Chapter 11

11.1 a. Correctness: Easy to make mistakes when programming in assembly
      b. Debugging: Hard to find bugs in programs written in assembly
      c. Programming: Code has to be expressed at a very low level
      d. Readability: Assembly code is hard to read

11.3 High level languages are not as flexible as lower level languages. In assembly language, for instance, one can write code specific for a particular task that consists of fewer instructions, or is faster, than the corresponding program in a high-level language.

11.5 Once a program is compiled into a particular ISA, it can only run on machines that support that ISA. A program written in language X running through an interpreter, however, can run on any machine in any ISA provided that someone has written an interpreter for language X for that ISA.

11.7 The LC-3 simulator is an interpreter. It interprets LC-3 instructions one at a time and executes each in the ISA of the underlying machine (for example, an x86-based Windows machine).

11.9 a. The C preprocessor takes as input the original C source and header files as provided by the programmer.
      b. The C compiler receives input from the preprocessor. All preprecessor macros are already expanded by the preprocessor. All included files have been attached in the appropriate places. The input to the compiler is valid C code.
      c. The linker receives one or more object modules. These object modules can have external variable and subroutine references, which the linker will try to resolve amongst the provided object modules and possibly to objects in libraries.

11.11 The statements read in a character from the keyboard and display it a decimal. In other words, they display the ASCII value of each key typed at the keyboard.

11.13 This program would contain a scanf that read in a decimal number using the format specification %d, and a printf that outputs the same value using the %x specification.

Questions in the text denoted by the question mark icon:

Page 303 The program output will be as follows:

```
===== Countdown Program =====
Enter a positive number: 5
5 0
4 1
3 2
2 3
1 4
0 5
```