Accomack County Public Schools

3rd Grade
Learning Plans

These plans are also available on our website:

www.accomack.k12.va.us

Please note: The online portion of these plans is optional.

Elementary Learning Plans

3rd Grade

Elementary Learning Plans during the school closure will focus on reviewing additional priority skills in preparation for new content. Elementary students will receive integrated Learning Plans that include reading, math, science, and/or social studies activities.

Optional online literacy, math, science and social studies extensions have been included in back portion of each packet. Additionally, several hands-on math activities have been added to offer fun ways to extend learning as a family. To expand literacy development, remember to encourage your child to read each day and discuss/write about what was read.

Important to Note:

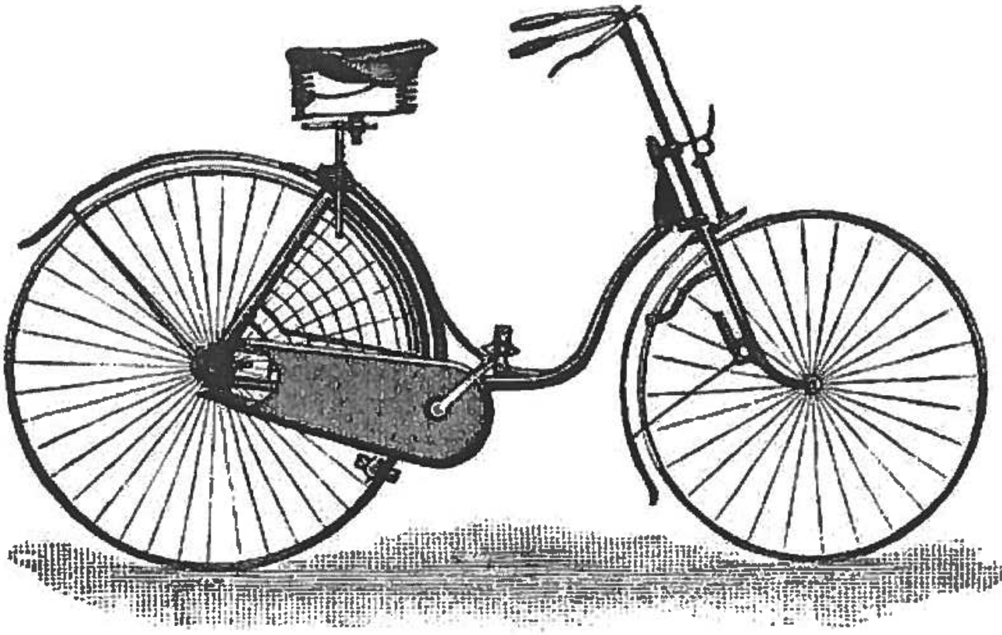
- Teachers will continue student check-ins.
- Learning Plans will be provided on the division's website, at meal delivery sites, and at other selected schools.
- Teachers of exceptional learners will connect with students to determine possible accommodations, modifications, and supports for equitable participation.
- Schools and teachers have been invited to provide additional enrichment and support activities for their students.
- Teachers will hold office hours for students and families via phone, email, Google Classroom, Google Meet, and Synergy to offer instructional assistance, feedback, or information.
- Additional online resources are available via the ITRT website.
    - https://sites.google.com/accomack.k12.va.us/itrt/home

FICTION PASSAGE RESPONSE CHOICES

Before you read your passage, select a choice from below. This will help you set a purpose for reading. After you complete your book, you will complete the task. *note: some tasks are to be completed as you read (during)			
Stop & Jot Grab 3 sticky notes. Write "Before", "During", and "After" on the separate sticky notes. Jot your thinking about the book before you read it on one post-it. As you read, stop and jot on the "During" post it. When you finish reading, jot your final thought on the "After" post it.	**Prediction Post-It** As you read, pause and make a prediction. Write your prediction on the post-it. Continue reading, then ask yourself, "Did my prediction happen or did something else happen?" Compare your prediction to what actually happened.	**Author's Purpose** Read your book. What is the author's purpose for writing the book and how do you know? Is the purpose to inform, persuade, or entertain? "The author's purpose is to....I know this because...."	**Unknown Words** As you read your book, write down words you do know know the meaning of. Use context clues or a dictionary to determine the meaning of the words. Challenge yourself to use those new words in your next writing piece or when you speak to your family and friends.

Fixing My Sister's Bike

by Kyria Abrahams



I love to fix things. I'm only eight years old, but I can figure lots of stuff out by myself. I want to be a scientist when I grow up.

Last week, the red, shiny reflector came off my sister's bicycle seat. My sister Ariel said she wanted to take it to the bicycle repair shop to be fixed.

"No way!" I stopped her. "I know how to fix things, so I'll fix this too!"

"Well, it had better work!" Ariel said. She looked like she didn't believe me.

I got some rope from the closet, and I tied the reflector right back onto the bike. It dangled a little bit, but it still worked just fine.

"It looks messy," Ariel said.

When my dad came home, I showed him how I had fixed the bike.

"Do you think that's the best solution?" he asked me.

I looked over at the reflector. On second glance, it didn't look that secure after all. There were some pieces of rope hanging off.

I shrugged.

"Yes! It's fine!" I said.

I thought it was the best solution. I had come up with it, after all, so it had to be the best.

"Okay," he said. "Let's see how long it stays attached to the bike."

My dad said he was proud of me for taking initiative. That means I see something that needs to be fixed and do it without being told!

"I think I have a new lesson for you, though," Dad said. "I want to show you how to conduct an experiment."

I had come up with a solution to a problem, and now the second step was to test it under different conditions.

I asked my sister when she was planning to go for a bike ride. She said at 2:00 p.m.

I grabbed a pen and a piece of paper and made two columns on the paper. One column said GOOD, and one column said BAD. At 2:00, I went outside to watch her ride.

First, she rode down the sidewalk and the reflector stayed on. I made a checkmark in the GOOD column.

Next, she went over a bump and the reflector stayed on. I made another checkmark. Good again!

Then, she rode underneath a tree. *Uh oh!* I knew what was coming next.

One of the branches from the tree swept across the back of her bike, and the next thing I knew the whole reflector was untied and on the ground!

Ariel cried out, "My reflector!"

I made another checkmark, this time in the column that said BAD.

"Back to the drawing board!" I said.

"Grrr!" said Ariel.

Later that night, my dad and I sat down with my paper to look at the checkmarks.

"Under what conditions did the reflector stay on the bike?" he asked me.

I looked. "Well, it stayed on when the bike was riding normally, but it fell off when it was hit by that tree branch."

"What you have on that sheet of paper is called *scientific data,*" Dad said. "What do you think you can learn from this?"

"I don't think the rope worked very well," I said.

"I don't think so, either," he said. "But you did have to test it first to be sure."

"Well, I tested it and now I know."

"What will hold the reflector on a little better?"

"Let's use glue!" I said.

We went downstairs, where the family keeps all our tools. Dad pulled the bike up onto the bench and took out the Super Glue.

I'm not allowed to use strong glue by myself. So we did this part together.

We let the glue dry overnight, and the next day I conducted my experiment all over again.

"You're not going to break my reflector again, are you?" my sister asked. She looked a little mad and suspicious.

"Well, I don't think so," I told her. "But that's what this experiment is for. Do you trust me?"

"I guess so," Ariel said. "But mainly because Dad helped this time!" She stuck her tongue out at me.

I made her ride the bike exactly the same way she had the last time so that we could try to recreate the conditions. This is important in a scientific experiment.

She rode down the sidewalk. The reflector stayed on. So far, so good!

Then, I had her go over the bump again. The reflector stayed on. I made another checkmark. But now it was time for the final test.

"Okay, get ready!" I yelled. "It's time to ride under the tree!"
Just like last time, my sister rode under the tree. However, this time, the reflector stayed on the bike.

"Yay! It didn't fall off!" Ariel squealed happily.

I was pretty proud myself. I made a great big checkmark in the GOOD column, and then drew a smiley face just for fun.

I turned around to see that my dad had been watching the entire time.

"Excellent work, little scientist," he said. "You recreated the experiment and found the solution to your sister's bike problem."

"And I saved us a trip to the bike shop!" I said.

"You sure did," Ariel said. And then she gave me a great big hug.

Name: ______________________________

Date: __________________

1. What keeps falling off Ariel's bicycle?

   A. the front wheel
   B. the back wheel
   C. the reflector
   D. the seat

2. The narrator is the person who is telling the story. In this story, the narrator is Ariel's sibling. How does the narrator finally solve the problem of the reflector falling off Ariel's bike?

   A. by taking Ariel's bike to a repair shop
   B. by tying the reflector on with some rope from a closet
   C. by asking her dad to fix the reflector by himself
   D. by gluing the reflector on with help from her dad

3. Rope does not keep the reflector on the bike as well as glue does.

   What evidence from the passage supports this statement?

   A. The main character's father helps her glue the reflector onto the bike after the reflector falls off a second time.
   B. After the reflector is tied onto the bike with rope, it stays on when Ariel rides down the sidewalk.
   C. After the reflector is tied onto the bike with rope, it stays on when Ariel rides over a bump.

D. The reflector falls off after being tied onto the bike, but it does not fall off after being glued on.

4. Why does Ariel give the narrator a hug at the end of the story?

A. Ariel is upset about how long it has taken to fix the bike.

B. Ariel is happy that her sister has fixed the bike.

C. Ariel is excited to take her bike to a repair shop.

D. Ariel is confused because she does not understand how her sister fixed the bike.

5. What is this story mainly about?

A. two sisters who do not get along until their dad makes them be nice to each other

B. a bike that is unsafe to ride because it is falling apart

C. a problem with a bike and what the main character does to solve it

D. a girl whose bike breaks and what happens when she takes it to a repair shop

6. Read the following sentence: "Last week, the red, shiny **reflector** came off my sister's bicycle seat."

What does the word **reflector** mean?

A. a wheel that turns very slowly

B. something that shines when light hits it

C. a type of metal that is worth a lot of money

D. a safety pad that someone riding a bicycle wears

7. Choose the answer that best completes the sentence below.

The narrator tries fixing the reflector with glue _______ rope does not work.

A. after

B. although

C. before

D. so

8. What causes the reflector to fall off Ariel's bike after it has been tied on with rope?

9. What are the three bike riding conditions that the narrator has Ariel recreate after gluing the reflector on Ariel's bike?

10. Why is recreating these conditions important to the narrator's experiment?

NONFICTION RESPONSE CHOICES

Before you read your text, select a choice from below. This will help you set a purpose for reading. After you complete your text, you will complete the task. *note: some tasks are to be completed as you read (during)			
3 Favorite Facts Write down your top 3 favorite facts that the text taught you! Remember to paraphrase (do not plagiarize)	**KWL** Before you read, create a KWL chart. Write down what you already know about the topic and list that under the K. Under the W, you will write down what you want to learn or what questions you have. After you read the book or as you read the book, you can complete the L section, which is where you write down what you learned from the text.	**Wonderings** As you read, jot down questions you have. If the text answers your questions, write the answers down. If it does not answer your questions, have your parent or family member help you research them.	**Evolving Thoughts** When you finish your text, think about how your learning has changed or grown. Use the sentence stem, "At first I thought ____ But now I know____." Write a response about how your thoughts have changed.

History

The Pharaohs of Ancient Egypt

Around 3000 B.C. a civilization began along the banks of the Nile River in Africa. Today we know this civilization as ancient Egypt.

Pharaohs, or kings, ruled ancient Egypt. The pharaohs were both the religious and military leaders of Egypt. They were the judges and lawmakers, too. Pharaohs owned all the land in Egypt, and had complete power over its people.

Ancient Egyptians believed in life after death. They preserved bodies as mummies and placed the mummies in burial chambers, or tombs. Since pharaohs were so important in life, their tombs were much bigger and more expensive than those of common people. Some of the pharaohs' tombs were great pyramids.

A pharaoh named Tutankhamun had one of the most amazing tombs of all. When archaeologists discovered King Tut's four-room tomb in 1922, they found more than 5,000 objects inside, many covered in gold.

Read the passage above, "The Pharaohs of Ancient Egypt" and answer the following question.

1. Can you think of any simple machines the Egyptians could have used to help them build pyramids? Explain your thinking. The six simple machines are lever, inclined plane, pulley, wheel and axle, wedge, and screw.

____

____

____

____

2. Draw a picture of the simple machine you chose for question #1.

Science

Simple machines are devices with no, or very few, moving parts that make work easier. Many of today's complex tools are really just more complicated forms of the six simple machines: wedge, wheel and axle, lever, inclined plane, screw, and pulley.

Design Challenge

While we are all spending time at home with our families keeping healthy, we challenge you to work with your family to design a machine that will allow you to ride your bike inside without moving. Think about what simple machine(s) you will need. Draw a picture of your ideas. Label the parts of your model, including the simple machine(s) you used.

Brainstorm Solutions

Analyze the pictures you drew in the brainstorm section. Which model would you choose to build if you were able to? Draw a model of it below and label the parts, including the simple machine.

Explain how your prototype works.

MATH

3.15: Collect, organize, represent, read, and interpret data in pictographs or bar graphs.

Family Bicycle Data Collection & Graphing Activity

In the garage, you find four of your family's bikes. Follow the directions and answer the questions below:

1. Label the wheel and axles, pulleys, and levers on each bike.
2. Count how many total wheel and axles, pulleys, and levers are on all of the bikes.
3. Record your data in the tally chart.
4. Make a bar graph based on the number of wheel and axles, pulleys, and levers that you counted. Don't forget to label your x-axis and y-axis and create a title.

*For this activity's purpose, bike chains are considered pulleys.

DIRECTIONS: Label the wheel and axles, pulleys, and levers on each bike:

Brother's Bike

Grandpa's Unicycle

Sister's Tricycle

A Parent's Bike

Tally Chart

Type of Simple Machine	Number of Simple Machines Counted
WHEEL AND AXLE	
PULLEY	
LEVER	

Bar Graph

Title: ________________________________

Lever	**Pulley**	**Wheel and Axle**

Questions

1. Which bike has the fewest wheels and axles?
2. How many levers does Grandpa's Bike and Sister's Bike have combined?
3. How many more levers does a Parent's Bike have than Grandpa's Unicycle?
4. Write 2 questions that you still have about the graphs:

1) ____

____

____

____

2) ____

____

____

____

3)

Choose two simple machines around your house. Make a Venn Diagram to compare and contrast the two machines on your paper diagram

Extension Online Resource

https://www.brainpop.com/search/?keyword=simple+machines

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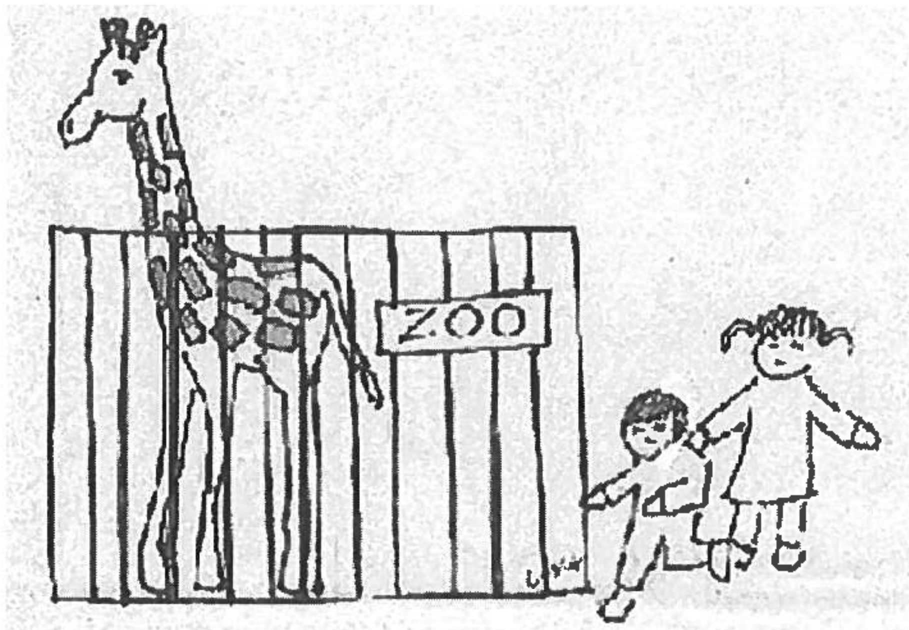
Habitats - Zoos



One of the best ways to learn about different kinds of habitats is to go to your local zoo. Zoos are usually arranged by habitat. For example, African animals are often together. Elephants, zebras, lions, rhinoceroses, and monkeys are in the same habitat. Australian animals, such as koalas, kangaroos, platypuses, and emus are kept in another section.

Some parts of the zoo keep animals in indoor habitats. It is easier to control the temperature in indoor habitats. This keeps the animals from getting too hot or too cold. Snakes and reptiles are kept in indoor habitats. Penguins are often kept inside as well. Birds are kept in aviaries. Aviaries are large enclosed spaces that seem like the birds' natural environment. Aviaries keep birds from escaping and keep other animals away from them.

Zookeepers are people that work at zoos. They have studied animals and know how to care for them. Zoos often have animals that are sick. Zookeepers work to make the animals better. Zoos also try to keep animals that are endangered. There are many programs that work to breed endangered animals. Zookeepers teach the animals how to interact with their natural environments. Then they let them back into the wild.

A visit to the zoo teaches people a lot about animals and their habitats.

Reading Comprehension

1. Zoos are usually structured

A. by animal.

B. by habitat.

C. by size.

D. by age.

2. Why does the author describe where different animals live in zoos?

A. To show how different animals are to humans

B. to show how controlled the animals are

C. To show different types of habitats

D. To show examples of how to make animals happy

3. Based on the passage, it is likely that zookeepers

A. Have many pets at home

B. Generally do not like working at zoos

C. Know how to teach animals how to act so they can survive in the wild

D. Do not know how to take care of sick animals

4. Break the following words into syllables.

enclose ____________________ arrange ________________

5. Read the following sentences:

"Zoos are usually arranged by habitat. For example, African animals are often together."

The word arranged most nearly means

A. disorganized

B. organized

C. centered

D. built

6. What is the main idea of this passage?

A. Zoos are sectioned into habitats

B. Zoos sometimes keep animals indoors

C. Zoos are places

D. Zookeepers are people who work in zoos

7. How do zoos work to help endangered animals? Explain.

8. Based on the passage, explain why zoos are good places to learn about different habitats.

Making Connections

readwritethink NCTE

- Text-to-Self connections:
  - What does this text remind you of?
  - Can you relate to the characters in the text?
  - Does anything in this text remind you of anything in your own life?
- Text-to-Text connections:
  - What does this remind you of in another text you have read?
  - How is this text similar to other things you have read?
  - How is this text different from other things you have read?
- Text-to-World connections:
  - What does this remind you of in the real world?
  - How are events in this text similar to things that happen in the real world?
  - How are events in this text different from things that happen in the real world?

Passage or Quote from Text	Explain the connection you made to yourself, another text, or the real world.	What kind of connection did you make?
		☐ Text-to-Self ☐ Text-to-Text ☐ Text-to-World
		☐ Text-to-Self ☐ Text-to-Text ☐ Text-to-World
		☐ Text-to-Self ☐ Text-to-Text ☐ Text-to-World
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		☐ Text-to-Self ☐ Text-to-Text ☐ Text-to-World
		☐ Text-to-Self ☐ Text-to-Text ☐ Text-to-World

Science

Design Challenge:

You have just discovered a new animal species! Design a habitat that your species is adapted to survive in.

What is the name of the species of your discovery?

____

What are some of its physical adaptations?

What are some of its behavioral adaptations?

How do the behavioral adaptations help it live in its habitat?

Draw a model of the animal in its habitat. Include its life needs.

Use detailed sentences to describe how your animal's specific adaptations help it survive in the habitat you have chosen.

Math

Adaptations in Action!

A blue whale is adapted to swim for long distances. They swim at speeds up to 30 miles per hour! How far would a blue whale swim if it swam an average of 18 miles per hour for 5 hours?

An adult elephant has to eat a lot of food to maintain its weight. The National Zoo has 3 Asian elephants. Spike eats 523 pounds of food each day. Rani eats 487 pounds of food, and Bozie eats 543 pounds of food. About how much food do the elephants eat in one day combined?

You have been selected as one of the animal research scientists to go on an exploration of Antarctica to research adaptations of arctic animals. Since we, as humans, do not have physical adaptations like blubber to keep us warm, you will need to purchase some important cold weather items to make sure you are prepared for your trip. You have been given $500 to buy the items you need. You must buy at least 3 items from the list below. After choosing your items, determine how much money you have spent and how much you have left over.

Item	Cost
Fur-lined parka	$149
Snow suit	$98
Waterproof gloves	$38
Waterproof boots with fleece lining	$119
Heavy blanket	$94
Thermal sleeping bag	$126
Camp Tent	$228

Please note that parents/caregivers may need to set up free accounts to access material on some websites.

Literacy

These websites contain digital books, videos, activities, and games focused on helping young learners to build and practice literacy skills.

Read, Write, Think - www.readwritethink.org/

Time for KIDS - https://www.timeforkids.com/

Storyline Online - https://www.youtube.com/user/StorylineOnline

Readworks - https://www.readworks.org/

United for Literacy - https://www.uniteforliteracy.com/

International Children's Literacy Library - http://en.childrenslibrary.org/

Unite for Literacy - https://www.uniteforliteracy.com/

One More Story - http://onemorestory.com/

Scholastic https://classroommagazines.scholastic.com/support/learnathome.html

Mathematics

These websites contain puzzles and games focused on helping elementary students build and practice math skills.

3 – Act Tasks - https://gfletchy.com/3-act-lessons/

GregTangMath - https://gregtangmath.com/index

Open Middle - https://www.openmiddle.com/whats_open_middle/

Bedtime Math - http://bedtimemath.org/fun-math-at-home/

SPLAT
https://www.adaptedmind.com/MathWorksheets.html?campaignId=770019025&gclid=EAIaIQobChMI4PusjMK76AIVSBWHCh15wAg2EAEYASAAEgJH4PD_BwE

Science & Social Studies

These websites contain videos, activities and games focused on helping young learners to expand their science and social studies skills.

Smithsonian - https://www.si.edu/kids

National Geographic - https://kids.nationalgeographic.com/

San Diego Zoo - https://kids.sandiegozoo.org/

NASA Activities - https://www.nasa.gov/

Encyclopedia Virginia - https://www.encyclopediavirginia.org/vr

Virginia Virtual Field Trips - http://virginiafieldtrips.com/index.php?id=163

Ben's Guide to U. S. Government - https://bensguide.gpo.gov/

Discovery Education Virtual Field Trips
https://www.discoveryeducation.com/community/virtual-field-trips/

NASA's Air & Space Anywhere, Anytime
https://airandspace.si.edu/anywhere?utm_source=whatsup-launch&utm_medium=email&utm_campaign=anytime

Beach Ball Party

The Big Idea:

Get moving with numbers! Kids practice math facts while tossing a ball around.

You Will Need:

Add numbers to a ball you already have.

- ★ A lightweight ball
- ★ Masking tape
- ★ Permanent marker

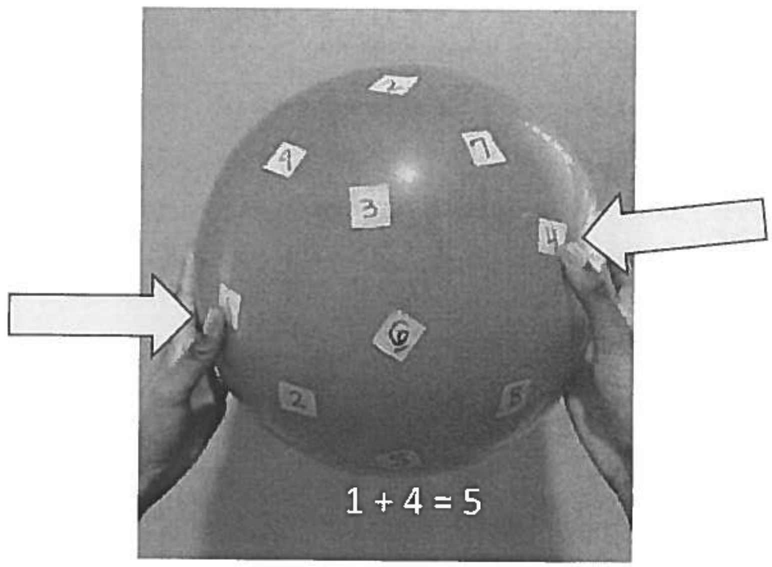
Or, purchase a Bedtime Math beach ball here: http://bedtimemath.org/make-a-purchase/. We charge only the cost of making the ball and shipping it to you.

The Math Behind the Scenes:

Once kids develop a sense of how numbers and quantities work, knowing math facts automatically can help them tackle harder problems with greater ease.

Design Your Ball

1. Cut several pieces (about 1-inch each) of masking tape.
2. Spread the pieces of tape around all sides of the ball.
3. Write one number on each piece of tape. The numbers on our ball range from 1 to 9.



Many Ways to Play

Toss the ball from one player to the next. The player who catches the ball performs a number challenge with the numbers closest to their thumbs.

Number Challenges:

- ★ Name the numbers
- ★ Count from the lesser number to the greater one, e.g. 1..., 2, 3, 4.
- ★ Compare, e.g. 1 is less than 4
- ★ Add
- ★ Subtract
- ★ Multiply
- ★ Make a 2-digit number and double it, e.g. 14 doubled is 28.
- ★ Make a fraction and find its equivalent, e.g. $\frac{1}{4} = \frac{2}{8}$.

M&M™ March Madness

The Big Idea:

Use your M&Ms™ to explore counting and comparisons. Group them by color, then line them up to make rows marching across the paper. Turns out you've just made an official bar graph!

You Will Need:

★ 1 single-serving pack of regular M&Ms™ (1.69 oz.)
★ To print: M&M™ Bar Graph – last page (p. 4)

The Math Behind the Scenes:

Bar graphs are a tool used by grown-ups all the time to show facts and figures in an easy-to-digest way - and that's literally true for our candy graph! The bars show key statistical concepts:

★ **maximum**: the color with the most M&Ms™
★ **minimum**: the color with the fewest M&Ms™
★ **median**: if ordered from fewest to most, the middlemost color

Instructions

1. Dump out the M&Ms™. Regular is flatter than peanut and won't roll.
2. Group the M&Ms™ by color. How many colors are there? Different mixes have different sets of colors!
3. Decide the order you want for the colors, rainbow order or mixed up. Write the colors on the dotted lines under the sideways arrow (the **x-axis**).
4. Line up the M&Ms™ of each color edge to edge in a vertical row above that color name, starting at the x-axis.
5. The **y-axis** is that line running up and down the left side. In our graph, this tells you the number of M&Ms™ of each color. See which color wins!

Riddles and Questions

PreK: Find your favorite color. Count up the M&Ms™ as high as you can!

Kindergartners: How many M&Ms™ are there in your favorite color? Can you count down from that number?

1st-graders: Which color has the most M&Ms™? Which has the fewest?

2nd-graders: Find a color that has exactly twice as many M&Ms™ as another color. Then find a set of colors that add up to lucky 13.

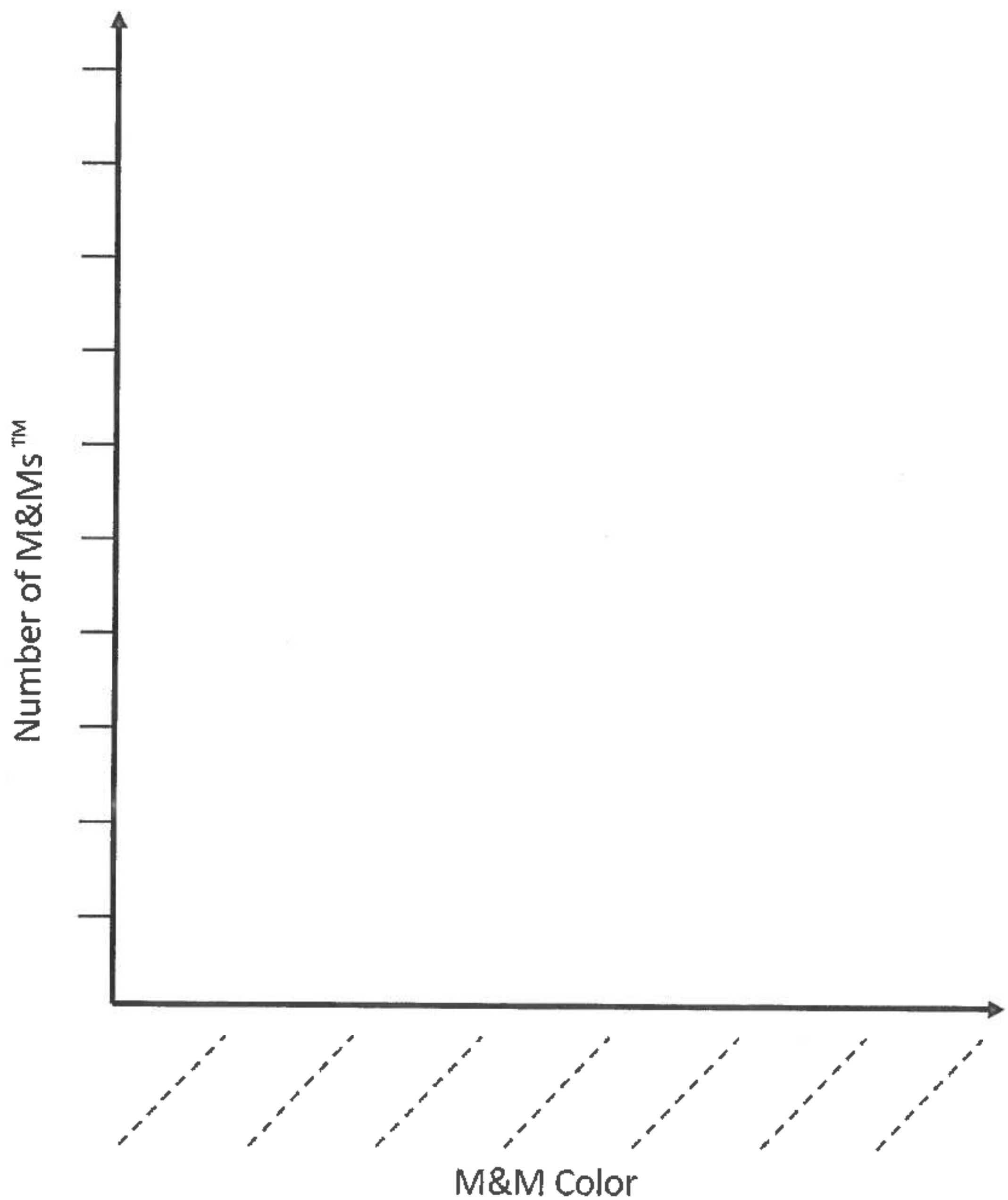
3rd-graders: Find 2 pairs of colors that add up to the same number as each other.

4th-graders: If there were the same number of M&Ms™ for every color, how many would that be? Can you divide them up evenly? How few M&Ms™ can you move to make the columns close or equal to the same number?

5th-graders: If you had 100 M&Ms™ in the same ratios, about how many blues would you have? How many reds?

M&M Bar Graph

Print this page and write the colors on the dotted lines in your favorite order. Place the paper on the table or counter. Line up your M&Ms™ in the correct columns and find out how many the M&M™ factory gave you for each color!



Two Parts Chocolate

The Big Idea:

Learn about ratios while making delicious chocolate-y treats for your family!

You Will Need:

★ Chocolate chips, or any chocolate chopped up
★ Milk and/or heavy cream
★ Measuring cups, spoons and a bowl

The Math Behind the Scenes:

Ratios are used in all parts of our lives, but seeing them in action in the kitchen is a great way to remember how they are used.

How Ratios Work:

A **ratio** is used to show a relationship between two numbers of the same kind or unit. You can use a ratio to compare the number of boys to the number of girls in your family or class. Ratios can be written in different ways:

- ★ For little kids: using the ":" to separate the two numbers
- ★ As a fraction, using the "/" to separate one of the numbers from the sum of both numbers
- ★ As a decimal, after dividing one number by the sum
- ★ As a percentage, after multiplying the decimal by 100 and adding the percent sign

For example, if there are 2 boys and 3 girls in your family, you can write the ratio as:

- ★ 2:3 (for every two boys there are 3 girls)
- ★ 2/5 are boys and 3/5 are girls
- ★ 0.40 are boys (by dividing 2 by 5)
- ★ 40% are boys (0.40 as a percentage)

Now you try! If you have a bag of candy that has 4 red pieces and 9 yellow pieces, how could you write the ratio?

- ★ 4:9 (for every 4 red pieces there are 9 yellow pieces)
- ★ 4/13 are red and 9/13 are yellow
- ★ 0.31 are red (by dividing 4 by 13)
- ★ 31% are red (0.31 as a percentage)

Ratios can also be **simplified**. A family with 4 girls and 2 boys can be written as 4:2 **OR** 2:1.

Rich Ratios:

Now use ratios to make a delicious chocolate treat - or more than one, if you can convince your parent! In all the examples, 1 ounce is equivalent to 2 tablespoons.

Chocolate Math Recap

Treat	*Ratio of chocolate:milk or cream*
Hot chocolate	1:3
Ice cream sauce	1:1
Ganache/frosting	2:1
Chocolate truffles	3:1

Hot Chocolate

1:3 – 1 ounce chocolate chips to 3 ounces warm milk
Mix and drink

Ice Cream Sauce

1:1 – 2 ounces chocolate chips to 2 ounces warm milk or cream
Mix and serve over ice cream

Ganache/Frosting

2:1 – 4 ounces chocolate chips to 2 ounces warm cream
Mix and serve on toast, cake or anything else

Chocolate Truffles

3:1 – 3 ounces chocolate chips to 1 ounce warm cream
Mix, cool down and roll into balls. You can then roll the balls into different toppings such as powdered sugar, crushed cookies, etc.

Bonus:

Get creative! Think of other fun ways to use ratios in your kitchen! For example, make a fruit parfait with two fruits. What is your ratio of strawberries to bananas? Blueberries to orange pieces? The possibilities are endless. Can you express those ratios as fractions, decimals, and/or percentages?

Funny Money

The Big Idea:

We'll take coins to a new level by "buying" fun prizes using specific amounts, and play a new twist on Rock, Paper, Scissors!

You Will Need:

★ Coins: 4 quarters, 4 dimes, 4 nickels, and 4 pennies per person
★ Pencil (or other fun prize): 1 per person
★ Ruler (or other fun prize): 1 per person

The Math Behind the Scenes:

Grades K-2

★ Addition
★ Comparisons (greater than, less than)
★ Counting by 5s and 10s
★ Valuing units of money

Grades 3-5

★ Addition
★ Counting by 5s, 10s, and 25s
★ Simple combinatorials
★ Valuing, comparing units of money
★ Bonus: fractions, probability

Time for a Change

When you buy things, the price doesn't always come out to full dollars. That's why we need coins. Today we get to 'buy' fun items, but you'll first have to figure out which coins add up to the right amount.

Grades K-2:

1. Give everyone 4 dimes and 4 pennies then ask:
   - ★ "I've given you 4 pennies and 4 dimes. Do you know how much each coin is worth?"
   - ★ "How much money do you think is in your pile?" (Discuss.)
   - ★ "Do you think you have the best coins to buy a pencil for 12¢? Can you add your coins to make 12¢?"
2. When done, ask: "What combination worked?" (It should be 1 dime and 2 pennies.)
3. "We're just getting warmed up! Now, to buy this ruler you'll need coins worth 33¢." Each person finds coins from the pile that add up to 33 cents.

BONUS: Add 4 nickels to the pile. Challenge kids to pick exactly 6 coins that add up to 31 cents. They should come up with 1 dime, 4 nickels, and 1 penny.

Grades 3-5:

1. Give everyone 4 quarters, 4 dimes, 4 nickels, and 4 pennies then ask:
   - ★ "How much money do you think is in your pile?" (Answer: $1.64)
   - ★ "Do you think you have the right coins to buy this pencil (hold up a pencil) for 32¢? Can you make 32¢ in 4 different ways using these coins?
2. When they're done, ask:
   - ★ "What combos worked?" There are 4 possibilities: 1Q+1N+2P; 3D+2P; 2D+2N+2P; 1D+4N+2P.

★ "What was your system for catching them all?" (Discuss.)

3. "Now, to buy a ruler you'll need to pay 73¢ with exactly 10 coins!" Each kid selects 10 coins from the pile that make 73¢

   ★ "Which 10 coins did you use?" They should be 1Q+3D+3N+3P.

   ★ How did you solve it?" (Discuss.)

BONUS: Pick a number between 100 and 150. Challenge players to find the fewest coins and/or the many different coin combinations that add up to that number of cents.

Time for a Change

Do you know the game Rock, Paper, Scissors? Two people face each other and say 'Rock, Paper, Scissors,' then each puts out a hand shaped like one of those three things. Rock beats scissors because it can smash them; scissors beat paper because they cut it; and paper beats rock since it can wrap around it. So, any item can win or lose. We're going to play this game today, but with coins!

1. Give each player 1 of each coin: quarter, dime, nickel, penny.
2. Each player holds all 4 coins in 1 hand and secretly takes 1 of the 4 coins into the other hand. We'll call that the "playing hand."
3. Each pair of players faces each other and says "Penny, nickel, dime, quarter!" while pumping their playing hand. When they say "quarter," both kids open their playing hand to reveal their coin!
4. Start by counting the number of rectangles along the right-hand column.
5. The winner of each round is the player who has the higher value coin EXCEPT when it's a penny paired with a quarter, in which case the penny wins. The winner keeps both coins, sets them aside and continues the game.
6. If both players reveal the same coin, it's a tie, and players put those coins back to use again in another round. If that's the last coin to play, each player keeps his/her coin and the game ends.
7. After all 4 coins have been played, the winner of the game is the player with the most coins!

If there's time and interest, players can reset their coins (so they each have 1 quarter, 1 dime, 1 nickel, 1 penny) and play again.

Funny Money Coin Chart

Coin	Name	Value
	penny	1 cent
	nickel	5 cents
	dime	10 cents
	quarter	25 cents

Get a Jump on It

The Big Idea:

Kids get moving and practice math facts in this classic game of Hopscotch with a math twist.

You Will Need:

- ★ Outdoor space for drawing the hopscotch board
- ★ Chalk
- ★ A small rock

The Math Behind the Scenes:

Once kids develop a sense of how numbers and quantities work, knowing math facts automatically can help them tackle harder problems with greater ease.

How it Works:

★ Use chalk to draw a hopscotch board like the one shown here.

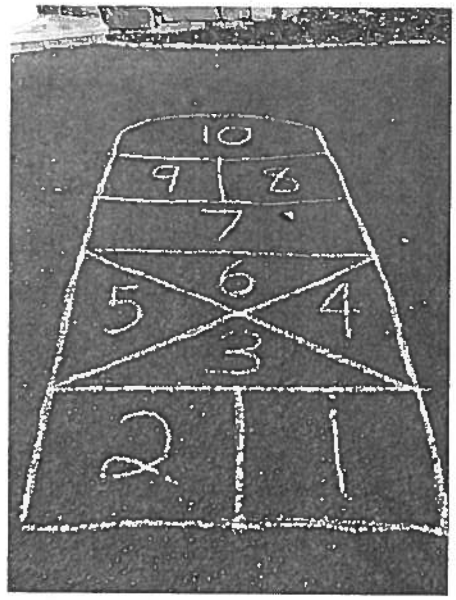


Photo: Laura Overdeck

★ Decide whether you'll play with addition, subtraction, or multiplication.

★ The first player tosses the rock onto a number square, e.g. 2.

★ The player hops onto each space and says a math fact out loud.

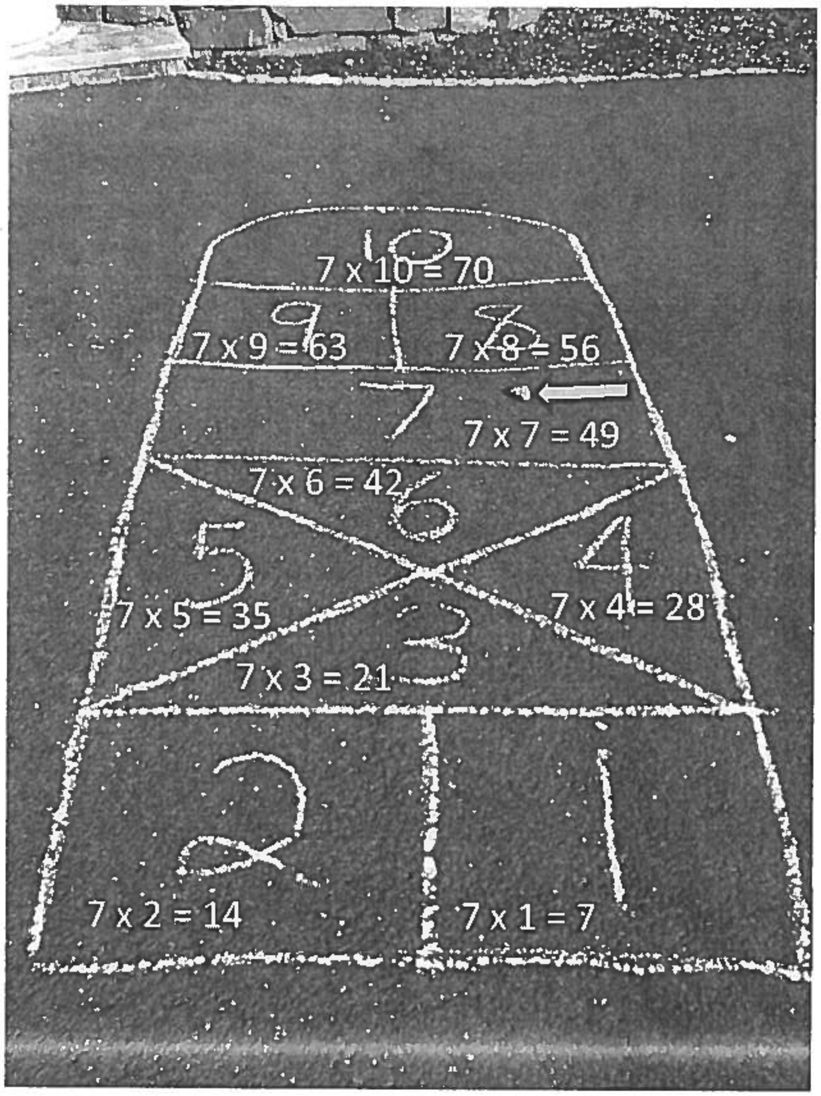
- Addition version: add 2 to each number
- Subtraction version: subtract 2 from each number
- Multiplication version: multiply each number by 2

★ When the player reaches the 10-space s/he:

- Turns around and continue hopping and solving facts back to the beginning.
- Picks up the rock on the way back.
- Passes the rock to the next player.

★ Players take turns tossing the rock to different numbers and using that number to solve math facts. If a player gets stuck, help out by counting on out loud together!

In this example, the player tossed the rock onto the 7 space. The players decided to work on multiplication facts, so each problem in this round includes 7 as a factor.



Glow-in-the-Dark Geometry

The Big Idea:

Everything is better when it glows in the dark. This activity uses glowsticks to explore geometry!

You Will Need:

- ★ Glowsticks: 10 or 12 per person, or more if you have them!
- ★ If you don't have glowsticks on hand, try toothpicks, straws, or another set of objects of the same size

The Math Behind the Scenes:

- ★ Counting
- ★ Identifying 2-D shapes
- ★ Categorizing 2-D shapes
- ★ Exploring how shapes relate

Instructions

1. Give each kid 10 to 12 glow sticks.

2. Start with triangles.

★ How many sizes and kinds of triangles can you make?

★ How many can you name?

Equilateral triangles: All sides the same length
Isosceles: Only two sides are the same length
Scalene: All sides different lengths

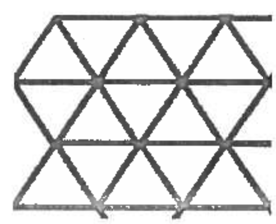
3. Now try 4-sided shapes.

★ How many sizes and kinds can you make?

★ How many 4-sided shapes can you name?

Rectangle: a parallelogram with all right angles, not necessarily all equal sides
Square: a parallelogram with equal sides and all right angles
Trapezoid: top and bottom are parallel, sides slant outward
Parallelogram: pairs of parallel equal sides, tilted
Rhombus: a parallelogram with all equal sides

4. Finally, decorate the floor! Clear the floor of sticks; then lay out glow sticks in a **lattice of equilateral triangles**. Turn off the lights after you make it to see it glow!



★ How many triangles did you make?

★ What size triangles are you counting? Don't forget the big ones!

★ How many sticks per triangle should you need as you make more triangles?

★ What's the fastest way to make hexagons from our triangles?

★ How many hexagons can we make from all the sticks?

★ Where do you see this pattern in nature?

Take Flight

The Big Idea:

Have your ever made a paper airplane? In this activity you'll get to make one, launch it, and do some math to figure out how far it flies!

You Will Need:

- ★ Printer paper: 1 sheet per plane
- ★ A measuring tool (e.g. ruler or measuring tape)
- ★ Pencil and scrap paper

The Math Behind the Scenes:

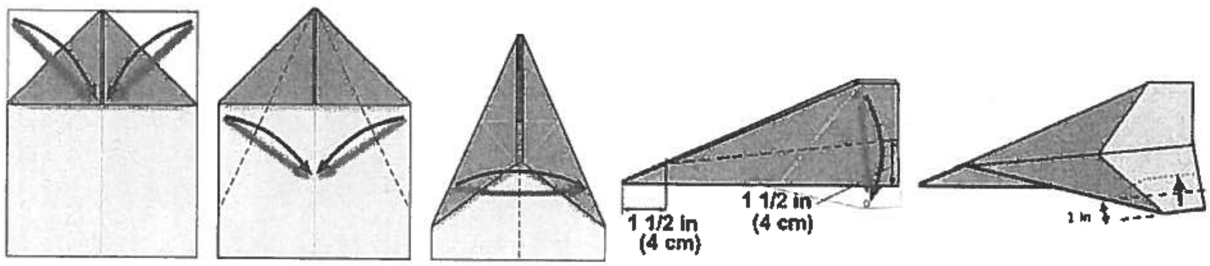
Just like real airplanes, your paper airplane will rely on aerodynamic forces (thrust, lift, gravity and drag). Unlike real airplanes, you'll fold your paper version symmetrically and measure the distance it travels in different ways.

- ★ **symmetry**: one side of an object looks exactly like the other
- ★ **standard units**: measuring based on a common system, e.g. inches, feet, yards.
- ★ **non-standard units**: measuring in a way that isn't commonly used, e.g. crayons, toy cars, socks.

Take Flight

★ Everyone gets a sheet of printer paper.

★ Fold each paper into an airplane as shown below (courtesy of amazingpaperairplanes.com).



★ Choose a starting point and launch the planes across the room one at a time.

★ Measure each flight distance in different ways!
- Non-standard units: Use a household object as a measuring tool, e.g. a shoe, book, marker, etc.
- Standard units: Use a measuring tape, ruler, or other measuring tool.

★ Record the flight distances on a piece of scrap paper.

★ Compare distances. Which plane flew the furthest and by how much? What changes could you make to your plane for it to fly farther? Try it!

Riddles and Questions

Kindergarten: If you laid down on the floor from the starting point, which is longer - you or the length your airplane flew?

1st-graders: Find 3 objects you can hold, e.g. pencil, LEGO® piece, book. Put them in order from shortest to longest. Where would your paper airplane fit?

2nd-graders: Use your paper airplane to estimate the lengths of other items. For example, how many paper airplanes long is the table?

3rd-graders: If your paper airplane is 1-foot long, how many inches is that?

4th-graders: Look closely at the angles on your paper airplane. Do you have more obtuse, acute, or right angles?

5th-graders: If your plane flew 8 yards, how many inches is that?

Answers:
K: Answers will vary.
1st: Answers will vary. Remember to line up the objects from the same starting point!
2nd: Answers will vary.
3rd: 12 inches!
4th: Hint: Right angles are 90 degrees, acute angles are less than 90 degrees, and obtuse angles are great than 90 degrees.
5th: Remember, 1yd = 3ft and 1ft = 12in.; 8 x 3 = 24in; 24 x 12 = 288in

Knockin' Hockey

The Big Idea:

Learn the value of pennies, nickels, dimes and quarters, and practice money math by knocking the coins into the goals – and each other!

You Will Need:

★ To print: Score card, Helmets and Rink (pages 3-5)
★ Pennies, nickels, dimes, quarters: 4 of each
★ Pair of scissors
★ Scotch tape

The Math Behind the Scenes:

Every sport has some scorekeeping math, but this takes it up a notch. Your kids will get great practice with subtraction and place value in this game. Older kids can experiment with fractions, decimals, and percentages – what portion of a dollar does their final score equal?

Knockin' Hockey

- ★ Print and arrange the 2 pages of the hockey rink on a table to create your playing surface. You may want to tape the seam and corners of the pages for smooth gameplay.
- ★ Each team has 4 designated "sticks" – one penny, nickel, dime and quarter. Cut out the helmets on page 3 and tape them to the stick coins. The sticks start the game in front of the goal they are defending.
- ★ Scatter "puck" coins in the center circle of the rink. Use 2 of each coin value.
- ★ The purpose of the game is simple – flick or slide your stick coins into the pucks to knock pucks into your opponent's goal and keep pucks out of your own.
- ★ But there is a catch! The stick coin you use to score counts against the puck coin you put in the net. For example, knocking a quarter in with a penny gives you 24 points, but knocking a penny in with a quarter gives you 0 (there's no negative points in hockey).
- ★ Only 1 flick of a stick per turn, so strategize wisely! Which stick is best to score with? Which is your best goalie? Is it better to score a quarter or block a dime?

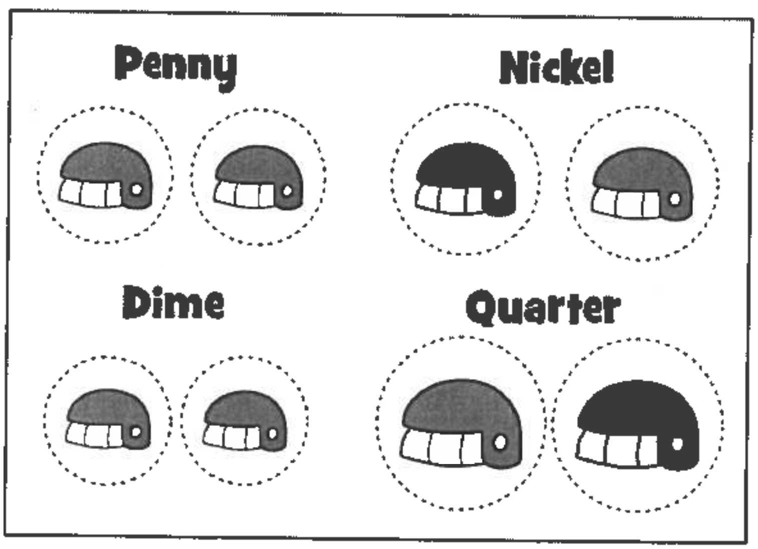
Keep track of your scores using the score card on page 3. You can play a set number of turns, until all the coins have been scored, or to a set amount of points.

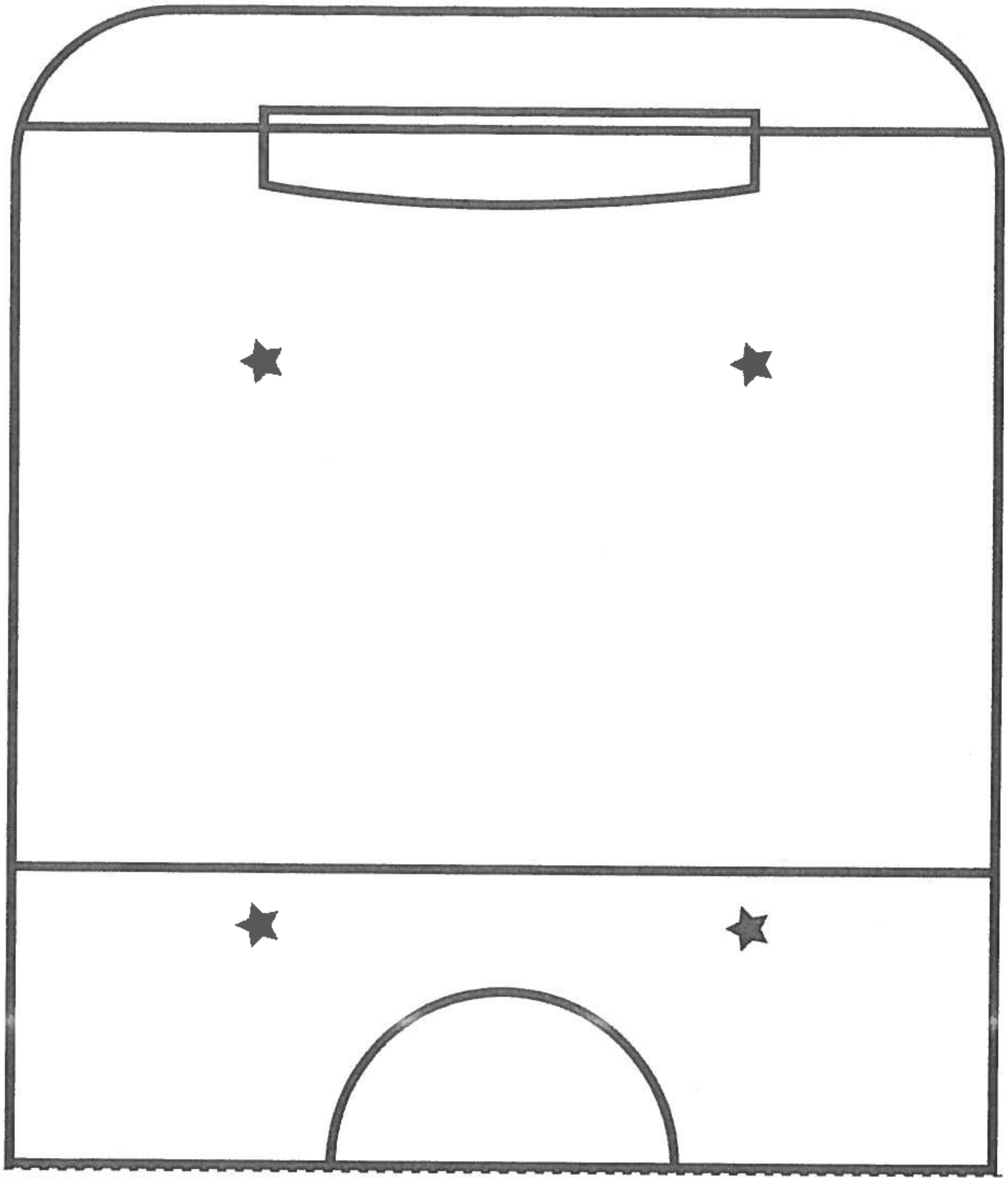
Score Card

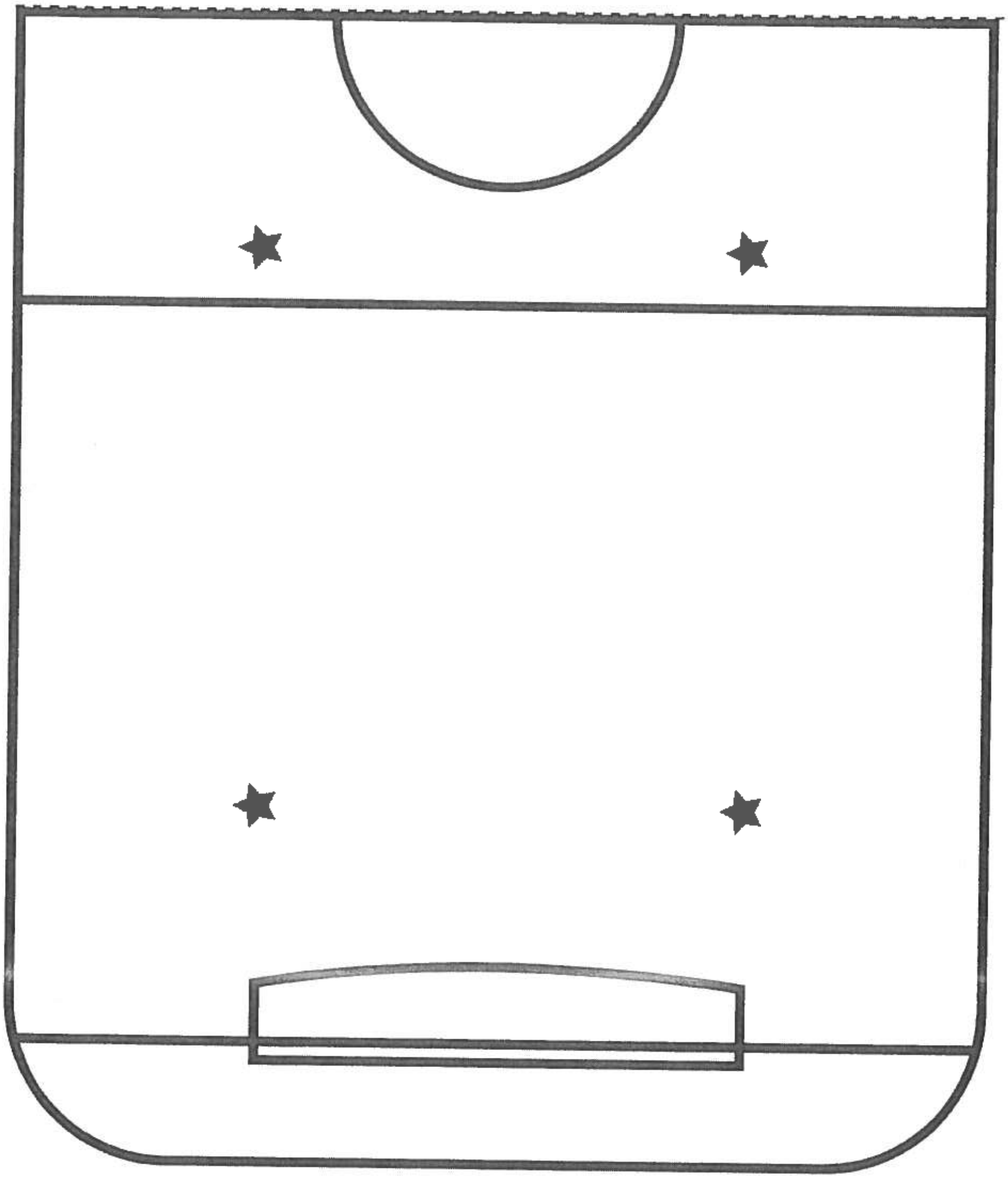
Team ______________			Total
Puck Scored	Scored By	Points Scored	
		Team Total	

Team ______________			Total
Puck Scored	Scored By	Points Scored	
		Team Total	

Helmets for Coins:







Terrifically Twisted Tangrams

The Big Idea:

A tangram is an ancient Chinese puzzle made up of 7 shapes: five triangles, one square, and one parallelogram. Move around the shapes to match a picture. Some of the pictures give no clues about where the shapes go – for those you have to figure it out!

You Will Need:

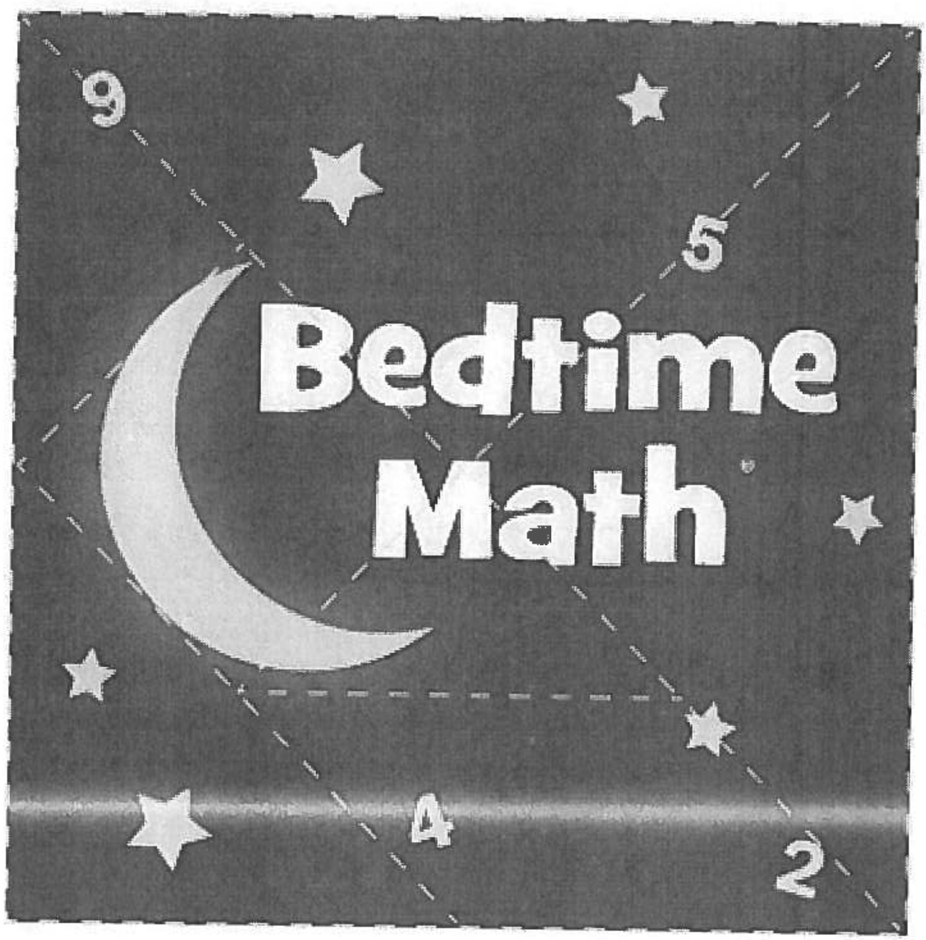
★ To print: Bedtime Math's Tangram puzzle and set of pictures
★ Pair of scissors

The Math Behind the Scenes:

Tangrams use geometry, a subject where many kids have natural abilities they hardly get to show off in school. In this game, kids use symmetry, rotational and spatial skills to see how shapes fit together. They also develop a sense of scale, since each triangle is twice the area of the next size down.

Make Your Own Tangrams

Cut out the square and cut the shapes along the yellow dotted lines. Then use the shapes to match the pictures or make your own creations! Fun riddles about the shapes follow on the next page.



Terrific Tangram Teasers

Try as many questions as you can! Answers upside-down below.

PreK: Point to a triangle. How many sides does it have?

Kindergarteners: How many triangles are in the whole set? Count them up!

1st- graders: How many different sizes of triangles are there? How do they relate to each other? Try putting one size triangle on top of another to figure it out.

2nd-graders: Find the two smallest triangles. Which other shapes in the set can be formed from just those two small triangles?

3rd-graders: What do you call the two 4-sided shapes in the set?

4th-graders: Make a square using the two biggest triangles. Use the rest of the shapes to form that same size square.

5th-graders: See if you can put all the shapes back together to make the big perfect square from the start!

Answers:

PreK: Find any 3-sided shape!

K: 5 triangles.

1st: 3 sizes – each is twice the size of the next size down.

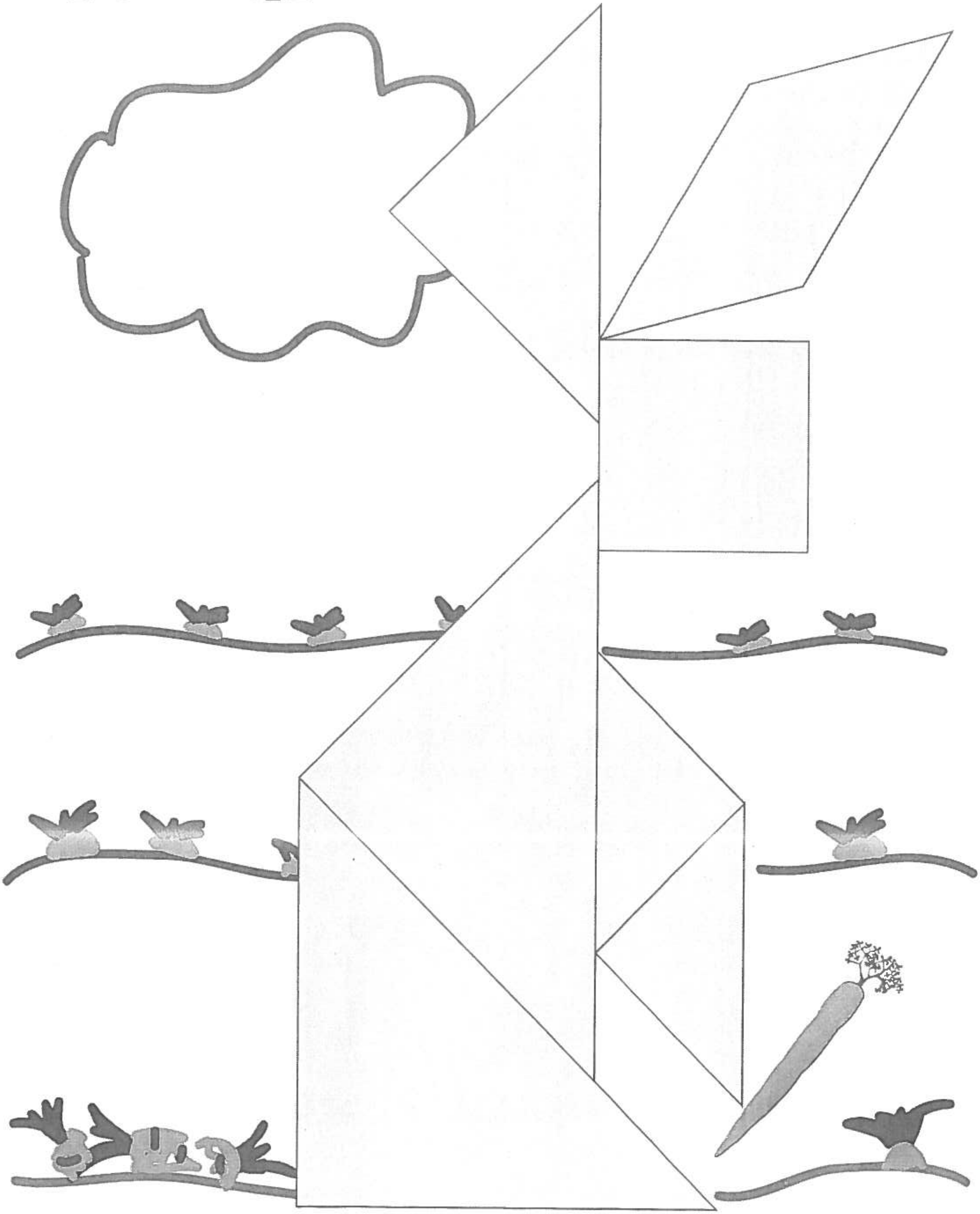
2nd: You can form the square, the medium triangle, and the parallelogram.

3rd: A square and a parallelogram. Both are "quadrilaterals," which means "four-sided."

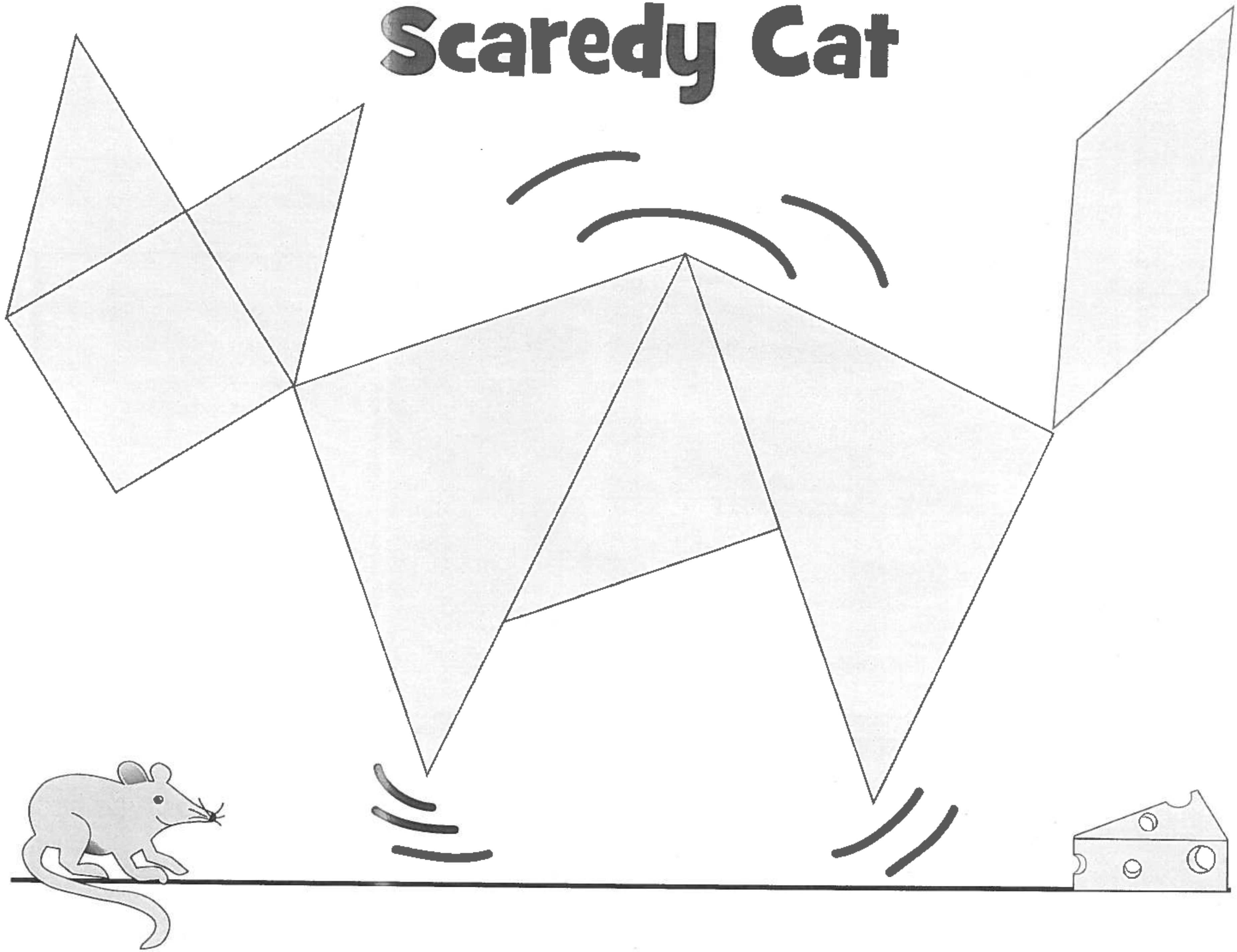
4th: Hint: Make the medium triangle's long side a side of the square, and put the little square in the next corner going clockwise...

5th: Try to remember how you started!

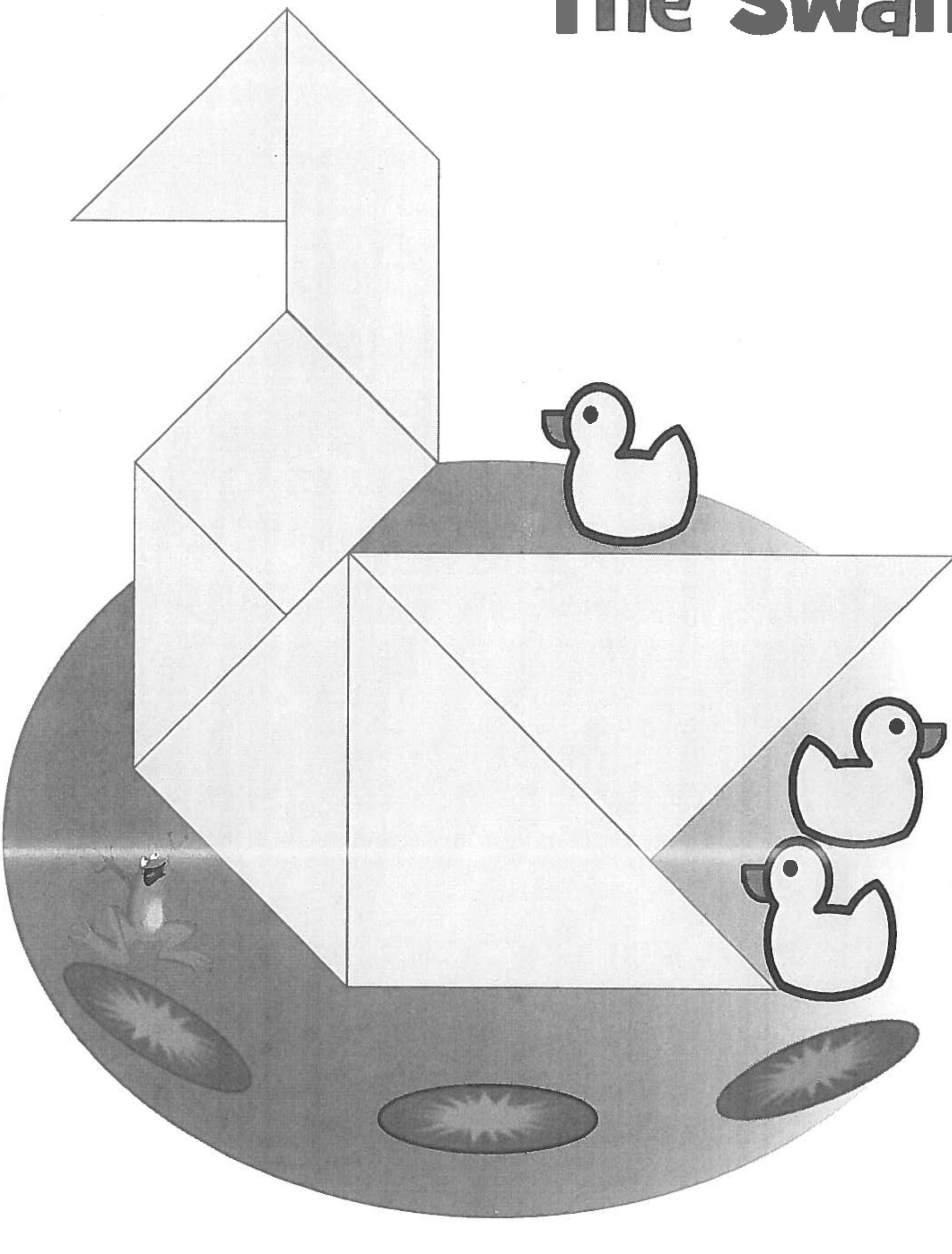
The Hare



Scaredy Cat

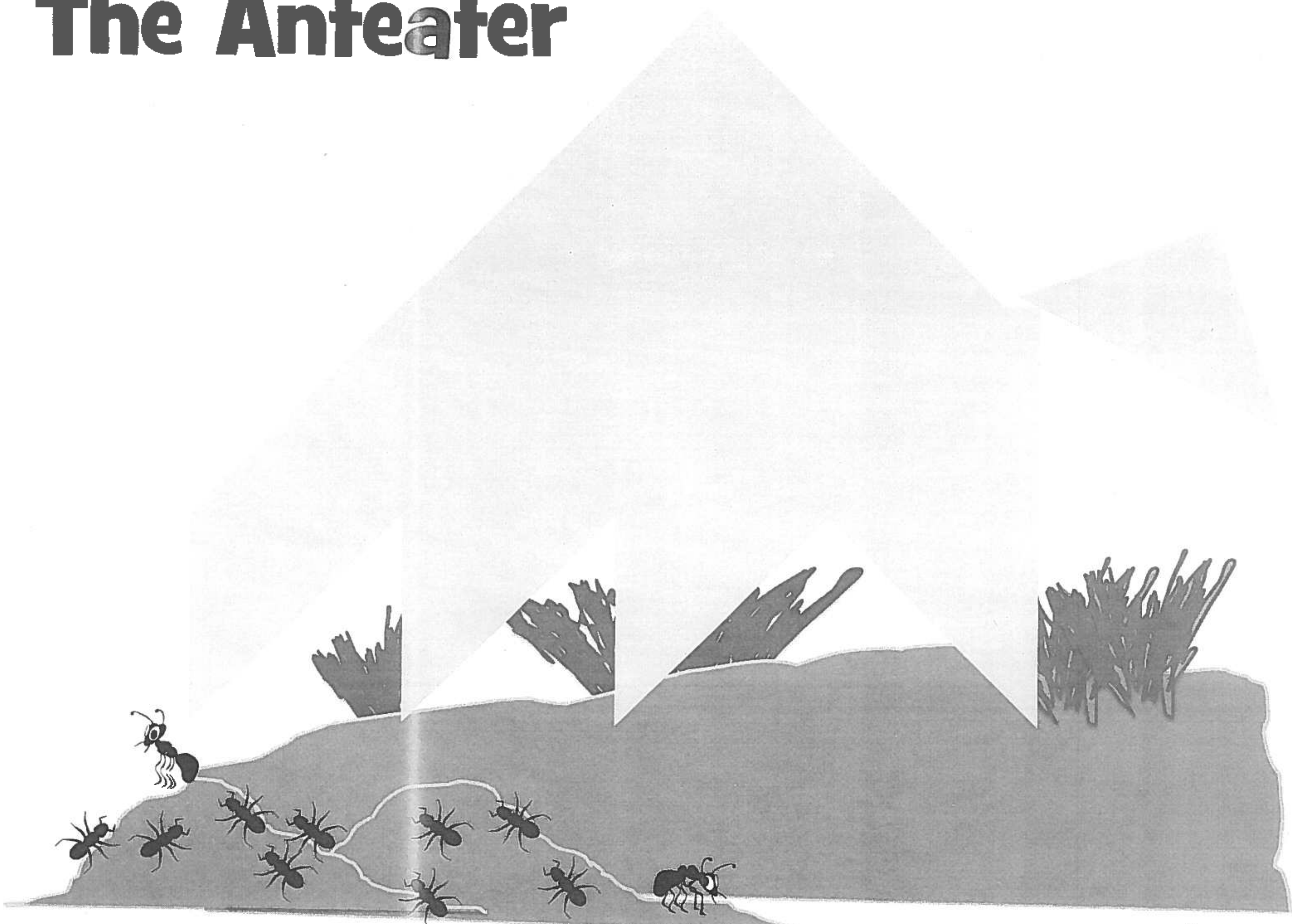


The Swan



Grades K-2

The Anteater

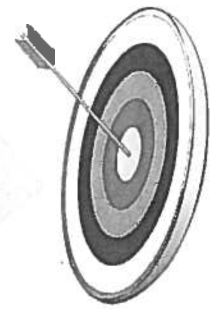


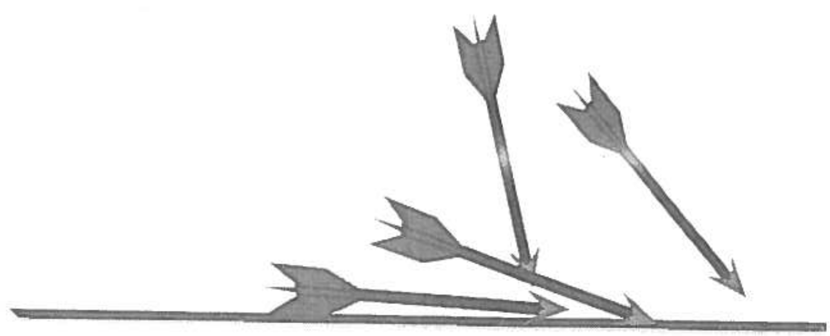
Grades 3-5

The Meteor

Grades 3-5

The Archer





Grades 3-5

Time of Your Life

The Big Idea:

There's a lot of math involved in telling time! Let's explore time by turning ourselves into the hands of an analog clock.

You Will Need:

★ To print (optional): Clock numbers (1 packet)
★ Digital clock or cell phone with a digital clock display
★ Masking tape
★ Paper: 1 sheet per kid, plus 2 extra
★ Pencil
★ Stopwatch or cell phone with a stopwatch function

Key Prep:

★ Tape the clock numbers (or just numbered pieces of masking tape) to the floor in a 10 foot circle, like a giant clock. Mark the center of the clock with a small masking tape X.
★ Write "Hour Hand" on one sheet of paper, and "Minute Hand" on another.

The Math Behind the Scenes:

Clocks help us measure the passage of time, and are really helpful tools when we need to be someplace at a certain time. To read an analog clock, we need to know how to count to 60 and how to skip count by 5s. Telling time with a clock is a great way to learn about basic fractions, too.

Time for a Birthday (for little kids)

There are 2 kinds of clocks, digital and analog. Digital clocks are the kind that you see on microwave ovens, stoves, cars and smart phones. They display the time like this:

09:14

- ★ What would your birth date look like on a digital clock? That's the month and day of your birthday. This clock shows September 14, because September is the 9th month and the 14 shows it's the 14th day.
- ★ Are you able to come up with a time that shows your birthday?
- ★ Would any birthday work?
- ★ Your birthday time shows up on the clock twice every day. Are you usually awake both times or just one?

Now let's find out what time our names make:

- ★ Count the number of letters in your first name and use that number as the hour.
- ★ Now count the letters in your last name and use that number as the minutes. For example, the name Jonathan Smith would be 08:05.
- ★ If you have more than 12 letters in your first name, use 12 for the hour and add the extra letters to the last name for additional minutes!

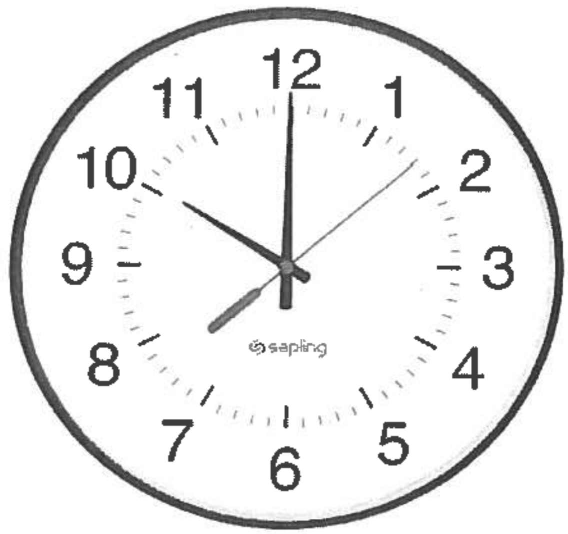
BONUS:

- ★ What time has the same digits in all 4 spaces?
- ★ What's the largest number you can make using the digits on the clock?
- ★ What's the smallest number you can make?

All Hands on Deck
(for 2 or more little and big kids)

Not all clocks look like the digital one. Some clocks have hands that spin in a circle and point to numbers to tell us the time. Those are called analog clocks. They were invented long before electricity and digital clocks.

Analog clocks look like this:



★ The short ("hour") hand takes an hour to advance from one number to the next number (for instance, from 1 to 2).
★ The long ("minute") hand takes 5 minutes to advance from one number to the next number, and it takes an hour to go around the clock once.
★ Each number on the clock represents the hour when reading the hour hand, and 5-minute increments when reading the minute hand (so 1 is 5 minutes, 2 is 10 minutes, 3 is 15 minutes, etc.).
★ What time does the clock say when the hour hand is on 10 and the minute hand is on 12?
★ How do you read the clock when the hour hand points halfway between 10 and 11, and the minute hand is on the 6?
★ What if both the hour and the minute hand are on the 1?

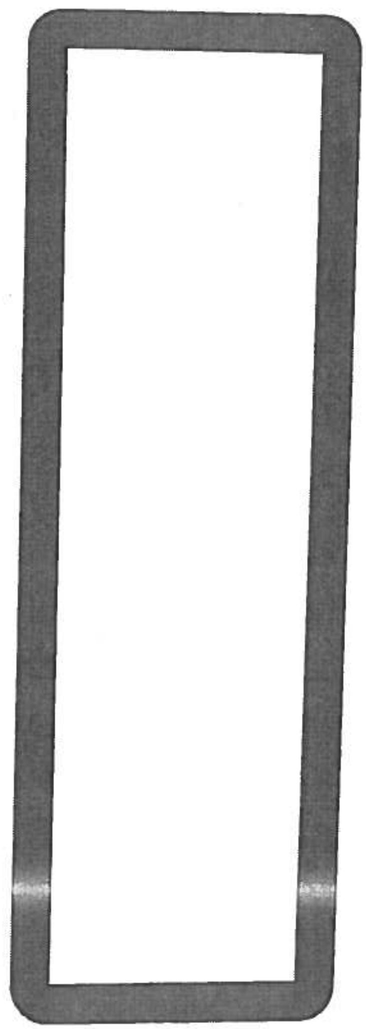
Today, you're going to be the hands on a clock and race to show the time!

- ★ Give one kid the "Hour Hand" sign, and another kid the "Minute Hand" sign.
- ★ Have an adult or older kid call out a whole-hour time, like "6 o'clock!" and start the stopwatch
- ★ The two kids lie inside the clock as the "hands," each pointing to the correct number. The minute hand kid should extend his/her arms longer than the hour hand kid.
- ★ Stop the stopwatch when the kids display the time correctly.
- ★ Repeat with different times ending in 0 or 5 and see if the kids can display the times faster.
- ★ Times to avoid for overcrowding: 12:00, 1:05, 2:10, 3:15, 4:20, 5:25, 6:30, 7:35, 8:40, 9:45, 10:50, 11:55.

As Time Goes By (for big kids)

Now that we have the basics figured out, let's see what our clock looks like when time elapses, and the hands move!

- ★ Give the kids a starting time (e.g., 4:15, 3:55), and then have them advance 15 minutes by figuring out the new time and rolling the hands to it. Both hands may need to move!
- ★ Try it again with different starting times, and advancing by longer times (e.g., 30 minutes, 60 minutes, 90 minutes).



2

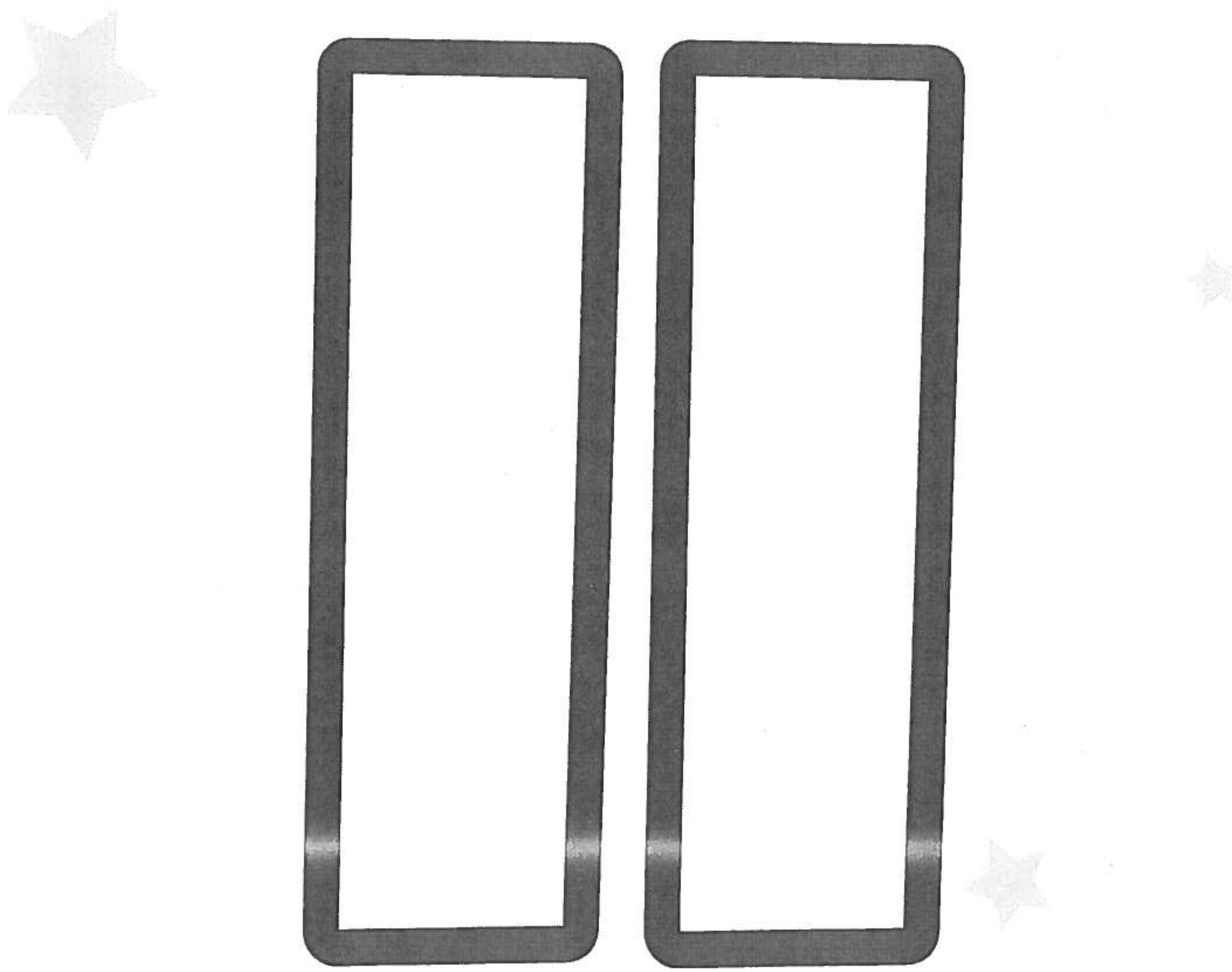
3


4

6


7

10



12

Tricks of the Eye

The Big Idea:

Sometimes our eyes play tricks on us, and the things we think we see are different from reality. These are called optical illusions. Even though they seem like magic, it turns out there's a lot of math involved!

You Will Need:

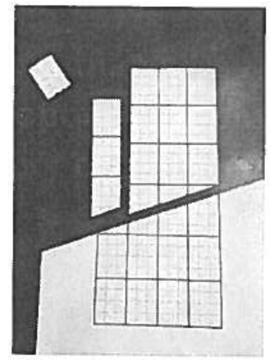
- ★ To print: Bedtime Math's Chocolate Bar Printable: 1 per kid
- ★ To print (optional): Optical Illusions Packet: 1 per kid
- ★ Pair of scissors
- ★ Index cards: 2 per kid
- ★ Marker
- ★ Drinking glass with smooth, clear glass
- ★ Water for the glass
- ★ Ruler
- ★ Laptop, smartphone, or tablet with internet access (optional, but strongly encouraged)

The Math Behind the Scenes:

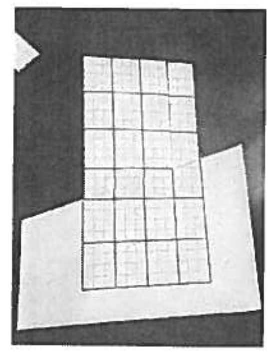
We'll measure the length and width of rectangles, which helps us calculate their area. We'll also practice our estimation skills. Some optical illusions rely on refraction, the "bending" of light rays. Others rely on our "blind spot" – the area in our eye that can't pick up light. We can use math to figure out how large it is!

Infinite Chocolate Bar:

Have you ever wished you could have an endless supply of chocolate? What if you had a chocolate bar that you could break apart, eat a bite, and put back together again, just like new? Let's practice with this grid, which looks a little like a chocolate bar.



1. Start by counting the number of rectangles along the right-hand column.
2. Now cut out your Chocolate Bar:
   - ★ First, cut across the diagonal line and set the bottom piece aside.
   - ★ Then cut the top pieces along the dotted lines. Make sure to trim the solid white margins off the pieces.
   - ★ Set aside the smallest "bite" of chocolate.
   - ★ Like a puzzle, rearrange the remaining pieces to form a complete chocolate bar.
3. Now how many rectangles are there along the right-hand column?

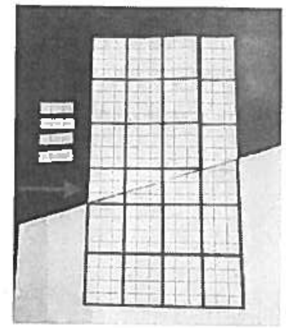


What's going on here?! Is it really possible to take away a piece of chocolate and still have a complete chocolate bar?

- ★ If you look at the little bite of chocolate bar that we set aside, you'll see that it's a grid 3 squares wide and 4 squares long for a total area of 12 tiny squares (width x length = area).
- ★ Now, look back at your reassembled chocolate bar. Notice that the rectangles in the 4th row, through which we made our diagonal cut, are still 3 squares wide but only 3 squares long - that's a total area of 9 squares in each of those bites, unlike the other bites that have 12 squares.

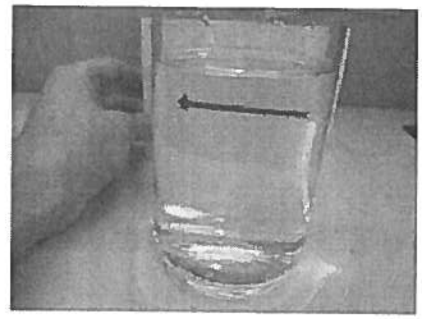
★ So, if 4 bites are missing 3 squares each, that means we're missing a total of 12 squares from the whole chocolate bar.

★ Can we cut our little bite into 4 mini-bites of 3 squares each? Yes, and when we do, it's the same number of rows and squares that are missing from the diagonal cut of the giant chocolate bar!



Reversing Arrows:

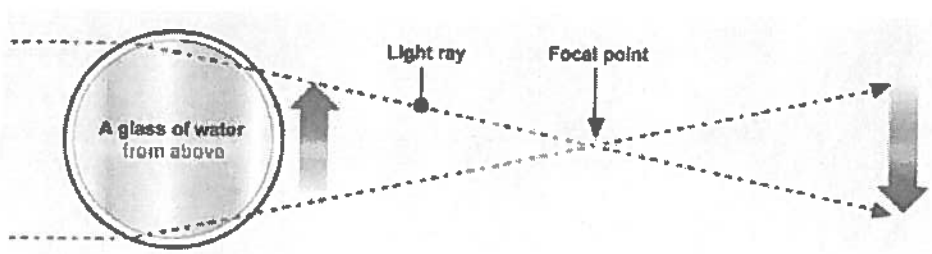
Next up is an optical illusion called reversing arrows. Forget everything you thought you knew about left and right!



1. Using a marker, draw a thick arrow on an index card.
2. Fill a glass with water and put it on a table.
3. Place your arrow card behind the water and against the glass pointing either left or right, and then slowly move the card backward while watching through the water.

What happens when you move your arrow backward? Why do you think the arrow reverses itself?

It happens because of refraction, the bending of light. When light travels through water, it bends, so the rays pop out shining toward a single center point, called the focal point. Any images on the other side of the focal point will look reversed to us.



To See or Not to See:

Have you ever heard of a blind spot? It's a spot in the air where your eye can't see anything. There is 1 spot on the inside of your eyeball where there are no cones or rods, which are the parts in your eye that pick up light. Everyone has a blind spot, so let's find yours!

1. Draw an x on the right side of an index card. Then use a ruler to measure about 5 inches to the left of the x and draw a dot the size of a penny.
2. Hold your card at eye level an arm's length away. Make sure the x is on the right.
3. Close your right eye and look directly at the x with your left eye. You should be able to see both shapes.
4. Now <u>slowly</u> bring the card toward your face, focusing on the x. Keep looking at it – no looking side to side!

What happens as you bring the card closer? (The dot should disappear, then reappear as you bring the card even closer to your face. See if you can pinpoint where it happens!)

5. Now close your left eye and look directly at the dot with your right eye. Repeat the game.

What happened this time? Is the distance from your face about the same for both eyes?

Will the dot still disappear if it's as big as a quarter? Make the dot larger and try.

What if it's a different shape, like a triangle or square? Make another shape on the back of the card, again 5 inches to the left of an x.

6. Next, draw a straight line from the dot to the x using a ruler.
7. Repeat the game, focusing on the x with your left eye (close your right eye).

What happens when you bring the card closer? (The dot disappears, but the line looks continuous without a gap where the dot used to be.)

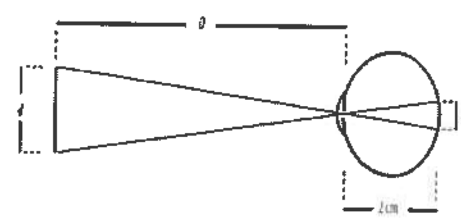
Why isn't there a gap where the dot used to be? Fun Fact: **When our eye can't see what's in a certain spot, our brain fills in that area to match what surrounds it.**

Bonus (optional): Now that you've found your blind spot, let's figure out how big it is by measuring its diameter, or width.

1. Hold your index card at arm's length from your face, and the other holding a pencil and a ruler.
2. Have a family member use a ruler to measure the distance from the card to your eye and write it down.
3. Now close your right eye and look directly at the x with your left eye. Slowly move the card side to side and have your family member mark on the card where the x disappears and where it reappears. Measure the distance between the two places.
4. You can measure the diameter of your blind spot using this simple equation, assuming the pupil is 0.78 inches (2 centimeters) from the retina:

$s/2 = d/D$

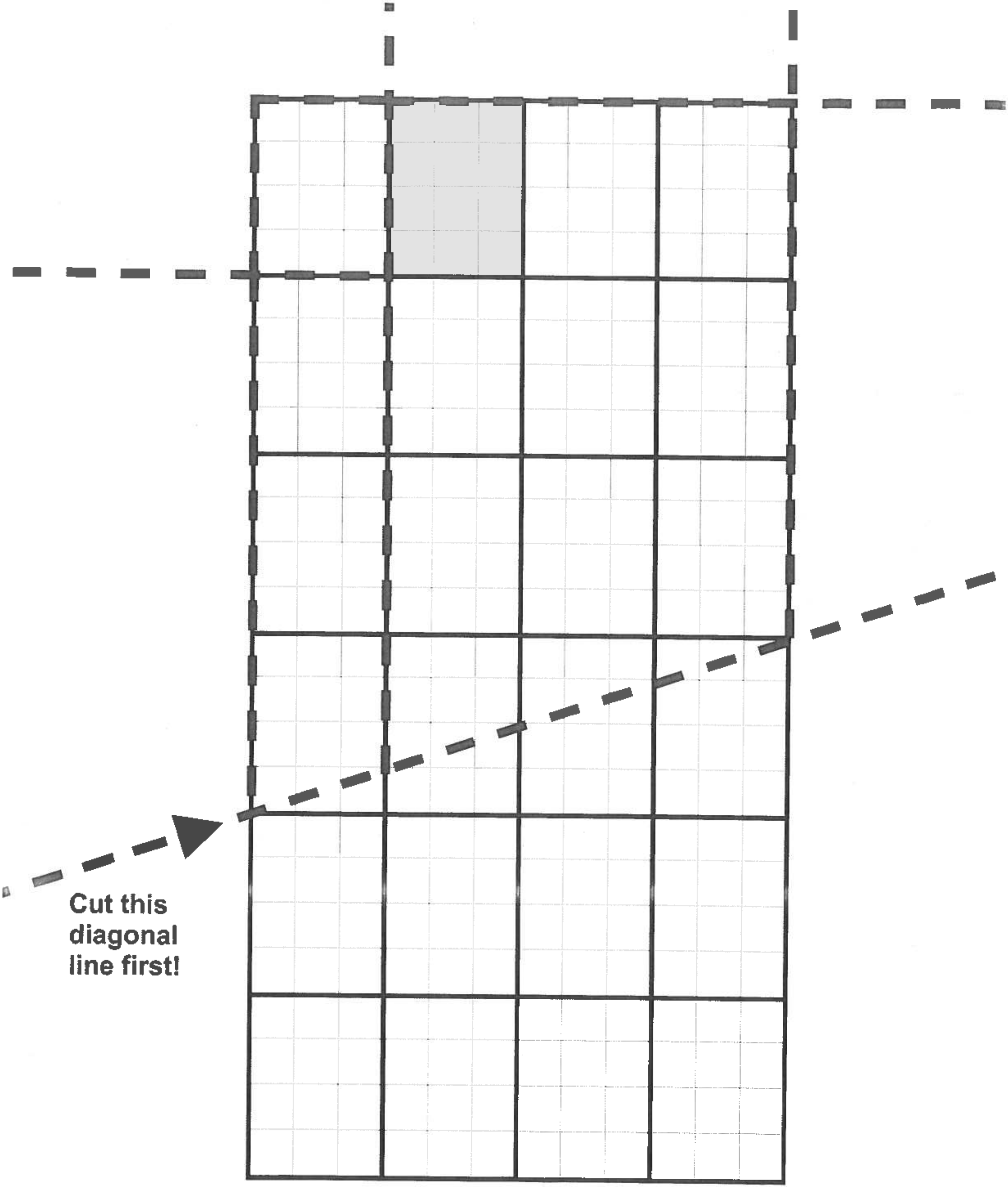
s = size of the blind spot on the retina
d = diameter of the blind spot on the card
D = distance from the eye to the card



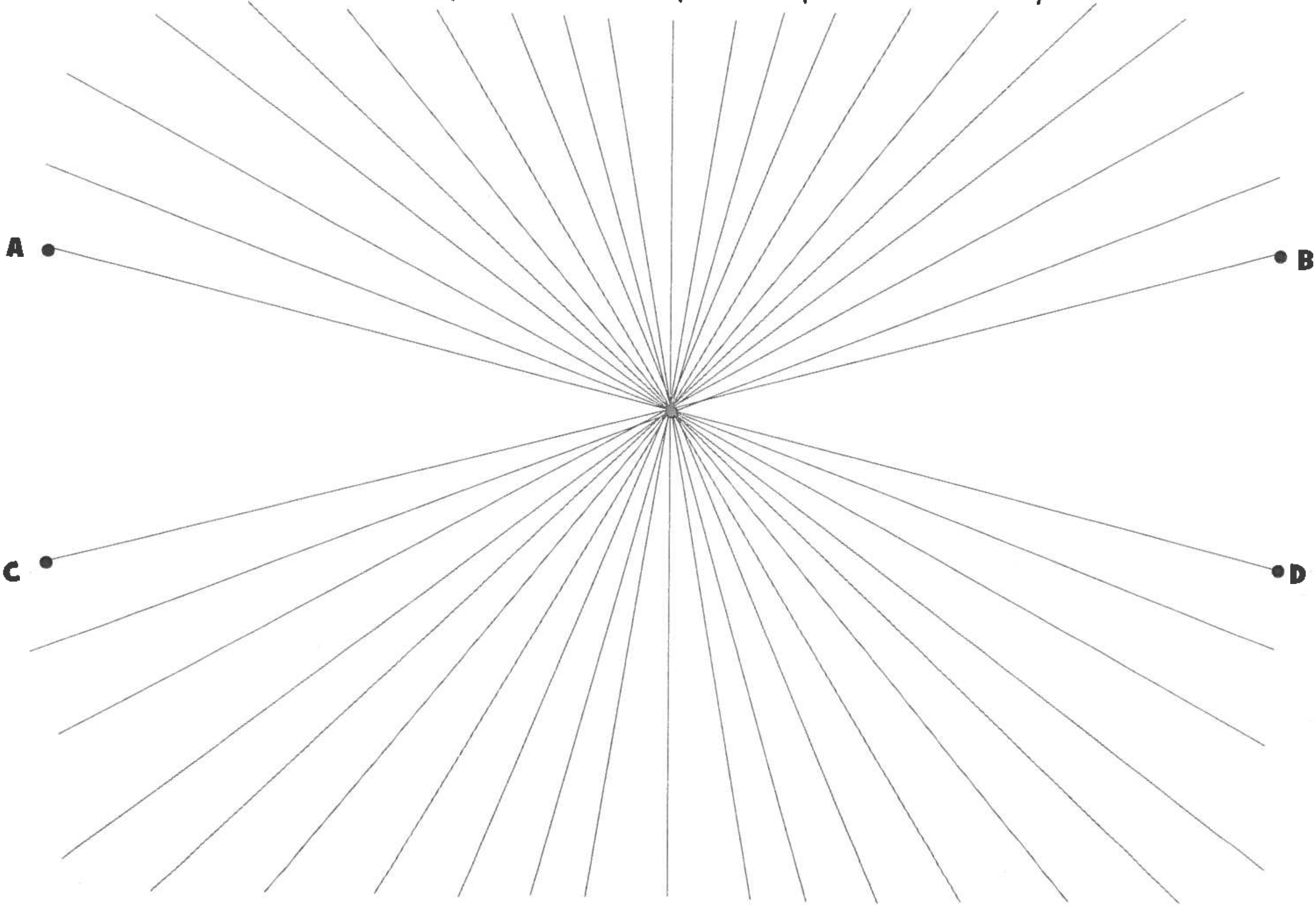
*Thanks to www.exploratorium.edu for coming up with this activity!

Grand Finale: Crazy Circles

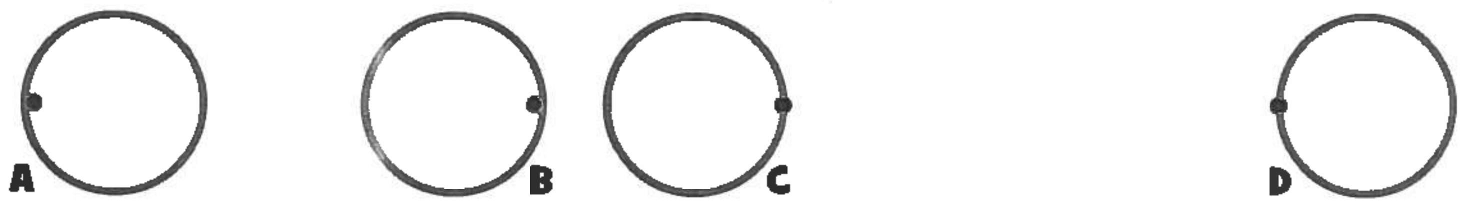
Watch this cool optical illusion video from your laptop, phone or tablet: http://safeshare.tv/v/ss571e3c0b2ad60 and check out the Optical Illusions Packet. Have a pencil and ruler handy.


Cut this
diagonal
line first!

Draw a straight line from point **A** to point **B**, then from point **C** to point **D**. How do they look?

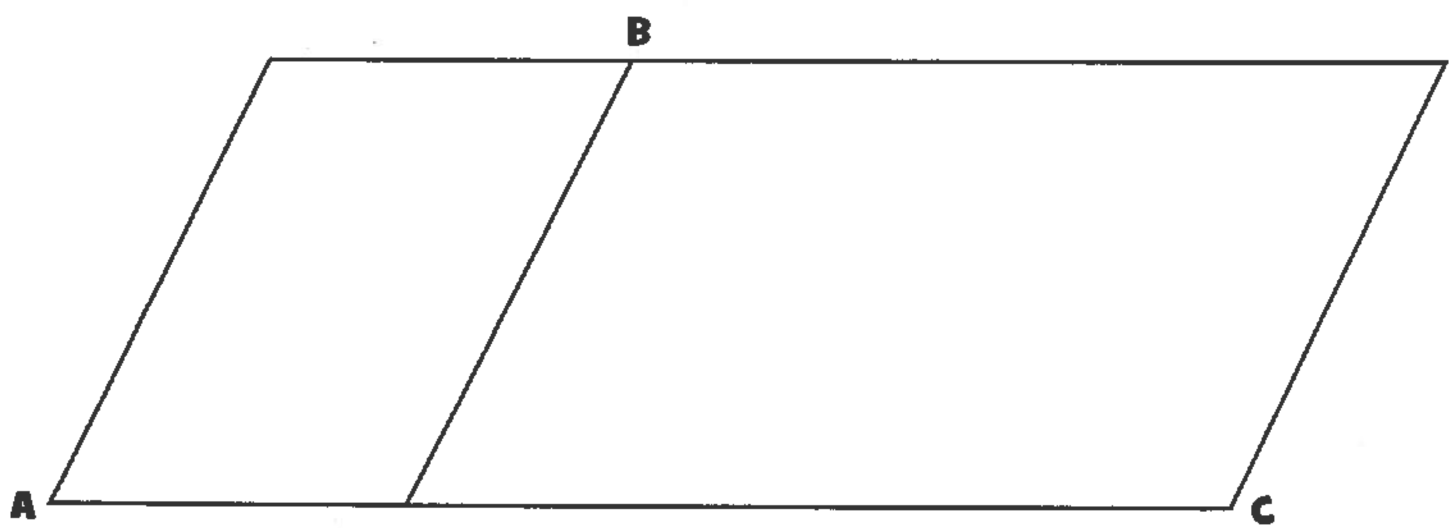


Draw a straight line from point **A** to point **B**. Then draw another from point **C** to point **D**.



Which new line looks longer? **Measure** both to find out!

Draw a straight line from point **A** to point **B**. Then draw a straight line from point **B** to point **C**.



Which new line looks longer? **Measure** both to find out!

Wacky Water Race

The Big Idea:

Kids get moving and learn about volume in this family backyard race!

You Will Need:

- ★ Outdoor space to set up two 25 foot racetracks
- ★ A set of measuring cups
- ★ Two plastic pitchers to place at the starting lines
- ★ Two more pitchers, bowls, or buckets to place at the finish line
- ★ Water!

The Math Behind the Scenes:

Kids learn about measurement and volume, two subjects that are much easier to understand when they're experienced hands-on.

How it Works:

1. Set up two side-by-side raceways outside, about 25 feet long.
2. Use the measuring cups to fill two pitchers with the same amount of water. Before you start, talk about measurement. Ask:
   - ★ How much does each pitcher hold?
   - ★ How many cups will it take to fill the pitcher?
   - ★ How many half cups?
   - ★ How many quarter cups?
3. Place the full pitchers at the two starting lines.
4. Place an empty pitcher or bowl at each finish line.
5. Kids race to see who can transfer **all** of their water first! They can't go too fast, or the water will spill!
6. When someone finishes, you can measure how much water made it to the finish line – what fraction made it all the way to the end?

BONUS: Have kids try the race a few times – each time with a different size measuring cup. Hypothesize how much longer it will take to complete the race with a full cup versus a half cup vs a quarter cup. Also guess which race will result in the most water in the finish line pitcher – e.g. will a larger or smaller cup spill more?

Walk This Way

The Big Idea:

It's one thing to take a walk. It's another to follow someone else's instructions telling you where to walk! Today we'll take turns writing "code" for "robots" (kids and adults) to follow. Let's see what funny robot moves the coders have in store!

You Will Need:

1. To print: Radical Robot Commands (page 4)
2. Scrap paper
3. Pencil or pen

The Math Behind the Scenes:

We've all seen robots, but what exactly is a robot? It's a programmable machine, meaning people write a set of instructions, or a program, that tells it what to do. Robots only understand actions that are listed step by step in specific "code," which is a special set of words and symbols that a computer can understand. You may have heard the term "coding." That's another way of saying that you're writing a program.

Simon Says – for Robots

First, let's see what it feels like to follow a program. Follow these instructions as exactly as you can.

1. Step right foot forward.
2. Step left foot forward.
3. Lift right hand up.
4. Put right hand on head.
5. Lift right hand up and down on head 3 times.
6. Yell "Panda parade!"

You probably didn't know why you were doing this silly routine, but a program is a program – you just follow it, step by step. We normally call picking up your hand and putting it back down on your head as patting yourself on the head, but robots only understand actions that are listed step by step in specific "code." This ensures that every robot follows the program the same exact way.

Radical Robots

Now you're going to program each other! As a robot you only understand certain words, so you'll have to start your action using the moves listed on the Radical Robot Commands list. You may combine a move with a direction and number of times to perform a single action. For example, "LIFT RIGHT ARM" or "3 HOPS FORWARD." But remember – you have to write the program one action (or one command) at a time. And when the command reads: step, skip or hop, it means one normal step, skip, or hop, not a gigantic one!

1. Hand one kid a piece of scrap paper, a pencil or pen, and a copy of the Radical Robot Commands list.
2. Decide where the starting spot will be.

3. Have the kid write the robot's final position (e.g. sitting in the middle of the couch, standing in front of the kitchen sink) on the bottom of their paper. They should work quietly to keep the final position a secret!
4. Have the kid spend 5-7 minutes writing a routine to get the robot to its final position using the specific language on the Radical Robot Commands list.
5. Give a 2-minute warning if they are very engrossed!
6. When time's up, have another kid or adult act as the robot, make sure to keep the final position a secret from the robot!
7. Have the first kid read its instructions to the robot. The robot follows the steps as given. See what unexpected things happen!

Debugging Out

Now that you've seen a robot do your program, do you think you know what steps to write differently? Sometimes machines stop working because of an error in the program called a "bug." Finding and fixing bugs is called debugging in computer science. We're now going to debug our programs and have a new robot try it!

1. Talk through anything that went unexpectedly, and what steps should change to enable any robot to reach its goal.
2. Have the first kid write up the program again from start to finish.
3. Have another kid or adult be the robot. If you don't have another person to be the new robot, then write a new program for a different final destination and have the same person be the robot.
4. The kid reads the debugged program to the new robot. See if the program works better this time!
5. Feel free to continue debugging, robot-rotating and program-running as interest allows!

Radical Robot Commands

You can pair a move with a direction when writing each command. You can also include the number of times you'd like your robot to perform that move.

Move	Direction
Clap	Backward
Grab	Forward
Hop	Right
Lift	Left
Pick up	Up
Put down	Down
Sit	Around
Spin	Half-way
Stand	One-quarter
Step	
Stomp	
Wiggle	
Yell	