A Simple Machine Language

Sep 22, 2009

The Machine's Architecture

- 16 general-purpose registers
  - numbered 0 through F (in hexadecimal)
- Each register is
  - one byte (8 bits) long
  - assigned an unique four-bit pattern to represent its register number
  - E.g.
    0000 (0x0) -> register 0
    0100 (0x4) -> register 4

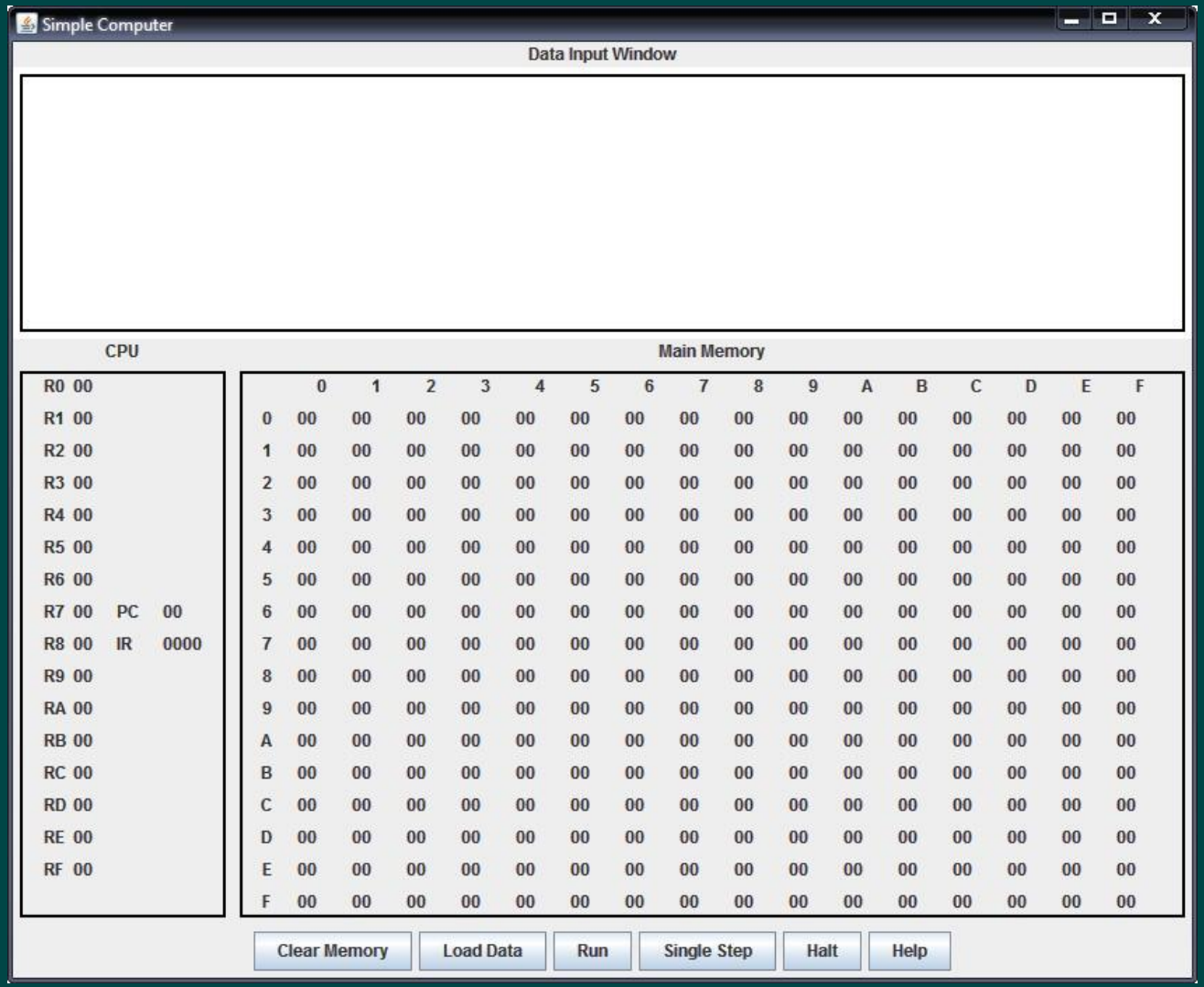
The Machine's Architecture (Cont.)

- Main memory
  - 256 memory cells
  - Each cell is located by an integer (8 bits)
    - 0 (0x00) ~ 255 (0xFF)
- Floating-point values are stored in the eight-bit format disscussed in Section 1.7 and summarized in Figure 1.26

The Machine's Language

- Machine language
  - two bytes (16 bits) long
  - op-code field -> leftmost 4 bits
  - operand field -> the remaining 12 bits

Simulator (Java version)



Example

- From Questions & Exercises
  - Suppose the memory cells at addresses B0 to B8 in the machine described in Appendix C contain the (hexadecimal) bit patterns given in the following table:

Address	Contents
B0	13
B1	B8
B2	A3
B3	02
B4	33
B5	B8
B6	C0
B7	00
B8	0F

Example (Cont.)

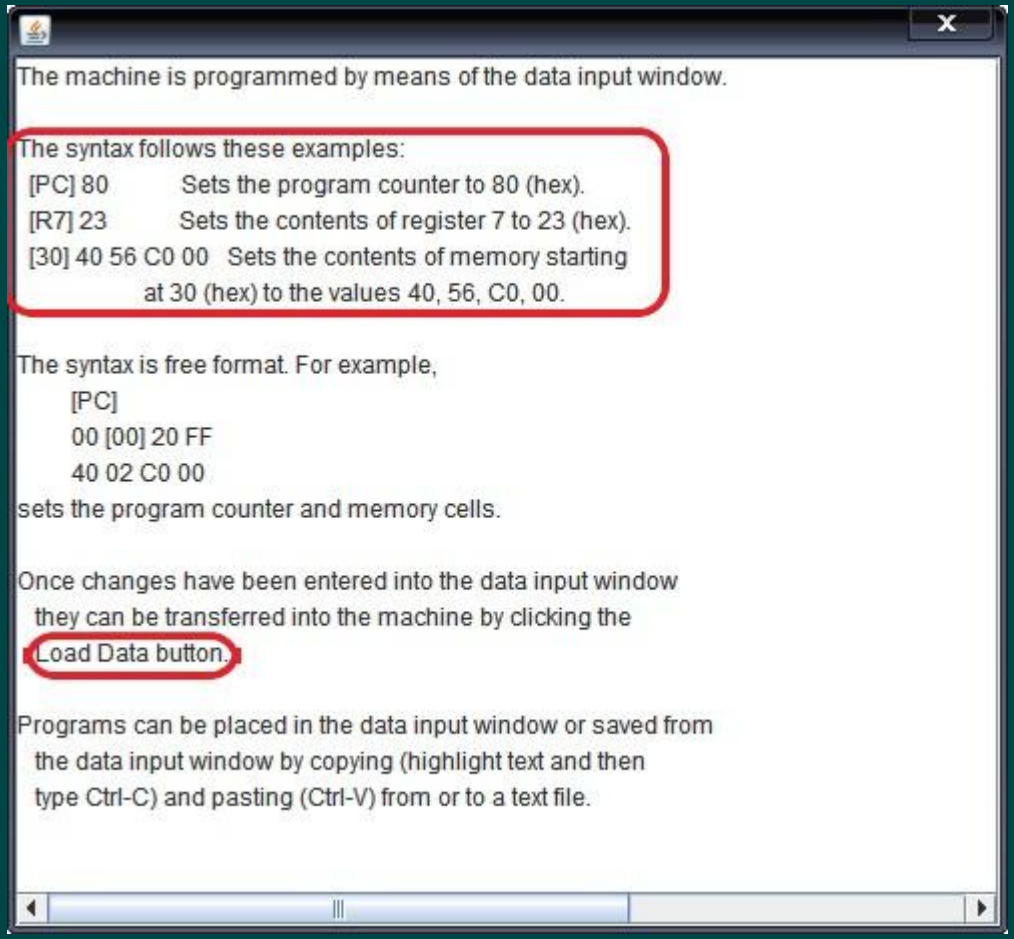
a. If the program counter starts at B0, what bit pattern is in register number 3 after the first instruction has been executed?

Syntax

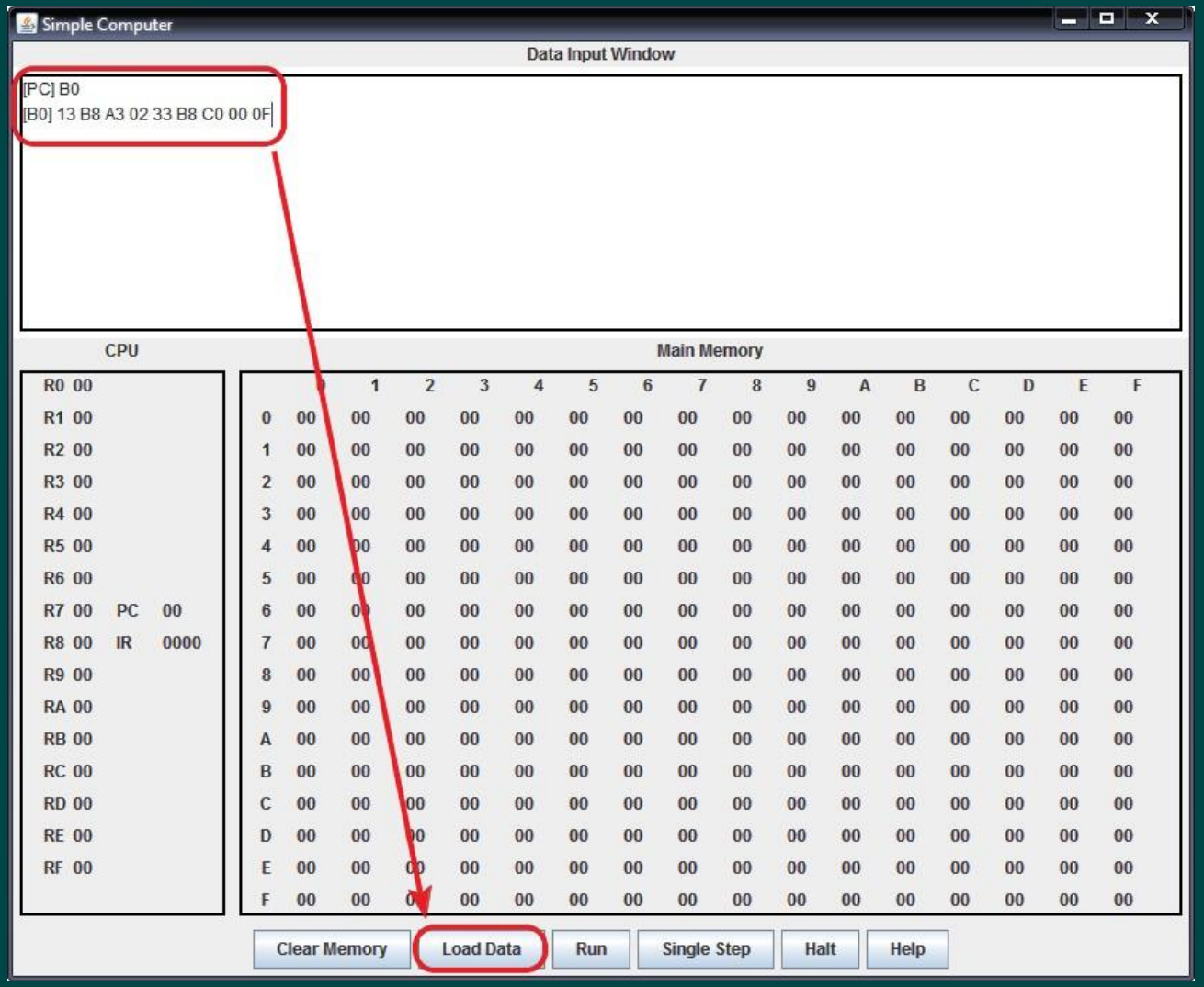
[PC] B0

[B0] 13 B8 A3 02

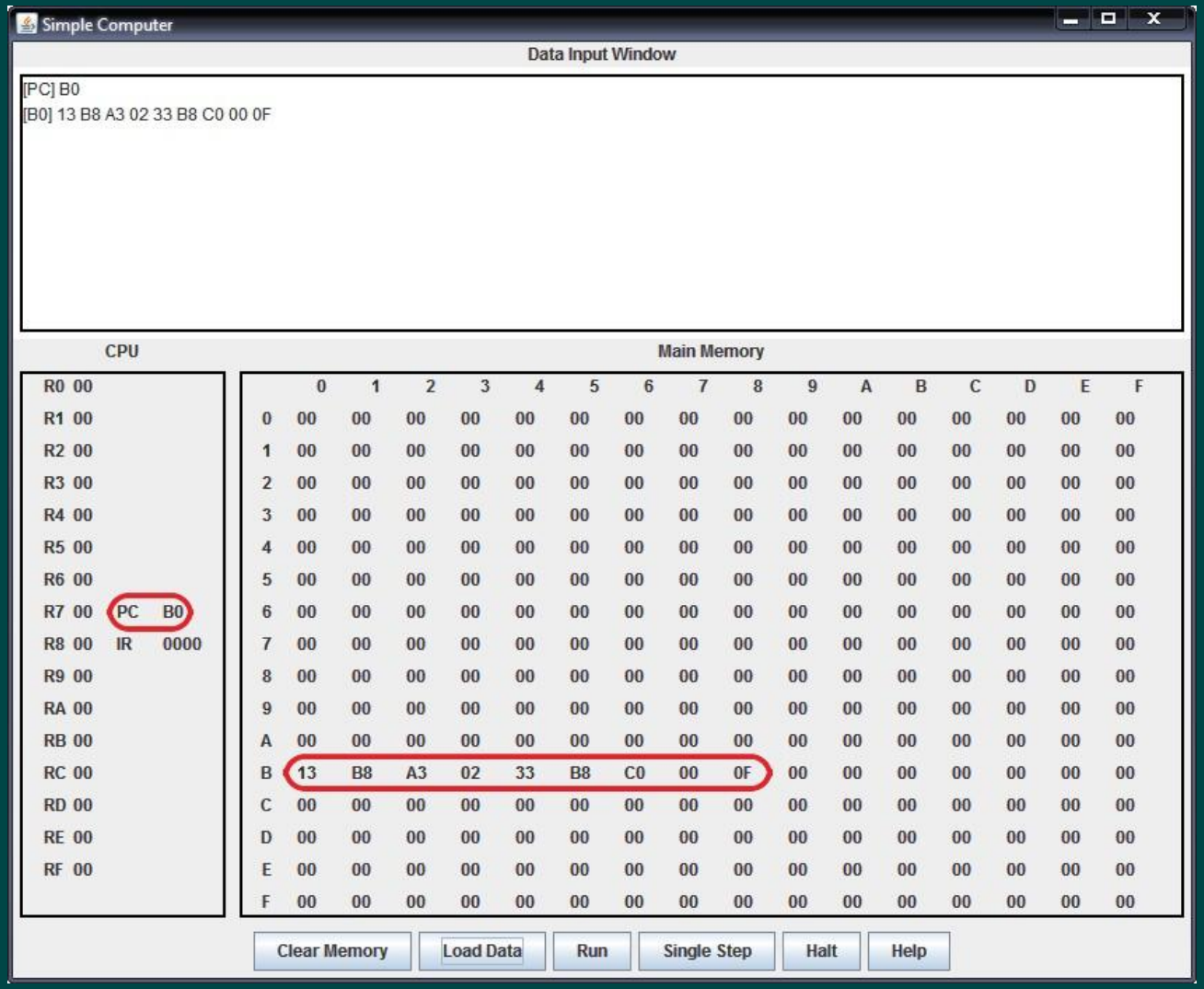
33 B8 C0 00 0F



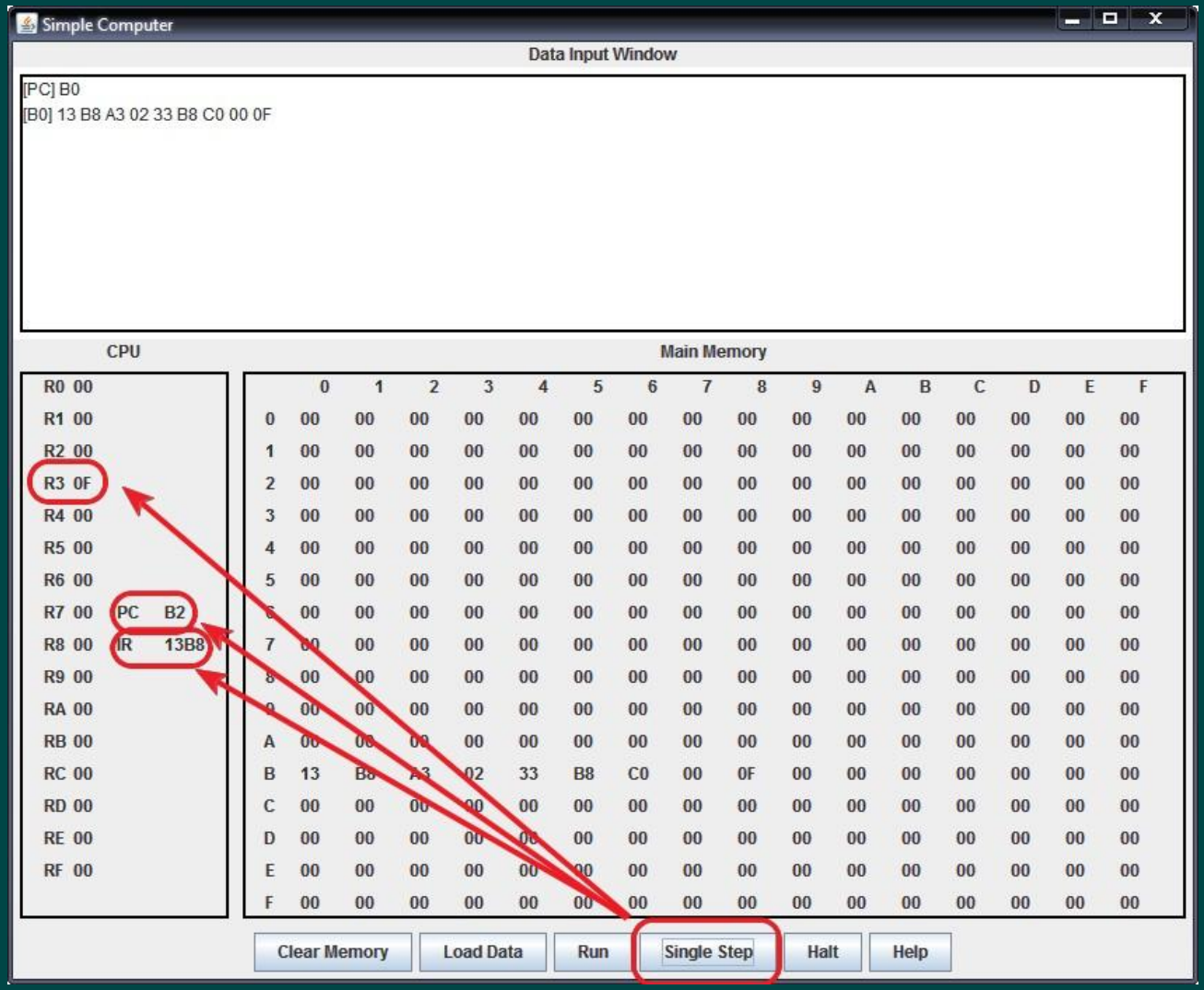
Load Data


Simple Computer
Data Input Window
[PC] B0
[B0] 13 B8 A3 02 33 B8 C0 00 0F
CPU
R0 00
R1 00
R2 00
R3 00
R4 00
R5 00
R6 00
R7 00
R8 00
R9 00
RA 00
RB 00
RC 00
RD 00
RE 00
RF 00
PC 00
IR 0000
Main Memory
0 1 2 3 4 5 6 7 8 9 A B C D E F
Clear Memory
Load Data
Run
Single Step
Halt
Help

Load Data (Cont.)



The Result of Sub-problem a



Example (Cont.)

b. What bit pattern is in memory cell B8 when the halt instruction is executed?

The Result of Sub-problem b