

Introduction to Computer Science E14 – Lab – Week 38

Meet in IMADA's terminal room with your login information. Work in groups of size 2 (maybe some of size 3). You will work with a simulator for the example machine language from your textbook. It is available from the course's homepage. Depending on the Java settings of your computer, it may start directly. Otherwise, create a directory for this course, save the file as `BrookshearMachine.jar`, and run the simulator using `java -jar BrookshearMachine.jar`.

The simulator will show you the registers and memory of the machine, as in Figure 2.10, though two memory cells are stored together in one cell that you see. You can type values into these memory cells directly, or type several at a time (4 hexadecimal numbers per line) using the Import/Export capability under **File**. There is a **Help** menu which contains a list of all the instructions in this machine language.

1. Do problem 1 on pages 102–103 of the textbook.
Use Appendix C, starting on page 565 of the textbook (or the list of instructions in the **Help** menu), to figure out what should happen. Then, **Step** through the execution to see that it does happen.
2. Do problem 2 on page 103. Note that the program counter is below the other registers, and you can type a value into it. Or you could enter `B0B0` at address `00` to jump to `B0`. Why does register 3 get the values it does when you step through the program?
3. Do problem 3 on page 103. Note that the operation **B** is usually referred to as a *conditional* branch, and there is usually also an *unconditional* branch instruction, which always causes the program counter to get the specified value (without checking the values of any registers). How is the conditional branch instruction used here to get the effect of an unconditional branch?

4. Do problem 4 on page 104. This is strange in that it is an example of how a program can modify itself when there is no distinction between program and data. Discuss the security implications of this.

Discuss the following problems from the textbook in groups of three or four:

Page 49: Problem 4.

Page 55: Problems 1, 2 (see the appendix on page 561).

Pages 118–119: Problems 23 and 33.

Page 120: Problem 41 (more challenging).