

STEM in the lab

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DICE ALGORITHMS



GRADE LEVELS

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



MISSION

Use dice to relate the concept of a computer algorithm.



VOCABULARY

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

LOOP: Programming structure that repeats a sequence of instructions until a specific condition is met.

PROGRAM: Collection of instructions that can be executed by a computer to perform a specific task.



MATERIALS

- » 1 die per player
- » Paper to make a score card
- » Pen or 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.

Almost every task we complete during the day requires a set of steps. Whether it is making a peanut butter and jelly sandwich, brushing our teeth, or feeding the dog, there are smaller steps that must be followed to finish the task. Our brains are so smart that we can complete these steps without even thinking about it. Computers don't have a brain like we do. They have to be told what to do. An **algorithm** is the thinking behind what needs to happen. Algorithms are essential to computer science. Computer programmers combine the step-by-step algorithms into a program. A **program** is the instructions given to the computer to complete the task.

In this activity, you will have the opportunity to use dice to relate the concept of a computer algorithm. Students will experience the process that computer programmers go through when turning a step-by-step plan into a program. By rolling dice, students will learn how to translate instructions into an algorithm and how that plays a role in programming.



Photo credit: teachyourkidscode.com

DIRECTIONS

- 1 Make a chart to keep track of player scores:

PLAYER NAMES	TURN 1	TURN 2	TURN 3	TURN 4	TOTAL

- 2 Series of Steps (Algorithm):

1. Give each a player one die. Every player will start their score at zero.
2. The youngest player will go first. They roll the die and write the number they roll next to their name.
3. Move clockwise, and the next player rolls their die and writes the number they rolled next to their name.
4. Continue in a circle until everyone has completed one turn.
5. Starting the second round, each player goes again and adds their new roll to their old score.

REPEAT 3
TIMES

6. Add up all the points. The person with most points **WINS!**

- 3 Look at this game from a computer's point of view. If this game was played on a computer, it would need all of the steps for this game programmed into an algorithm. When a player needs to roll the dice, the computer would have to be told how to roll the dice. The computer would also have to be told to repeat steps, or loop, if going through the same steps multiple times.

- 4 Now write down your own series of steps to create your own dice game. If you have steps that need to be repeated, you can write in a loop. Give your game to a family member and see if they can play your game.

FURTHER EXPLORATIONS

- » Use different mathematical operations on each roll of the die.
- » Roll a separate die to determine the mathematical operation. **Example 1:** Rolling even numbers add, rolling odd numbers subtract. **Example 2:** Rolling 1 or 2 = add, 3 or 4 = subtract, 5 = multiply, 6 = divide. **Make up your own rules!**

RESOURCES

- » **Code.org CS Curricula**
<https://curriculum.code.org/>
- » **Computer Programming - Loops**
https://www.tutorialspoint.com/computer_programming/computer_programming_loops.htm

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