

## ROBO Tic Tac Toe: An Introduction to Basic Programming

From <http://www.nytimes.com/learning/teachers/lessons/20010802thursday.html>

**WARM-UP/ DO-NOW:** Prior to class, arrange desks in pairs. Upon entering class, students respond to the following as a pair (written on the board prior to class): "Play a game of tic-tac-toe with your partner. Then, think about these questions together, and write down your answers: What are the rules of tic-tac-toe? What decisions does a player need to make before taking a turn? How would you verbally describe each of those decisions?" After a few minutes, ask the students to share with the class some of their responses. What kinds of statements are used to describe the rules and moves of the game?

Explain to students that they will be working in pairs to write an application (a string of basic computer code) for robots to enable them to play tic-tac-toe. They will then be competing in the first annual "RoboTic-Tac-Toe Tournament." Begin by returning to the earlier discussion of the rules of tic-tac-toe. What goals does each player have? Who starts the game? Is there a "best place" to put the first X? What are some winning strategies for the next move? For example, "If the X is in the center, then where should I put an O?" Why is "if-then" logic a good way to explain strategy for a simple game like tic-tac-toe?

Now, further consider the "if-then" statement. Ask students to share some "if-then" statements about everyday situations, and write a few on the board (such as "if I stay up late, then I am tired the next day" or "if I jump in the mud, then I get my shoes dirty.") How do the terms "if" and "then" govern a logical sequence? Does an if-then statement need to be true? (Technically, no. The words "if-then" define a cause and effect sequence, not a truth. It might be possible to state "If I stay up late, then my shoes get muddy." However, this is not a true or logical statement.) What, then, makes an if-then statement for tic-tac-toe true? (In tic-tac-toe, the rules of the game determine whether the if-then statement is true. For example, it would not be possible to truthfully state, "If there is an X in the center, then place four O's in each corner.")

To show how an if-then statement can be applied to tic-tac-toe, demonstrate the opening move for a game of tic-tac-toe on the board. Draw a nine-space grid and label the squares one through nine. Then ask the students where to place the first X. Depending on where it is placed, have students create an if-then statement that determines the next move. For example, "If the first X is in the center, place an O in a corner square." This is the first command in an application for the robot. What would the next line of code be?

Ask students to work in pairs to complete the application. Each line of code in the entire sequence will cover every possible combination of moves the students can think of until a game is completed. Students need to remember that there are multiple options for each move (including the beginning move, which could be the placement of an X in the center, a corner, or in the middle of one of the outer perimeters of the grid.) They should consider all of the possibilities in developing their code.