Introduction to Computer Programming

Computers are really very dumb. In order to get them to do a job, you need to give them very detailed instructions. One of the goals of this course is for you to be able to write the instructions which will enable the computer to accomplish a particular task. The list of instructions is called a program. A computer is dumb, but it is also obedient. It will do exactly what you tell it to do – which may or may not be what you actually want it to do. If it does something which is not what you wanted, that means that you need to revise the instructions. The process of finding out what is wrong with the instructions (the program) and fixing it is called debugging.

Program (noun) a list of instructions
Programming (verb) the act of writing a program
Debugging (verb) the act of finding and correcting errors in a program

The program instructions must be written in a language which the computer understands. Now a computer actually only understands its own language which is called object code. Object code is a long sequence of binary numbers and is extremely difficult to use. Happily, computer scientists have devised "higher level" computer programming languages which actually take a bunch of commands which look like a combination of English and algebra called "source code" and translates them into object code. There is a vast array of computer programming languages. Each language has its advantages and disadvantages. The name of the language we will be using at the beginning of this year is called BlocklyProp.

BlocklyProp is a visual language. You arrange predefined blocks which get translated into another language which is called C.

C is a general-purpose programming language initially developed between 1969 and 1973 at AT&T Bell Labs. C is one of the most widely used programming languages of all time. C compilers are available for the majority of available computer architectures and operating systems. That means that the language you are learning this year may be useful to you later on. Even if you are using a different computer language in the future, the logic you will learn this year should be valuable.

You may wonder why you need a special language to program a computer. The thing is that, as I said before, a computer is really very dumb. Ordinary languages (like English) are frequently quite ambiguous. A given word may have many meanings, and which meaning is intended may be inferred only from context. The computer needs instructions which have exactly one meaning so it can do the one thing you want.

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A deep understanding of programming, in particular the
notions of successive decomposition as a mode of analysis
and debugging of trial solutions, results in significant
educational benefits in many domains of discourse,
including those unrelated to computers and information
technology per se.
                        (Seymour Papert, in "Mindstorms")
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There are only 10 different kinds of people in the world:
those who know binary and those who don't.
                                    - Anonymous
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As I said above, the language the computer understands (object code) is written entirely in binary. Writing in binary is extremely tedious and prone to error. For that reason, computer scientists have invented various methods of avoiding making people write object code. The first level of abstraction was called Assembly language. When you write in assembly language you write certain codes which a program (the assembler) translates into object code.

The next level of abstraction is a higher level language (like C) where you write what is called source code in a language which looks like a combination of English and algebra with strange punctuation thrown in. A special program called a compiler converts the source code into object code. BlocklyProp is an even higher abstraction, taking care of the confusion and profanity caused by minor grammar and syntax errors (frequently punctuation) which occur in C.

Object Code (noun) or machine code, or machine language is the code which can be understood directly by a specific CPU.

Source Code (noun) is the program code which you write. You write source code. The compiler or interpreter converts it into object code.

Assembly Language (noun) a human-readable notation which is converted into Object Code by a compiler.

High level language (noun) A programming language which, through abstraction, hides the most tedious and error prone parts of programming.

BlocklyProp (noun) a visual programming language.

Sequence:
1. You write your program in BlocklyProp
2. BlocklyProp generates code in the C language
3. The C code is compiled into object code which executes in the "Propeller" chip.