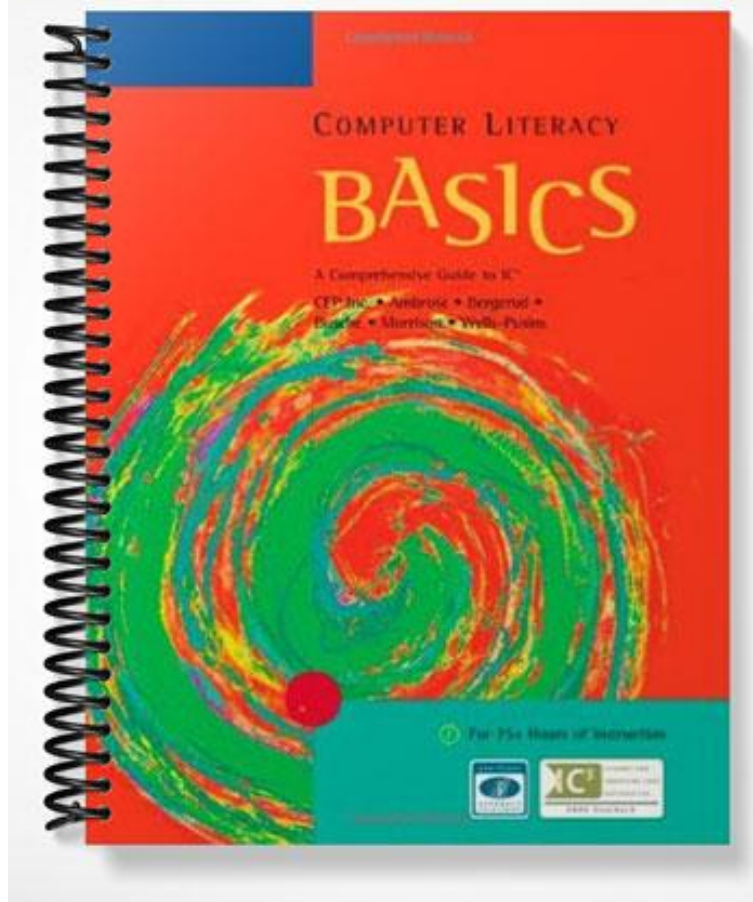


SOLUTIONS MANUAL



MODULE 1—COMPUTING FUNDAMENTALS

LESSON 2—COMPUTER HARDWARE

Objectives

- Identify computer system components.
- Explain how the CPU works.
- Differentiate between RAM and ROM.
- Describe how data is represented.
- Identify and describe the most common input devices.
- Identify and describe the most common output devices.
- Identify and describe storage devices.

Teaching Materials

- Learner text
- PowerPoint presentation from the **PowerPoint Presentations** drop-down menu on the *Instructor Resources CD*
- Solutions to end-of-lesson review questions, projects, and activities from the **Solutions to Exercises** drop-down menu on the *Instructor Resources CD*
- ExamView® test questions from the **Test Bank & Test Engine** drop-down menu on the *Instructor Resources CD*

Prepare

- Focus learners' attention on the objectives for the lesson.
- Set up a projection system and show the PowerPoint presentation for the lesson, if desired.
- Determine the end-of-lesson activities to be completed by learners who finish early.
- Prepare questions from ExamView.

Technical Notes

There are no hands-on exercises requiring a computer in this lesson, but the show-and-tell method works well to provide learners with visual aids to make the information easier to understand. Try to find an old computer and open the case. Label the parts and leave it in the classroom for students to view. Label appropriate input and output devices to familiarize learners with these devices, too.

Lecture Notes and Teaching Tips

This lesson focuses on how the hardware components of a computer work and how data is changed to information. The input, output, storage, and processing devices that make up a computer are discussed in detail. The concept and types of computer memory are also investigated.

Intel offers an interactive, media-rich Web site called *The Journey Inside*SM that answers questions about computers through activities that help explain how technology works and impacts our society. It contains a student section and an instructor's guide and is a wonderful teaching aid. You can find *The Journey Inside* Web site located at <http://www.intel.com/education/journey/index.htm>.

System Components

Give examples of the many different ways in which we use computers, then relate this to how computers work. For the IPOS cycle, use the brain for comparison purposes: We input data, we process data, we store it for later retrieval, and then we output it in some way—talking, action, writing, and so forth. After using this example, ask students: “If we can do all of the things the computer can do, what’s the advantage of a computer?” Answers may be speed, reliability, and so forth.

If possible, use a real motherboard to illustrate the discussion of system components. If not available, use a large diagram. If you have a motherboard available, show the expansion slot and how a board fits into a slot. Try to find a chip to show students. Use a bug jar or magnifying glass when passing the chip around so students can examine the chip more closely.

The Central Processing Unit

Emphasize that the computer can only do two things—arithmetic operations (add, subtract, multiply, divide) and comparisons (greater than, less than, equal to). Arithmetic operations and comparisons take place in the ALU. Show an example of the ASCII code. If you are also teaching mathematics, you could bring binary math into this lesson.

Basic Controllers

Make sure learners understand how a controller enables data to be transferred to and from the central processing unit of a computer to peripheral devices for input and output and that the chips that serve as controllers are part of the computer's motherboard.

Peripheral Ports and Expansion Slots

Mention ports and expansion slots and how they are used to connect peripheral devices to the computer system.

Troubleshooting Tip

Note that the discussion of ports and how they are used to connect devices to a computer is cursory here because the subject is discussed in more detail in Lesson 3.

Quick Quiz

1. How many primary sections does the CPU contain?
Answer: two
2. Which of the following is the most popular standardized coding system?
A. ABCDE
B. EXEXCT
C. ASCII
D. STDRD

Answer: C

Types of Computer Memory

Explain the difference between short-term and long-term memory to introduce this section. As an example, compare the computer's different types of memory to how the brain remembers something in the short term, such as directions to a party or a phone number to call about an apartment for rent, and in the long term, such as stored information including vocabulary, friend's names and faces, or an identification number.

Random Access Memory

Make sure learners understand the step-by-step process of the instruction cycle and execution cycle and how the process is affected by the amount of RAM available.

Read-Only Memory

Explain that ROM chips in a computer system store information even when the power is turned off, unlike RAM, and that the information on a ROM chip can only be read by the computer. It cannot write to the chip to change the information or store data on it.

Quick Quiz

1. Short-term memory on the motherboard is also referred to as _____.
A. RAM
B. ROM
C. PROM
D. None of the above

Answer: A

Input Devices

Discuss the purposes and sophistication of input devices, relating the choice of device to the particular task to be completed. If possible, provide examples of several types of devices for students to examine. Discuss why there are so many different types of input devices.

Keyboard/Mouse

Explain why the keyboard and mouse are the most popular input devices. Highlight the various types of keys that simplify the keyboarding process. Describe the functions of the mouse and what can be accomplished by pointing, clicking, and dragging.

Voice Recognition Devices/Scanners/Other Input Devices

Introduce students to voice recognition devices, scanners, video input, and digital cameras. Ask students to think of other types of sensors and remote recording devices that are used or could be used to input data in a computer.

Quick Quiz

1. Which of the following is not an input device?
A. mouse
B. RAM
C. scanner
D. keyboard

Answer: B

Output Devices

Explain that output devices are used to display information. Explain why the printer and the monitor are the most popular output devices. Provide examples of output devices as

well as different kinds of output, such as a plotter drawing or a computer-generated photograph.

Monitors

Touch on the topics of monitor screen size and screen resolution.

Printers

Compare laser, inkjet, and dot matrix printers and the capabilities of each.

Other Output Devices

Mention how specialized output devices are used to produce data for different applications, and ask students to provide examples of other kinds of specialized output devices.

Quick Quiz

1. Which of the following display information in a computer system?
A. storage devices
B. input devices
C. output devices
D. memory

Answer: C

Storage Devices

Discuss why a computer user would want to create a permanent copy of data rather than just storing it in RAM until the computer is turned off. Explain how storage devices are categorized, and provide examples of several different kinds of storage media for students to examine. Include a discussion of what circumstances determine which type of storage medium to use.

Floppy Diskettes/Hard Disk Drives/Zip Drives and Jaz Drives

Offer examples of different types of storage devices. Explain how storage capacity has increased from that provided by floppy diskettes, to Zip and Jaz disks, to hard disk drives that can now store many gigabytes of data.

Magnetic Tape Drives/Optical Storage Devices

Discuss specialized storage media, including magnetic tape (often used to back up large amounts of data), and CDs, DVDs, and other types of optical storage that use laser beams to write and read data. Give examples of the kinds of data that are commonly stored on these different types of media, and provide examples for students to examine.

Network Drives/Virtual or Internet Storage

Describe the ways data can be stored in locations that are not physically part of a computer system, such as network drives and virtual storage. Ask students to provide examples to illustrate when and why this kind of storage can be useful.

Flash Memory and Memory Cards

Explain that the small size of flash memory sticks or cards make this kind of memory useful in small computerized devices, such as cell phones and digital cameras. Encourage students to consider examples of how flash memory may be used in new types of devices in the near future.

Quick Quiz

1. Which of the following has the highest storage capacity?
A. CD-ROM
B. 3-inch floppy diskette
C. Zip disk
D. hard disk

Answer: D

Discussion Questions

1. If you had to choose, do you think a computer with a faster processor or one with more RAM is a better system? Explain your reasoning.
2. Early computers used punch cards to input data in a process that was laboriously slow. Now it is a relatively simple process to input information using a keyboard, mouse, or even a voice recognition device. What are some other methods being developed or used as input devices?
3. What are the advantages of making it easier to provide input to or create specialized output with a computer system? Are there any disadvantages to making the input/output process simpler?

Key Terms

- **American Standard Code for Information Interchange (ASCII):** Coding system that computers of all types and brands can translate.
- **Bit:** In binary, a bit represents a zero or one.
- **Byte:** A byte is another word for character; generally represented by eight bits.
- **CD-ROM:** Disk that can store up to 680 MB of data; data can only be read from it.
- **Central processing unit (CPU):** Also known as the microprocessor; the brains of the computer.
- **Controller:** Device that controls the transfer of data from the computer to a peripheral device and vice versa.
- **DVD:** Also called Digital Versatile Disk; video output, including full-length movies, can be stored on this medium.
- **Execution cycle (E-cycle):** The amount of time it takes the central processing unit to execute an instruction and store the results in RAM.
- **Hard disk drive:** A data storage unit inside a computer that can store a large quantity of data (60GB or more), but cannot easily be removed from the computer.
- **Impact printers:** Type of printer that uses a mechanism that actually strikes the paper to form characters.
- **Input devices:** Enable the user to input data and commands into the computer.
- **Instruction cycle (I-cycle):** The amount of time it takes the central processing unit to retrieve an instruction and complete the command.
- **Keyboard:** Common input device for entering numeric and alphabetic data into a computer.
- **Main memory:** Also called random access memory or RAM, it is like short-term memory. It stores data while the computer is running. When the computer is

turned off or if there is a loss of power, any data in the main memory disappears. The computer can read from and write to this type of memory.

- **Memory:** On the computer's motherboard, it's where data is stored.
- **Motherboard:** A circuit board that contains all of the computer system's main components.
- **Mouse:** A pointing device that serves as a faster, more effective alternative to the keyboard in communicating instructions to the computer.
- **Network drive:** A disk drive located on another computer or server that provides space you can use for data storage.
- **Nonimpact printers:** Type of printer in which characters are formed without anything striking the paper.
- **Optical storage devices:** Devices that enable the computer to give the user the results of the processed data.
- **Output devices:** Enable the computer to give you the results of the processed data.
- **Plotter:** An output device used to produce charts, engineering plans, and other large-sized printed material with lines drawn by pens that move on rails.
- **Pointer:** On-screen object (whose shape changes depending on the function) that can be moved and controlled by the mouse.
- **Random access memory (RAM):** Where instructions and data are stored on a temporary basis. This memory is volatile.
- **Read-only memory (ROM):** Permanent storage; instructions are burned onto chips by the manufacturer.
- **Scanner:** An input device that can change images into codes for input to the computer.
- **System clock:** An electronic pulse that is used to synchronize processing; it controls the speed of the central processing unit.

Projects to Assign

- In Project 2-1, learners prepare a spreadsheet comparing different computers and then write a short paragraph to explain which computer they would choose to purchase and why.
- For Project 2-2, you may want to bring in an old computer with the case removed to share with students. Help students locate the expansion slots, RAM chips, and CPU. Students then create a drawing of the system to help reinforce their understanding of the system.
- In Project 2-3, learners prepare a table displaying five types of printers that compares the capabilities and prices of the different models.
- In the Teamwork Project for Lesson 2, learners work in teams of two to prepare a step-by-step guide for setting up a teleconference. They should also include basic information about teleconferencing.
- In Critical Thinking Activity 2-1, learners prepare a report describing several applications in which a user would need to use an optical scanner to input data. The report should include a description of the application and explanation of why

it would be efficient to use a scanner; it should also suggest alternative methods to input the same kind of data.

Assess

Administer the ExamView test for Lesson 2.