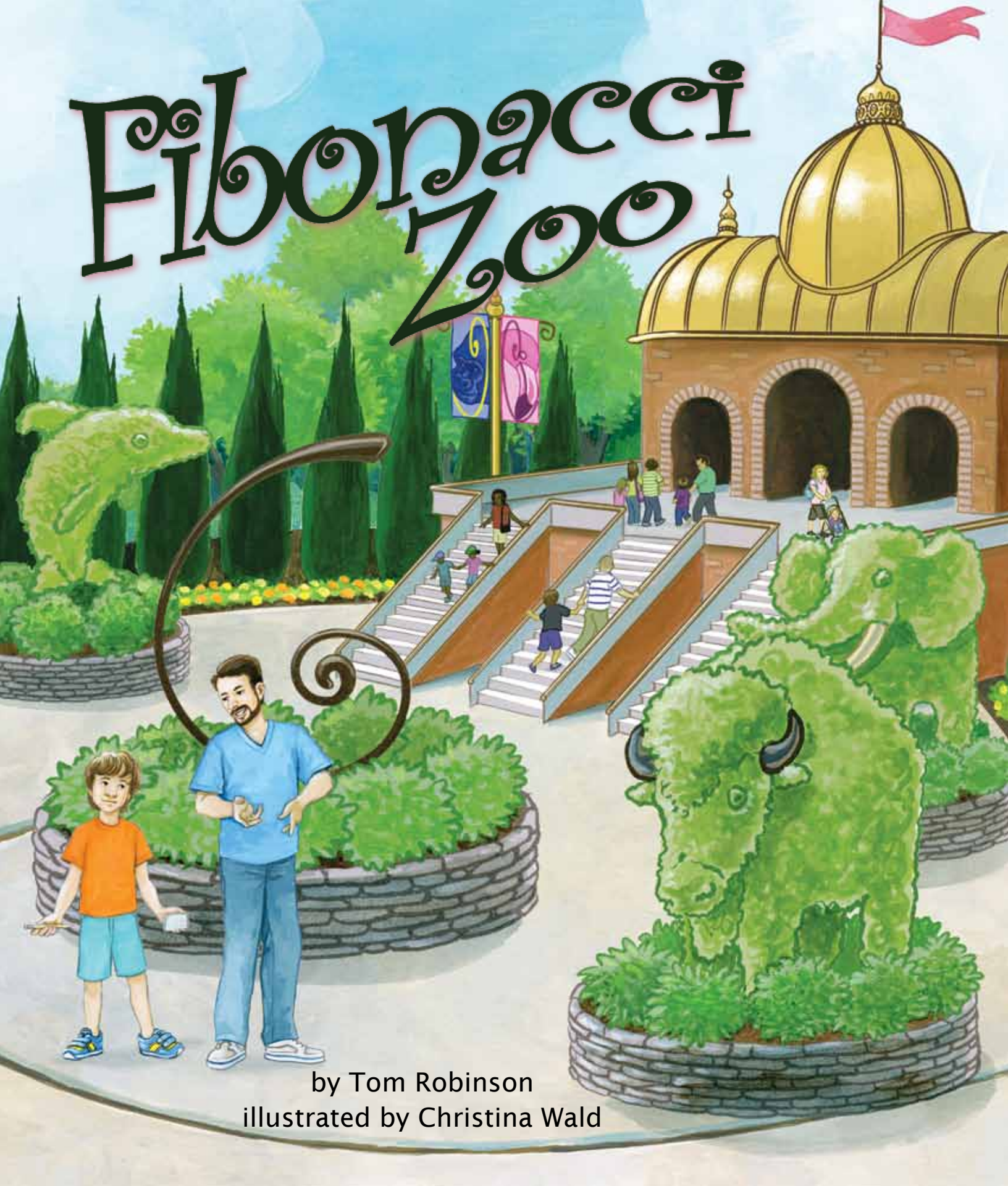
Fibonacci Zoo



by Tom Robinson
illustrated by Christina Wald

Fibonacci Zoo

When Eli and his father visit an unusual zoo, they count the creatures in each exhibit. Eli sees one alligator, then one bison, and next two camels. Soon a number pattern emerges and Eli thinks he can predict how many animals will be in the next exhibit. Explore the zoo with Eli as he runs ahead to test his hypothesis.

Animals in the book include: alligator, bison, camel, dolphin, elephant, flamingo, gorilla, and hippopotamus.

It's so much more than a picture book . . . this book is specifically designed to be both a fun-to-read story and a launch pad for discussions and learning. We encourage adults to do the activities with the young children in their lives both at home and in the classroom. Free online resources and support at www.ArbordalePublishing.com include:

- For Creative Minds as seen in the book (in English & Spanish):
  - Number Patterns
  - Fibonacci Numbers in Nature
  - Golden Spiral
  - Animal Matching
- Teaching Activities (to do at home or school):
  - Reading Questions
  - Language Arts
  - Science
  - Math
  - Geography
  - Coloring Pages
- Interactive Quizzes: Reading Comprehension, For Creative Minds, and Math Word Problems
- English and Spanish Audiobooks
- Related Websites
- Aligned to State Standards, Common Core & NGSS
- Accelerated Reader and Reading Counts! Quizzes
- Lexile and Fountas & Pinnell Reading Levels

eBooks with Auto-Flip, Auto-Read, and selectable English and Spanish text and audio are available for purchase online.

Thanks to Dr. James Wilson, Professor of Mathematics Education at the University of Georgia, and to Karen Mitchell, elementary teacher from Smyrna, GA, for reviewing the accuracy of the information in this book.

Tom Robinson is a high school math teacher with more than 20 years of experience in the classroom. He wrote ***Fibonacci Zoo*** to introduce young readers to fun number patterns. Tom is the author of *The Everything Kids Science Experiments Book, The Everything Kids Magical Science Experiments Book,* and *Forcing Out: A Guide to Better Physics Fitness*. Tom lives in Chelan, WA, with his wife and two children. Visit his website at trobinspire.wix.com/authortomrobinson.

Christina Wald has illustrated for a wide variety of toys, games, books, and magazines. From a book that featured hundreds of animals on each page (*Look, Find, and Learn: Animals of the World*) to games including the Star Wars role playing game series, every assignment covers something new and exciting. In addition to ***Fibonacci Zoo***, she has illustrated ***A Cool Summer Tail, A Warm Winter Tail, Fort on Fourth Street, Habitat Spy, Little Red Bat***, and ***Henry the Impatient Heron*** for Arbordale. Christina enjoys the research aspect of each project, saying that each new book is a fascinating new learning experience. She lives in Ohio with her husband and three cats. Visit Christina's website at www.christinawald.com.

Tom Robinson

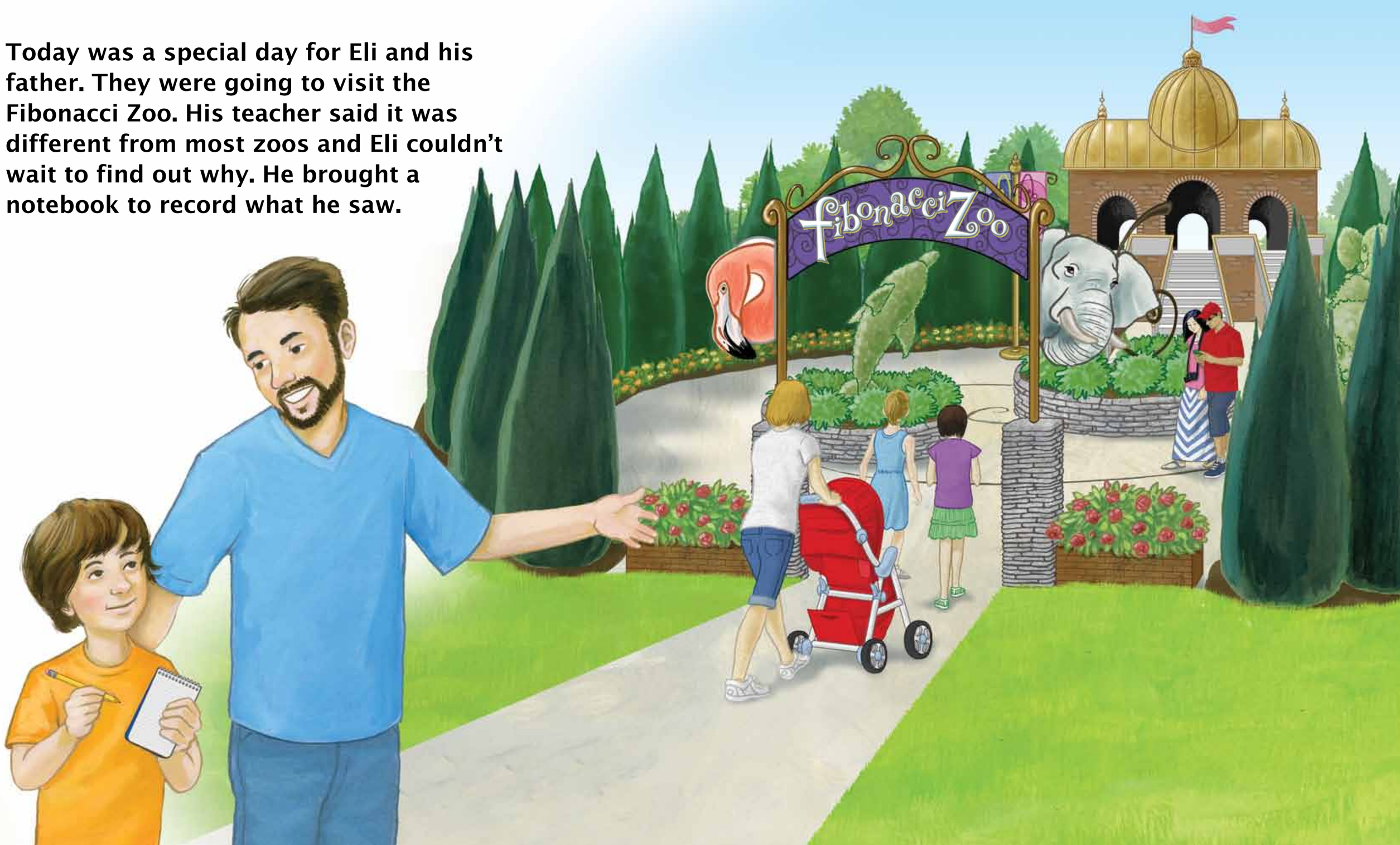
Christina Wald

Fibonacci Zoo

by Tom Robinson

illustrated by Christina Wald

Today was a special day for Eli and his father. They were going to visit the Fibonacci Zoo. His teacher said it was different from most zoos and Eli couldn't wait to find out why. He brought a notebook to record what he saw.



Eli entered the zoo and saw an alligator swimming in a shallow lake. He looked around for others but there were none. He pulled out his notebook and wrote: “1 alligator.”

1

Leaving the alligator, he discovered a bison out sunning himself. Again Eli looked but he could see only one. In his notebook, he wrote: “1 bison.”

1 = 1

1 1

Eli wondered why there were so few animals in this zoo. He and his father left the bison and saw two hairy camels standing near a pond. Eli knew they were camels because of the humps on their backs. He added a new entry: “2 camels.”

For Creative Minds

This For Creative Minds educational section contains activities to engage children in learning while making it fun at the same time. The activities build on the underlying subjects introduced in the story. While older children may be able to do these activities on their own, we encourage adults to work with the young children in their lives. Even if the adults have long forgotten or never learned this information, they can still work through the activities and be experts in their children's eyes! Exposure to these concepts at a young age helps to build a strong foundation for easier comprehension later in life. This section may be photocopied or printed from our website by the owner of this book for educational, non-commercial uses. Cross-curricular teaching activities for use at home or in the classroom, interactive quizzes, and more are available online. Go to www.ArbordalePublishing.com and click on the book's cover to explore all the links.

Number Patterns

A number pattern is a list of numbers that follows a particular sequence.

When a number pattern is made by skip counting, it is an **arithmetic sequence**. For example, "5, 10, 15, 20," is an arithmetic sequence. This sequence is made by skip counting with fives. The number you skip count by—in this case, 5—is called the common difference.

Some number patterns use multiplication to find the next number. This is called a **geometric sequence**. For example, "1, 3, 9, 27" is a geometric sequence. Each number is the product of 3 and the previous number.

There are other kinds of number patterns that are not arithmetic or geometric patterns. One example is the pattern Eli discovers in the zoo: the Fibonacci sequence. A mathematician named Leonardo Pisano (whose nickname was Fibonacci) first discovered this number pattern in the year 1202. The Fibonacci sequence begins with the number 1. Each number in the pattern is the sum of the previous two numbers.

Look at the number patterns below. Match each number pattern to its description. Then fill in the missing number.

A. 1, 2, 4, __, 16, 32, 64 . . .

B. 0, 7, 14, 21, 28, 35, __ . . .

C. __, 2, 3, 4, 5, 6, 7, 8 . . .

D. 2, 4, 6, 8, __, 12, 14 . . .

E. 1, 3, 5, __, 9, 11, 13 . . .

1. This is a number pattern of even numbers, made by skip counting with 2s.
2. This is a number pattern of odd numbers, starting with 1 and skip counting by 2s.
3. In this geometric pattern, each number is double (two times) the previous number.
4. In this arithmetic sequence, the common difference is 1.
5. In this arithmetic sequence, the common difference is 7.

Match to the description: A-3. B-5. C-4. D-1. E-2.
Missing number: A-8. B-42. C-1. D-10. E-7

Fibonacci Numbers in Nature

The numbers of the Fibonacci sequence often appear in nature. Count the number of petals on a flower, the number of leaves on a twig, or the number of seeds in an apple. You might find a Fibonacci number! Many plants—but not all—have a general tendency to grow leaves or petals that match a Fibonacci number. Even in plants that usually have a Fibonacci number, there can be individual plants that grow differently. For example, most clovers have 3 leaves. But sometimes a clover grows an extra leaf and is a lucky four-leaf clover! Sometimes a flower might have one petal that is stunted or torn off.

Count the petals or leaves of the plants below and see how many are Fibonacci numbers.



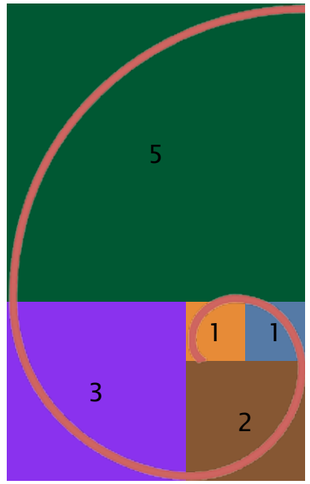



Answer: All of them!

Fibonacci and You

The Fibonacci numbers appear in the human body! Humans have 5 appendages off the trunk of the body: 1 head, 2 arms, and 2 legs. We have 2 arms. Each arm has 3 parts: upper arm, forearm, and hand. Each hand has 5 fingers. Where else can you find Fibonacci numbers?

Golden Spiral



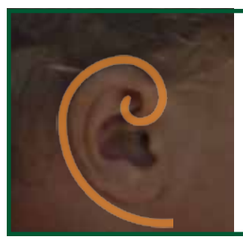
The Fibonacci sequence can be used to create a spiral. Begin with the 1 square inside. If you trace from corner to corner on each square, you will see a spiral pattern. This pattern can continue forever, adding bigger and bigger squares.


galaxy


hurricane

This spiral often appears in nature and is called the **golden spiral**. This is the shape of spiral galaxies in space. This is the spiral of hurricanes moving across the ocean.

Look at the images below to see other examples of the golden spiral in nature.



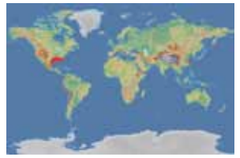
Fibonacci and You

The golden spiral can be found in the human body too! It is in the curve of our ears and the swirl in our closed hands.

Animal Matching

Match the description of each animal to the name and picture on the left. Answers are below.

A. This large reptile is covered in small, bony scales. When it rests in the water, this animal looks like a log or part of a tree. This animal is native to North America and Asia.



B. This mammal is the largest land animal in North America. It weighs up to 2,800 pounds (1270 kg). This animal is often confused with its African relative, the buffalo, but they are different species.

C. This mammal is known for the humps on its back. Some have only one hump and are found in Africa and the Middle East. Others have two humps and are native to central Asia.

D. This mammal uses tools to find food, cross rivers, and build nests. It can use sign language to talk with humans. This animal is native to Africa.

E. This bird likes to stand on one leg. Most of these animals live in South America or Africa. They can also be found in North America, Asia, and Europe.


camel


gorilla


alligator


flamingo


bison

Answers: A-alligator. B-bison. C-camel. D-gorilla. E-flamingo.

For Lisa, my inspiration—TR

To the Cincinnati Zoo, one of my favorite places to sketch, even if it is not a Fibonacci—CW

Thanks to Dr. James Wilson, Professor of Mathematics Education at the University of Georgia, and to Karen Mitchell, elementary teacher from Smyrna, GA, for reviewing the accuracy of the information in this book.

Thanks to the following photographers for releasing their images into the public domain (in order of appearance): Lynn Greyling: gardenia leaves, Maliz Ong: wild calla lily, Alison Breskin: tree leaves, Maliz Ong: kalachuchi flower, Josef Petrek: apple blossom, Maliz Ong: Flower, ESA/Hubble & NASA: spiral galaxy, Tim Loomis (NOAA/NESDIS/Environmental Visualization Program): hurricane, Carlos Sardá: ram horn, Rostislav Kralik: plant spiral, Lisa McCarty: seahorse, Lesley Huntley: fern frond.
Thanks to Zoomdak Photography (www.zoomdak.com) for the photo of author Tom Robinson.
Arbordale Publishing: human ear and hand

Library of Congress Cataloging-in-Publication Data

Robinson, Tom, (Tom Mark), 1968-
Fibonacci Zoo / by Tom Robinson ; illustrated by Christina Wald.
1 online resource.
Summary: When Eli and his father visit an unusual zoo, Eli keeps track of the numbers of animals and soon sees there is a pattern that will predict how many creatures are in the next exhibit. Includes an activity and facts about number sequences.
Description based on print version record and CIP data provided by publisher; resource not viewed.
ISBN 978-1-62855-580-6 (English Downloada) -- ISBN 978-1-62855-589-9 (Spanish Downloada) -- ISBN 978-1-62855-553-0 (English hardcover) [1. Zoos--Fiction. 2. Fibonacci numbers--Fiction. 3. Sequences (Mathematics)--Fiction.] I. Wald, Christina, illustrator. II. Title.
PZ7.R62
[E]--dc23
2014038321

Translated into Spanish: *El zoológico Fibonacci*
Lexile® Level: 510L
key phrases for educators: number patterns, fibonacci, counting, addition, skip-counting, zoo animals

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Manufactured in China, January 2015
This product conforms to CPSIA 2008
First Printing

Arbordale Publishing
Mt. Pleasant, SC 29464
www.ArbordalePublishing.com