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# Discover Summer Activity Booklet

FOR 6TH - 8TH GRADERS

## SUMMER 2020

CincinnatiLibrary.org

## For summer fun and games with your child, check out these great resources on CincinnatiLibrary.org:

- Video STEM activities, storytimes and more

  **CinLib.org/video**

- eBooks, eAudiobooks, movies and more

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# Math & Science can be fun – really!

**Discover that math and science aren't dull and difficult, but fun and imaginative.**

### HOW TO GET STARTED:

1. Choose an exploration from this booklet, complete it, and record your results and observations at the bottom of the page.
2. Create your own exploration, and record your results and observations on the blank pages provided at the back of the booklet. Or make your own science notebook to log your activities in.

## A SCIENTIST IS A PERSON WHO ASKS QUESTIONS AND TRIES DIFFERENT WAYS TO ANSWER THEM.

**A scientist is a person who:**

- Asks questions
- Learns from his/her senses
- Notices details
- Draws
- Writes
- Measures
- Counts
- Sorts
- Tests predictions
- Experiments
- Thinks logically
- Keeps trying
- And has fun.

— Barbara Lehn from:
What is a Scientist (Millbrook, 1998)

# What do I do with this activity booklet?

## HERE ARE A FEW THOUGHTS TO HELP YOU ON YOUR WAY:

- Use this activity booklet in the way that works best for YOU.
- The booklet includes ideas for science explorations, but you can also try explorations from books or websites, or make up your own.
- We are including blank pages in the back of this booklet. Feel free to use them to record the results of your own explorations.
- Every scientist has his or her own way of thinking. You may choose to make your own notebook at home and decorate it. Your notebook may look like ours, or it may look totally different.
- Always be mindful of safety when you try science activities. Check with an adult if you are thinking of working with any dangerous materials.
- Remember, staff at the library can help you with your questions. Call your local Library: 513-369-6900.

# Discover Summer TRACKER

NAME _____

AGE _____

Color in a circle each time you complete an activity until you have filled in all 25.

Favorite activity and why?

_____

_____

_____

_____

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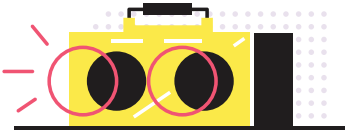

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at all levels. The need for STEM skills is increasing each year.

## What are some ways to explore?

There are many ways to do science. We've outlined a few ways to help you on your journey to become a Science Explorer!

### OBSERVE:

Take the time to watch something closely and learn from it. Examine all the details and see if you notice something new. If you have a magnifying glass, use it! Ask questions while you're observing

### ASK/PREDICT/TEST:

Ask a question, predict (a best-guess answer or hypothesis) and then set up an experiment to test your prediction and find an answer to your question. This can be fun!

### INVESTIGATE:

This is where you read or listen to information from a book, an online source, an interview, or any other way you can get the "nitty-gritty" on what you're wondering about.  Investigating to find background information helps scientists further their explorations.

### ORGANIZE/CATEGORIZE:

Scientists classify objects into groups according to certain characteristics. Finding similarities and differences between objects helps us use what we know in order to organize them into groups that make sense to us. There is no right or wrong way to do this.

### DESIGN YOUR OWN:

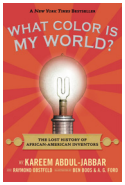
Think outside the box and create your own way of doing science. Be creative and have fun!

# Great Collection of Nonfiction eBooks


***The Girl Who Drew Butterflies:*** *How Maria Merian's Art Changed Science*
by Joyce Sidman


***Calling All Minds:*** *How to Think and Create Like an Inventor*
by Temple Grandin


***The Way Things Work Now***
by David Macaulay




***What Color is My World?:*** *The Lost History of African-American Inventors*
by Kareem Abdul-Jabbar


***STEM Lab:*** *25 Super Cool Projects*
by Jack Challoner


***Minecraft STEM Challenge:*** *Build A Theme Park*
by Anne Rooney

Check out these cool STEM eBooks and find others:
**CinLib.org/stembookskids**

# High 5

**What is your fingerprint signature?** Fingerprints help us hold onto things. They also create a unique signature for each of us. For a big investigation, compare your signature to each person in your family!

## PROCEDURE:

1. Make a chart like the one below using a blank piece of paper. Make each circle about the size of your index fingertip.
2. Rub a pencil back and forth on another piece of paper or index card to make a very dark smudge spot.
3. Rub one of your fingertips in the smudge spot, then gently press a clear piece of tape on your fingertip.
4. Carefully peel the tape off and place the lifted fingerprint on the correct spot on your chart.
5. Repeat the procedure for all of your fingers.

### RIGHT HAND

| Thumb | Pointer | Middle | Ring | Pinkie |
|---|---|---|---|---|
| ◯ A | ◯ A | ◯ A | ◯ A | ◯ A |
| ◯ W | ◯ W | ◯ W | ◯ W | ◯ W |
| ◯ L | ◯ L | ◯ L | ◯ L | ◯ L |

### LEFT HAND

| Thumb | Pointer | Middle | Ring | Pinkie |
|---|---|---|---|---|
| ◯ A | ◯ A | ◯ A | ◯ A | ◯ A |
| ◯ W | ◯ W | ◯ W | ◯ W | ◯ W |
| ◯ L | ◯ L | ◯ L | ◯ L | ◯ L |

**Simple fingerprint patterns:**

Loop (L)

Arch (A)

Whorl (W)

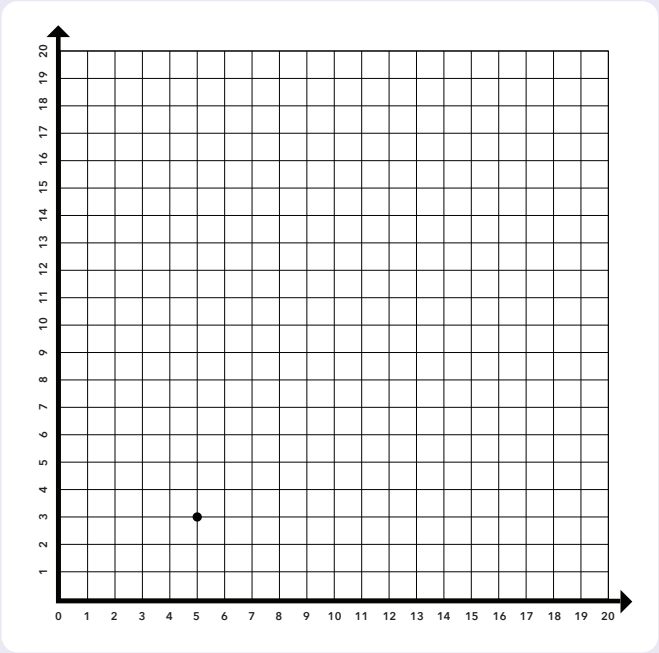
# "X" Marks the Spot

A "coordinate" is a number that tells you where to find a point. Sometimes you need several coordinates to find exactly where a point is. You can think of a point's coordinates as its address. The graph below has two numbered lines, the "x-axis" → and the "y-axis" ↑.

## PROCEDURE:

To find a point on the graph using an ordered pair, such as (5, 3), run your right finger along the x-axis first, to the number 5. Then run your left finger up to the number 3 on the y-axis.

The graph below has a hidden picture in it. Follow each set of ordered pairs to make points on the graph. Connect the points as you go. The first one (5, 3) is done for you.




**Start:**
**(5, 3)**
(7, 9)
(2, 13)
(8, 13)
(10, 19)
(12, 13)
(18, 13)
(13, 9)
(15, 3)
(10, 7)
**Finish:**
**(5, 3)**

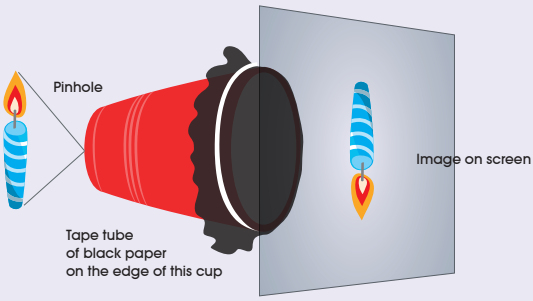
# Take Another Look

**How do our eyes see things?** Build a pinhole viewer to find out. You might be in for a big surprise. Our brains "trick us" from what our eyes actually see.

## PROCEDURE:

1. Use a pushpin to punch a hole in the center of the bottom of a dark colored plastic cup. Make the hole small to limit the amount of light that can enter. (You can make it bigger if you don't see a "picture" on the wax paper "screen")
2. Cut out a piece of wax paper slightly larger than the cup's mouth and use a rubber band to stretch and hold the paper smoothly across the top. (Your viewer will work best if you next tape a tube of black construction paper like a megaphone, extending beyond the wax paper. This paper will block out more light from around the wax paper. Not shown in picture)
3. In a dark room, aim the pinhole at a light source, like a candle, lamp, or bright window. The light will shine into the pinhole.
4. Look at the side of the cup with the wax paper. Rotate or move the cup a bit if you need to get an image on the wax paper.
5. What do you see? How does the image compare to the actual scene?

6. Try waving your hand in front of the pinhole or going outside.



# The Egg Is Not Too Big

**Can you get a big egg to go through a small opening?** By doing this experiment you will make the air molecules inside a jar move faster or slower with temperature changes, which results in air pressure changes as well.

## PROCEDURE:

1. Hard boil a medium-size egg. Let it cool, and then peel the shell off.
2. Find a bottle (a juice bottle works well) with an opening slightly smaller than the egg. The egg should be able to rest in the opening.
3. Place the bottle in a bowl of hot water for about five minutes. Be careful around hot water!
4. Now move the bottle to a bowl filled with ice cubes. Wet the egg and place it on the opening with its pointy side down.

**Watch and wait. What happens?**

# Design It, Build It

**How will you design a big tower that holds weight?**

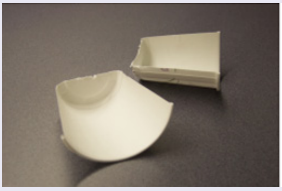
## PROCEDURE:

Your tower needs to be at least 1 foot tall and be able to hold the weight of a small stuffed animal. The only materials you may use are:

- 20 small paper cups (8 oz. or less)
- 2 pieces of construction paper
- 1 foot of masking tape

You may use scissors and rulers as tools to build and measure your big tower.

**Hints:** You can slice the cups in half, cut and flatten them, or cut the rims like an octopus.



You can roll and tape the paper into tubes, fold the paper like a fan, or fold and tape the paper into strips.

**Build your tower big and strong! Draw a picture of your design or take a photo and tape it here.**

**Test:** Does your tower hold the weight of small stuffed animal?

# Catch It Quickly

**Do you have a quick grip?** You need a partner for this experiment. Test other friends or family members to see who has the quickest reaction to something that they see.

## PROCEDURE:

1. Hold a ruler at the highest number, letting it hang down.
2. Have the person you are testing place their hand open at the bottom of the ruler, not touching the ruler.
3. Say that you will drop the ruler soon, but **don't let them know when**. Their job is to catch the ruler as fast as they can after it is dropped.
4. Measure the level of their thumb on the ruler (in inches or centimeters). That is their "reaction" level.

### Record different people's reaction levels here:

| PERSON'S NAME | MARK ON RULER |
|---|---|
| | |
| | |
| | |
| | |

A lower number would mean they are faster at reacting to what they see. A high number is a slow reaction time. Do you notice any patterns?

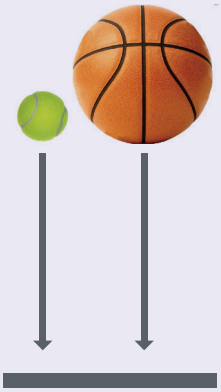
# Bounce It

**How big a bounce will a basketball and a tennis ball make together?**
Take advantage of how energy transfers from one item to another.

## PROCEDURE:

1. You will need two balls: a large ball (soccer or basketball) and a small ball like a tennis ball or rubber ball.
2. Take the balls outside. First hold the balls right next to each other. Right now the balls have "potential energy."
3. Let go of both the balls at the same time. Now both balls have moving or "kinetic energy." **What happens? How big/high is the bounce for each ball?**

Drop together



4. Now, hold the small ball on top of the large ball. Drop both the balls at the same time. Step back quickly! **What happens this time?**

Drop together

**Note:** As the balls hit the ground, the energy of the big ball is transferred to the small ball.

# You've Got Mail

Graphs are a good way to organize the data you collect. Scientists and mathematicians use graphs to communicate results, draw conclusions, make connections, and make predictions. Here is a fun activity to do with the mail you receive at home. Be sure to get your parents' permission first!

## PROCEDURE:

1. Collect the mail each day and sort it into these piles: Bills and statements (important stuff!), friendly mail (greeting cards or letters you receive from folks you know, magazines you subscribe to, etc.), and junk mail (catalogs, coupons, advertisements, and other things you did not sign up to receive). You can make your own categories if you'd like. Ask your parents to help you sort, or to check your piles when you're finished.
2. Count the pieces of mail in each category and color in one square for each piece of mail. Do this every day for one week.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bills/Statements | | | | | | | | | | | | |
| Friendly Mail | | | | | | | | | | | | |
| Junk Mail | | | | | | | | | | | | |

3. Questions:
   - How many pieces of mail did your household receive altogether in one week?
   - What kind of mail does your household receive the most of in one week?
   - Do you think your data only represents your household, or do you think other households would show similar data? How could you find out?
4. Discuss your data results with your family. What does your household do with the junk mail no one wants? Is it recycled, or does it go to the landfill?

**Did you know?** If you are receiving a lot of unwanted junk mail there is something you can do! Ask your parents to help you do an internet search using these key words, "Unsubscribe from all junk mail." There are lots of websites that show your parents how to take your household's address off mailing lists.

# Exploration Journal Examples

**QUESTION 1:** What do bugs look and act like?

**DESCRIPTION OF EXPLORATION:**

Observe bugs on a nature walk. "My dad and I took a walk in the field behind my house."

**NOTES:**

- There is an anthill right behind my house.
  The ants are tiny, and it looks like there are thousands of them!
- The ants are making a trail from their hole to my house. Uh, oh!
- Near the anthill I can hear grasshoppers or crickets, but I cannot see them. What can I do to try to catch one?
- Underneath a rock I found a pill bug and an earthworm.
- When I tried to pick up the pill bug, it curled up into a ball. I wonder if he's scared of me?

---

**QUESTION 2:** What will float in water?

**DESCRIPTION OF EXPLORATION:**

I picked five different things to put in my bathtub. First, I guessed what would float and what would sink, and then I tested it.

**NOTES:**

**My Prediction:**

- Toy boat: yes
- Ice cube: yes
- Wash cloth: no
- Rock: no
- Toilet paper: no

**Test Results:**

- Toy boat: yes
- Ice cube: yes
- Wash cloth: floated until it got wet, then sank
- Rock: no
- Toilet paper: floated until it got wet, then sank

# SALTY EGGS

**MATERIALS:**

- 2 clear glasses
- Lukewarm water
- Salt
- Egg
- Teaspoon

Watch this experiment on our YouTube channel!
**CinLib.org/stemvideos**

**ACTIVITY:**

Make an egg float using salt.

**STEPS:**

1. Fill two glasses with water.
2. Drop the egg into one glass of water. Record/discuss what happens.
3. In the other cup, add 1 teaspoon of salt, stir, add the egg. Record/discuss what happens.
4. Take turns removing the egg, adding 1 teaspoon of salt, adding the egg until the egg floats at the top of the water.

**ENDING QUESTION:** How might this experiment change if you used a different sized glass?

**FUN FACT!**

An object sinks when its density is greater than that of the liquid. An object floats when its density is less than that of the water.

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# BINARY JEWELRY

## MATERIALS:

- Binary code
- 3 colors of beads
- Paper
- Pencil
- String

Watch this experiment on our YouTube channel!
**CinLib.org/stemvideos**

## ACTIVITY:

Write your names in binary code and use beads to make jewelry.

## STEPS:

1. Google "Binary Code Alphabet" and write each letter and its code on your paper (i.e., A = 01000001).
2. On a new piece of paper, write each letter of your name. Next to each letter of your name, write the correct code.
3. Assign one color of beads for 0, 1 and a space.
4. Using your sheet as a guide, thread the beads on the string for each letter in your name or just your initials according to binary code.
5. Wear your fashion proudly!

## ENDING QUESTION:

Why is binary code only 0s and 1s?

# MISSON SPACE LANDER

## MATERIALS:

- Index cards
- Marshmallows
- Paper
- Paper cups
- Tape
- Scissors

Watch this experiment on our YouTube channel!
**CinLib.org/stemvideos**

## DESIGN CHALLENGE

Design and build a shock-absorbing lander to protect two "aliens" (marshmallows) as they crash from 2 feet in the air.

## DESIGN ELEMENTS:

The space lander must have legs that both allow it to stand when dropped and also keeps the marshmallows contained.

## GUIDING QUESTIONS:

- How might you absorb the impact of the fall?
- What will your structure look like? You can research what the Mars Rover looks like as an inspiration.
- What part does weight distribution play in your design?

## LEARN MORE:

NASA Jet Propulsion Laboratory created a video to describe the challenges of landing the Curiosity Rover on Mars. Google it!

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# BLOCKO

## MATERIALS:

- Paper
- 12 building blocks per player
- Pencil
- 2 dice

Watch this experiment on our YouTube channel!
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## ACTIVITY:

Explore experimental probability.

## STEPS:

1. Using the paper, create a game board with 11 columns numbered 2 through 12.
2. Give each player 12 building blocks and place them on any number on the game board. (You can place more than one block on each number.) Roll two dice and announce the sum of the dice.
3. If there is a building block on that number on the game board, it is removed (only one at a time.)
4. Make a tally for each sum rolled.

The first player to remove all of their building blocks wins!

## ENDING QUESTION:

Using the tallies on the game board, what was the experimental probability of rolling each sum?

**HINT!** Experimental probability is the ratio of the number of times an event occurs to the number of trials the event was repeated.

# SWEET FRACTIONS, DECIMALS AND PERCENTAGES

## MATERIALS:

- 1 pack of candies
- Paper
- Colored pencils

Watch this experiment on our YouTube channel!
**CinLib.org/stemvideos**

## ACTIVITY:

Determine the fraction, decimal and percentages for each color of candy.

## STEPS:

1. Pour 20 candies out of the bag and separate by color, assign each family member a color.
2. On the paper, create a section for each color and label.
3. Starting with the first color and label.
4. Starting with the first color, count the number of candies and write a fraction.
5. Calculate the fraction as a decimal.
6. Turn the decimal into a percentage.
7. Calculate the number back into a fraction. Repeat steps 3-6 with each color.

## ENDING QUESTION:

What is a graph you could make using the data collected?

## TIPS!

**Fraction to decimal – Divide the numerator by the denominator**

**Decimal to percent – Move the decimal two places right**

**Percent to fraction – Put the percent over 100 and simplify**

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# EGG DROP

## MATERIALS:

- 1 Egg
- Sponges
- Straws
- Cardboard
- Cotton balls
- Tape

Watch this experiment on our YouTube channel!
**CinLib.org/stemvideos**

## DESIGN CHALLENGE:

Have each family member create a container that will keep a raw egg safe when it's dropped from a height.

## DESIGN ELEMENTS:

Keeping the egg safe means finding a way to pad its fall or slow it down enough so it won't crack. Many designs find ways to cover the egg so it doesn't make direct contact with the ground.

## GUIDING QUESTIONS:

1. What items could be used as padding?
2. How will you secure the egg while it falls?
3. How could you slow down the egg when it's falling?
4. How might height affect this experiment?

## CHALLENGE YOURSELF!

Do this activity again but with extra rules. (Examples: Use the least amount of materials, design in five minutes, etc.)

# PB&J PROGRAMMING

## MATERIALS:

- 2 slices of bread
- Peanut butter
- Blindfold
- Jelly
- Spatula

Watch this experiment on our YouTube channel!
**CinLib.org/stemvideos**

## ACTIVITY:

Explore how specific a computer programmer must be when programming a robot to do a task.

## STEPS:

1. Choose one person to be the "robot" and one to be the "programmer". The robot puts on the blindfold.
2. Robot starts with materials in front of them and spatula in hand.
3. Programmer verbally instructs the robot to make a PB&J sandwich.

## RULES:

The programmer cannot use the words "peanut butter, jelly, or bread." The robot must follow the directions exactly as said.

## FUN FACT!

The world's largest peanut butter and jelly sandwich weighed 1,342 pounds.

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# AN APPLE A DAY

## MATERIALS:

- 1 Apple (sliced)
- Baking soda
- Lemon juice
- Milk
- Vinegar
- 5 bowls

Watch this experiment on our YouTube channel!
**CinLib.org/stemvideos**

## ACTIVITY:

Is there a substance that keeps apples from browning?

## STEPS:

1. Slice the apple into equal pieces.
2. Place one apple slice in each bowl.
3. Cover the slice with one substance.
4. Let the apples soak for an hour.
5. Compare each apple in a substance to the "control" apple.

## ENDING QUESTION:

Oxygen reacts with an enzyme in the apple to brown it. How is this similar to when iron or steel rusts?

## FUN FACT!

Having a control in an experiment allows you to see how variables (elements that change) affect what you're testing. Try this experiment again but with new variables!

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# Your Exploration Journal

Your Question:

Description of Exploration:

Notes:

# Your Exploration Journal

Your Question:

Description of Exploration:

Notes:

# Your Exploration Journal

Your Question:

Description of Exploration:

Notes:

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Your Question:

Description of Exploration:

Notes:

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TriHealth

**Children who do not read over the summer can lose up three months of reading progress, and are more likely to return to school in the fall further behind their peers who do keep reading. Summer reading loss for many of our children can be avoided if we can simply keep them reading during the summer months.**

**Children are more likely to read when they are allowed to choose what interests them, and the staff at your Library branch can help find high-interest, age-appriate books in a variety of formats.**

**Don't let your child or children slide this summer – be sure to sign them up for a summer reading program at your Library!**

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