Amazing Math Games V

Estimate and count popcorn, determine the secret rule, become champion of the "factor factory"… these games are sure to build your youngster's math skills. And they're so much fun that he'll want to play them again and again!

Multiplication bump

Bump your opponent's tokens to claim the most squares. As you play, your child will practice multiplication.

You'll need: *paper, pencil, a different set of 10 tokens for each player (buttons, plastic chips), 2 dice*

1. Your youngster can create a game board by drawing a grid with 3 rows and 6 columns. He should write these numbers randomly in the 18 squares: 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 16, 18, 20, 24, 25, 30, and 36.

2. On each turn, roll the dice and multiply the numbers rolled (for example, 3 x 2 = 6). Locate the product (6) on the board, and put a token on it.

3. If another player is on your spot, bump his token and replace it with one of your own. But if you already have a token on the square, add a second one. Now your tokens are safe and can't be bumped off. (If 2 tokens are already on the square, your turn ends.)

4. Play until someone has placed all 10 of his tokens on the board—he's the winner.

Popcorn estimation

Give your youngster's estimation skills a boost with this challenge.

You'll need: *large bowl of popcorn, small containers in different shapes and sizes (coffee mug, teacup, ramekin), small bowl for each player, paper and pencil*

1. Have each person select a container and think about how many pieces of popcorn will fit inside. *Hint:* Suggest that your child put a layer in the bottom and count the pieces (say, 5). She could estimate the number of layers that would fit (6), and multiply (5 x 6 = 30).

2. Announce your estimates.

3. Now fill your containers with popcorn. Your score is the difference between your estimate and the actual number. (So if 42 pieces fit in your youngster's container, she gets 12 points, since 42 – 30 = 12.)

4. Dump the popcorn into your bowls. The person with the lowest score wins — and everyone gets to eat their bowl of popcorn!

Division roll

Here's a simple dice game that lets your child work on division.

You'll need: *6 dice, paper, pencil*

1. Roll all 6 dice at once, and add the numbers together. *Example:* Roll 3, 1, 5, 3, 2, and 4 for a total of 18.

2. Then, roll 1 die, and divide your total by that number. So if you roll a 3, you score 6 (18 ÷ 3 = 6). *Note:* If the total doesn't divide evenly, use fractions (19 ÷ 3 = $6\frac{1}{3}$).

3. Take turns rolling and dividing. After 5 rounds, the player with the highest score wins.

continued

The greatest fraction

Correctly determine the bigger fraction in this competition.

You'll need: *4 paper plates, scissors, marker, 13 index cards*

1. Have your youngster fold 1 paper plate in half, cut along the line to create equal halves, and label each piece $\frac{1}{2}$. She should fold and cut another plate into fourths (labeled $\frac{1}{4}$), and another into eighths (labeled $\frac{1}{8}$). Help her cut the last plate carefully into thirds (labeled $\frac{1}{3}$).

2. Next, let her write these fractions on separate index cards: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, $\frac{1}{8}$, $\frac{2}{8}$, $\frac{3}{8}$, $\frac{4}{8}$, $\frac{5}{8}$, $\frac{6}{8}$, and $\frac{7}{8}$. Shuffle the cards, and stack them facedown.

3. The first player draws 2 cards (say $\frac{2}{3}$ and $\frac{1}{2}$) and states which fraction she thinks is greater or whether they're equivalent (equal).

4. Using the paper plate fraction pieces, she checks her answer. In this case, she'd lay two $\frac{1}{3}$ pieces next to each other ($\frac{2}{3}$), then lay one $\frac{1}{2}$ piece on top of them. This will show that $\frac{2}{3}$ is larger than $\frac{1}{2}$.

5. If she's right, she keeps the fraction cards. If not, she places them at the bottom of the stack.

6. When all the cards have been drawn, the person with the most cards is the winner.

What's your (number line) rule?

Be the first to spot the pattern and name the rule.

You'll need: *sidewalk chalk*

1. Draw a number line on a sidewalk or playground blacktop, with the numbers 0–50 evenly spaced.

2. Let your youngster secretly think of a math "rule" (say, "start at 1, and multiply by 2" or "begin at 15, and add 6").

3. Now he follows his rule repeatedly to create a pattern on the number line until someone figures it out. He should draw curved arrows to connect the numbers in the pattern, starting at 1. If his rule is "multiply by 2," the arrows would go from 1 to 2 (because 1 x 2 = 2), from 2 to 4 (since 2 x 2 = 4), and so on.

4. The first player to call out the rule that created the number pattern scores a point. Then, he erases the arrows and illustrates a new rule.

5. Earn 5 points to win.

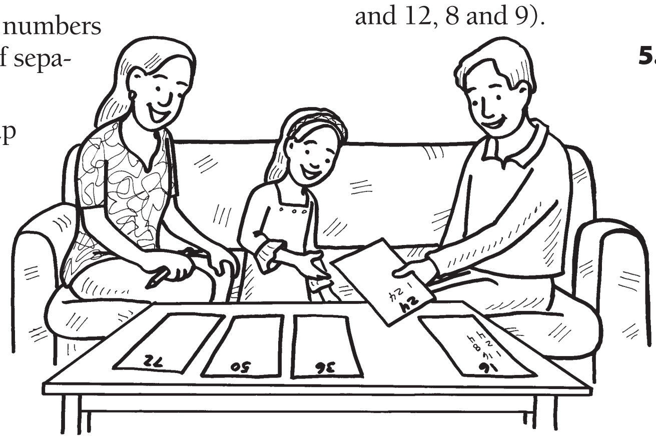
Factor factory

In this "factory," your child will need to find factors of a number, or numbers that equal it when multiplied.

You'll need: *paper, pencil*

1. Ask your youngster to write the numbers 16, 24, 36, 50, and 72 at the tops of separate sheets of paper.

2. Place the numbered sheets faceup for everyone to see. Your child picks any sheet and writes 2 of the number's factors underneath, starting with 1 and the number. For 72, she would write 1 and 72, because 1 x 72 = 72. Then, she hands the paper to the next person.



3. That player writes the next set of factors (2 and 36, since 2 x 36 = 72) and passes the paper on.

4. Continue until all factors are listed (3 and 24, 4 and 18, 6 and 12, 8 and 9).

5. The player who wrote the last factors keeps the paper. She takes a new numbered sheet and starts another round.

6. Play until all the numbers have been factored. The person who collects the most papers is the winner.

7. Choose new numbers between 1 and 100, and play again.

Resources for Educators, a division of CCH Incorporated ■ 128 N. Royal Avenue, Front Royal, VA 22630 ■ 800-394-5052

MI18xx554E

Engineer That!

One day, your child may have a job that doesn't even exist yet! She'll need creativity, problem-solving skills, and persistence—qualities that engineers rely on. Share these projects to help your youngster think like an engineer and enjoy taking on challenges.

Build a stronger bridge

Let your child construct a bridge to explore what kind of design supports the most weight.

Materials: *books or internet access, craft sticks, glue or clear tape, soup cans*

Together, look at photos of bridges in books or online. Talk about design elements, such as arches, vertical beams, or triangular supports. This will give your youngster clues on different ways to build her bridge.

Using craft sticks and glue, can she design a bridge that will support one or more cans? To test her bridge, she should rest it atop two stacks of books and add cans, one at a time.

Suggest that your child redesign her bridge so it holds more cans. For instance, a series of connected triangles (called a *truss*) is one design element engineers use to make strong bridges.

Don't stop spinning!

Generations of children have played with spinning tops. No need for your youngster to buy a top to see how its motion keeps it balanced—he can create his own.

Materials: *old CDs, bottle caps, tape, marble, timer, pennies*

Have your child tape a bottle cap over the hole in a CD. He should place a marble on the table and carefully set the CD over it so the marble fits into the hole. To spin the top, he'll need to grasp the bottle cap, twist quickly, and let go. Help him time how long it stays in motion before any part of the disc touches the table.

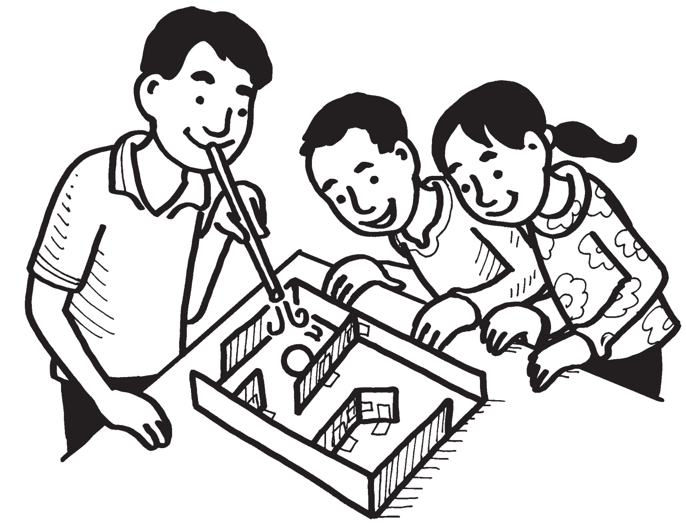
Now suggest that he tape a penny to the top of the bottle cap, then spin and time the top again. He should stack and tape additional pennies, one at a time, testing and timing the top after adding each coin. What happens? The more pennies he adds, the longer the top spins. That's because a heavier disc stores more energy, which keeps it going longer.

Engineering step by step

How do engineers design rockets that launch into orbit or running shoes that help athletes run faster? Here's a framework your youngster can use to tackle engineering projects.

- **Define the challenge.** Maybe you'd like to play pinball, but you don't have a machine, so you decide to make one.
- **Research.** What designs already exist that you can draw from? You might examine a real pinball machine or look at photos to see what parts they include (ball launcher, tube, obstacles, flippers).
- **Design.** Create a model. Sketch out possibilities, gather materials, and experiment.
- **Test.** Does your design work? Put the model through its paces. Do the flippers move? Does the ball bounce off of obstacles?
- **Redesign and retest.** Use what you learned from your test to improve your model, and test it again. The flippers may need to be longer or sturdier, for instance.
- **Repeat.** Continue to design and test new models until you find the one that lets you play a game of pinball.

continued



Design a maze

Can your child build a maze and blow a Ping-Pong ball all the way through it?

Materials: *empty cereal box, scissors, masking tape or duct tape, straw, Ping-Pong ball or another lightweight ball*

Help your youngster lay the box flat and cut off the front panel, setting it aside. The rest of the box (back and side panels) is the base for his maze. He can cut out two doors to create an entrance and exit. Then, have him make walls to tape onto the base by cutting the front panel into different-sized strips.

Encourage him to create twists and turns, adding ways for the ball to get around corners. He might tape cardboard squares to corners for the ball to bounce off of.

Your child can test his maze by placing the ball at the entrance and blowing air through the straw to make the ball move. Does it get stuck? Time for a redesign!

Create a toy swing set

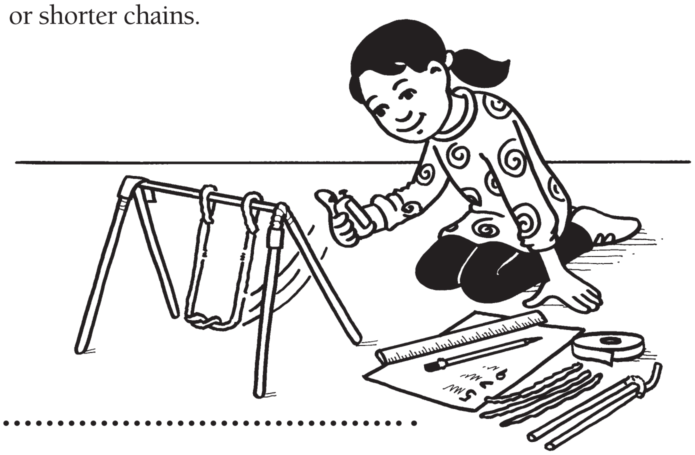
This homemade swing set shows your youngster how pendulums work.

Materials: *flexible straws, scissors, tape, pipe cleaners, timer, ruler, paper, pencil*

Suggest that she tape together straws (or straw pieces) to form a swing set frame. She can wrap the ends of 2 pipe cleaners around the top of the frame to make "chains" for the swings, then bend and connect their bottom ends to create a "seat."

The swing is a *pendulum*—a suspended weight that swings freely. Have your child hold onto the frame with one hand and, with the other, pull the swing back and up so it's parallel to the ground. Start a timer for her as she lets go of the swing. She can count how many swings (back and forth) the pendulum completes in 30 seconds. She should measure the chains and record their length and the number of swings. To redesign, she can make the pendulum shorter by wrapping the pipe cleaners around the top of the swing set a second time. Again, she could measure the chains and test the swing.

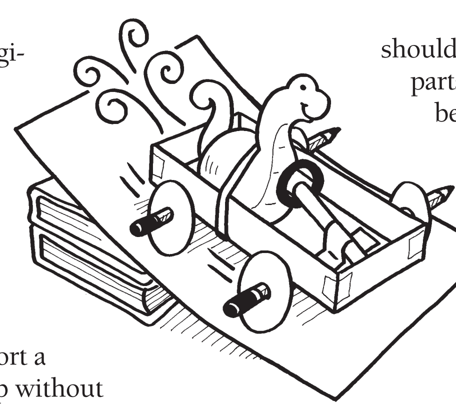
How does length affect the pendulum's speed? The next time your youngster is at the playground, she can use what she discovered to decide whether she'd prefer a swing with longer or shorter chains.



Buckle up

Designing a vehicle is a fun way to engineer for safety—and to show your child why he should always wear a seat belt.

Materials: *piece of cardboard, books, index cards, scissors, tape, pencils, rubber bands, lightweight plastic toy*



Have your youngster prop the cardboard at an angle against a stack of books to make a ramp. Then, challenge him to construct a vehicle that will support a toy passenger and carry it down the ramp without ejecting it. He can tape index cards together to make the bottom and sides of the car. Suggest that he cut circles out of more index cards to create wheels and use pencils as axles. He should think carefully about how he'll connect the parts of the car together and how he'll attach a rubber band seat belt.

Let your child conduct a vehicle safety test by rolling the car down the ramp. Does his passenger stay in place? If not, he should redesign so that the seat belt restrains the toy.

What's the science behind a seat belt? Newton's first law of motion states that an object in motion stays in motion, and an object at rest stays at rest, unless an outside force acts upon it. So a passenger would keep moving when the car stops—unless a force (a seat belt) prevents it.

Resources for Educators, a division of CCH Incorporated ■ 128 N. Royal Avenue, Front Royal, VA 22630 ■ 800-394-5052

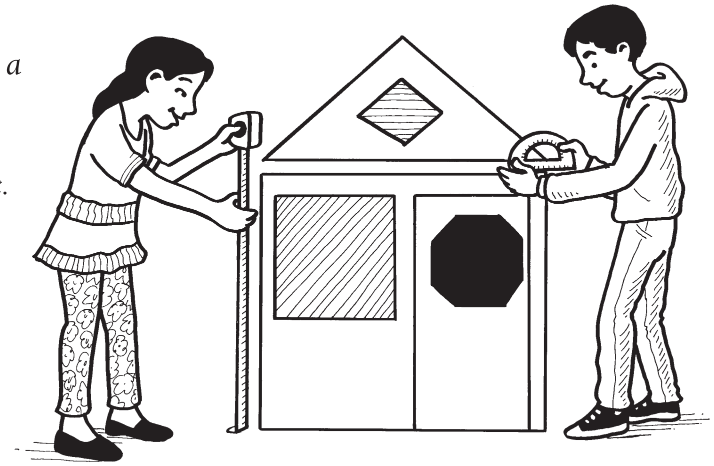
MI18xx555E

Oak Ridge School

Ms. Trish Hill, Principal

Geometry Around the House

Geometry is everywhere! Just ask your youngster to take a look around any part of your home. She's sure to spot cubes, obtuse angles, perpendicular lines, and more. The following activities will help her explore the geometry in everyday life.



House tour

Let your child pretend she's a real estate agent or a TV host. She'll practice measuring perimeter and area—then take your family on a "math tour" of your home. Ahead of time, she'll need to measure each room so she can announce how big it is.

First, help your youngster use a tape measure or a yardstick to measure each wall. She should write the measurements on a sheet of paper and add them together—that's the room's perimeter. So a room with 2 8-ft. walls and 2 10-ft. walls has

a perimeter of 36 feet (8 + 8 + 10 + 10 = 36). Then, she can multiply the room's length (8 feet) by its width (10 feet) to find the area (8 x 10 = 80 square feet).

Now go outside, ring the doorbell, and have your child invite you into the home. Her job is to lead you through each room, describing it and telling you its size. "This bedroom is 64 square feet with a window overlooking trees—just right for your little girl!"

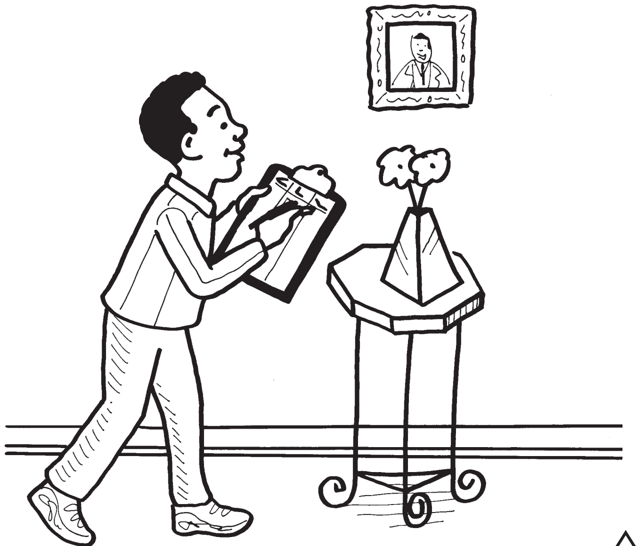
Shape museum

Encourage your youngster to gather objects of different shapes from around the house. He'll use geometry vocabulary like *vertices* and *cone* as he displays the items in his very own "shape museum."

Together, list all the flat (2-D) and solid (3-D) shapes you can think of, such as circle, octagon, pyramid, and cone. Your child's goal is to find objects representing each shape on the list. He might locate a tennis ball (sphere), a Rubik's Cube (cube), an envelope (rectangle), and a soup can (cylinder). If he wants to include an object he can't pick up (say, a light fixture that's a hexagon), he could snap a photo.

To create his museum, he can arrange the shapes on a table and make an index card "plaque" for each one. Each plaque should identify the shape and tell how many corners (vertices) and sides a 2-D object has, or how many vertices, edges, and faces a 3-D object has. A plaque for a soup can would say, "This is a cylinder. It has 3 faces, 2 edges, and 0 vertices."

continued



Angles at every corner

With this idea, your family will discover acute, right, and obtuse angles in your home.

Have each person divide a sheet of paper into 3 columns—each labeled with a different type of angle: < (acute), ∟ (right), and ⦦ (obtuse). Set a timer for 5 minutes. Walk around the house, and draw objects that contain angles in the correct column. For instance, your youngster might draw a dartboard in the acute column (20 acute angles touch the bulls-eye) and a square picture frame in the right-angle column (each corner is a right angle). And he could draw part of a slanted ceiling in the obtuse-angle column (the ceiling forms an obtuse angle with the wall).

When the timer goes off, share your papers, and compare your findings. Which type of angle is the most common in your home?

A rhombus sandwich

Can your youngster transform her usual square sandwich into a rhombus that *isn't* a square?

Together, make your favorite sandwiches, whether it's peanut butter and jelly or turkey and cheese. Then, let your child cut each sandwich so that all 4 sides are equal but none of the angles are 90 degrees. She can measure the sides with a ruler to make sure they're equal. Now enjoy eating your rhombuses!

Fun fact: Any shape with 4 equal sides is a rhombus. So every square is a rhombus—but not every rhombus is a square (since a square must have 4 right angles as well as 4 equal sides).

Parallel or perpendicular?

This activity will call your child's attention to parallel and perpendicular lines. Go outside together so he can draw the front of your house or apartment building, making sure to include the roof, windows, doors, shutters, bricks, siding, and any other features with lines.

Now encourage your youngster to highlight the two types of lines in different colors, perhaps the parallel (||) lines in yellow and the perpendicular (⊥) lines in green.

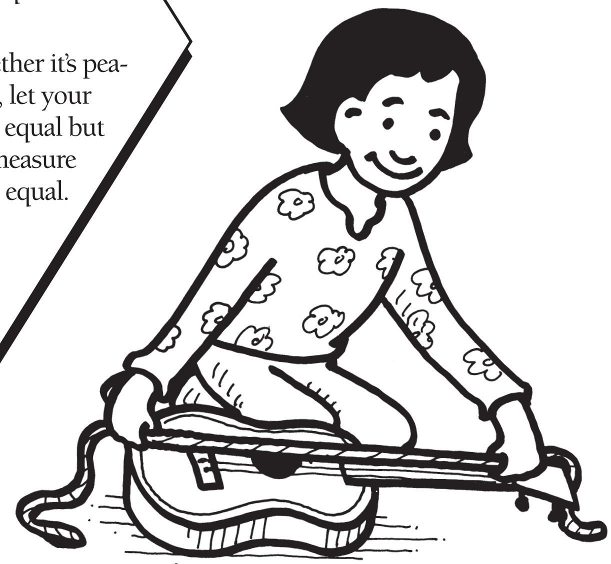
Parallel lines, such as those at the top and bottom of your front door, would never intersect—even if they continued forever. But the lines at the corner of your home are perpendicular (they form a right angle at the point where they intersect).

Symmetry scavenger hunt

A piece of yarn serves as a *line of symmetry* as your child searches for household items that are *symmetrical*—each half is a mirror image of the other. The invisible line down the center is the line of symmetry.

Make a list of things to find (*examples:* 1 symmetrical object that makes music, 1 symmetrical object that is purple). Then, ask your youngster to stretch the yarn across the center of various household objects to see which ones are symmetrical. For example, perhaps her ukulele is symmetrical, but the pantry door is not because one half has a doorknob and the other half doesn't.

Suggest that she check objects off the list and add more to find—soon she'll be seeing symmetry everywhere she goes!



Resources for Educators, a division of CCH Incorporated ■ 128 N. Royal Avenue, Front Royal, VA 22630 ■ 800-394-5052

MI18xx556E