

STEM in the lab

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CHECKERBOARD CODING ART



GRADE LEVELS

This activity is appropriate for students in grades 3-6.



MISSION

Use computational thinking to create coding art.



VOCABULARY

ABSTRACTIONS: Taking the differences that have been found in pattern recognition and then discounting them because they didn't fit the pattern.

ALGORITHM: Set of instructions designed to perform a specific task.

DECOMPOSITION: Breaking something down into its basic parts.

ENCODING: The process of putting a sequence of characters (letters, numbers, punctuation and certain symbols) into a specialized format for efficient transmission or storage.

PATTERN RECOGNITION: Finding order to something and then analyzing the pattern to the logical answer.



MATERIALS

- » Graph paper
- » Pencil

ABOUT THIS ACTIVITY

Computer programmers at INL use code to tell computers what to do. Programmers write instructions, or code, which the computer then executes. Computer programmers solve real-world problems by creating code that will analyze the problem and provide solutions.

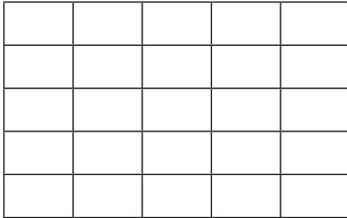
Even though this activity uses graph paper instead of a computer, you are still learning how to think computationally. Computational thinking is the cornerstone for many coding programs. This step-by-step strategy is important for you to learn to become a successful problem solver. This method teaches you to think as if you were a computer. Through decomposition, pattern recognition, abstraction, and algorithms, you can learn how to approach new information and solve problems. In this activity, you will use the four steps of computational thinking to create coding art.

DIRECTIONS

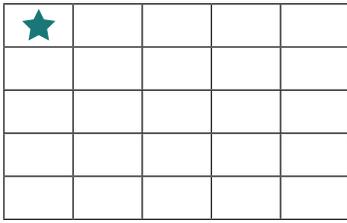
COMMANDS

MOVE ONE SQUARE LEFT		MOVE ONE SQUARE DOWN		FILL IN SQUARE WITH COLOR	
MOVE ONE SQUARE RIGHT		MOVE ONE SQUARE UP		END	

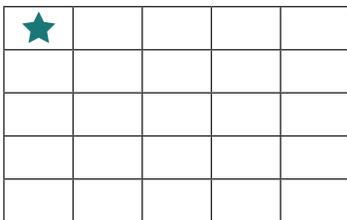
1 Draw a five-by-five grid on graph paper.



2 Draw a star in the top left corner. This will be your starting point.

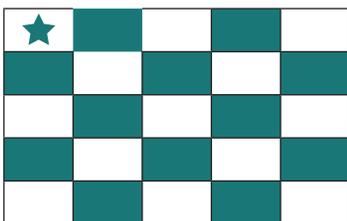


3 Make a list of steps to fill in every other square (in a checkerboard pattern) on your five-by-five grid (checkerboard). In computer programming, a list of steps to finish a task is called an **algorithm**.



4 Your code could be: 


Just like real coding, there are multiple ways to reach the same answer. Get creative and try to find new ways to make the same checkerboard pattern shown below.



THE SCIENCE BEHIND IT

Imagine you had to write out each command word every time you wanted to give directions. If you had to write out "move right, move right, color in the square" each time you wanted to code something, then writing out even this simple code would be a lot of work. Instead, computer scientists simplify these long words into shorter words or symbols. When we take words and turn them into symbols, we are encoding. Using the encoding symbols in a certain order is called programming.

FURTHER EXPLORATIONS

- » Using the five-by-five grid, color a pattern in the squares. Give your design to a friend and have them write your pattern in symbols.
- » Increase the number of squares in your grid to 20x20. Color in the squares to make a recognizable picture. Then turn your pattern into symbols. Give your symbols to a friend and see if they can recreate your picture.
- » Use a 20x20 grid to create a pattern of the letter of the first letter of your name. Then turn your pattern into symbols.
- » Create new symbols for more complex tasks. Then use the symbols you created to make new patterns. These new symbols could be anything: diagonal lines, multiple movements, loops, etc.

RESOURCES

- » **Code.org CS Curricula**
<https://curriculum.code.org/>
- » **What is Computational Thinking?**
<https://teachyourkidscode.com/what-is-computational-thinking/>
- » **Encoding and Decoding**
<https://searchnetworking.techtarget.com/definition/encoding-and-decoding>

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