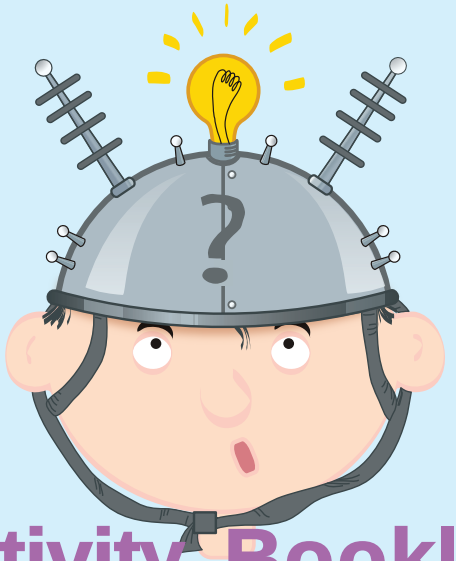
Have fun with

MATH & SCIENCE



Activity Booklet

FOR ELEMENTARY-AGE CHILDREN

A Note to Families:

Welcome to the Fun with Math & Science Activity Booklet.

We hope your children will use this guide to explore science at home and record their efforts with their Exploration Journal located at the back of the booklet. The goals of this activity booklet are:

- To provide a low-key, fun environment for children to retain and build the skills they need to succeed in school.
- To enjoy self-directed reading, learning, and exploring.
- To connect with library resources.
- To explore the world of math and science.
- To have fun (of course)!

Your library has many resources you can use to help build your child's math, science, and early literacy skills. The library has great online tools, programs, and information books to help you explore and learn with your child.

A special thanks to the Wilsonville Public Library in Wilsonville, Oregon for permission to adapt many of these activities for our booklet.

What is Fun with Math & Science and who can do it?

Fun with Math & Science is a tool to inspire children of all ages to learn more about science and the world.

HOW DO I DO FUN WITH MATH & SCIENCE ACTIVITIES?

1. Choose an exploration from this booklet, complete it, and record your results and observations in the provided spaces.
2. If you choose your own explorations, record your results and observations on the blank pages at the end of this booklet or in a science notebook you create.

What is a scientist?

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 or visit your local public library often!

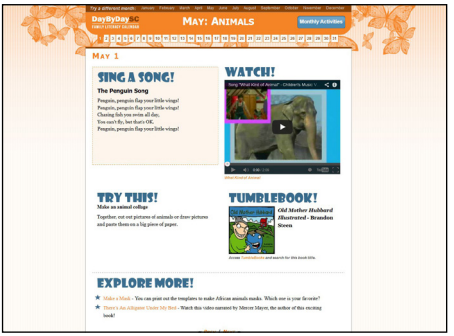
More Resources to Explore!

statelibrary.sc.gov/children-and-teens

- Great book lists
- Fun activities
- Interesting websites

DayByDaySC.org

- Great storytimes, e-books, games, puzzles and more. Check out the bottom of the page for STEM Resources



WHAT IF MY CHILD IS UNDER FIVE?

Playing and exploring are foundational scientific experiences for young children. You can adapt the activities in this booklet, or check out a special activity booklet for children under five available at the library.

WHAT IS STEM?

"STEM stands for "Science Technology Engineering Math." The acronym is used to refer to those areas of study which are encompassed by a wide range of sciences. The last decade has seen an increase in STEM education and programming 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:

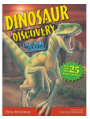
Think outside the box and create your own way of doing science. Be creative and have fun!

Great Collection of Non-fiction Books!

Explore Life Cycles!
by Kathleen M. Reilly

Food: 25 Amazing Projects: Investigate the History and Science of What We Eat
by Kathleen Reilly

Crazy Concoctions: A Mad Scientist's Guide to Messy Mixtures
by Jordan D. Brown



Dinosaur Discovery: Everything You Need to Become a Paleontologist
by Chris McGowan

Bug Science
by Karen Romano Young

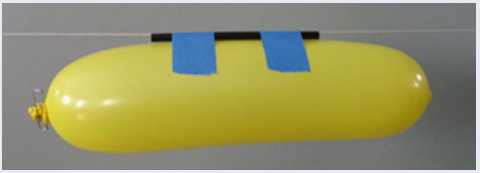
The Flying Machine Book: Build and Launch 35 Rockets, Gliders, Helicopters, Boomerangs, and More
by Bobby Mercer

Nature Science Experiments: What's Hopping in a Dust Bunny?
by Sudipta Bardhan-Quallen

Blast Off!

How does a rocket work? Make a balloon rocket to find out and see Newton's Law that for every action there is an opposite reaction. How far a distance can your rocket go?

PROCEDURE:



1. Thread a 10-15-foot length of kite string through a soda straw.
2. Tie the string onto two supports like a chair or a door knob so it is pulled tight.
3. Inflate a long balloon but don't tie it. Either pinch the end or secure with a paper clip. (A round balloon will work too.)
4. Tape the balloon to the top of the straw.
5. To launch the rocket, release your hold on the balloon.

What happened?

Test different balloon sizes or types, or cut different lengths of straws. See how far your rocket can go on the string.

Is a big balloon or a longer piece straw better or worse?

Big Bubbles!

What is the biggest bubble you can make? Trap air in a soap-and-water mixture to create some scientific bubbles.

PROCEDURE:

Stir together 1/4 cup Joy or Dawn detergent, 3/4 cup cold water, and 5 drops of corn syrup. Store this mixture in a clean container. Let it sit overnight. This will make stronger bubbles.

After dipping a wand into a flat pan of bubble mixture, blow air into the wand or wave it through the air.

Use a store-bought wand or make your own:

1. Make bubble wands from pipe cleaners. Bend a metal hanger and wrap the edge with string, taping the end. Try bending a circle, triangle, square or other shapes too.
2. Experiment with cookie cutters, slotted spoons, 6-pack soda rings, or a funnel.
3. Use two straws (that serve as handles) and string in a length at least four times that of one of the straws as a rectangular wand. Thread the string through the straws and tie in a knot.

Does the shape of the bubbles change with a different-shaped wand?

How big did your bubbles get?
How long did they last?

Stand Back!

How can a chemical reaction create a big explosion? Mix two common kitchen chemicals to find out. Make sure you do this experiment outside, as it can be messy!

PROCEDURE:

1. Make a little packet by wrapping 1 1/2 tablespoons of baking soda in a 6-inch square piece of paper towel. Measure the soda onto the paper towel and fold up the 4 sides of the towel tightly so the soda will stay inside. (It's like a little envelope.)
2. Mix 1/2 cup of white vinegar and 1/4 cup of warm water together, then pour this mixture into a sandwich bag that will seal tightly (like Ziploc). Partially zip the bag shut, but leave an opening that is big enough to put the packet you just made through.
3. Drop the soda packet into the sandwich bag through this opening, quickly but carefully. Immediately seal the rest of the bag closed. (Work very quickly!)
4. Standing outside in a clear area, shake the bag a bit. Put in on the ground and step way back.

Draw and explain what happens:

Note: When vinegar and baking soda combine, they produce the gas carbon dioxide.
Warning! Never combine chemicals without a grown-up's supervision.

Jumping Paper!

Can you make paper jump? Use static electricity to move paper without touching it. You will get a big charge out of this one!

PROCEDURE:

1. Cut up a piece of tissue paper, kleenex, or regular paper into very tiny pieces, like confetti size. (Try one type or all three types of paper at different times.)
2. Put the pieces of paper on a table top.
3. Rub a balloon across your dry hair many times. Negative electrons leave your hair and go to the surface of the balloon. Your hair is now more "positively" charged.
   Note: As you pull the balloon away, notice what happens to your hair.
4. Take your balloon and move it slowly close to, but not touching, the pieces of paper. About an inch away works well.

Describe what happens. Does anything change? Do you hear anything?

If you rub your hair longer with the balloon, can you increase the charge and the distance between the balloon and paper?

Magic Mud!

Can a liquid turn into a solid? Test how a temperature change turns a liquid into a solid by putting water into the freezer. Next, explore a different liquid called "magic mud." Warning: this exploration is big and messy but also fun and easy to clean up.

PROCEDURE:

1. Place 10 tablespoons of cornstarch in a bowl. Take time to feel the texture of the cornstarch with your fingers.
2. Add about 6 tablespoons of water and mix it in slowly until it becomes a thick batter. (You can use a spoon or your fingers. Less water is better than too much.)
3. Now explore the magic mud with different amounts of pressure.

- Gently dip your finger into the magic mud and then poke it.
- Pick some mud up and squeeze it together or roll it into a ball.
- Let it go.
- Drag a toothpick in it, slowly then fast.
- Pour it onto a piece of wax paper and smack it with the heel of your hand.

Describe what happens: What do you think, is magic mud a liquid or a solid?

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. Rub a pencil back forth on a separate piece of paper or index card to make a very dark spot.
2. Rub the flat end of your finger in the smudge, then gently press a clear piece of tape on your finger. Do this one finger at a time.
3. Peel the tape slowly off the finger and place the lifted print on the correct spot below.
4. Identify each print as arch A, whorl W, or loop L. This is your fingerprint signature.

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)

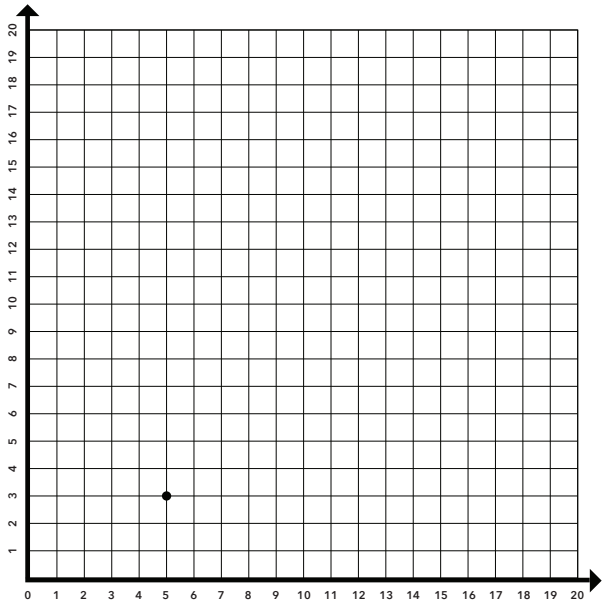
“X” Marks the Spot!

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 Back at
(5, 3)

Find & Sort!

Are you up for a big nature scavenger hunt?

PROCEDURE:

Collect the following items in a small bag. Remember to wash your hands after working with your collection, and keep everything out of your mouth.

1. 1 or more pieces of bark
2. 2 bird feathers
3. 3 or more little stones, different textures or colors
4. 4 tiny flowers or seeds
5. 3 sticks as big as your baby finger
6. 5 leaves (look for different shapes)

Some item that no one else will find.
(What about moss, clover, a pinecone, berry, nut, or mushroom?)

Now sort your items and ponder about what you collected.

How are the items alike and different?

Take a photo or sketch what you found here. Label or write notes about things you notice.

Use a field guide to figure out what types of rocks you found, and what organisms the leaves, flowers, sticks, feathers and bark came from. You can check one out from your library.

Watch It Grow, Roots and All!

How do plants grow in a greenhouse? Make a see-through greenhouse to watch a plant grow from a seed. When your plant gets big, plant it outside!

PROCEDURE:

1. Clean and dry a 2-liter clear soda bottle. Cut off the label.
2. Have an adult carefully cut the bottle in half.
3. On the lower half, poke a few holes in the bottom for drainage holes and fill the bottle with potting soil.
4. Plant seeds (herbs, beans, flowers, or seeds from fruit), cover with soil, and water them. Place the bottle on a plate.
5. Keep the cap on the top half of bottle. Tuck this half over the bottom half. Cutting slits on the top's edge helps it fit, or use tape to keep the bottle together.
6. Water sparingly, as condensation gets trapped in the greenhouse. If it gets too steamy, take off the cap for awhile.
7. Keep the greenhouse in a warm, sunny spot. Observe how your plant grows and write observations about what you see.

What happens first, next?

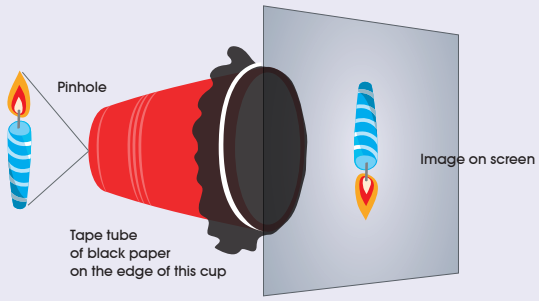
Take Another Look!

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.



Magic Balloon!

Can you blow up a balloon until it is big without using your mouth? Yeast is a type of fungus that, in the right conditions, creates a gas called carbon dioxide. Yeast is used to make bread.

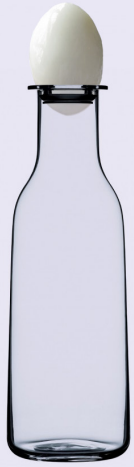
PROCEDURE:

1. Stretch the opening of the balloon and place a funnel inside.
2. Pour 1 tablespoon dry yeast (you can get at a grocery store) and 1 teaspoon of sugar into the balloon through the funnel.
3. Fill a measuring cup with 1 cup of warm water from the sink and carefully pour the water into the balloon.
4. Remove the funnel and tie a knot in the balloon to keep the water-and-yeast mixture inside.
5. Measure how big the balloon is with a ruler.
6. Place the balloon in a warm place and wait for awhile.

What is happening? Take another measurement to see.

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 5 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?

Night Nature Bingo!

What can you find at night outside? Go on a big bingo search to find bugs, birds, bats, stars and more.

PROCEDURE:

At dusk, during the night, or early at dawn, take a walk or sit on a blanket to observe how the day ends or begins around us.

On this bingo card, draw what you see or explain what you see or hear: See if you can get three in a row or fill out the whole card, each square being a new item.

Bird	Moon	Your Choice
Insect	Your Choice	Bat
Nature Sound	Constellation	Any Animal

Wave Bottle!

Do oil and vinegar (or water) mix? Make a wave bottle to find out, and then make some big waves.

PROCEDURE:

1. Clean and dry a bottle with smooth sides. It needs a lid that fits tightly. You may use a 1 liter soda bottle.
2. Fill the bottle 1/3 of the way with white vinegar (or you may use water). Add drops of blue food coloring.
3. Fill the rest of the bottle with a light-colored oil like canola oil, or use clear mineral or baby oil. Use a funnel so you don't spill any oil on the outside of the bottle.
4. Make sure to close the lid tightly. Use electrical tape to seal the cap.

Describe what happens when you rock the bottle back and forth to create waves.

Shake the bottle. Now what happens?

Creatures in the Dark!

What is a nocturnal animal? INVESTIGATE owls, bats, opossums or raccoons in a library book or online.

Things I learned:

Fact 1:

Fact 2:

Fact 3:

Books or online resources I used:

Run Run as Fast as You Can!

Can you scare pepper and make it run away? Water molecules hold tightly together to form surface tension, which supports the weight of some objects. Soap weakens surface tension.

PROCEDURE:

1. Fill a bowl with clean water.
2. Next sprinkle pepper on top of the water.
   Does the pepper float or sink?
3. Dip your clean finger into the pepper.
   What happens? (Draw it.)

4. Now put a drop of dish detergent or liquid soap on your finger, and dip your finger into the pepper. What happens now? (Draw it)

Design It, Build It!

How will you design a big tower that holds weight?

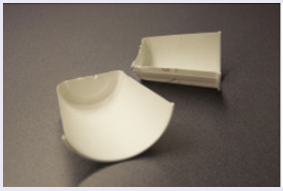
PROCEDURE:

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

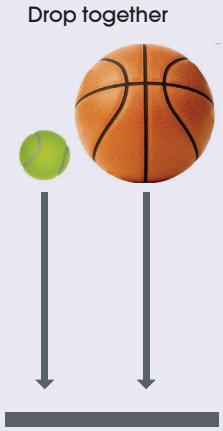
A lower number would mean they are faster at reacting to what they see. A high number is a slow reaction time. Do you notice any patterns?

Bounce It!

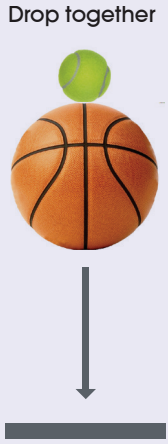
How big a bounce will a basketball and a tennis ball make together? Take advantage of how energy transfers from one item to another.

PROCEDURE:

1. You will need 2 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?**



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?**



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 ant-hill 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 ant-hill 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 5 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

Your Exploration Journal

Your Question:

Description of Exploration:

Notes:

Your Exploration Journal

Your Question:

Description of Exploration:

Notes:

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Description of Exploration:

Notes:

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Description of Exploration:

Notes:

Fizz, Boom, Read!

Children who do not read over the summer can lose up to three months of reading progress, and are more likely to return to school in the fall farther 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 local library can help find high-interest, age-appropriate books in a variety of formats.

Don't let your children slide this summer-- be sure to sign them up for a summer reading program at your library!

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