CANADA LEARNING CODE

Speed Stacker

By: Thinkersmith
Duration: 30 minutes

LEVEL	SUBJECTS	PROVINCES / TERRITORIES	TOOL
Everyone	Mathematics, Language Arts	Across Canada	Unplugged

Overview

This activity reinforces basic computational thinking through using code to build cup towers. Learners will work in pairs as 'robots' and 'programmers' to write out algorithms, or step-by-step instructions, for each other, then debug and problem-solve their code together.

This activity was created by Thinkersmith for Hour of Code

Prep Work

Materials:

- Plastic cups (10 per pair)
- Paper and pencils
- Printed Symbol Key and Cup Stack sheets for the main activity: **http://bit.ly/speed-stacker-thinkersmith** (1 per table)
- Cut out cup sheets ahead of time

Key Coding Concepts

- Algorithms
- Debugging
- Modularizing

Terminology

Modularizing

Exploring connections between the whole and the parts.

References

Original Lesson by Thinkersmith
http://www.thinkersmith.org/curriculum.php

Lesson

Run through this example as a class: **http://bit.ly/speed-stacker-eg**

Pair up learners. One person will begin as the **programmer**, and one as the **robot**

Programmer instructions:

1. Choose a Cup Stack sheet from the pile (don't show the robot!)
2. Use the symbols from the Symbol Key to write instructions for the robot to follow, in order to build this cup tower
3. Give the robot your instructions
4. After the robot has finished, debug your code (catch any problems and try to solve them). Write new instructions and try again, if needed.

Robot instructions:

1. Take the cups and practice stacking them away from the programmer
2. When the programmer calls you over, use their instructions to build a tower. Use the Symbol Key to decode their step-by-step instructions.
3. When you are finished, check to see if the tower looks the same as the Cup Tower sheet. If it does not, work with the programmer to fix the instructions.
4. Try again! Keep debugging until the instructions are correct.

After running through once have learners switch with their partners.

Assessment

Learning Outcomes

- We created and decoded algorithms (our cup stacking instructions)
- We learned the importance of sequence and clear instructions in coding
- We worked with our partners to debug (or fix) our instructions
- We practicing modularizing by breaking down a larger task into smaller parts

Assessment Ideas:

Have pairs submit their final instructions with a written reflection outlining their debugging process.

Extensions

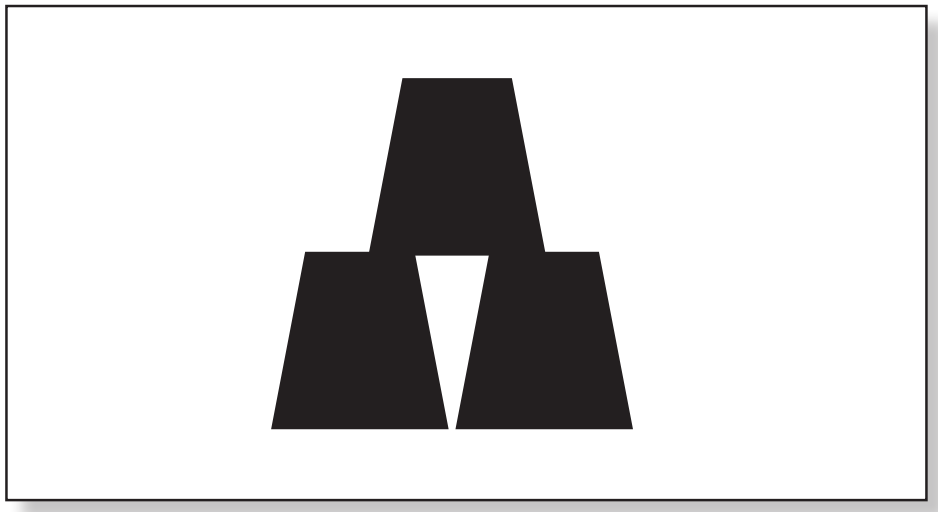
Make it into a competition!

- Have pairs sit back-to-back, with the programmers facing you and the robots looking away (no peeking towards the front!)

- Show all programmers the same [tower] at once and have them race to write down an algorithm for their partner to build
- When they are finished, then can pass their written algorithm to their robot partner (robots must still face away - no peeking!)
- Robots with an algorithm can begin building their cup tower. Programmers may watch and take away the paper at any time to “debug” and adjust their code before returning it to their robot.
- Whichever pair successfully builds the tower first, wins!

Example

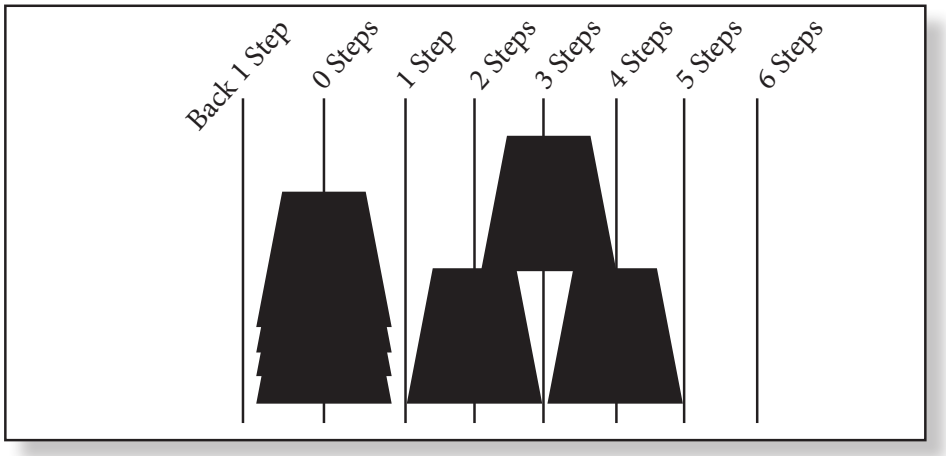
Beginning: It can be helpful to go over an example as a class. There is one cup stack in the pack that includes only three cups, that is the sample card. Hold it up for the class and walk them through the exercise.



3 Cup Stack from Cup Stack Pack

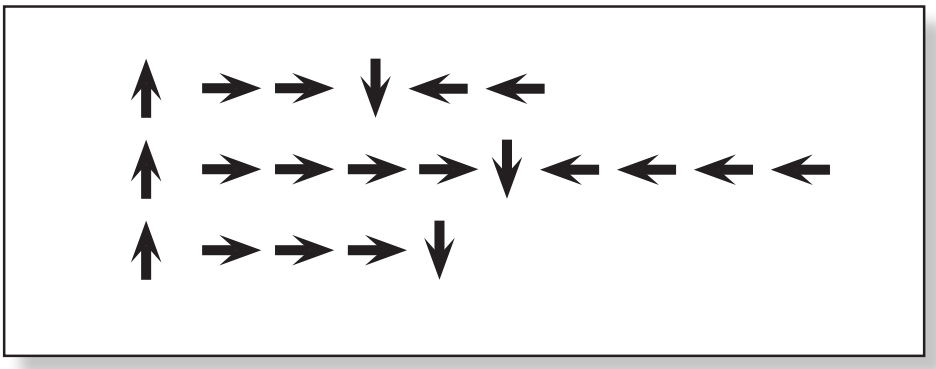
Place your stack of cups on the table where everyone can see them. Ask the class to instruct you on the first thing to do. The correct answer is "pick up cup". When you pick up each cup, note that the cup should automatically rise above the highest cup already in the stack.

With your hand still in the air, ask for the next move. You may have to remind the class a time or two that one step forward is only half the width of a cup.



Step Guide

Middle: Once you've placed a single cup, transition back to the blackboard (or document camera) and challenge the class to help you write the symbols on the board so that you can "run the program" later. One possible solution looks like this:



One Solution for 3 Cup Stack

Completion: With the program written down for the class to see, you can call a volunteer to "run" it, or you can run the program yourself. Say the arrows out loud as you move the cups into place. For example, the program above would be pronounced:

"Pick up cup", "Step forward", "Step forward", "Put down cup"
"Step backward", "Step backward"

"Pick up cup", "Step forward", "Step forward", "Step forward",
"Step forward", "Put down cup", "Step backward", "Step backward",
"Step backward", "Step backward"

"Pick up cup", "Step forward", "Step forward", "Step forward",
"Put down cup"

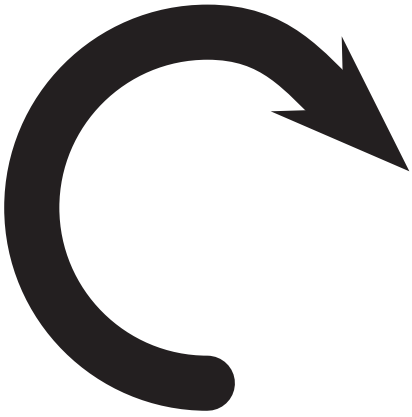
Symbol Key

Pick Up Cup

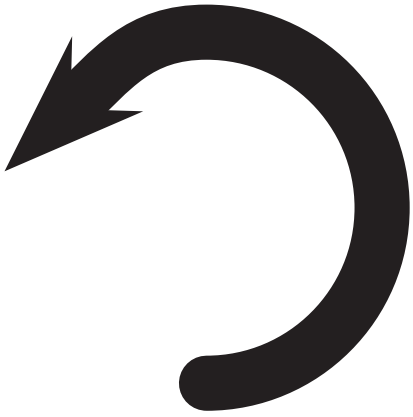
Put Down Cup

Step Forward

Step Backward



Turn Cup Right 90°



Turn Cup Left 90°

Cup Stack Pack™

THINKERSMITH™