## It Started with Pizza Reader

## Learning Objectives

- Mathematics: Students will understand the meaning
of variables and expressions and how they are related to writing equations.
- Nonfiction reading: Students will ask questions in order to make connections to the text.
- Nonfiction writing: Students will use expressive language, such as similes, metaphors, and vivid details, in written compositions.


## Materials

- It Started with Pizza readers
- copies of student reproducibles (pages 68-69; page068.pdf; page069.pdf)
- art supplies, such as markers or crayons
- blank paper
- a copy of the book Math Curse by John Scieszka (optional)
- It Started with Pizza digital version (pizza.pdf) (optional)


## Using the Readers

## Before Reading

1. Complete the Introduction to Mathematics Vocabulary activity (page 58) with the class. Then, divide students into ability-based reading groups. This book is written for students at fourth-grade reading levels or above.
2. Reading Activity-Write the title of the reader on the board: It Started with Pizza: Variables, Expressions, and Equations. Have students, as a whole group, form questions about this title to predict what the reader may contain. Write their questions on the board as they state them. Then, distribute copies of Turning Questions into Facts (page 68) to students. Have them list three of the questions on their activity sheets. Explain that as they read, they should find the answers to these questions.
3. Mathematics Activity-With a partner, have each student search the room for examples of how math is represented in the room. For example, they may choose the clock and the time it shows, or even the number of tiles on the floor. Have them list at least five examples to save for later use.
4. Writing Activity-Have students close their eyes as you read the following sentences: The pizza was a piece of heaven. The toppings on the pizza were as crowded as a group of people at a concert. Ask them to share the images that formed in their minds as you read the sentences. Then, explain to students that the above examples are metaphors and similes. They help make writing more vivid and lively. Tell students that they will be writing similes and metaphors to make their own writing more expressive.

# It Started with Pizza Reader (cont) 

## Using the Readers (cont.) <br> During Reading

5. Assign each student a word from the glossary. Then, ask students to think of creative ways to express their word's meaning. They may use actions, pictures, clues, or other ideas. Have a list of the vocabulary words written on the board. Then, have students present their definitions to the whole group. Students should guess the vocabulary words based on the definitions given. You may want to use the digital version of the reader (pizza.pdf) as an electronic big book to display the text and pictures as you discuss the vocabulary words.
6. Place students into groups of three. Have them share their questions from their Turning Questions into Facts (page 68) activity sheets with the other group members. Then, ask students to read the text with their groups.
7. Reading Activity-Once students have completed the first reading with their small groups, have them read the text again in pairs. This time, ask them to record the answers to their questions on their activity sheets. They should then come back together in their small groups to discuss the answers.
8. Mathematics Activity-Have students use their lists of examples of math in the classroom to write an equation for one of the examples. Remind them to use their readers for examples of how to write an equation.
9. Writing Activity-Have each student choose his or her favorite food. Then, have them list five adjectives to describe that food. Remind them to use their five senses. Finally, have them turn those adjectives into similes and metaphors, comparing the food to other things.
10. Assign Let's Explore Math—It Started with Pizza (page 69). This assignment can be used as classwork while you meet with other groups. Or, you can give it as a homework assignment. The activities will be discussed on the following day.

## It Started with Pizza Reader <br> (cont.)

## Using the Readers (cont.)

## After Reading

11. Writing Activity-Have students organize their similes and metaphors into paragraphs about their favorite foods. Then, place them with partners. As they read their paragraphs, have the partners visualize the foods. Then, have each set of partner pairs draw pictures to show what they visualized. You may wish to display the artwork next to the writing for the entire class to view.
12. Reading Activity-Students should complete the final portion of their tables, making connections between the answers and the main idea of the readers. Once they have completed their tables and answered the questions on the Turning Questions into Facts activity sheet (page 68), have students share their connections with two other classmates.
13. Mathematics Activity-Have students trade their equations with another classmate. They should then solve their classmates' equations. As a whole group, share the equations and the answers.
14. Review student work on their Let's Explore Math—It Started with Pizza activity sheets (page 69). Go over the problems together, referring back to the book to find support for their answers. Answers for the problems are provided on page 254 in this book or on the last page of the reader.
15. To conclude the study of the reader, discuss how writing equations helps us organize our thoughts in order to solve problems. Ask students to give even more examples of writing equations if time permits.

## Differentiation

- Provide below-grade-level students with word problems that they can use to form their own equations. This way, they will not get caught up on figuring out the information to put in their equations, but instead can concentrate on writing the equations themselves.


## STEPS

## Mathematics

- Pull the students back together as a whole group and present the Focused Mathematics Lesson on pages 70-75.
- The lessons using the problem-solving transparencies (pages 76-79) are a great way to conclude the week's study of variables, expressions, and equations.


## Language Arts

- Read aloud a book about mathematics in the real world, such as Math Curse by John Scieszka. Then, have students create lists of how they may encounter mathematics in one day. Ask them to write about how mathematics affects them and their daily lives.

Name $\qquad$

## Turning Questions into Facts

Directions: Complete each section of the activity sheet below. First, ask questions you may have about the text. Then, find facts to answer those questions. Finally, connect the facts to the key ideas or concepts of the reader. Answer the questions below after you have completed the chart.

| $\begin{array}{c}\text { Questions About } \\ \text { the Text }\end{array}$ | $\begin{array}{c}\text { Facts to Answer the } \\ \text { Questions }\end{array}$ | $\begin{array}{c}\text { Connecting the } \\ \text { Questions }\end{array}$ |
| :--- | :--- | :--- |
| (How does the fact |  |  |
| connect to the key topic |  |  |
| or main idea of the text?) |  |  |$]$

1. How do these facts help you understand the topic?
$\qquad$
$\qquad$
$\qquad$
2. Was it difficult or easy to make connections between the facts and main idea of the text? Why or why not?
$\qquad$
$\qquad$
$\qquad$

Name $\qquad$

## Let's Explore Math—It Started with Pizza

Directions: Answer the following questions.

## EXPLORE <br> 

1. Variables (VAIR-ee-uh-buhls) are letters or symbols that can be used to represent numbers. Often, the letter $x$ is used to represent a number.
An equation is a mathematical sentence that shows 2 equal numbers or quantities. It is written with an equal sign.
Look at the pictures in your reader. They show the pizzas that were eaten at the birthday dinner. Each pizza had 4 slices. The equation $\frac{1}{4}+\frac{1}{4}=x$ can be used to find what fraction of the pizza each kid ate.
a. What does $x$ represent? $\qquad$
b. What does $x$ equal? $\qquad$

## EXPLORE MATH

2. The total area of the bedroom is 126 square feet. The bedroom furniture takes up 74 square feet. Let $x$ represent the amount of unused space in the bedroom.
a. What equation could be used to find the amount of unused space in the room?
b. Solve the equation you wrote in problem a. $\qquad$
c. What would you do with the unused space? $\qquad$

## EXPLORE MATH

3. There are 8 planets in our solar system. Mercury, Venus, Earth, and Mars are called inner planets. The rest of the planets are called outer planets.
a. Write an equation to show the number of outer planets. $\qquad$
$\qquad$
b. How many outer planets are in our solar system? $\qquad$

## It Started with Pizza

Variables, Expressions, and Equations


# It Started with Pizza 

Variables, Expressions, and Equations

## Dawn McMillan

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## Math in Food

On my birthday, I invited two of my friends to a pizza restaurant for dinner. Of course, we ordered pizza. We all love pizza! We sat with Mom and Dad, and my older brother. The waiter brought two pizzas to the table.
"Two pizzas!" joked Dad. "One for Mom and me to eat, and one for the rest of you!"
"That is unfair!" I exclaimed. "That means that you and Mom will have 2 slices each, which is half of the pizza. We will only have 1 slice each. That is only one quarter of the pizza!"
"Never mind!" said Mom. "We can order another pizza. The four of you can share 2 pizzas."


Before we knew it, the waiter had delivered another pizza for us kids to share.
"So," said my older brother, who thinks he is really good at math, "if we all eat a quarter from both of the pizzas, what fraction of a whole pizza will each of us eat?"


Variables (VAIR-ee-uh-buhls) are letters or symbols that can be used to represent numbers. Often, the letter $x$ is used to represent a number. An equation is a mathematical sentence that shows 2 equal numbers or quantities. It is written with an equal sign.

Look at the pictures above. They show the pizzas that were eaten at the birthday dinner. Each pizza had 4 slices. The equation $\frac{1}{4}+\frac{1}{4}=x$ can be used to find what fraction of the pizza each kid ate.
a. What does $x$ represent?
b. What does $x$ equal?

I looked at my two friends. "Easy!" I said. "We each eat a quarter from one pizza, then a quarter from the other. That makes two quarters, which makes half a pizza. We will each be eating the same fraction of pizza as Mom and Dad! We could write an equation to show the equivalent fractions: $\frac{2}{4}=\frac{1}{2}$,


Later that night, back at home, I grabbed an apple for a snack. I cut the apple into slices. Quickly, my older brother ate 3 of the slices. There were 5 slices left for me. I used math to figure out how many slices I started with.

## How Many Slices?

I can use the equation $x-3=5$ to figure out how many slices I started with.
$x$ represents the number of slices I started with.
3 represents the number of slices my brother ate.
5 represents the number of slices I had left.
I can add to solve for $x$.
$x-3=5$
$5+3=\mathrm{x}$
$5+3=8$
That means I started with 8 slices.

## Math Is

## Everywhere

My brother and I talked more about math later that night. We realized that we could use math to figure out how many hours we sleep each school night. Our bedtime is 8:00 Р.м. and we wake up at 7:00 A.m. in order to get ready for school.

## How Many Hours?

We go to bed at 8:00 P.M. and we wake up at 7:00 A.M. We can count up from 8:00 to figure out how many hours of sleep we get each night. We can also draw a clock and use it to solve the problem.
sino $\operatorname{ll}$

These clocks show what time we get up and what time we go to bed.


As my head hit the pillow, I was still thinking about math. I thought about the environment and the world around me. I thought about all the things that people do. And I began to understand that math is everywhere.

I decided that tomorrow I would do a test to see how many places I could find math throughout the day.


## Math at Home

## In the Bedroom

After school, I looked around my bedroom for different examples of math. Each thing in my room takes up a different amount of space.

So I used grid paper and made a simple floor plan of my room. I sketched how much space my bed takes up. I also have a desk, a bookcase, a dresser, a night stand, and a rug. My brother helped me work out how much space each piece of furniture takes up.


I realized that math could be shown in my floor plan. I could calculate the perimeters and areas of all of the objects in my room. I could also use the dimensions to rearrange my room and design a new floor plan.
 The bedroom furniture takes up 74 square feet. Let $x$ represent the amount of unused space in the bedroom.
a. What equation could be used to find the amount of unused space in the room?
b. Solve the equation you wrote in problem a.
c. What would you do with the unused space?

## In the Kitchen

Then I went into the kitchen to help make dinner. The kitchen is another great room for finding math. Recipes show measurements of ingredients. And recipe and division.


There are many kitchen tools that are used to measure ingredients. Measuring spoons are different sizes:
$1 / 8$ teaspoon, $1 / 2$ teaspoon, and $1 / 4$ teaspoon. They are all fractions of 1 teaspoon. Measuring cups are marked with fractional measurements: $1 / 2$ cup, $1 / 3$ cup, and $1 / 4$ cup. They are all fractions of 1 cup.


## measuring cups

$\frac{1}{3}$ cup
$\frac{1}{4}$ cup

Mom and I decide to make pizza for dinner. We follow her recipe, but we have to double it to make 2 pizzas. To do this, we multiply each quantity in the recipe by 2 .

It was easy to double the quantities of the flour, sugar, olive oil, and dry yeast. The fractions made it harder to double the amount of water and salt. Mom suggested using repeated addition instead.


## Double Quantities

## Water

$\frac{3}{4}+\frac{3}{4}=\frac{6}{4}=1 \frac{1}{2}$ cups warm water
Salt
$\frac{1}{2}+\frac{1}{2}=\frac{2}{2}=1$ teaspoon salt

## Mathematical Names

As Mom and I were cooking, I realized that we can talk about numbers in different ways. I looked at our kitchen scale. Two cups of flour weighs about 8 ounces. If 8 ounces equals $1 / 2$ pound, then 8 ounces is also $50 \%$ of a pound. And $50 \%$ can also be written as a decimal number, 0.5.

The quantity remains the same. It does not matter if you use the decimal, percentage, or fractional name.


When we doubled the pizza-dough recipe, we calculated that we needed 16 grams of dry yeast. Dry yeast comes in packets that hold 2 grams each. We can use the variable $p$ to represent the number of packets we need to use.
a. Which equation below could be used to find the number of packets needed for the recipe?

1. $2+p=16$
2. $2 p=16$
3. $2 \div p=16$
b. Use the equation you chose to figure out how many packets of yeast are needed for the recipe.

## Math and the Human Body

Dad came into the kitchen. "I will show you something else to do with math," he said.
"Come with me!"
He led me to a full-length mirror. Then he stood in front of it. "A great example of proportions stares out at us from the mirror!" he said.

I looked at Dad's reflection. His head takes up about $1 / 8$ of his body. So, the human body stands about 8 heads high. That means a body is about as tall as 8 heads of that body, stacked on top of each other.

In other words, the ratio of the head to the whole body is 1 to 8 ; the head is $1 / 8$ of the height of the whole body.

Then Dad stepped away from the mirror. "Now it is your turn," he told me. "Look closely at your face."

I looked at my reflection. I noticed that my face was symmetrical.

Next, I found a magazine. I looked at some faces and saw how they were symmetrical, too.

## More Faces

There were 4 faces in the magazine that were not symmetrical. Those people had freckles. I wrote an expression to show the total number of faces I found in the magazine: $4+18$. What does the number 18 represent?

After dinner, I went outside to play with my neighborhood friends. I noticed my friend's younger sister, Nita, had some adult teeth growing in. She told me that she has 7 adult teeth.
Altogether, she has 20 teeth. I can use the variable $t$ to figure out how many baby teeth she has left.

## How Many Teeth?

$7+t=20$
$20-7=t$
$20-7=13$
Nita has 13 baby teeth left!

## EXPLORE MATH

While playing, a group of my neighborhood friends are discussing how tall they are. Luis is 55 inches tall, Madeleine is 56 inches tall, and Jamie does not know her height.
a. Write an expression to show the combined height of all three friends.

The total combined height for all 3 friends is 162 inches: $55+56+x=162$
b. What is Jamie's height?
c. Who is the tallest?

## Math in Space

When I came in from playing, Mom came into my room to see what I was doing.
"What about math in space?" asked Mom. "Think about the size of the planets in our solar system. Maybe we could make a proportional model of some of the planets."

The planets that make up our solar system


Mom told me that astronomers collect proportional data about the solar system. Our solar system is huge in size and distance. There are 8 planets and a sun in our solar system. Some of the planets are smaller than Earth. Some are much larger.


There are 8 planets in our solar system. Mercury, Venus, Earth, and Mars are called inner planets. The rest of the planets are called outer planets.
a. Write an equation to show the number of outer planets.
b. How many outer planets are in our solar system?

Dad suggested that we research the size of the planets and the sun on the Internet. It was amazing. I had not realized just how large the solar system is, or how big some of the planets are. The sun is a star. It is even bigger than all the planets in our solar system combined!


The more I thought about the solar system, the harder it was to visualize the size of the planets in it. So Mom helped me some more.

First, we found out the actual diameter of the sun and the planets. Mom got me to write them down. Then, Mom helped me change the diameter of the planets from kilometers into millimeters! Then Mom reduced that number by 100 million. So, our scale is 1 millimeter $=$ 1,000 kilometers.

It was a lot of hard work. Mom used her calculator to help her. But it was worth it. Mom and I found a great way to make a proportional model of the planets and the sun using food.

The proportional model helped me see just how big the sun is compared to Earth. It was amazing!

| Star/Planet | Actual Diameter <br> $(\mathbf{k m})$ | Reduced <br> Diameter (mm) | Food Items <br> (in approximate <br> proportional size) |
| :---: | :---: | :---: | :---: |
| sun (a star) | $1,391,980$ | 1,392 | giant pumpkin |$|$| Mercury | 4,900 | 4.9 | coffee bean |
| :---: | :---: | :---: | :---: |
| Venus | 12,100 | 12.1 | large blueberry |
| Earth | 12,700 | 6.7 | cherry |
| Mars | 6,700 | 142 | large grapefruit <br> or cantaloupe |
| Jupiter | 142,000 | 120 | very large orange |
| Saturn | 120,000 | 51.8 | kiwi |
| Uranus | 51,800 | 49.5 | apricot or <br> nectarine |
| Neptune | 49,500 |  |  |

> Jupiter = large grapefruit

Earth = cherry
"Now imagine trying to work out proportional distances for our solar system," said Mom.

That made me stop and think some more. During my
Internet research on planet sizes, I had found the distance of each planet from the sun. I had read on the Internet that
Earth is over 92 million miles (over 148 million km ) from the sun. And Jupiter is around 484 million miles ( 779 million km ) from the sun.

Jupiter is a giant planet made of gas.

The table below shows the distance of each planet from the sun. The distances in our solar system are really incredible!

## Planet Distances from the Sun

| Planet | Distance |  |
| :---: | :---: | :---: |
|  | Miles | Kilometers |
| Inner Planets |  |  |
| Mercury | $35,983,093$ | $57,909,175$ |
| Venus | $67,237,912$ | $108,208,930$ |
| Earth | $92,955,819$ | $149,597,890$ |
| Mars | $141,633,262$ | $227,936,640$ |
| Outer Planets |  |  |
| Jupiter | $483,682,805$ | $778,412,020$ |
| Saturn | $886,526,063$ | $1,426,725,400$ |
| Uranus | $1,783,939,419$ | $2,870,972,200$ |
| Neptune | $2,795,084,767$ | $4,498,252,899$ |

## That's Far!

I can use variables and expressions to show planets' distances from the sun. Mars is about 4 times farther away from the sun than Mercury. The variable $m$ can represent the distance Mercury is from the sun. So, the expression $4 m$ can represent the distance Mars is from the sun.

Let's say my house was Earth, or the cherry. Then the sun, or giant pumpkin, would need to be about a city block away. And Jupiter, or the large grapefruit, would have to be about five blocks away from the pumpkin.


## Math Gives Meaning

My brain was buzzing. In just one day, I learned so much about math in the world around me. I love thinking about math. It makes my world so much more interesting. It's amazing to think that I learned so much, and it all started from eating pizza!


## Space Discovery

Astronomers have just discovered a new solar system in a distant galaxy. It has six planets orbiting around a sun. Some of the planets are about the size of Earth. Others are much larger. And this new solar system has a combined total of 30 moons!

The table below is missing some of the current information astronomers have learned about this new solar system.

Planets in New Solar System

| Name of Planet | Approximate Diameter <br> (miles) | Number of Moons |
| :---: | :---: | :---: |
| Zenner | $z$ | 1 |
| Xenox | 3,000 | $x$ |
| Axiom | $a$ | 2 |
| Centaur | 75,000 | $c$ |
| Yukka | 36,000 | 17 |

## Solve It!

For each question below, write mathematical equations using variables to help you figure out the answers.
a. Xenox has 15 fewer moons than Yukka. How many moons does Xenox have?
b. Centaur has 6 more moons than Axiom. How many moons does Centaur have?

Centaur's diameter is 68,500 miles bigger than Zenner's diameter. Axiom's diameter and Xenox's diameter total 4,000 miles.
c. What are the diameters of planets Zenner and Axiom?

Use the steps below to help you solve the problems above.
Step 1: Use the information in the table to write question a. as a mathematical equation. Then solve your equation.
Step 2: Use the information in the table to write question b. as a mathematical equation. Then solve your equation.
Step 3: Use the information in the table and above question c. to write mathematical equations. Then solve your equations.

## Glossary

 astronomers-people who study objects and matter outside the Earth's atmospherediameter-a line joining 2 points of a circle and passing through its center
dimensions-the measurements of shapes; 2-D objects have width and length
environment-the place in which people and other animals live, and the circumstances under which they live
equation-a mathematical sentence that shows 2 equal numbers or quantities; written with an equal sign
expression-a group of symbols or numbers standing for a number or quantity; a mathematical phrase without an equal sign
proportions-a statement that ratios are equal $; \frac{4}{8}=\frac{1}{2}$
quantity-the amount or number of something recipes-instructions for cooking food
reflection-a mirror image of something
represent-stand in place of; to stand for
research-to study and investigate something
solar system-the part in space that is made up of all the planets that orbit the sun, including moons, comets, asteroids, and meteoroids symmetrical—having balance in size, shape, and position on opposite sides of a dividing line
variables-symbols or letters representing unknown values visualize-to see or form a picture of something in your mind

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## Let's Explore Math

## Page 5:

a. $x$ represents the fraction of a pizza

## Page 18:

a. $55+56+x$ each child ate
b. Jamie's height is 51 inches.
b. $x$ equals $\frac{2}{4}$ or $\frac{1}{2}$ of a pizza

Page 9:
$25+14+x$

## Page 11:

a. $126-74=x$
b. 52 square feet ( $\mathrm{ft} .{ }^{2}$ )
c. Answers will vary.

## Page 15:

a. 2. $2 p=16$
b. 8 packets

## Problem-Solving Activity

a. $17-15=x$
$17-15=2$ moons
Xenox has 2 moons.
b. $2+6=c$
$2+6=8$ moons
Centaur has 8 moons.
c. $75,000-68,500=z$
$75,000-68,500=6,500$ miles in diameter
Zenner has a diameter of 6,500 miles.
$3,000+a=4,000$
$4,000-3,000=a$
$4,000-3,000=1,000$ miles in diameter
Axiom has a diameter of 1,000 miles.

