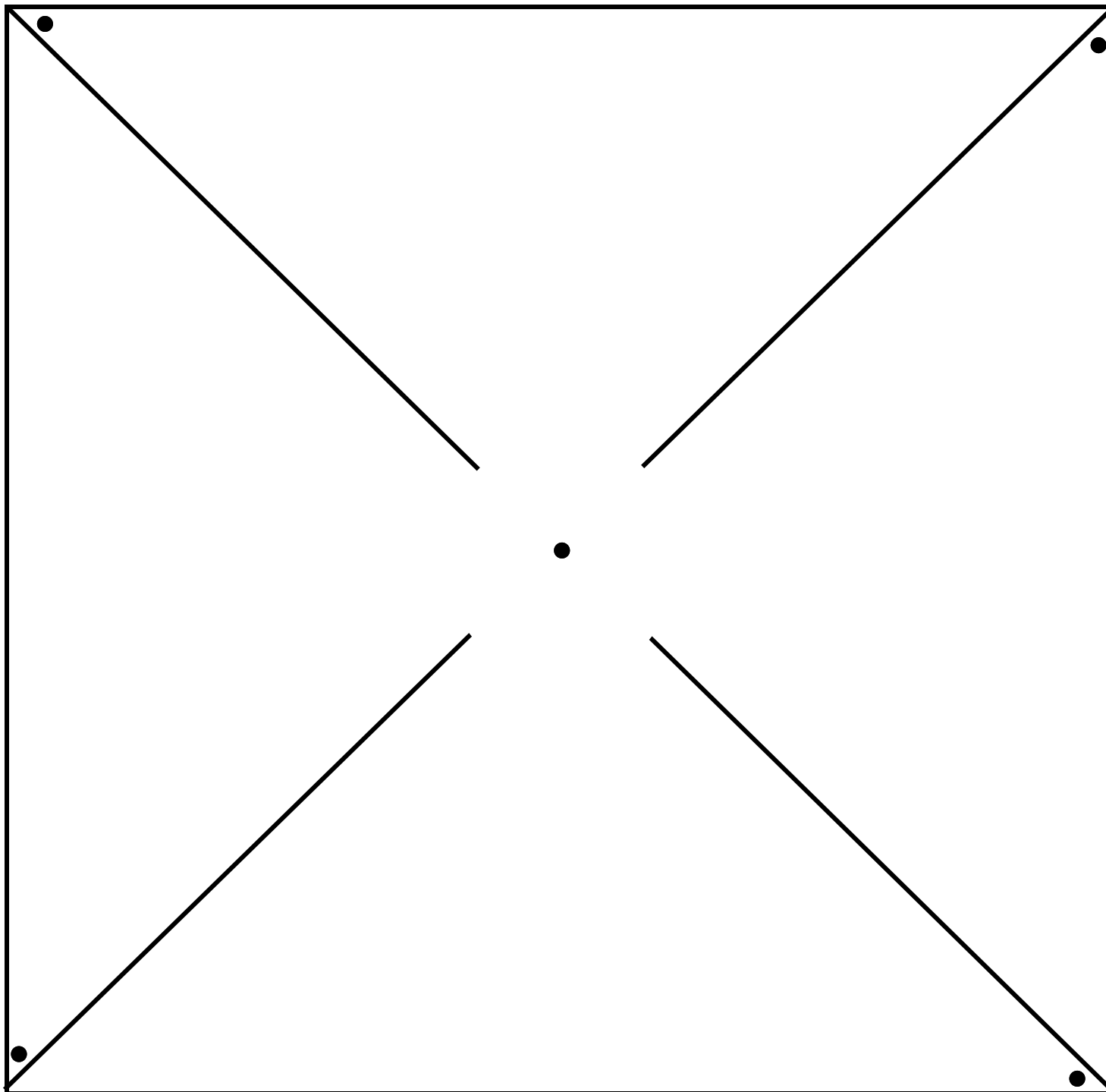
**Create**

I will test my plan.



**Improve**

What changes can I make to make it better?

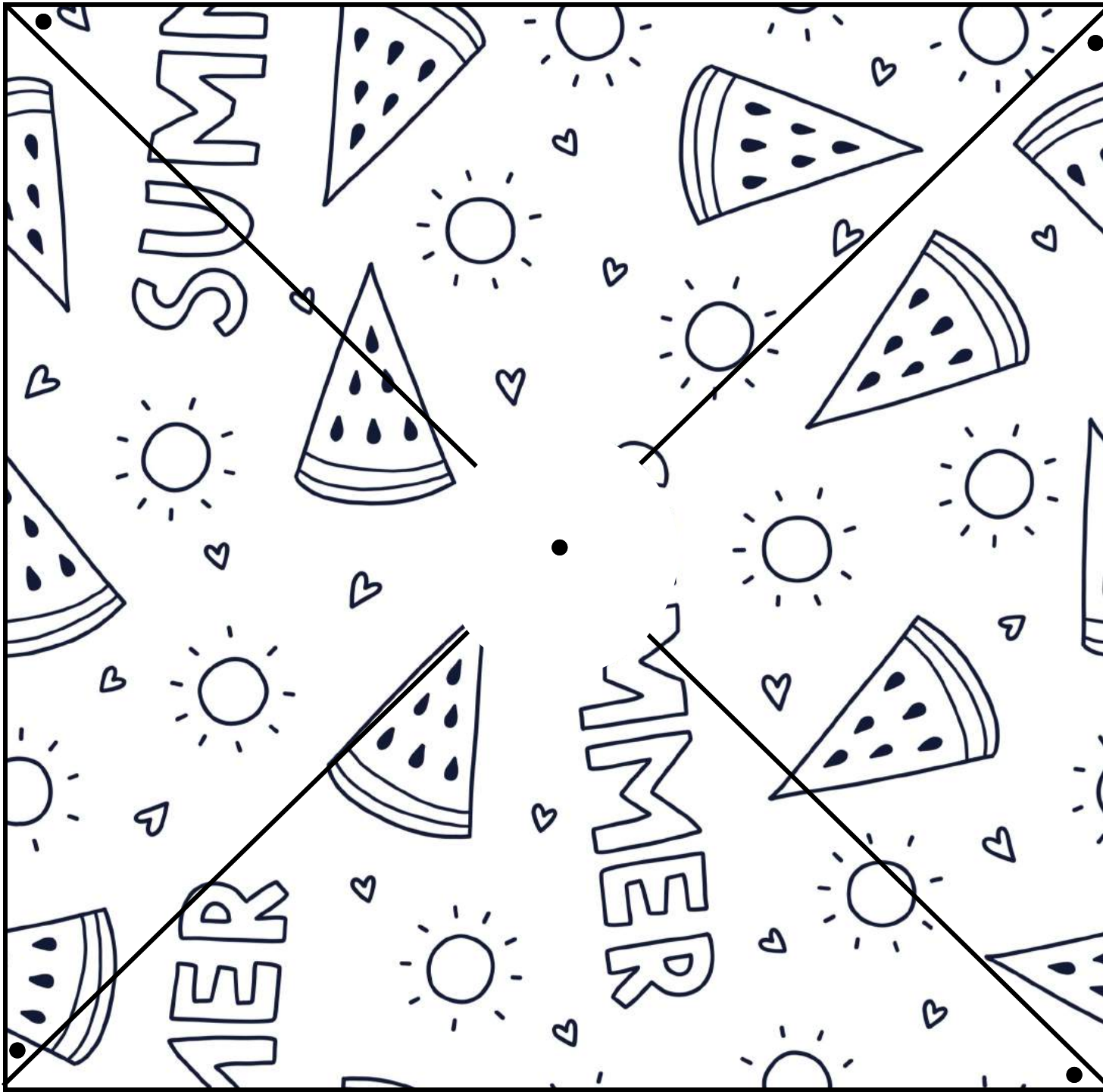


### What You Need

- Scissors
- Straight Pin
- Pencil with eraser
- Colored pencils, crayons, markers
- Straw or Skewer

### What To Do

- Color your pinwheel
- Cut out the square
- Cut along the black lines. Stopping before reaching the center dot.
- Gently bend every other corner toward the center, don't fold the paper, you are forming a curve.
- Line up the dots at the center and use the straight pin to secure in place.
- Stick the straight pin into a pencil eraser.



#### What You Need

- Scissors
- Straight Pin
- Pencil with eraser
- Colored pencils, crayons, markers
- Straw or Skewer

#### What To Do

- Color your pinwheel and color backside a plain color.
- Cut out the square
- Cut along the black lines. Stopping before reaching the center dot.
- Gently bend every other corner toward the center, don't fold the paper, you are forming a curve.
- Line up the dots at the center and use the straight pin to secure in place.
- Stick the straight pin into a pencil eraser.

# SPINNING COLOR WHEEL

## Spinning Color Wheel: version 1

### Supplies:

- Paper plate
- String
- Sharpies
- Scissors
- Drawing compass

### Directions:

1. Use a compass to draw three circles inside of each other on the paper plate.
2. Divide the paper circle into 6 even sections.
3. Color one each of the 6 primary/secondary colors.
4. Poke holes 1-inch apart in the center of the wheel. Tie a 4-foot string around the holes, making a loop.
5. Spin the two sides of the string to wind up the string.
6. Pull tightly to release the circle. The colors will blend, making white if you spin it fast enough.



# SPINNING COLOR WHEEL

Spinning Color Wheel: version 1



# SPINNING COLOR WHEEL

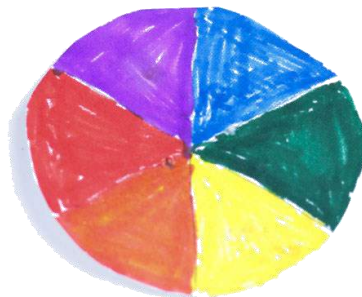
## Spinning Color Wheel: version 2

### Supplies:

- Paper plate
- String
- Sharpies
- Scissors
- Drawing compass

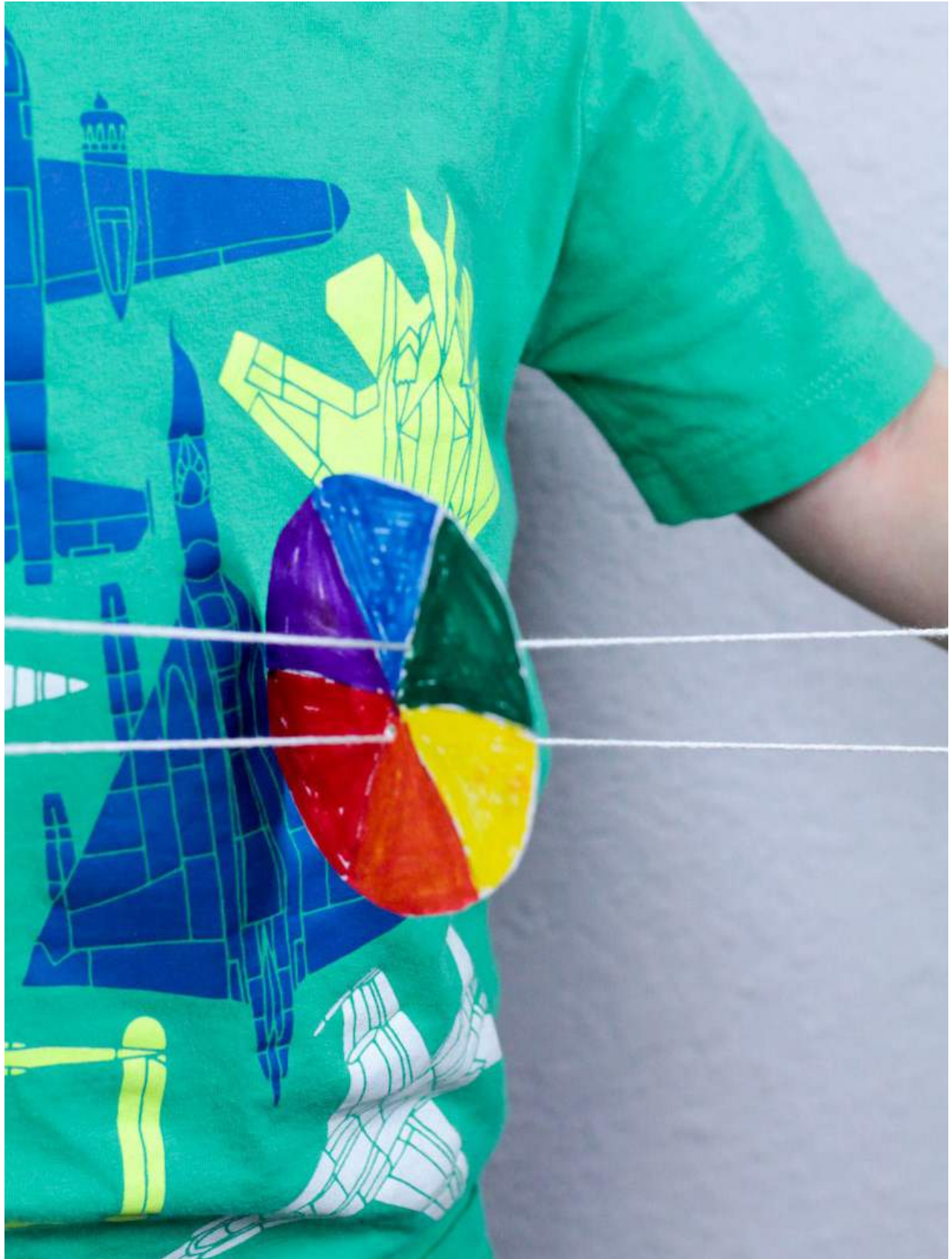
### Directions:

1. Use a compass to draw three circles inside of each other on the paper plate.
2. Divide the paper circle into 6 even sections, following the photo pattern.
3. Color the circle in on both sides following the pictured pattern.
4. Poke holes 1-inch apart in the center of the wheel. Tie a 4-foot string around the holes, making a loop.
5. Spin the two sides of the string to wind up the string.
6. Pull tightly to release the circle. The colors will blend, making the secondary colors if you spin it fast enough. This can take a bit of practice to get right.



# SPINNING COLOR WHEEL

Spinning Color Wheel: version 2



# Summer I Spy



# Summer I Spy





# SUMMER BINGO



				
				
		<b>FREE</b>		
				
				



# SUMMER BINGO



				
				
		<b>FREE</b>		
				
				



# SUMMER BINGO



				
				
		<b>FREE</b>		
				
				



# SUMMER BINGO



				
				
		<b>FREE</b>		
				
				



# SUMMER BINGO



# SUMMER BINGO



		<b>FREE</b>					<b>FREE</b>		



# NATURAL STEM CHALLENGE INSTRUCTIONS

**Instructions:** Try to use as many natural items as possible such as sticks, leaves, rocks, bark, reeds, and anything else you have around the area! Go on a nature hunt and take a paper bag to collect goodies.

You may need to sparingly use string or twine, but please remember not to litter and bring these extra supplies back inside!

Do your best not to use any man-made materials!

Encourage kids to not pick leaves off of trees or break branches off of trees! Use items that are already on the ground as much as possible!



## BUILD A FORT

**Challenge:** To create some shade on this hot day, you need to build a fort you can sit in comfortably.

Use natural materials to build your structure.



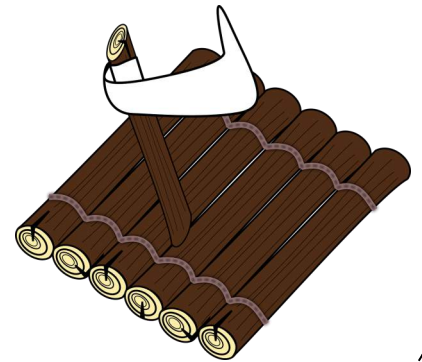
## DESIGN A MODEL HOUSE

**Challenge:** Design and build a model house out of only materials found in nature. Can you add a working door? How does your house stand up to the weather over time?



## DESIGN A STICK RAFT

**Challenge:** Can you design and build a stick raft that floats! What could you use for a sail? Will your stick raft hold a load of rocks? If so, how many rocks will it hold before taking on water? If possible, take your stick raft to a small stream.

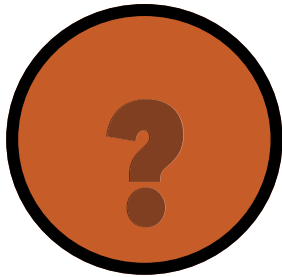


## ART & NATURE

**Challenge:** Get creative and add art to your nature finds! Build a sculpture, make a picture, or design a mandala with nature. Can you make a self-portrait or build a rock sculpture?



# STEM Steps to Success



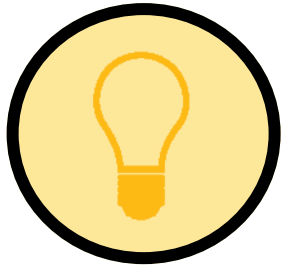
## Observe/Ask

- What is the problem?
- How have others solved the problem?
- What are the limitations/guidelines?
- Who can help me solve this problem?



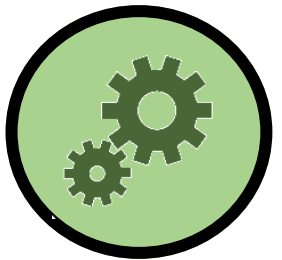
## Collect

- What information will I need to solve this problem?
- What resources do I have or need to solve this problem?



## Imagine

- How can I solve this problem?
- Have I found an “out of the box” solution?
- Do I have more than one solution?



## Plan

- What materials do I have/need?
- What steps will I take to solve this problem?
- What could go wrong?



## Create

- I will test my plan!
- I will take notes of my process/observations!
- I will draw/take pictures as I work, for reference later!



## Improve

- I will reflect on my design.
- What changes can I make to improve my plan/solution?
- What does my data tell me about my first attempt?
- I can create another plan and retest!

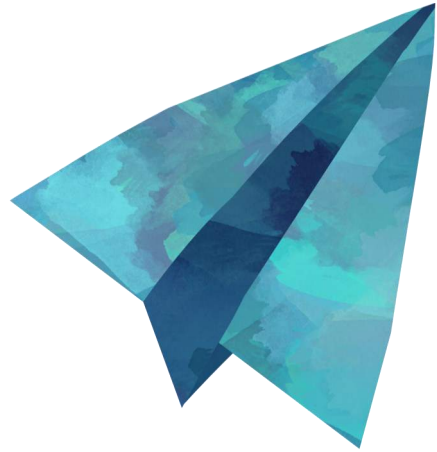
# SUMMER STEM CHALLENGE SUPPLY LIST

Acrylic paint	Glow stars	Shells
Aluminum foil	Glow sticks	Shredded paper
Aluminum trays	Glue	Skewers
Baking soda	Golf tees	Sponges
Baggies	Google eyes	Stapler
Beads	Gumdrops	Sticks
Cardboard	Hammer	Straws
Clothes pins	Hand saw	String
Coffee filters	LEGO® bricks	Styrofoam
Coins	Magnets	Styrofoam balls
Cookie cutters	Marshmallows	Sugar cubes
Cotton balls	Measuring cups	Tape
Cotton swabs	Nails	Tape measure
Craft foam	Paint	Tea lights
Craft paper	Paper	Tin can
Craft sticks	Paper cups	Toilet paper rolls
Dowel rods	Paper clips	Toothpicks
Duct tape	Pencil	Trash bags
Fabric	Pinecones	Twine
Feathers	Pipe cleaners	Twist ties
Felt	Plastic bags	Washi Tape
Flat marbles	Pom-poms	Water
Food coloring	Pool noodles	Water beads
Funnel	Raffia	White vinegar
Gears	Ribbon	Wire
Gems	Rubber Bands	Wooden planks
Glitter (gold)	Scissors	Yarn
Glitter glue	Scrap wood	Zip ties

# PAPER AIRPLANE CHALLENGE

**Challenge:** Who can design and make an airplane that soars the farthest?

**Supplies:**  
paper



# POOL NOODLE & TOOTHPICK STRUCTURE

**Challenge:** Cut a pool noodle into pieces of varying size. Build a structure! Test your structure in water to see if it floats!

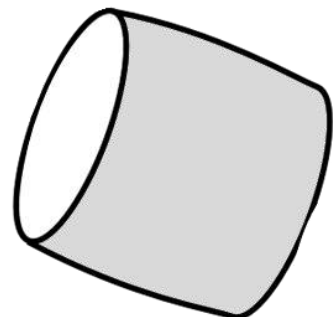
**Supplies:**  
pool noodles, toothpicks



# BUILD A SOLAR OVEN

1. **Challenge:** Design and build a solar oven to melt a marshmallow or make s'mores.

**Possible Supplies:**  
Cardboard, aluminum foil, aluminum tray, duct tape, toothpicks, skewers, marshmallows



# DESIGN & BUILD A DOG HOUSE

**Challenge:** You could really use a dog house to get through the hot, dog days of summer.

Design and build your pup a shady spot to call home when you are outside.

**Supplies:**

Scrap wood, nails, hammer, screws, screw driver, hand saw,



# DESIGN & BUILD A KITE



**Challenge:** Design and build a kite that will fly on a windy day!

**Supplies:**

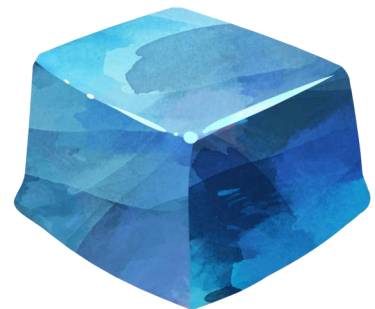
String, sticks, craft sticks, skewers, fabric, cardboard, Craft paper, glue, dowel rods

# DESIGN & BUILD AN ICE BOX

**Challenge:** Design and build a container to keep an ice cube from melting out in the sun! How long does it take for the ice cube to melt?

**Possible Supplies:**

Cardboard, tape, duct tape, Styrofoam, craft foam, trash bags, plastic bags, glue

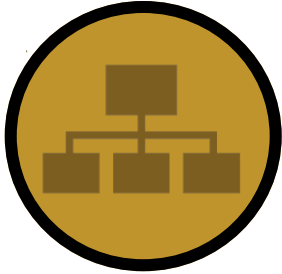


# STEM Steps to Success



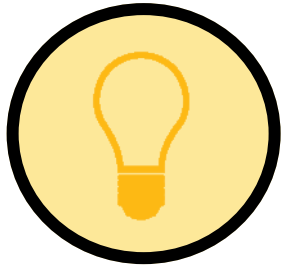
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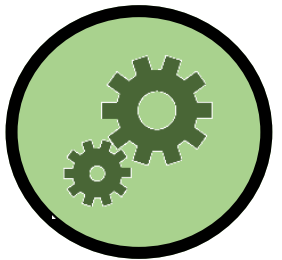
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