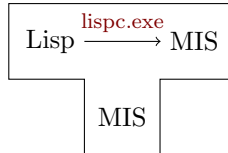
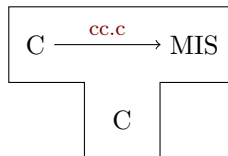


## 2 Compiler Construction (jdy22)

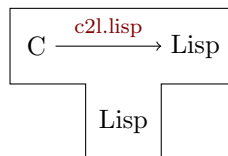
You have acquired an old computer, and you would like to write programs for it in C. Unfortunately, the computer has no executable C compiler: it has only a Lisp compiler `lispc.exe` (an executable that uses the machine's instruction set MIS):



and the source code for a C compiler `cc.c` (written in C):



- (a) You would like to get the C compiler running efficiently on your computer with as little programming as possible. A useful first step is to write a quick-and-dirty C-to-Lisp compiler in Lisp:



What further steps are needed? Describe and illustrate each step using the same illustration scheme as above.

[8 marks]

- (b) You would like to extend the C compiler to support foreign function calls so that your C programs can use libraries compiled by `lispc.exe`.

- (i) What information from the *Application Binary Interface* might you need to ensure that foreign calls work correctly? Comment on function calls, on the stack, on object layout, and on any other relevant considerations.

[6 marks]

- (ii) Programs written in Lisp use a garbage collector (GC) to reclaim unreachable objects. Explain how the GC determines reachability, how calls between C and Lisp might affect the reachability check, and what changes are needed to make the check work in the presence of those calls.

[6 marks]