

A Balanced Introduction to Computer Science, 3/E
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Chapter 1 Review Question Solutions

1. TRUE or FALSE? In order to be classified as a "computer," a device must have a keyboard and display screen.

FALSE

2. TRUE or FALSE? A bus is a collection of wires that carry information as electrical signals between the hardware components of a computer.

TRUE

3. TRUE or FALSE? As computer programs can be complex and difficult to write, they are known as "hardware."

FALSE

4. TRUE or FALSE? A bit is a unit of data that correspond to one of two potential values (commonly written as 0 and 1).

TRUE

5. TRUE or FALSE? A kilobyte of storage is $2^{10} = 1,024$ bytes, where a byte is a collection of eight bits.

TRUE

6. TRUE or FALSE? A hard disk is classified as volatile memory, because it requires a constant power supply in order to retain its information.

FALSE

7. TRUE or FALSE? Keyboards and mice are examples of computer input devices.

TRUE

8. TRUE or FALSE? A directory is a collection of files that are organized together and labeled with a common name.

TRUE

9. TRUE or FALSE? The World Wide Web was developed in the early 1970's, shortly after the creation of the Internet.

FALSE

10. TRUE or FALSE? A Web browser is an example of applications software.

TRUE

11. Describe the difference between hardware and software and identify two examples of each type.

The term *hardware* refers to the physical components of the computer, such as the monitor, keyboard, hard drive, etc. *Software* refers to the programs that execute (i.e., run) on the computer, carrying out tasks such as word processing or accessing the Web.

12. Describe the three essential components of a computer that make up the von Neumann architecture. How do these components work together to produce a machine that can be programmed to complete different tasks?

Input/Output devices allow the user to communicate with the computer by entering commands and then viewing the results. *Memory* stores information for the computer to process, as well as *programs*, or instructions specifying the steps necessary to complete specific tasks. Finally, the *Central Processing Unit (CPU)* is the component that carries out programmatic steps in order to process data.

13. Modern computers integrate several different types of memory, such as cache, RAM, hard disk, and floppy disk. Why are different types of memory used, as opposed to the exclusive use of a particular technology? What would be the drawbacks, for example, of using only cache memory, or only hard disk?

Different types of memory have different characteristics with respect to cost and volatility. Main memory (cache and RAM) is fast, and so is used for data that is currently being accessed. However, cache and RAM are too expensive for mass storage, and they are volatile (requiring a constant flow of electricity to maintain stored values). Secondary memory (hard disk, floppy disk, etc.) is much cheaper and permanent, but also much slower than cache and RAM. However, it is sufficient for storing data that is not currently needed.

14. Computer memory is usually grouped in bytes, which consist of 8 bits each. How many different values can be represented using a byte? How many different values can be represented using two bytes?

One byte (8 bits) can represent $2^8 = 256$ different values. Two bytes (16 bits) can represent $2^{16} = 65,536$ different values.

15. The Intel Core 2 Duo is an example of a processor, or CPU, as are the Celeron and PowerPC. List the two main tasks that the CPU performs in controlling the computer's workings and provide a short explanation of each.

The CPU is responsible for two key tasks: (1) fetching program instructions from memory, and (2) executing those instructions.

16. In what units are CPU speeds measured, and what does this measurement unit refer to? If one computer has a 2 GHz Celeron D processor and another has a 2 GHz PowerPC processor, does that imply they will be able to execute the same program in the same amount of time? Explain.

CPU speed is generally measured in gigahertz (GHz), which indicates how many *billions* of basic instructions a CPU can execute *in a second*. For example, a 2 GHz CPU can execute approximately 2 billion instructions in a second. Since different families of CPUs will provide different basic operations, performance comparisons based on CPU speed are not always accurate.

17. Windows 7 is an example of an operating system, as are the Mac OS and Linux. List the three main tasks that the operating system performs in controlling the computer's resources and behavior. Provide a short explanation of each.

The most fundamental task performed by the operating system is to schedule the operation of the CPU, controlling how data and instructions are loaded from memory and accessed by the CPU. The operating system also manages the memory of the computer, organizing storage into files and directories (or folders). Finally, the operating system connects the CPU and memory with the other hardware components of the computer, allowing software applications to access memory and interact with the input/output devices.

18. Describe three elements common to a Graphical User Interface (GUI)? How do these elements make it easier for a user to interact with the computer.

A GUI utilizes intuitive, visual elements to simplify the process of viewing files and executing programs. Programs, directories and files are represented as *icons*, or small pictures that convey some aspect of the element they symbolize. *Windows* represent separate workspaces that can be active at the same time, displaying files or executing programs. Most GUIs also utilize *pull-down menus* of commands, which allow the user to identify and select common commands easily.

19. Suppose you are shopping for a personal computer that you plan to use exclusively for email and Web access. Which would be a better use of your limited funds – a faster CPU or a larger hard drive? Why?

Since sending email and accessing the Web do not require extensive computation, blazing speed is not necessary in a CPU. Most of the time, the CPU will be idle while you are typing an email, or reading a message or Web page. On the other hand, if you are going to be storing a large number of messages and downloading files off the Web, lots of hard drive space might prove useful.

20. It has been said that the Internet could exist without the Web, but the Web couldn't exist without the Internet. Why is this true?

The Internet is a vast, international network of computers, which existed more than 20 years before the World Wide Web. Many networking applications are supported by the Internet, such as email, instant messaging, ftp (file transfer), and the Web. The Web is a collection of software that spans the Internet and enables the interlinking of documents and resources.

21. What is a Web server, and what role does it play in the World Wide Web?

A *Web server* is an Internet-enabled computer that executes software for providing access to Web documents. When the server receives a request for a particular page from a Web browser, it locates the specified page in its directories and sends the page back to the browser via the Internet.

22. Consider the following fictional URL: `http://www.acme.com/products/info.html`. What does each part of this URL (separated by slashes) specify?

`http://`, specifies that the HyperText Transfer Protocol should be used in communications between the browser and server. `www.acme.com` identifies the Web server that stores the page. `products` is a directory on that server, and `info.html` is the name of the file stored in that directory.