

Chapter 2 - Study Guide

Below is a list of questions that we consider representative of the questions that will be asked on the competency demo for this unit. You may see some of these exactly as is. Others may be worded slightly differently or contain different examples. However, this guide should help you understand what we consider key and what will be part of the question pool for the competence demo.

1. Suppose the memory cells at addresses X through Y in the Vole contain the following bit pattern. [A sequence of address/contents information]. Assume that the machine starts with its program counter containing 0x00. What will be the result(s) when the machine halts? [This is problems 12-18 and 28 on pages 140-143 in your textbook].
2. Op-codes (operation instructions) are encoded in computer registers with 16 bits in the sample Vole machine (see Figure 2.5). How many different instructions can we fit in those 16 bits? (Note: this is more than the 12 basic instructions discussed in the book.)
3. In the example shown in Figure 2.6, the operand for the STORE op-code instruction includes 4 bits for the register whose contents are to be stored and 8 bits for the memory cell that is to receive data. What is the maximum number of registers we can address with 4 bits? Why?
4. The following are instructions written in Vole machine language. Rewrite them in English.
 - a. 0x368A
 - b. 0xBADE
 - c. 0x803C
 - d. 0c40F4
5. What is the purpose of:
 - a. ALU
 - b. Control Unit
 - c. Registers
 - d. Bus
 - e. Main Memory (RAM)
 - f. Program Counter
 - g. Instruction Register
6. Some types of buffer-overflow attacks work by overwriting the value in the special PC (program counter) register with a different memory address. Why might that be bad?

7. Ports on the side/back of your smart-phone or laptop connect to hardware controllers inside the computer.
 - a. Please identify three commonly-used ports for smartphones. List the communication standard for that port and the type of device you may plug into it.
 - b. Please identify three commonly-used ports for laptops. List the communication standard for that port and the type of device you may plug into it.

8. Machine level instructions are/can be thought of as being in one of several categories.
 - a. Consider **transfer instructions**. Generally, what do these instructions do? Provide an example instruction and indicate more specifically, what it does indicating the role of data, registers, memory addresses, etc.
 - b. Consider **arithmetic/logic instructions**. Generally, what do these instructions do? Provide an example instruction and indicate more specifically, what it does indicating the role of data, registers, memory addresses, etc.
 - c. Consider **control instructions**. Generally, what do these instructions do? Provide an example instruction and indicate more specifically, what it does indicating the role of data, registers, memory addresses, etc.

9. What is a controller and what is its role in communication between the CPU and other devices?

10. Most people do not design, build, maintain, or fix computer systems when problems arise. Should a person understand the internal workings of a computer? Does the person's job make a difference, e.g., one who works in networking, a more general computer science professional, a teacher of high school computer science, a high school social studies teacher, a high school music teacher, a member of the US congress who will make law about technology? Identify likely **considerations** for examining this issue and use them to answer the question if the person is _____.