

# CODING WITH CUPS

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. In order to analyze large amounts of data, programmers require very fast computers to run their code. Sawtooth is one supercomputer at INL used to run code. Sawtooth is one of the top 100 supercomputers in the world, and can solve problems in minutes that would take a personal computer years to complete.

In this activity, students will write a code and then use plastic cups to demonstrate the code.

## GRADE LEVELS: K-6

### VOCABULARY

**Algorithm:** set of instructions given to a computer to perform a specific task. Computers need instructions given in a specific sequence.

**Coding:** Transforming actions into a symbolic language.

**Debugging:** Computer programmers don't always get it right the first time. In that case, they need to use 'debugging' to find and fix any mistakes in their code.

**Processor:** The "brains" that respond to and process the basic instructions that drive a computer.

**Supercomputer:** A computer that performs billions of tasks at the same time. Supercomputers can use multiple processors to perform tasks simultaneously. Traditionally, supercomputers have been used for scientific and engineering applications that must handle very large databases or do a great amount of computation (or both).

### MATERIALS

- 6 plastic cups- you can use whatever size you have at home but they all need to be the same size
- piece of paper- to draw the code
- pencil/pen- to write the code



# PROCEDURE

1. Think of a layout for stacking 6 plastic cups.
2. Draw pictures of your ideas of how to stack the cups on a piece of paper. Your pictures must have the cups stacked taller than one level.
3. Using the codes below, change your ideas into symbols.
4. Following the code (the symbols) that you wrote, try to stack the cups to look like the ideas on your paper. If your code doesn't work, then you will need to "debug" it and go back and rewrite and retest your code.
5. To start your "code" all the cups need to be in a single stack of cups.
6. Give your code to a family member. Can they stack the cups to look like your diagram?

Use these symbols to draw diagrams:

 stop	 pick up cup	 move cup 1/2 width right
 go to cup stack	 put down cup	 move cup 1/2 width left
 new row	 flip cup over	 turn 90 clockwise

Example:



Using the above code, your cup stack would look like this:



---

# THE SCIENCE BEHIND IT

*Coding is a precise set of instructions a computer can understand. The instructions or steps that a computer uses to complete a task are called an algorithm. Computer processors use a small number of instructions (around 300) to perform very complicated tasks.*

---

## EXTENSIONS

- *Create different symbols for your "code."*
- *This activity only moved the cups in two directions (up and down and left to right). Create symbols to go forward and backwards to make a 3-D stack.*
- *Add more cups*
- *Use colored cups to create different patterns*



---

## RESOURCES

<https://csedweek.org/files/CSEDrobotics.pdf>

---

## LEARN MORE ABOUT INL

**STUDENTS + PARENTS + EDUCATORS**

*For information on grants, training and student opportunities; curriculum ideas and resources, please visit us at: **[stem.inl.gov](http://stem.inl.gov)**.*

