Intermediate Edition
Math+Science Connection
Building Understanding and Excitement for Children
September 2018

INFO BITS

How old am I?

Ask your child how old she is. The catch? You want her age in months, days, minutes, and seconds. She'll need to decide how to approach each problem and then solve it. She can use paper and pencil or a calculator. But watch out if she asks how many seconds old *you* are!

Science reading

When your youngster reads his science textbook, suggest this 3-2-1 strategy. Have him jot down 3 things he discovered, 2 things he found fascinating, and 1 question he still has. Looking for facts and questions will keep him focused on what he's reading—and help him learn more.

Book picks

If You Were a Quadrilateral (Molly Blaisdell) lets your child discover all the different things one shape can be.

Travel back to ancient China, and find out how a little boy used math and the science of buoyancy to weigh an elephant in *Cao Chong Weighs an Elephant* (Songju Ma Daemicke).

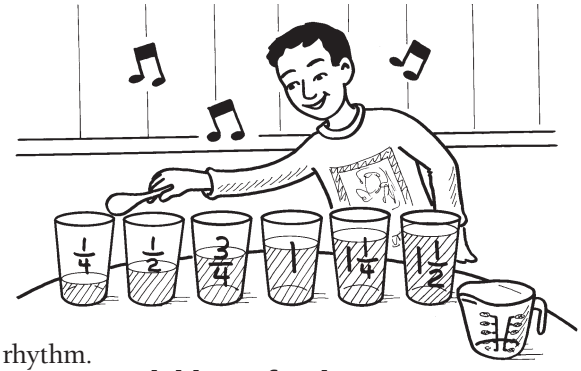
Just for fun

Q: What has 100 heads and 100 tails?

A: 100 pennies!

Playing with fractions

"We're halfway there." "I finished $\frac{3}{4}$ of my meal." "This recipe calls for $1\frac{2}{3}$ cups sugar." Hardly a day goes by that your youngster doesn't hear or use a fraction in everyday speech. Help him understand more about how fractions work with these ideas.



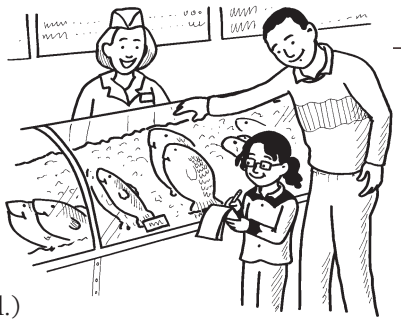
Make music

- Fractions are an expression of rhythm. Clap slowly, and tell your child to clap two, four, or eight times for every clap you make. He'll hear that each beat can be broken into fractions, and the fractions create the rhythm. For instance, each of his claps will take $\frac{1}{2}$, $\frac{1}{4}$, or $\frac{1}{8}$ the time of yours.
- Have him line up six identical glasses and measure water into each: $\frac{1}{4}$ cup, $\frac{1}{2}$ cup, $\frac{3}{4}$ cup, 1 cup, $1\frac{1}{4}$ cups, $1\frac{1}{2}$ cups. To play a song, he should strike each glass with a metal spoon. The pitch will change as he goes up the "scale"—showing the connection between fractions and music.

Divide up food

- Get two pretzel rods that are the same length. Ask your youngster to break one into 4 equal parts and the other into 8 equal parts. Then, he can line up pieces to find *equivalencies*. For example, he'll see that $\frac{2}{8} = \frac{1}{4}$ or that $\frac{4}{8} = \frac{1}{2}$.
- Let your child serve pizza and say the math as he gives each person 1 slice ($\frac{1}{8}$) or 2 slices ($\frac{1}{8} + \frac{1}{8} = \frac{1}{4}$ of the pizza). Or cut an apple into eighths. He could use the wedges to add fractions and write down the equation he makes (*example:* $\frac{1}{2} + \frac{1}{8} = \frac{5}{8}$). Or he might eat 4 apple wedges and say the fraction that's left ($\frac{1}{2}$).

Fish detective



Did you know that buying fish for dinner can help your child learn more about animal life? When you're in the grocery store or fish market, have her look carefully at the whole fish displayed and consider these three questions.

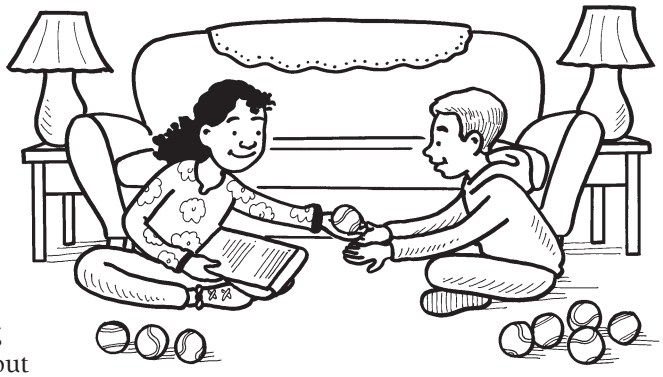
1. Who are the fastest swimmers? (*Hint:* Pay attention to the shape of the body, fins, and tail.)

2. Which ones eat plants? Which ones eat other fish? (*Hint:* Notice the size and shape of the mouth and teeth.)

3. How can they hide from predators? (*Hint:* Think about how their colors help them blend in with their ocean surroundings.)

Idea: Your youngster can confirm her findings with the fishmonger or by making sketches, taking notes, and consulting books or websites later.

Word problem strategies



Drawing, acting, and writing are all hands-on ways for your youngster to approach word problems. Let her try these activities.

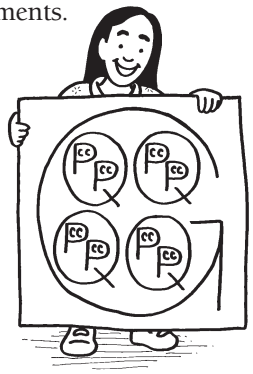
Draw a picture. Encourage your child to sketch the problem. Deciding how to illustrate it will help her pull out the important details and visualize what she has to solve.

Act it out. It's fun for kids to put on shows. Have your youngster enlist a friend or sibling (or you!) and act out word problems. She can count out the objects mentioned, perform the task in the word problem, and see the answer that results.

Create a story. Ask your child to rewrite the problem in her own words. Or she could create her own word problems that are similar to ones she's working on. Suggest that she use ideas from her daily life or make up scenarios. When she realizes she can write story problems as well as solve them, she'll feel she has "power" over word problems.

MATH CORNER What's in a gallon?

How many quarts are in a gallon? How many cups are in a pint? Here's a fun way to help your youngster remember the relationships among liquid measurements.



On a poster board, have her draw a large outline of the letter G for gallon. Inside the G, she should write four Qs to show that four quarts are in a gallon. She can put two Ps (two pints to a quart) inside each Q and two Cs (two cups to a pint) inside each P.

Next, have her use her "Big G" to figure out math problems. *Example:* The recipe calls for 4 cups of milk. How many pints should we buy? (2) Let your child make up questions for you, too.

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Q & A Help with homework

Q: *Our son's math homework is getting harder for him this year. Should we help him with it?*

A: You play an important supporting role in your youngster's homework. But remember it's *his* homework—and he'll learn the most by doing it himself. Also, when he turns in his own work, his teacher will be able to see what he knows and where he needs help.

If your child gets stuck on a math problem, you can guide him. For example, suggest that he look at sample problems in his textbook or classroom notes. Or ask him to read the directions out loud, and see if there are words he doesn't understand. You could also have him explain the method he's trying to use—teaching it to you might clear up his confusion.

Finally, if he's still unsure, encourage him to call the school's homework hotline or go to his teacher for help.

SCIENCE LAB Conserving water

The average person uses about 20 gallons of water to shower. Have your child multiply that by the number of people in your home—that's a lot of water! With this experiment, your youngster can see how engineers design products to save resources.

You'll need: 2 paper cups, pencil, straight pin, water, sink

Here's how: Let your child use a pencil to poke a few large holes in the bottom of one paper cup and a straight pin to make lots of small holes in the bottom of the second cup. Then, he should fill a sink with water, hold a paper cup in each hand, and lower the cups straight down until they're underwater. Once they fill with water, have him lift them out at the same time and watch carefully as they drain.

What happens? The water will drain faster out of the cup with larger holes.

Why? Smaller holes slow down the flow of the water. So a showerhead with smaller holes will use less water—conserving water *and* saving your family money!

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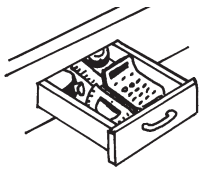
Our math drawer

Let your youngster stock a drawer in your kitchen with math tools. He might include a ruler, tape measure, timer, protractor, calculator, and measuring cups and spoons. Then, ask him to do real-life tasks like measuring the width of your refrigerator space or timing hard-boiled eggs.



Earth's neighbors

Jupiter is about 11 times bigger in diameter than Earth! Encourage your child to make play dough models of planets to scale. If Earth's diameter is 1 inch, what is Jupiter's? (11 inches) Help her look up other planets online and create models of them. *Idea:* She might use food instead. If Mars is a pea, Earth could be a blueberry (about twice as big in diameter).

Web picks

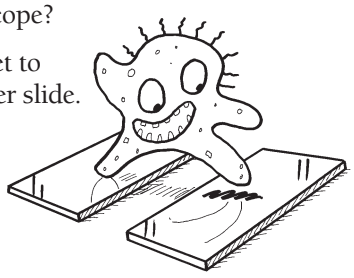
At *counton.org*, your youngster can play games in many areas of math, including fractions and geometry.

Open the world of coding to your child at *crunchzilla.com/code-monster*. A cute monster will teach him programming basics as he draws simple boxes.

Just for fun

Q: Why did the germ cross the microscope?

A: To get to the other slide.



Playful multiplication practice

Learning multiplication facts is fun with these games your child can play with friends or family.

Claim the product

On separate index cards, have your youngster write answers (products) for the 3s multiplication facts starting with 6 (3 x 2 = 6), and so on up to 36 (3 x 12 = 36). Lay the cards faceup.

To play, roll two dice. Add the numbers, and multiply their sum by 3. (*Example:* Roll 2 and 5, add 2 + 5 = 7, and multiply 7 x 3 = 21.) Take the card showing that product (21). If the card has already been taken, your turn ends, and the next player rolls. When all the cards are claimed, the player with the most cards wins. Play again with other sets of facts like 4s or 7s.

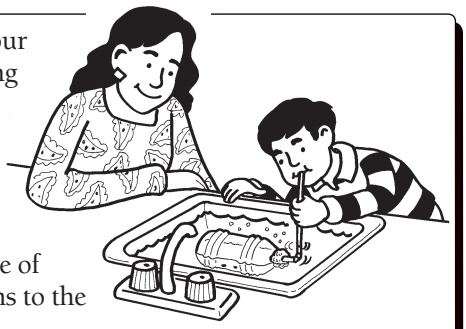
Multiplication "Whammy!"

Help your child write 30 multiplication problems (5 x 7, 4 x 9) on the ends of separate craft sticks. Then write "Whammy!" on 6 craft stick ends. Put the sticks in a cup with the printed ends down.

Take turns choosing a stick and giving the answer. If you're correct, keep the stick. If not, put it back in the cup. Draw a "Whammy!" and you'll have to return 2 of your sticks to the cup. The first player to collect 10 sticks wins.

Build a submarine

How can a submarine sink *and* float? Your youngster will discover *buoyancy* by making his own sub.



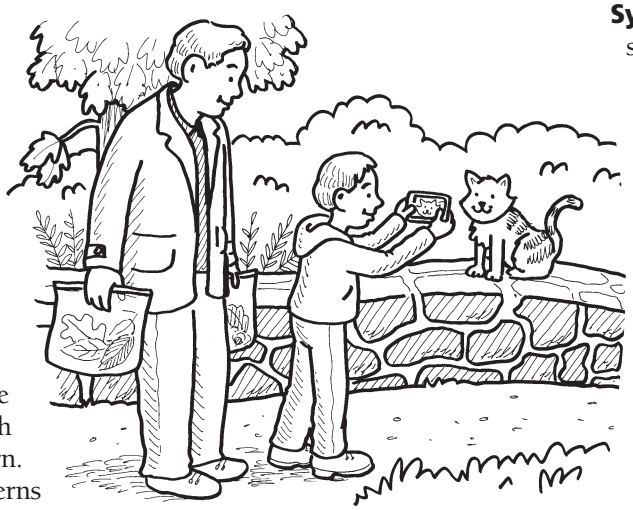
First, your child can put one end of a straw into an empty water bottle. He should seal the top with clay to hold the straw in place. Next, use a knife to cut a row of three dime-sized holes along one side of the bottle. Have him tape three stacked coins to the bottle on either end of the row of holes.

Now let him put his sub in water. As water displaces the air in the bottle, the sub sinks. But if he blows into the straw, air displaces the water—creating buoyancy—and the sub rises! This is how real submarines work: Air is pumped in to raise them to the surface.

Outdoor patterns and symmetry

From zebras to sunflowers, nature is full of patterns and symmetry. Your child can look for examples with these ideas.

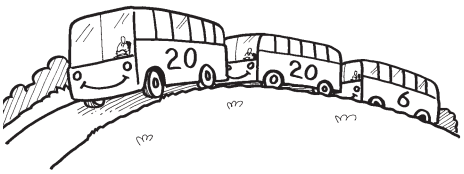
Patterns. Together, go on a pattern hunt outside. Your youngster could spot a striped cat. Or he might notice flowers that have the same number of petals in the middle, with more and more petals in each layer moving outward—it's a spiral pattern. Have him draw or take photos of the patterns he spots.



Symmetry. Leaves, butterflies, spiderwebs, and fruits can all be examples of symmetry in nature. To find leaves that are symmetrical (each half is a mirror image of the other), your child could make rubbings with ones from the ground. He should tape each leaf to a table, cover with white paper, and gently rub with the side of an unwrapped crayon. By folding the rubbing in half, he will see if it's symmetrical. And the place where he folded it in half is the *line of symmetry*.

PARENT TO PARENT Units matter

My daughter Virginia was losing points on math assignments because she wasn't labeling her answers with "units." In one problem, she was asked how many buses 46 students would need if 20 students could fit on each bus. Her answer was 3, and the teacher wrote "3 what?" on her paper.



When I asked Virginia what her response would be, she said 3 students. I asked, "You mean 3 students are going to carry all the other students on their backs?" She laughed and realized her mistake. She decided to draw 3 buses (the real answer) and mark where the 46 students would fit—20 on the first bus, 20 on the second bus, and 6 on the third bus.

Now Virginia shows me her story problems and explains them to me, especially the units in her answer. She double-checks to make sure she wrote "5 cars" and not "5 monkeys," and we have a good laugh.

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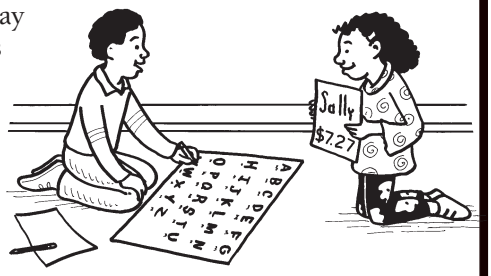
MATH CORNER How much is your name worth?



Your youngster will love this "rich" way to practice counting money. All he needs is paper and a pencil.

To set up the activity, ask your youngster to write the letters A–Z in rows across a sheet of paper, leaving space between each row. Next, he can write a random value under each letter. The letter A might be 53 cents, B $2.43, C $1.00, D $4.24, E 42 cents, and so on.

Then, challenge him to total up what his name is "worth." For instance, *Abe* would add the values for A, B, and E and get $3.38 (53 cents + $2.43 + 42 cents = $3.38).

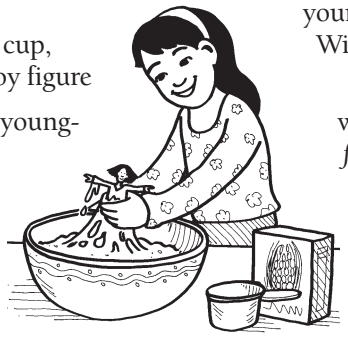
What are other family members' names worth? Who has the most "expensive" name?

SCIENCE LAB Quick! It's quicksand

It turns out that moving "quickly" is *not* the thing to do in quicksand. Your child can see why in this experiment that lets her explore properties of matter.

You'll need: measuring cup, cornstarch, bowl, water, toy figure

Here's how: Have your youngster measure 2 cups cornstarch into the bowl and gradually add 1 cup water, mixing with her hands. Now she should put the toy figure into the "quicksand" and try to "rescue" it, first by wiggling it and then by lifting it up slowly and gently.



What happens? The figure escapes more easily when your youngster removes it gently. Wiggling leaves it stuck.

Why? Cornstarch and water form a *non-Newtonian fluid*, much like quicksand, meaning it can demonstrate properties of both a solid and a liquid. When a force is applied, it's solid, while gentle or no force makes it liquid.

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Fractions everywhere

Your youngster might be familiar with using fractions when she divides up an apple or a pizza, but a fraction can represent part of a group, too. Challenge her to find this kind of fraction using household objects like socks or crayons. If she has 10 pairs of socks, and 3 pairs have polka dots, she could say that $\frac{3}{10}$ of her socks are polka-dotted.

Science comic strips

Drawing can help your child visualize science concepts. Suggest that he create comic strips about science topics he studies, such as plant growth or moon phases. The panels of a comic strip on plants might include a character planting carrot seeds, watering them with a hose—and munching on a freshly picked carrot!

Book picks

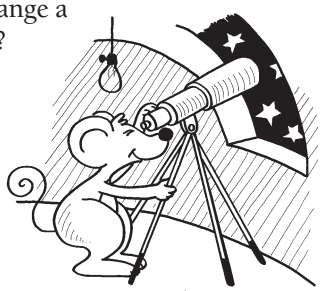
With cute rhymes, *The Best of Times* (Greg Tang) offers clever strategies for learning each set of multiplication facts.

How does a bionic leg work? Is there a flying car in your child's future? She'll learn about these and other inventions in *Super Cool Tech* (DK).

Just for fun

Q: How many astronomers does it take to change a light bulb?

A: Zero! Astronomers like it dark.



It's an algebra "mystery"

When 3 + 7 = ___ becomes 3 + x = 10, it's now an algebra problem! Encourage your youngster to put on his detective hat and solve the mystery of x with these ideas.

Hidden treasure

Get 20 small "treasures," such as jacks or game tokens. While your child closes his eyes, put some of the items (perhaps 14) into a brown paper bag. Have him open his eyes, count the remaining treasures (6), and make up an equation to figure out how many are still in the bag (6 + x = 20, so x = 14). Dump out the bag, and let him count to check his answer.

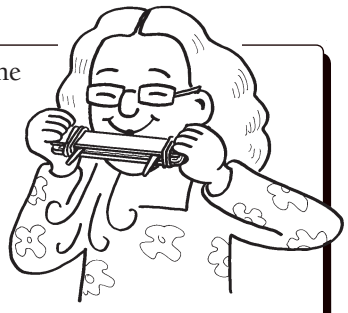
Mysterious stories

Make up algebra stories for each other. *Example:* "Jack was an unusual cat. He had 18 lives, which was 2 times as many as his dad, Mack, had. How many lives did Mack have?" Your youngster should use x for Mack's lives and write the equation (2 x x = 18). Since x = 9, Mack had 9 lives.

Secret equations

Ask your child to number separate slips of paper 0–12. Take turns picking two slips and writing an equation (addition, subtraction, multiplication, or division) involving those numbers. (*Example:* Draw 3 and 5, and write 15 ÷ x = 3.) Return the slips. After four rounds, trade papers, figure out what x equals in each of the 4 equations, and add up the 4 numbers. The player with the highest total wins.

Make your own harmonica



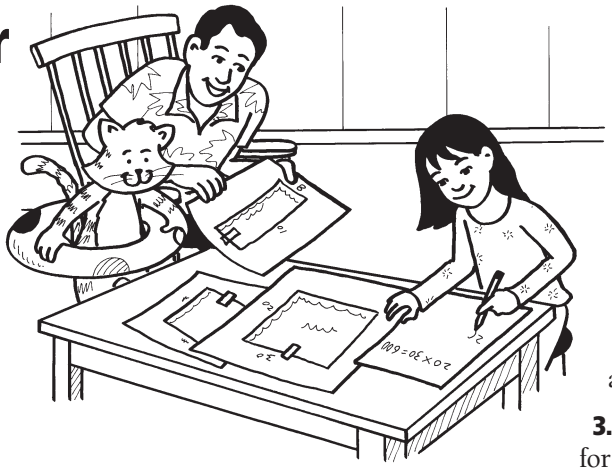
Your child will see how vibrations cause sound as she plays music on this homemade harmonica.

Have your youngster cut a strip of paper the length of a craft stick but slightly narrower. Help her make a "sandwich" by placing the paper between two craft sticks and secure the ends with rubber bands.

Now break a toothpick in half, and slide in one half between the sticks next to each rubber band.

Let your youngster blow in and out on the middle of her harmonica. The air she blows causes the paper strip to vibrate. It bumps into the craft sticks, making musical sounds!

Area and perimeter



What's the difference between *area* and *perimeter*? Area is the amount of space inside a shape, and perimeter is the distance around it. This activity will help your youngster "dive in" and practice calculating both.

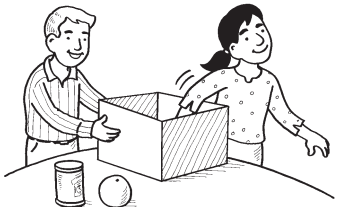
1. Imagine you're each designing a rectangular swimming pool. Take turns saying the length and width for your pool, and have your child predict whose will be longer and whose will be wider.

2. She can draw each pool and label it with its measurements. Then, she should find the area (multiply length times width) and the perimeter (add the lengths of all the sides). For instance, an 8-ft. by 10-ft. pool will have an area of 80 square feet (8 x 10 = 80) and a perimeter of 36 feet (8 + 8 + 10 + 10 = 36). But a 4-ft. by 5-ft. pool would have an area of 20 square feet (4 x 5 = 20) and a perimeter of 18 feet (4 + 4 + 5 + 5 = 18)—it's shorter and wider.

3. Now pick new measurements for your pools. With practice, your youngster will get better at calculating area and perimeter—and her predictions should get more accurate, too.

MATH CORNER Look, Ma, it's 3-D!

Solid shapes, or 3-D objects, have attributes just like their flat 2-D "cousins" do. Play this game with your youngster to help her identify attributes of 3-D shapes.



Secretly pick a 3-D object, like an orange (sphere), a soup can (cylinder), or a party hat (cone). Put the item in a box, and let your child reach in and examine it without looking.

Have her tell you about the object, such as that it has 1 face (flat surface) and 1 curved surface. Now she should name the shape (cone) and guess the object (party hat).

Then it's her turn to select an item for you. She might choose a die (cube) or a remote control (rectangular prism). Keep picking objects for each other to describe and identify—soon, she'll be comfortable using math vocabulary for 3-D shapes.

Q & A Need for speed?

Q: *When I was in school, our math tests were always timed. But now, my son says, there's no time limit on some of his math tests. Doesn't he need to solve math problems quickly?*

A: Your child's teacher knows it's important for students to think about the strategies they are using to solve problems, rather than just memorize facts and formulas. She uses tests to find out what students know, and if they're in a hurry, they may make mistakes—even though they know how to do the math.

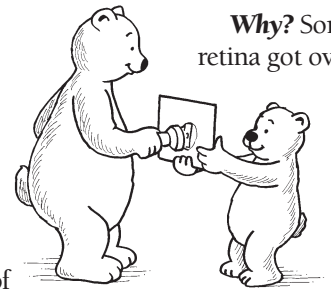
Your son does need to recall basic facts and choose problem-solving strategies efficiently. This is especially helpful as he moves on to longer and more complex problems. But there's no need for him to rush through his work. Taking an untimed test or having plenty of time to do math homework lets him try different strategies, show his work as he solves problems, and double-check his answers.

SCIENCE LAB I see an *afterimage*

Has your child ever seen a dark spot after looking at a bright light? This is called an *afterimage*—your youngster can learn what causes it with the following demonstration.

You'll need: scissors, cardboard square (6 inches or larger), transparent tape, flashlight

Here's how: Cut a dime-sized hole in the center of the cardboard. Have your child cover the hole with three layers of tape. In a dark room, your youngster should hold the cardboard straight out in front of him while you shine the flashlight through the hole (toward him). Tell him to stare at the tape-covered hole for 30 seconds and then look away at a blank wall.



What happens? He'll see an afterimage the same shape as the hole in the cardboard.

Why? Some cells in your youngster's retina got overstimulated and became less sensitive to the light. When your youngster looked at the blank wall, those cells saw the dark shape (the afterimage), and the rest of the cells in his retina saw the wall normally.

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