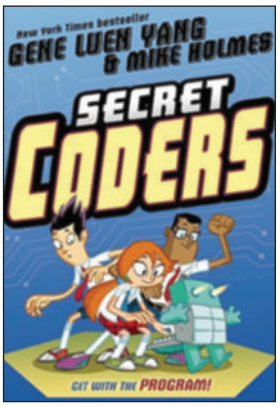
MAKING MATH COUNT: Exploring Math through Stories

Mathical
Books for Kids from Tots to Teens

Great stories are a wonderful way to get young people of all ages excited and interested in mathematics. The Mathical Book Prize recognizes the most inspiring math-related fiction and nonfiction books that bring to life the wonder of math in the world around us. This guide will help you use this 2016 Mathical award-winning title to inspire curiosity and explore math-related topics with the youth you serve.

For more great books and resources, including STEM books and hands-on materials, visit the First Book Marketplace at **www.fbmarketplace.org**.



SECRET CODERS VOL. 1

Written by Gene Luen Yang & Mike Holmes

GRADES 3-5 WINNER

Welcome to Stately Academy, a strange school that is just crawling with mysteries to be solved! The founder of the school left many clues and puzzles to challenge his enterprising students. Hopper, a new student and her friend Eni start to discover, and then solve many of the school's puzzles. Sadly, not everyone is happy about this – especially Mr. Bee, the school janitor. Using their wits and their budding computer coding skills, Hopper and Eni decide to solve the mystery of Stately Academy no matter what it takes! Secret Coders' celebrated author, Gene Luen Yang, is the 2016 National Ambassador for Young People's Literature.

KEY MATH CONCEPTS

Secret Coders focuses on:

- Developing curiosity for identifying number patterns and sequences
- Counting and alternative (binary) number systems
- Logic puzzles & geometry
- The basic elements of computer programming

DID YOU KNOW?

The main character, Hopper, is named after Grace Hopper, a pioneering computer scientist. Born in New York City in 1906, she is credited with creating the first compiler (or translator) for a computer programming language. She used binary code in her work, and was awarded the Presidential Medal of Freedom by President Barack Obama in 2016.

The Mathical: Books for Kids from Tots to Teens book prize, presented by the Mathematical Science Research Institute (MSRI) in partnership with the National Council for Teachers of English (NCTE) and the National Council for Teachers of Mathematics (NCTM), recognizes the most inspiring math-related fiction and nonfiction books for young people of all ages. The award winners were selected by a diverse panel of mathematicians, teachers, librarians, early childhood experts, authors and others.

First Book

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TALK AND ASK QUESTIONS AS YOU READ

Before reading

Stately Academy is a school with something to hide. The creepy birds, locked doors and odd trees make it look more like a haunted house than a school. Something is very different about Stately Academy. ASK: *Do you remember your first days of school? What was it like to be the new student, or go to a new school? What did you notice about the surroundings? What stuck out to you? Why?*

While you're reading

Patterns are all around Stately Academy. What secret pattern do Hopper & Eni discover about the birds that eventually help them break into Mr. Bee's Storage Shed? ASK: *What term helps them understand why the birds are so creepy?*

ANSWER: The term is binary numbers. Hopper and Eni learn the concept of binary numbers by observing the opening and closing of the birds eyes. Eventually, these numbers reveal the code to the padlocked storage shed.

Vocabulary is important as Hopper & Eni learn more about the birds, and how they work. Review the terms below, and ensure your class understands their meaning. How do Hopper & Eni use these terms as they uncover the secret of Stately Academy?

- Coder – someone who writes instructions for computers
- Commands – instructions for a computer
- Program – a list, or series of instructions, or commands, that a computer can follow
- Binary Numbers – a way of counting using only two options – in the book it is open & closed. In real life, it is "1" and "0."
- Repeat – a term used to tell a computer to repeat instructions

Draw connections after you read

Hopper & Eni have learned how to code the Turtle – that means give it instructions to follow. Have you ever had to follow instructions, or a pattern to get a specific result? Brainstorm the ways you follow instructions, or a pattern, to get a specific result (i.e. bake a cake, make cookies, play a sport, evening routine for going to sleep, etc.). Count how many sets of instructions you follow every day.

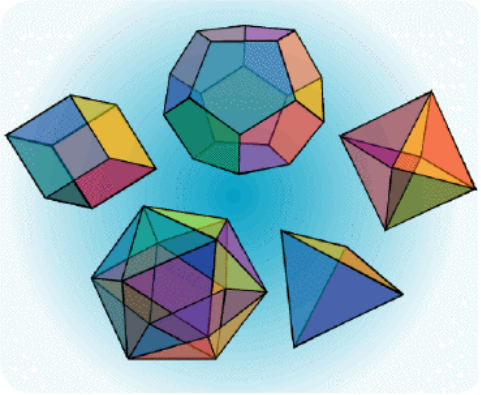

Illustration courtesy of New South Wales Department of Education and Communities, http://www.curriculumsupport.education.nsw.gov.au/primary/mathematics/

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DISCOVER BINARY NUMBERS!

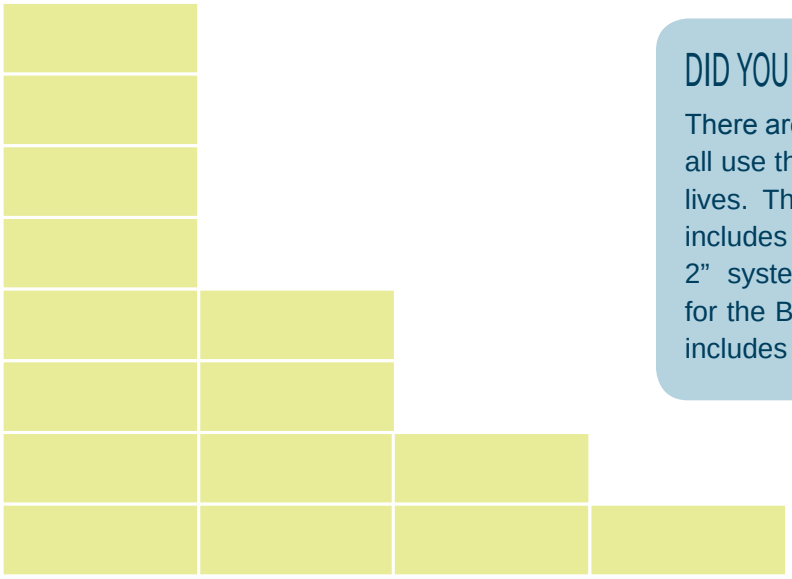
ACTIVITY 1

MATERIALS NEEDED

- 15 of the same sized small item (i.e. pieces of paper, paper clips, pennies, etc.)
- Pencil with eraser

DIRECTIONS

1. Start with 7 small items.
2. Fit all 7 items into the boxes below, but there is a catch! Every column of boxes has to be completely filled, or completely empty. There can be no half-filled columns.
3. When complete, write the number “0” on the line under each empty column. Write the number “1” beneath each filled column.
4. The result is 7 represented as a binary number! Try this with the remaining numbers below.



DID YOU KNOW?

There are multiple number systems? We all use the “Base 10” system in our daily lives. This is the decimal system, and includes the numbers 1 - 9. The “Base 2” system, however is another name for the Binary System. This system only includes the numbers 0 & 1!

What is the binary code for…

(Example) 7 =	0	1	1	1
13 =				
6 =				
15 =				
9 =				
2 =				

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ARE YOU A CODER?

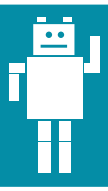
ACTIVITY 2

MATERIALS NEEDED

- Pencil with eraser

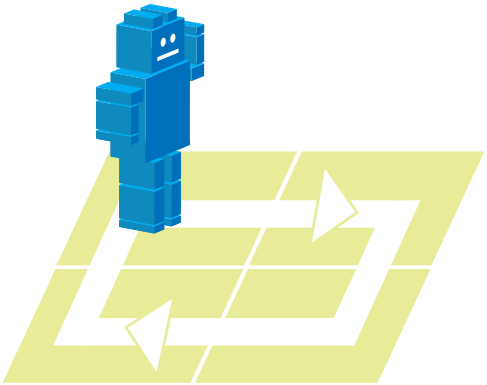
INSTRUCTIONS

Little Guy, the Robot Turtle in *Secret Coders* understands the following commands:

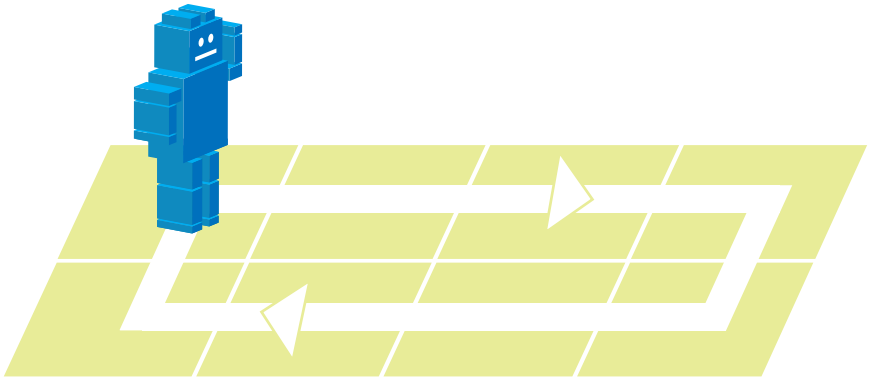
RIGHT – Makes him turn right	LEFT – Makes him turn left	FORWARD 1 – Forward makes him walk forward. Forward is always followed by a number to tell Little Guy how many steps to take.	Let's play, "Are You a CODER?!" 

1. What are the instructions, also known as the "program," for your robot to walk three steps forward?

2. What are the instructions, or program, for your robot to walk in the shape of a square?



3. What is the program for your robot to walk in the shape of a rectangle?



Answers: **1.** Forward 3, **2.** Forward 1, Right, Forward 1, Right, Forward 1, Right, Forward 1, **3.** Forward 3, Right, Forward 1, Right, Forward 3, Right, Forward 1

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