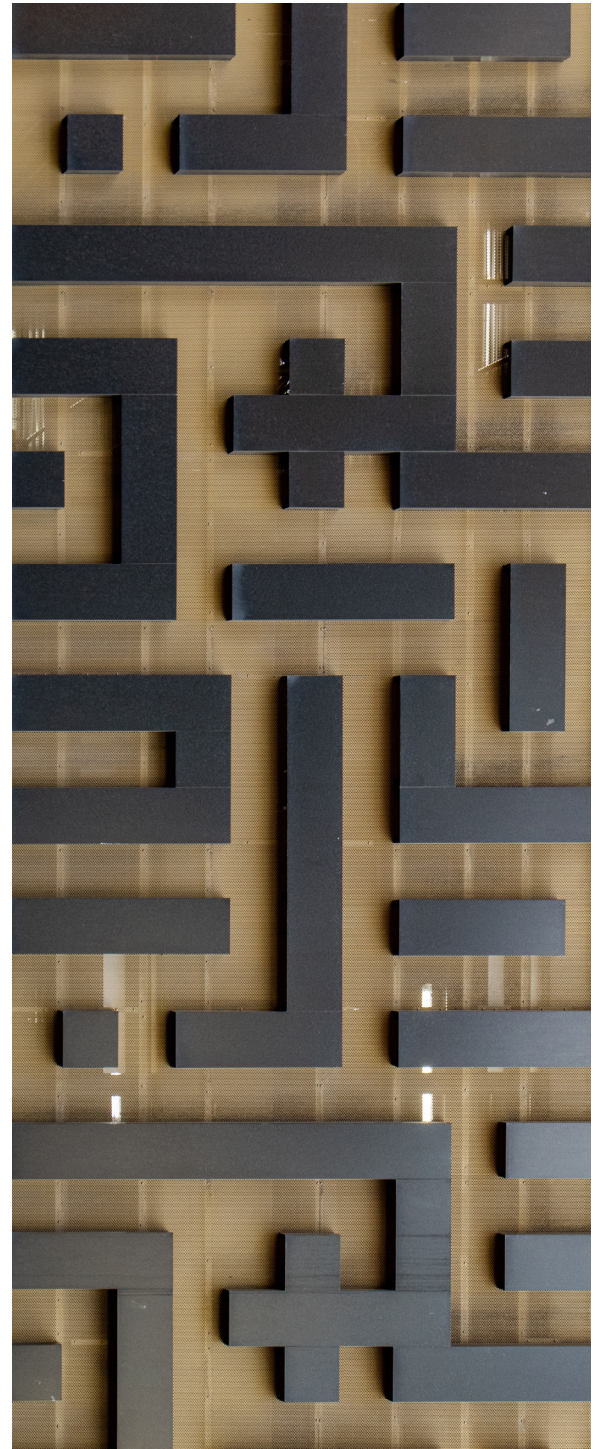# CURIOSITY AT HOME
ROBOT MAZES

How do programmers communicate with computers and robots? Find out by helping a robotic friend through a challenging maze of your very own design.

MATERIALS

· Open space free of obstacles to set up the maze
· Materials to build your maze (examples: furniture, pillows, blocks, books, shoes, string, painter's tape, etc)
· Two players: one to be the "programmer" and the other to be the "robot".
· Science notebook or paper
· Something to write with

PROCEDURE

· Select an open area to use as a location to build your maze. If you need to clear any objects out of the way, be sure to get permission and help from an adult.
· In your science notebook, sketch a simple design for your maze.
    – Decide where the "robot" will enter and exit your maze.
    – For an extra challenge, make the maze more complicated by adding dead ends, obstacles your robot will need to go around, or other features.
· Use your sketch and the materials you have collected to build your maze in your selected location.
· Remember that the maze needs to be big enough for the player acting as your robot to fit in
· To start the game, the player being the "robot" goes to the start of your maze.
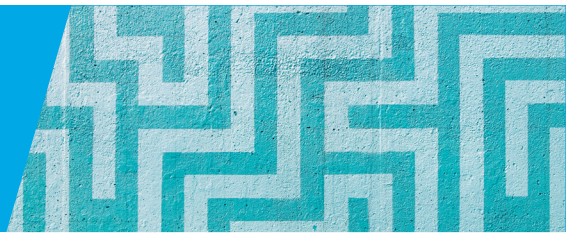
- The "programmer" guides the "robot" through the maze by giving them specific step-by-step instructions. The "robot" follows those instructions exactly.

    - Tips for the "robot": Do exactly what the "programmer" tells you to do, and nothing else. Take things very literally. For example, if they tell you to walk but not what direction, choose a direction at random. If they say to turn right, just keep spinning right until they tell you to stop. Pay attention to where you're moving and don't follow any instructions that would cause you to trip and fall.

    - Tips for the "programmer": Remember to be specific. Details you may want include directions, how many steps to walk, or ways to know when it's time to stop moving.

- Once the "robot" has reached the end of the maze, switch roles and play again.

- Redesign your maze and try again. This time, if it's safe to do so, have the "robot" close their eyes and navigate using only the "programmers" directions. Make sure to move slowly and carefully!

EXPLORE MORE

- Choose an everyday activity that has lots of specific steps in it. Examples include: brushing your teeth, tying your shoes, making a sandwich, or washing your hands.

- Write or draw instructions in your science notebook to tell your "robot" how to do this task.

- Take turns being the "robot" and sharing out directions from your science notebooks.

- When it's your turn to be the "robot", look for places where you can make mistakes. For example, if you're making a sandwich and the "programmer" says to "put the peanut butter on top of the bread" but hasn't told you to use the knife to take peanut butter out of the jar, just put the whole jar on top of the slice of bread!

WHAT'S HAPPENING?

Robots and computers work by following a set of instructions called a **program**. There are many different programming languages or ways of writing these instructions for computers. Unlike humans, our current robots and computers struggle with thinking on their own and with interpreting ideas. . If you give a robot a vague instruction like "go forward", it might go forward forever, or crash into a wall! When giving commands to robots and computers, programmers need to be as specific as possible to make sure their robot will do exactly what they want. This process takes a lot of practice and testing!
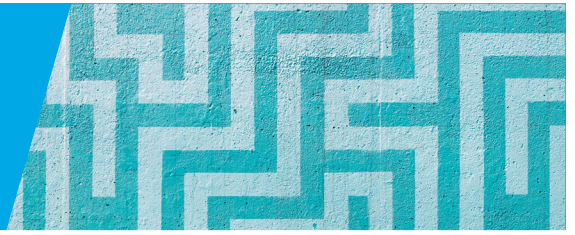
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6–8 GRADE EXPLORATION

· The instructions you wrote in your notebook are called "pseudocode". Pseudocode is a set of instructions for a computer program written out in plain language. This tool is used by some programmers to brainstorm and to share their ideas with others in a way that is easy to understand.

- What are some other strategies you can use to break a problem down into smaller steps?

· Write instructions for another simple task. This time, try adding these programming tricks to your pseudocode:

- If/then/else statements: These tell your "robot" to only do something if a specific thing is true, and otherwise to do something different. For example: "If it is rainy, then put on your boots and stop the program. Else, put on your sneakers and continue to the next step".

- While loops: These tell your "robot" to keep doing something for as long as a specific thing is true. For example: "While there are no obstacles in front of you, keep walking forwards".

- For loops: These are used differently by different computer programming languages (like python vs java). One way for loops are used is to tell a program to repeat an action for each individual in a list. For instance: "Write a list of friends who want a sandwich. For each friend on the list, put two pieces of bread on a plate."

· Interested in trying out writing code on the computer? Start coding with Scratch[1]!

· If you're already familiar with coding, try out a lesson on Google CS First[2] for an additional challenge.

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[1] https://scratch.mit.edu

[2] https://csfirst.withgoogle.com/c/cs-first/en/curriculum.html

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