



Investigating Types of Computers

A **computer** is an electronic device that accepts information and instructions from a user, manipulates the information according to the instructions, displays the information in some way, and stores the information for retrieval later. Computers are classified by their size, speed, and capabilities. Most of the staff at Sheehan Tours does not know anything about computers except for the ones that sit on their desks, so Kevin decides to start with a basic explanation of the types of computers available.

DETAILS

The following list describes various types of computers:

- **Personal computers (PCs)** are computers typically used by a single user, for use in the home or office. Personal computers are used for general computing tasks such as word processing, manipulating numbers, working with photographs or graphics, exchanging e-mail, and accessing the Internet. In common usage, the term "PC" refers to personal computers that use Microsoft Windows. Personal computers that are sold only by Apple Inc. are referred to as Macs (short for Macintosh).
- The following are types of personal computers:
 - **Desktop computers** are designed to sit compactly on a desk.
 - **Notebook computers** (also referred to as **laptop computers**), similar to the MacBook shown in Figure A-1, are small, lightweight, and designed for portability.
 - **Tablet PCs** are notebook computers that have a screen on which the user can write with a stylus.
 - **Subnotebook computers**, sometimes called **ultraportable computers** or **mini notebooks**, are notebook computers that are smaller and lighter than ordinary notebooks. **Netbooks**, a type of subnotebook computer, are notebooks that are primarily designed to allow users to access the Internet and check e-mail.
 - **Slate computers**, like the iPad shown in Figure A-2, are thin computers that do not have an external keyboard or a mouse. Users touch the screen or use a stylus to accomplish tasks. Slate computers are primarily used to read electronic books, view video, and access the Internet, although additional applications are added daily.
- **Handheld computers** are small computers that fit in the palm of your hand. Handheld computers have more limited capabilities than personal computers.
 - **Smartphones**, like the iPhone shown in Figure A-3, are used to make and receive phone calls; maintain an address book, electronic appointment book, calculator, and notepad; send e-mail; connect to the Internet; play music; take photos or video; and even perform some of the same functions as a PC, such as word processing.
 - **MP3 players** are handheld computers that are primarily used to store and play music, although some models can also be used to play digital movies or television shows.
- **Mainframe computers** are used by larger businesses and government agencies to provide centralized storage, processing, and management for large amounts of data. The price of a mainframe computer varies widely, from several hundred thousand dollars to close to one million dollars.
- The largest and fastest computers, called **supercomputers**, are used by large corporations and government agencies when the tremendous volume of data would seriously delay processing on a mainframe computer. A supercomputer, like the one shown in Figure A-4, can cost millions of dollars.

QUICK TIP

Desktop PCs and notebook computers range in price from as low as \$300 to as much as several thousands of dollars for high-end machines.

QUICK TIP

Machines dedicated primarily to playing games, such as the Xbox and PlayStation, are also computers.

Converging technologies

Every year, the lines between the types of computers are growing more and more blurry. Handheld devices like smartphones are more powerful than the first notebook computers were, and today's

desktop PCs are far more powerful than the mainframe computers of a few decades ago. As new technologies are developed, consumers will need fewer and fewer devices to accomplish their tasks.

Senior High Communication Technologies - Understanding Computer Components

FIGURE A-1: Apple MacBook



FIGURE A-2: Apple iPad

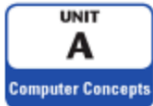


FIGURE A-3: Apple iPhone



FIGURE A-4: Supercomputer





Examining Computer Systems

A **computer system** includes computer hardware and software. **Hardware** refers to the physical components of a computer. **Software** refers to the intangible components of a computer system, particularly the **programs**, or lists of instructions, that the computer needs to perform a specific task. The **operating system** is special software that controls basic input and output, allocates system resources, manages storage space, maintains security, and detects equipment failure. 🎨 Kevin explains how computers work and points out the main components of a computer system.

DETAILS

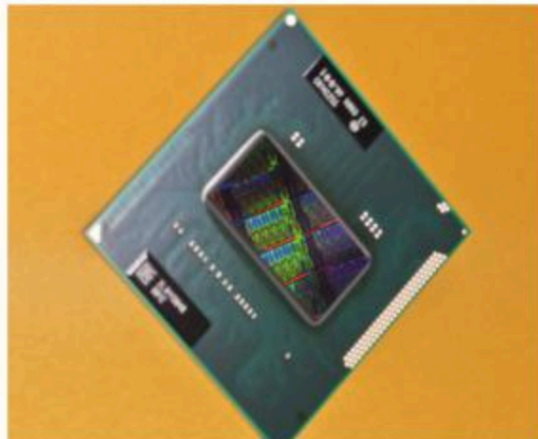
The following list provides an overview of computer system components and how they work:

- The design and construction of a computer is referred to as its **architecture** or **configuration**. The technical details about each hardware component are called **specifications**. For example, a computer system might be configured to include a printer; a specification for that printer might be a print speed of eight pages per minute or the capacity to print in color.
- The hardware and the software of a computer system work together to process data. **Data** refers to the words, numbers, figures, sounds, and graphics that describe people, events, things, and ideas. Modifying data is referred to as **processing**.
- In a computer, processing tasks occur on the **motherboard**, which is located inside the computer and is the main electronic component of the computer. See Figure A-5. The motherboard is a **circuit board**, which is a rigid piece of insulating material with **circuits**—electrical paths—on it that control specific functions. The motherboard contains the following processing hardware:
 - The **microprocessor**, also called the **processor** or the **central processing unit (CPU)**, consists of transistors and electronic circuits on a silicon chip (an integrated circuit embedded in semiconductor material). See Figure A-6. The processor is mounted on the motherboard and is responsible for executing instructions to process information.
- **Cards** are removable circuit boards that are inserted into slots in the motherboard to expand the capabilities of the motherboard. For example, a sound card translates the digital audio information from the computer into analog sounds that the human ear can hear.
- The data or instructions you type into the computer are called **input**. The result of the computer processing input is referred to as **output**. The computer itself takes care of the processing functions, but it needs additional components, called **peripheral devices**, to accomplish the input, output, and storage functions.
 - You use an **input device**, such as a keyboard or a mouse, to enter data and issue commands. **Commands** are input instructions that tell the computer how to process data. For example, you might want to center the title and double-space the text of a report. You use the appropriate commands in the word-processing program that instruct the computer to modify the data you have input so the report text is double-spaced and the report title is centered.
 - Output can be in many different forms, including reports, documents, graphs, sounds, and pictures. Computers produce output using **output devices**, such as a monitor or printer.
 - The output you create using a computer can be stored either inside the computer itself or on an external storage device, such as a DVD. You will learn more about storage devices later in this unit.

FIGURE A-5: Motherboard



FIGURE A-6: Intel microprocessor (CPU)



Comparing microprocessor speeds

How fast a computer can process instructions depends partially on the speed of the microprocessor. Among other factors, the speed of the microprocessor is determined by its clock speed, word size, and whether it is single or dual core. **Clock speed** is measured in **megahertz (MHz)**, millions of cycles per second, or in **gigahertz (GHz)**, billions of cycles per second. **Word size** refers to the number of bits—the smallest unit of information in a computer—that are processed at one time; for example, a 32-bit processor processes

32 bits at a time. A computer with a large word size can process faster than a computer with a small word size. PCs come with 32-bit or 64-bit processors. Finally, a **dual-core processor**, one that has two processors on a single chip, can process information up to twice as fast as a **single-core processor**, one with one processor on the chip. Likewise, a **quad-core processor**, with four processors on a chip, processes information up to four times as fast as a single-core processor.

Definition of: **storage vs. memory**

The terms used in this industry for storage and memory are not straightforward. Computers use storage to hold programs and data until purposely changed or removed by the user. Memory is required to execute the programs and process the data. Even though memory implies "remembering," memory is a temporary workspace.

What makes it confusing is that some vendors use the term "disk memory" for hard disk storage. Even more confusing is that USB drives, solid state disks and memory cards use flash memory, and flash memory does remember, holding its content until changed or removed. Following are the commonly used storage and memory technologies. See [storage](#) and [memory](#).

DATA AND PROGRAM STORAGE

[magnetic disk](#) (hard drives)

[optical disc](#) (CDs, DVDs, etc.)

[solid state drive](#) (flash memory)

[USB drive](#) (flash memory)

[memory card](#) (flash memory)

[flash memory](#) (built into devices)

MEMORY CHIPS FOR PROCESSING

[dynamic RAM](#) (DRAM chips)

[static RAM](#) (SRAM chips)

Definition of: **RAM**

(Random Access Memory) The main memory in a computer, smartphone or tablet. RAM is the temporary workspace where instructions are executed and data are processed. What makes RAM "random access" is its capability of reading and writing any single byte. This "byte addressability" differs from storage devices such as hard disks and flash memory chips, which read and write sectors containing multiple bytes. In addition, RAM is used as a temporary space for the software, while storage is permanent until deleted by the user. To learn how memory is used, see [computer](#) (look at the memory examples). Also see [memory](#), [memory module](#) and [future memory chips](#).

RAM Is DRAM or SRAM

The most common type of RAM is dynamic RAM (DRAM). When a computer data sheet states 4GB of memory or 4GB RAM, it refers to DRAM (see [dynamic RAM](#)). Higher-speed SRAM is also used as an internal staging area (see [static RAM](#)).

Memory Is Often Not RAM!

A smartphone or tablet's specification of 16GB or 32GB of memory does not refer to RAM; rather it is the unit's flash memory capacity for storing apps and data. The internal RAM is in the 256MB-3GB range but is not widely promoted to the general public, presumably to avoid confusion between RAM (temporary workspace) and flash memory (permanent storage). See [storage vs. memory](#).

ts promises. The dual-core 1GHz, TI OMAP processor certainly seen
ly paired with 512MB of memory. It also has 8GB of storage on tap
your content synced online, in theory there's no need for more. In t

Storage Vs. Memory

Although the terms are intertwined these days more than ever, this excerpt from the popular Engadget blog correctly states "storage" and "memory" capacities of Amazon's Kindle Fire tablet.

Memory – RAM

- ▶ **Random-Access Memory** works only when the computer is turned on.
- ▶ This memory is vital to the computer because it controls the moment by moment processes.
- ▶ The first thing that goes into RAM is the OS (operating system). Next for the RAM might be a game, or the Internet browser, or some type of software that you want to use.





Understanding Storage Media

RAM retains data only while the power is on, so your computer must have a more permanent storage option. As Figure A-9 shows, a storage device receives data from RAM and stores it on a storage medium, some of which are described below. Later, the data can be read and sent back to RAM to use again. All data and programs are stored as files. A computer **file** is a named collection of stored data. An **executable file** contains the instructions that tell a computer how to perform a specific task; for instance, the files that are used while the computer starts are executable. A **data file** is created by a user, usually with software. For instance, a report that you write with a word processing program is data, and must be saved as a data file if you want to access it later. 🗂️ Kevin explains the types of storage media available.

DETAILS

The types of storage media are discussed below:

- **Magnetic storage media** store data as magnetized particles on a surface. A **hard disk**, also called a hard disk drive, is the most common type of magnetic storage media. It contains several magnetic oxide-covered metal platters that are usually sealed in a case inside the computer. You can also purchase external hard drives for extra or backup storage.
- **Optical storage devices** are polycarbonate discs coated with a reflective metal on which data is stored using laser technology as a trail of tiny pits or dark spots in the surface of the disc. The data that these pits or spots represent can then be “read” with a beam of laser light.
 - The first standard optical storage device available for personal computers was the **CD (compact disc)**. One CD can store 700 MB of data.
 - A **DVD**, though the same size as a CD, can store between 4.7 GB and 15.9 GB of data, depending on whether data is stored on one or two sides of the disc and how many layers of data each side contains. The term *DVD* is no longer an acronym, although it was originally an acronym for *digital video disc* and later was sometimes updated to *digital versatile disc*.
 - **Blu-ray** discs store 25 GB of data per layer. They are used for storing high-definition video.
- **Flash memory** (also called **solid state storage**) is similar to ROM except that it can be written to more than once. **Flash memory cards** are small, portable cards encased in hard plastic to which data can be written and rewritten. They are used in digital cameras, handheld computers, video game controllers, and other devices.
- A popular type of flash memory is a **USB flash storage device**, also called a **USB drive** or a **flash drive**. See Figure A-10.
 - USB drives for personal computers are available in a wide range of sizes from 1 GB to 128 GB of data. They are becoming more popular for use as a secondary or backup storage device for data typically stored on a hard disk drive.
 - USB drives plug directly into the USB port of a personal computer; the computer recognizes the device as another disk drive. The location of USB ports varies with the brand and model of computer you are using, but the physical port may be on the front, back, or side of a computer.
 - USB flash storage devices are about the size of a pack of gum and often have a ring that you can attach to a key chain.

QUICK TIP

Optical storage devices, such as CDs and DVDs, are much more durable than magnetic storage media.

QUICK TIP

There is only one way to insert a flash drive, so if you're having problems inserting the drive into the slot, turn the drive over and try again.

Memory – Hard Drive

- ▶ A stack of round metal platters called disks encased in a metal air tight shell.
- ▶ The hard drive's function is to store all the files, and software the computer will ever use.
- ▶ Any file or software program used by RAM most likely will come from this drive.
- ▶ The hard drive is commonly lettered as the C drive.



Memory – CDs and DVDs and Blu-rays



- ▶ CD's function much like hard drive in that they store large amounts of memory.
- ▶ What separates them is their mobility and optical storage technology.
- ▶ Their storage capacity is very limited compared to hard drives.
 - CDs = ~650MB
 - DVDs = 4.34GB~7.95GB
 - Blurays = 25GB~50GB

FIGURE A-9: Storage devices and RAM

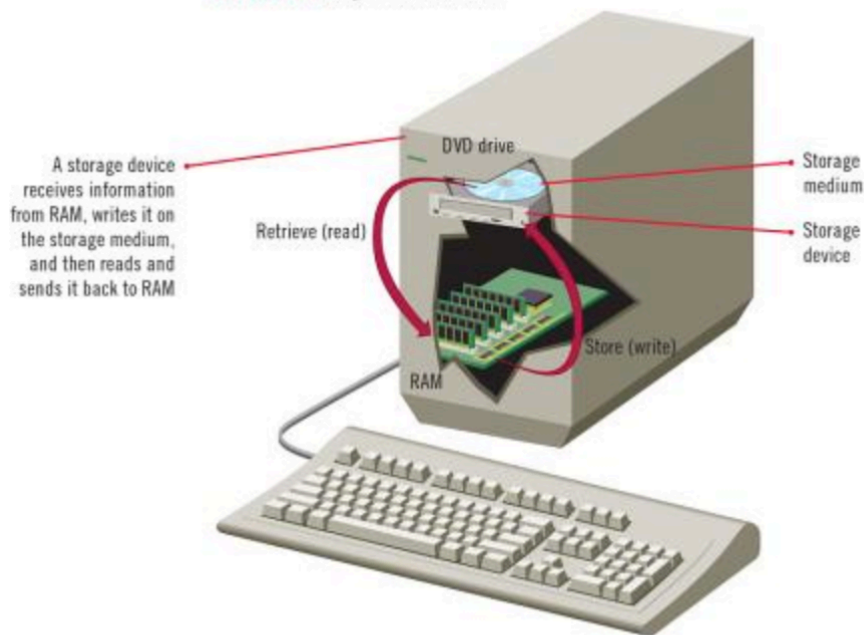


FIGURE A-10: USB flash storage device



Rewriting on optical storage

To store data on a CD, you need to record it on a **CD-R (compact disc recordable)** or **CD-RW (compact disc rewritable)** drive and a CD-R or CD-RW disc. CDs that you buy with software or music already on them are CD-ROMs (compact disc read-only memory)—you can read from them, but you cannot record additional data onto them. On a CD-R, after the data is recorded, you cannot erase or modify it, but you can add new data to the disc, as long as the disc has not been finalized. In contrast, you can rerecord a CD-RW. Recordable DVD drives are also available. As with CDs, you can buy a

DVD to which you can record only once, or a rewritable DVD to which you can record and then rerecord data. Recordable DVDs come in two formats, **DVD-R** and **DVD+R**, and likewise rerecordable DVDs come in two formats, **DVD-RW** and **DVD+RW**. DVD drives on new computers are capable of reading from and writing to both -RW and +RW DVDs and CDs, as well as DVDs with two layers. **BD-R** are Blu-ray discs that you can record to once, and **BD-RE** are Blu-ray discs that you can record to multiple times. You need a Blu-ray drive to use Blu-ray discs.

**UNIT
A**

Computer Concepts

Examining Input Devices

Before a computer can produce useful information, people must get data into the computer. This is accomplished by using input devices. In a typical personal computer system, you input data and commands by using an **input device** such as a keyboard or a mouse. Computers can also receive input from a storage device. You will learn about storage devices later in this unit. 🇵🇪 As Kevin explains peripheral devices to the Sheehan Tours staff, they ask several questions about input devices. For example, one person doesn't understand the difference between a mouse and a trackball. Kevin continues his explanation with a discussion of various input devices.

DETAILS
QUICK TIP

Another way to avoid repetitive-motion injuries is to take frequent breaks when working at a computer and stretch your hands and wrists.

There are many types of input devices, as described below:

- One of the most frequently used input devices is a **keyboard**. The top keyboard in Figure A-11 is a standard Mac keyboard. The bottom keyboard in Figure A-11 is **ergonomic**, which means that it has been designed to fit the natural placement of your hands and should reduce the risk of repetitive-motion injuries.
- Another common input device is a **pointing device**, which controls the **pointer**, a small arrow or other symbol on the screen. Pointing devices are used to select commands and manipulate text or graphics on the screen.
 - The most popular pointing device for a desktop computer is a **mouse**, such as the one shown on the left side in Figure A-12. An ordinary mouse has a rolling ball on its underside, and an optical mouse has a tiny camera on its underside that takes pictures as the mouse is moved. You control the pointer by moving the entire mouse. A mouse usually has two or more buttons for clicking commands. A mouse might also have a **scroll wheel** that you roll to scroll the page on the screen and that may function as one of the buttons.
 - The **trackball**, such as the one shown on the right side in Figure A-12, is similar to a mouse except that the rolling ball is on the top side and you control the movement of the pointer by moving only the ball.
 - MacBooks (notebook computers) are usually equipped with multitouch technology, such as a Multi-Touch trackpad. Macintosh computers come equipped with a trackpad or Magic Mouse. The **trackpad** is a touch-sensitive device that you drag your finger over to control the pointer. See Figure A-13. It does not contain any buttons. The trackpad itself is the button.
- A **touchscreen** is a display that while showing you the output, allows you to touch it with your finger or a stylus to input commands. Touchscreens are found on some ATMs, smartphones, and MP3 players. Tablet PCs and slate computers also use touchscreen technology.
- A **scanner** is a device that transfers the content on a piece of paper into memory. To do this, you place a piece of paper on the glass, a beam of light moves across the glass similar to a photocopier, and the scanner stores the image or words on the paper as digital information. You can scan a document or a photo and save it as an image file, or you can scan a document and have the text "read" by the scanner and saved in a document file for editing later.
- Microphones are another type of input device. You can use them to record sound for certain types of files, or, if you have voice-recognition software, you can use them to input data and commands.
- Input devices can be connected to the computer with cables or wirelessly. Wireless input devices connect to the computer using infrared or radio-frequency technology, similar to a remote control for a television.

Understanding assistive devices

People with physical impairments or disabilities can use computers because of advances in making computers accessible to everyone. For example, people who cannot use their arms or hands instead can use foot, head, or eye movements to control the pointer. People with poor vision can use keyboards with large keys for input, screen

enlargers to enlarge the type and images on the monitor, or screen readers to read the content of the screen aloud. Computers have even been developed that can be controlled by a person's thoughts, that is, the brain's electromagnetic waves.

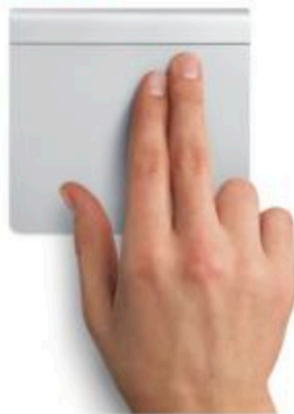
FIGURE A-11: Keyboards



FIGURE A-12: Personal computer pointing devices



FIGURE A-13: Multi-Touch trackpad



Output devices are anything that the computer sends information TO. This can include speakers to project audio, monitors and projectors to display video, or printers to create physical copies.

Output

- ▶ Computers can also send a lot of information to various outputs
- ▶ This is what we receive from the computer

