Objective
Create a program for a "robot" to find and dispose of "toxic waste" using a few simple commands and your imagination.

What You Need
• A friend.
• Program Cards - make command cards that say Turn Left, Turn Right, Forward 1, Back 1, Pick up Object, Put Down Object, Forward 10, Backward 10.
• A simulation area on the floor marked off in a 10 x 10 grid.
• Something to serve as "Toxic Waste".
• Something to serve as a "Containment Vessel".

To Do and Observe
(1) Mark off a grid in your simulation area - measure an area on the floor that’s 10 steps wide by 10 steps long, and use string or masking tape to mark off squares one-step long by one-step wide in your grid.

(2) Place the toxic waste and the containment vessel in different squares on the grid.
(3) Assess the situation: don’t step onto the grid; however, you should take a look at where the toxic waste and containment vessel are located.

(4) Think about or discuss the steps needed to contain the waste (to move the toxic waste into the containment vessel).

(5) Play the role of programmer - use the command cards to create a program for your robot that will safely contain the waste.

(6) Test your program - have either you or your friend pretend to be the robot in the simulation area and have the other person read the program. Make sure the robot follows only the instructions given to them.

(7) Fix/debug the program if needed (rearrange the command cards to make the program work).

(8) Remove a set of command cards (for example, remove all the Turn Right cards and/or all the Forward 1 cards). Can you still contain the waste?

(9) Reposition the waste and containment vessel in the simulation area. This time add obstacles that must be avoided.

What's Going On
Creating accurate instructions isn't as easy as it looks! Programmers must think about each detail and what events must happen in sequence to make a computer program. Machines aren't human and only know to do exactly what they're told - was it hard for you to be the robot and do only what your programmer told you?
Parent/Teacher Tips

1. If you don’t have room in your simulation area for a 10 x 10 grid, you can reduce the grid and the command cards to work in a smaller area (e.g. forward 5 or forward 3 instead of forward 10).

2. Help your child try to write a program for a simulation area where you do not know exactly where the waste is located. What additional commands might you need?

3. Challenge your child: What additional command cards can you stop using and still contain the waste?