

CODING WITH CARDS – a coding unplugged activity

Computers play an important part in helping us learn, play, work, and communicate. They allow us to complete tasks more quickly and with fewer mistakes. We use them in many areas of our lives to make our lives a little easier. Computers are also necessary for most jobs in practically all fields of employment. But what are they, exactly?

Computers are machines used for working with information, also called **data**. Data can be numbers, words, pictures, movies, or sounds, and computers can process huge amounts of data very quickly. These amazing machines perform many different jobs, from word processing for writing school papers to the very complex calculations and manipulations done to keep complex projects like the International Space Station running.



Because computers are just machines that can't think for themselves, we have to tell them what to do, how to do it in exactly the right order, and when to do it. To do so, we must understand how to communicate with computers to give them the directions and instructions they need in a way that the machines can understand.

We can communicate with computers in a language called **code**. That's what **programmers** (the people who write code) create and use to tell computers what to do. Coding is also called programming. It's a set of instructions written in a language the machine understands.

A list of detailed, step-by-step instructions used to complete a task is called an **algorithm**. A recipe for baking a cake or a description of how to tie your shoes are both algorithms. Both examples will give you specific instructions in the order in which they need to be followed so that you can complete the task correctly. An algorithm that can be run by a machine is called a **program**. Programs are used to create computer graphics, documents, music, and much more.

In order to understand how an algorithm works, we can practice giving instructions with a few simple supplies. A stack of index cards or a deck of playing cards comes in handy when trying to understand the basic step-by-step nature of algorithms and how coding instructions work. This type of hands-on learning activity is called **coding unplugged** or **unplugged coding**. "Unplugged" activities don't use a computer but do use supplies such as crayons, markers, paper, cards, and other **manipulatives** (objects you can touch and move around) for hands-on learning. They can help us understand complex and abstract concepts like you might want to study later in computer science and math classes.

Let's get started!



ACTIVITY: Code with playing cards

Materials

- Index cards, playing cards, stickie notes, or something similar (at least 36)
 - Floor-safe tape (like painter's tape, freezer tape, or white-out/cover-up tape)
 - A few small toys that will fit on top of a playing card
 - One special toy to use as a marker for your "robot"
 - A partner
1. Select one person to be the programmer and the other person to be the robot. The programmer gives directions and instructions. The robot follows the programmer's instructions.
 2. The robot selects a toy to use as a marker to represent the robot's location. The marker will move across the grid as the programmer gives instructions.
 3. The programmer lays the cards out in a square grid. If you're using playing cards, place the cards face down. The size of the grid will depend on how many cards you have and how much space is available for your grid. We used 36 playing cards to create a grid of 6 rows and 6 columns.
 4. Tape the cards down to secure them to the floor or table top if you need to so that they don't move as the robot travels across them.
 5. The programmer places toys on a few of the cards, with one toy on top of each card selected, and then marks the start and finish lines just outside of the grid with tape. The programmer is creating a maze, using toys as **obstacles** (things to block the path of the robot). We used an assortment of toys, rocks, and wrapped candy for our obstacles. Don't cover all of the cards with obstacles. Leave room for the robot to move through the maze from the start to the finish line.
 6. The robot places the robot marker at the start line.



Maze with obstacles, start, and finish line



Robot marker at the start line



7. The programmer gives instructions, one at a time, to direct the robot across the grid and to the finish line. (Example: "Move forward 2 cards"; "Move back 1 card"; "Move right 4 cards", etc.)
8. The robot uses its listening skills to follow each instruction and moves the robot marker in the correct direction the correct number of cards to the correct landing spot.
9. Once the robot marker reaches the finish line, give a big cheer and congratulate each other on creating a program that ran successfully!



Take turns and swap roles for the next round!

For more of a challenge, the programmer can give the entire code for moving through the maze in advance. The programmer and/or the robot can write down a longer code on paper (with pictures or with words). If there is a mistake in the code, there's a chance to **debug** (fix) the code for the next round.

ADDITIONAL RESOURCES

Books from the Washoe County Library System

[*Ada's Ideas : The Story of Ada Lovelace, The World's First Computer Programmer*](#) by Fiona Robinson

[*Ara The Star Engineer*](#) by Komal Singh

[*Awesome Space Robots*](#) by Michael O'Hearn

[*Coding, Bugs, and Fixes*](#) by Heather Lyons and Elizabeth Tweedale

[*Hello, Robots*](#) by Bob Staake

[*How Robots Work*](#) by Jenny Moss

[*Robots*](#) by Dr. Nathan Lepora

[*So, You Want to be a Coder?: The Ultimate Guide to a Career in Programming, Video Game Creation, Robotics, and More!*](#) by Jane Bedell



Videos:

National Geographic Kids, "Fun Facts About Robots! Nat Geo Kids Robots Playlist"

<https://youtu.be/UuPAImipntw>

RUMPUS!, "BBC Learning - What Is An Algorithm" <https://youtu.be/Da5TOXCwLSg>

SciShow Kids, "How Do Computers Work?" https://youtu.be/P2Fc0Aj_u58

Websites:

BBC Bitesize, Computer science <https://www.bbc.co.uk/bitesize/topics/z3tbwmn>

TedEd, Think Like a Coder (10-episode series) <https://blog.ed.ted.com/2019/09/30/learn-to-think-like-a-coder-with-our-new-series/>

University of Canterbury, UC Computer Science Education, CS Unplugged @home

<https://csunplugged.org/en/at-home/>

