

## Robotics Badges: Programming Robots 2

### Writing Pseudocode

#### Binary:

Computer programs are written in a type of code that can be understood by machines. This type of code is called “**binary**,” because there are only two choices – 1 and 0.

A computer is made up of millions of switches that can either be “on” or “off.” The number 1 represents “on” and 0 represents “off.” Every command can be translated into a pattern of ones and zeroes that corresponds to switches that are “on” and “off.”

#### Programming Languages:

Computer languages take commands written in words and numbers and translate them into binary code (ones and zeroes) so the computer can understand them. Some popular languages used in robotics research and education include Java, Python, and Arduino. There are also *graphical languages*, such as MIT’s Scratch, which create “scripts” or programs by dragging and dropping command blocks on the computer screen. The blocks click together to form a stack, and the commands are followed from top to bottom.

#### Writing a Computer Program:

When programming with a computer language, it is important to get the *syntax* exactly right. *Syntax* is the set of rules used by a language. It includes spelling, spacing, symbols, and punctuation.

To plan out a program without worrying about getting the syntax of a computer language exactly right, programmers sometime use *pseudocode*. (“Pseudo” means “fake.”) Pseudocode uses commands in regular human language. It can then be translated into any kind of computer language.

**The only rule for pseudocode is that it should be easy to understand.** For loops and functions, it helps to indent the steps inside them.

**Here are some examples of commands you can use to convert the flowchart into pseudocode:**

COMMAND	EXAMPLE
<p><b>For decisions, use conditional statements.</b> These are written in the form of IF-THEN or IF-THEN-ELSE.</p>	<pre>IF Light = on THEN go forward 1 step ELSE stop.</pre>
<p><b>For loops, use beginning and ending statements.</b> To start the loop, write REPEAT and then how long the loop should keep repeating, such as REPEAT FOREVER or REPEAT [number] TIMES. You can also control the loop with a conditional statement. REPEAT WHILE needs to meet the condition to start the loop. REPEAT UNTIL will stop the loop when the condition is met.</p>	<pre>REPEAT UNTIL Light = off   Move ahead 1 step   Turn left   Move ahead 2 steps END</pre>

(continued)

COMMAND	EXAMPLE
<p><b>For functions, you need to define the function.</b> Then you can call the function by inserting the name where you want those steps to run. Here's an example of a function called "cross" that tells the robot how to cross the street. (Notice that the function contains a REPEAT UNTIL loop.) Whenever you want to use those exact steps, you can write "CALL cross" instead.</p>	<pre> FUNCTION cross   REPEAT UNTIL traffic = none     Look left     Look right   END   FORWARD 50 steps END FUNCTION           </pre>