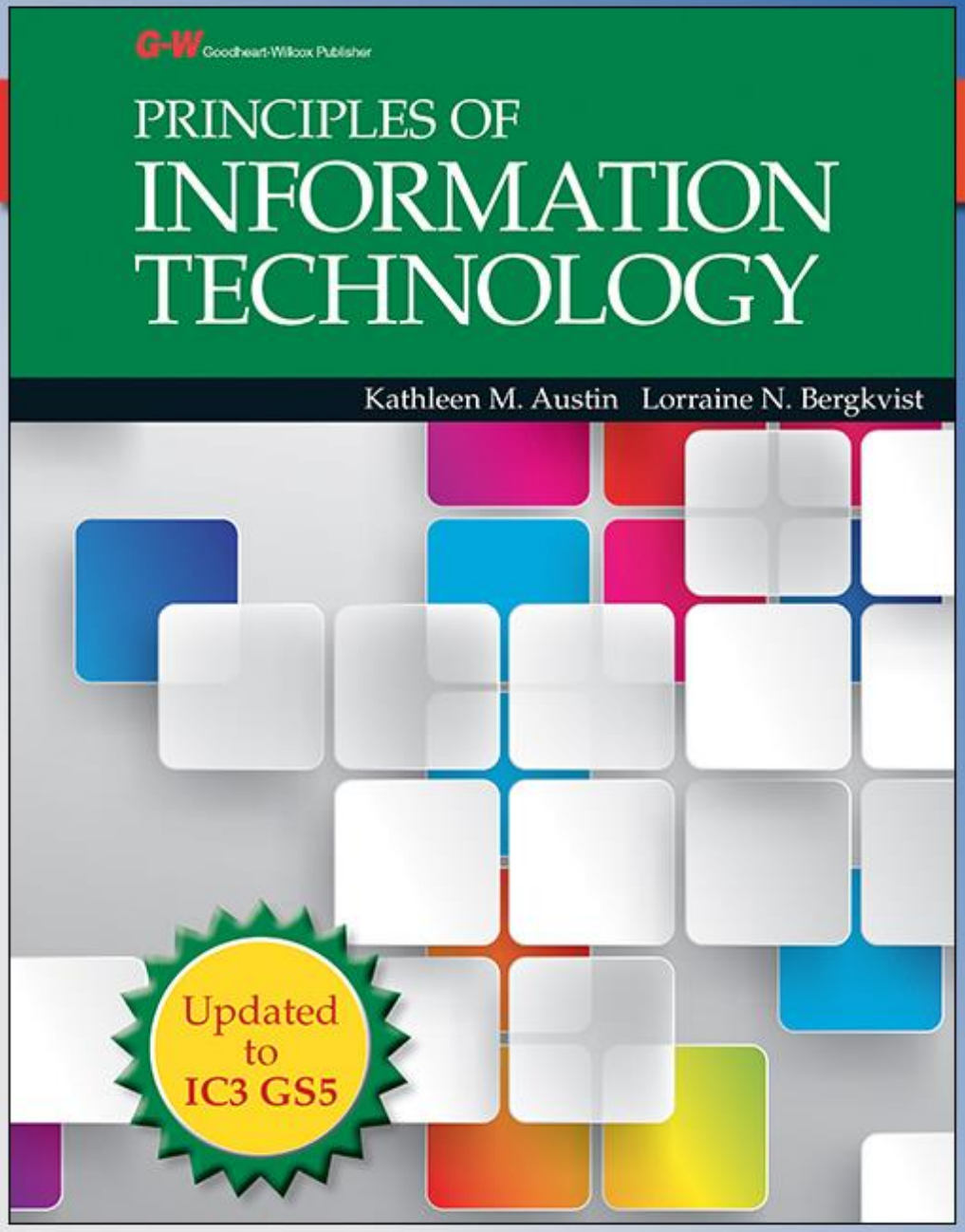



*Presentations for PowerPoint*

# PRINCIPLES OF INFORMATION TECHNOLOGY

G-W PUBLISHER

The Goodheart-Willcox Co., Inc.
Tinley Park, Illinois

# CHAPTER 2

## Hardware

# IC3 Certification Objectives

## GS5

- **Computing Fundamentals**
  - **Domain 1.0** Mobile devices
    - **Objective 1.2** Be familiar with cellular-enabled tablets
    - **Objective 1.3** Be familiar with smartphones
  - **Domain 2.0** Hardware devices
    - **Objective 2.1** Types of devices
    - **Objective 2.2** Know the impact of memory and storage
    - **Objective 2.3** Know how to connect different peripherals
    - **Objective 2.8** Know platform considerations and implications

# IC3 Certification Objectives

## GS5

- **Computing Fundamentals**
  - **Domain 2.0** Hardware devices
    - **Objective 2.12** Understand common hardware configurations
    - **Objective 2.14** Understand the pros and cons of touch screens vs. non-touch screen devices
  - **Domain 3.0** Computer software architecture
    - **Objective 3.7** Document management

# IC3 Certification Objectives

## GS5

- **Key Applications**
  - **Domain 5.0** Presentations
    - **Objective 5.2** Understand how to connect to external/extended monitors to display presentation

# IC3 Certification Objectives

## GS4

- **Computing Fundamentals**
  - **Domain 2.0** Computing hardware and concepts
    - **Objective 2.1** Common computer terminology
    - **Objective 2.2** Types of devices
    - **Objective 2.3** Computer performance
  - **Domain 3.0** Computer software and concepts
    - **Objective 3.3** Software usage
  - **Domain 4.0** Troubleshooting
    - **Objective 4.2** Hardware

SECTION

# 2.1

# Types of Computers and Components

# Essential Question

- How has the evolution of computers impacted your life?

# COMPETENCIES

- 6670.47 Identify the basic parts of a computer system and the relationships among components.
- 6670.48 Describe characteristics and functions of CPUs, motherboards, random access memory (RAM), expansion connections, hard drives, and CD-ROM drives.

# Section 2.1 Learning Goals

After completing this section, you will be able to:

- List the categories of computers.
- Identify basic parts and functions of a computer.
- Explain the purpose of an operating system.

# Terms

- arithmetic/logic unit (ALU)
- booting
- central processing unit (CPU)
- clock speed
- computer system
- control unit
- firmware
- floating point operations per second (FLOPS)
- hardware
- input
- input device
- mainframe computers
- memory

# Terms

- millions of instructions per second (MIPS)
- motherboard
- operating system (OS)
- output
- peripheral devices
- personal computer
- port
- processing
- random-access memory (RAM)
- read-only memory (ROM)
- server
- storage
- supercomputers
- universal serial bus (USB)

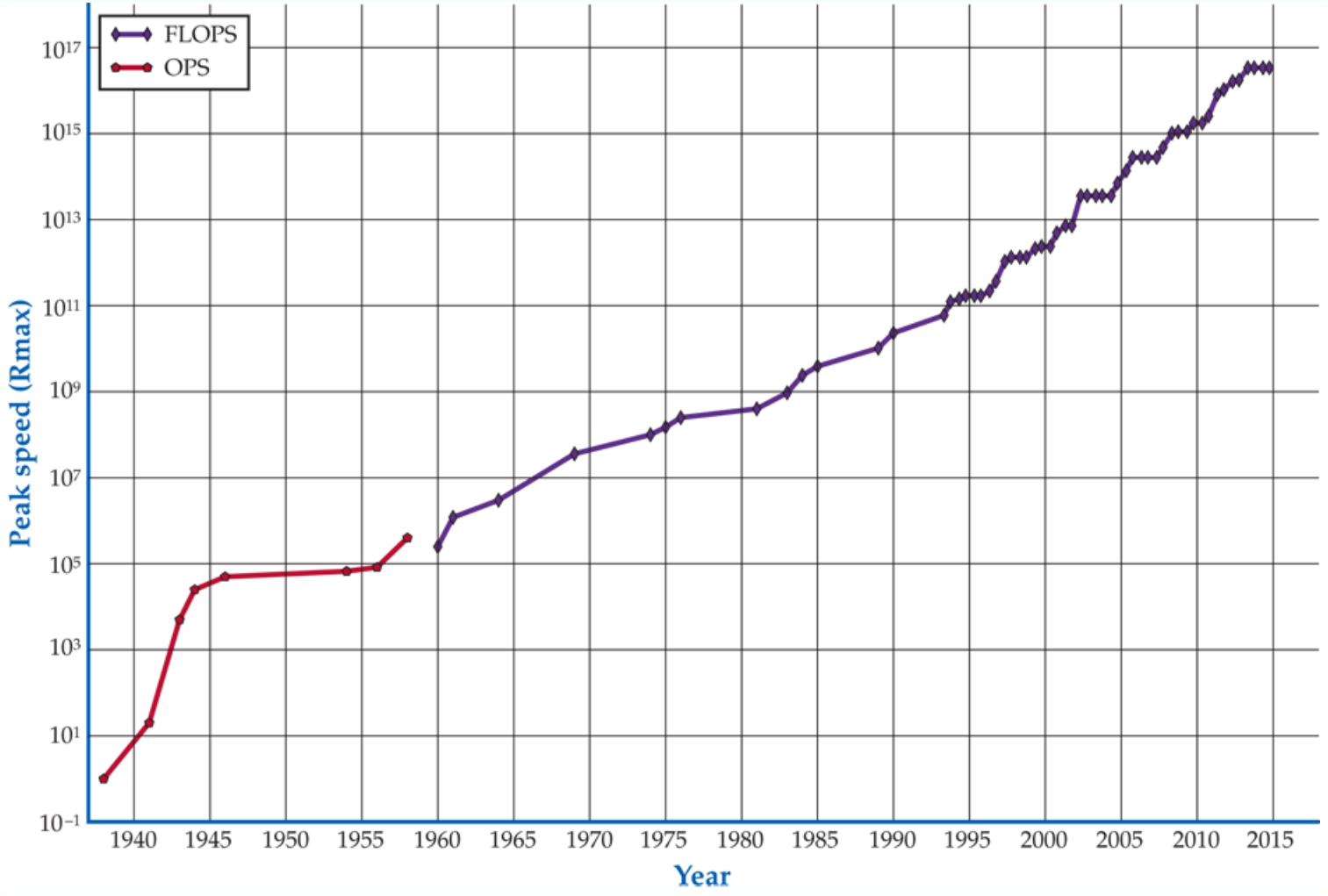
# Categories of Computers

- **Supercomputers**
  - Have processing power that can handle complex jobs beyond the scope of other computer systems
  - Speed is measured in **floating point operations per second (FLOPS)**

# Categories of Computers

- **Mainframes**
  - Provide centralized storage, processing, and overall management of large amounts of data
  - Speed is measured in **millions of instructions per second (MIPS)**

# Categories of Computers



# Categories of Computers

- **Servers**
  - Stores data and responds when requested by other computers in the network
  - Generally handles backing up the stored data for all users

# Categories of Computers

- Personal computers & mobile devices
  - **Personal computer** is a processing device designed to meet the needs of an individual user
  - Desktop computers
  - Laptop computers
  - Mobile devices

# Basic Parts and Functions of a Computer

- **Hardware** is the physical components of the computer
- Four main hardware components
  - Input device
  - Memory
  - Processor
  - Output device

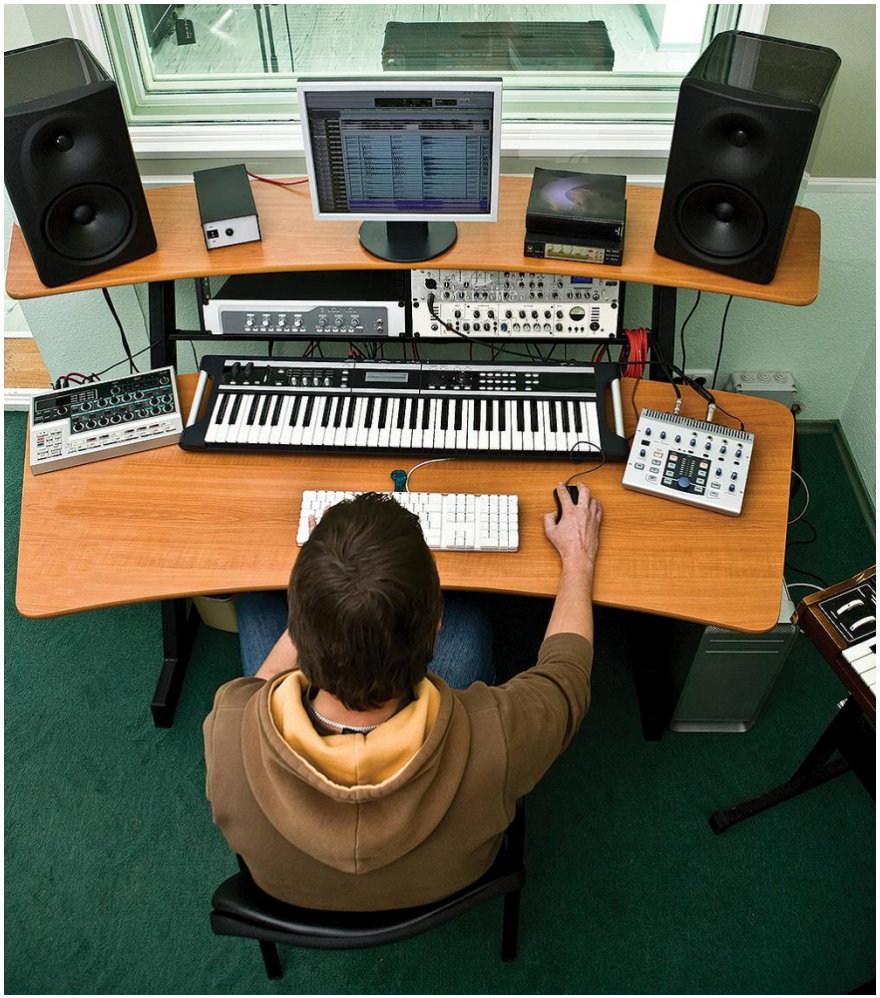
# Basic Parts and Functions of a Computer

- All computers accept data input, store data, process data, and produce output
- **Computer system** is a computer with its attached devices

# Basic Parts and Functions of a Computer

- Attached devices not critical to computer operation are **peripheral devices**
- **Input**
  - Translates data from the human world into computer data
  - An **input device** provides the computer with data on which it can act
  - Keys, touch, mouse, controller
  - Scanner, camera, microphone

# Basic Parts and Functions of a Computer



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# Basic Parts and Functions of a Computer

- Storage
  - Where the data are kept by the computer so the information can be viewed, played, or otherwise used
  - **Memory** is the part of the computer that stores information for immediate processing
  - **Random-access memory (RAM)** is memory that can be changed

# Basic Parts and Functions of a Computer

- Storage
  - **Read-only memory (ROM)** is memory that cannot be changed
    - Contains static information the computer will always need to operate
    - Involatile
  - Measuring memory
    - Capacity: 8 bits = 1 byte
    - 1 byte = 1 character
    - Metric prefixes: kilo, mega, giga, peta

# Basic Parts and Functions of a Computer

| Metric Symbols | Number of bytes* | Equivalent sizes |
|---|---|---|
| byte | 1 | One character. |
| kilobyte (KB) | 1 thousand bytes | One short letter or memo. |
| megabyte (MB) | 1 million bytes | A typical high-resolution photo is about 2.5MB.<br>The information in 40 paperback books (a stack about three feet high) is about 50MB. |
| gigabyte (GB) | 1 billion bytes | One hour of a feature film is about 1.5GB.<br>The information in 800 paperback books (a stack about 650 feet high) is about 20GB. |
| terabyte (TB) | 1 trillion bytes | The information in 800,000 paperback books (a stack about 10 miles high) is about 1TB.<br>Library of Congress archives contain 160TB. |
| petabyte (PB) | 1,000 terabytes | Seventy-seven million CDs each containing 700MB is 50PB. |
| exabyte (EB) | 1,000 petabytes | All words ever spoken by human beings are about 5EB. |
| zettabyte (ZB) | 1,000 exabytes | The information in 174 newspapers received daily by every person on Earth is about 4ZB. |

*Note: there are actually 1024 bytes in a kilobyte, so these values are rounded.

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# Basic Parts and Functions of a Computer

- **Processing**
  - Transformation of input data and acting on those data
  - **Central processing unit (CPU)** is the device that fetches coded instructions, decodes them, and then runs or executes them
    - **Arithmetic/logic unit (ALU)** temporarily holds data that are being processed and handles all arithmetic operations
    - **Control unit** fetches each instruction from the list directed by the program being run

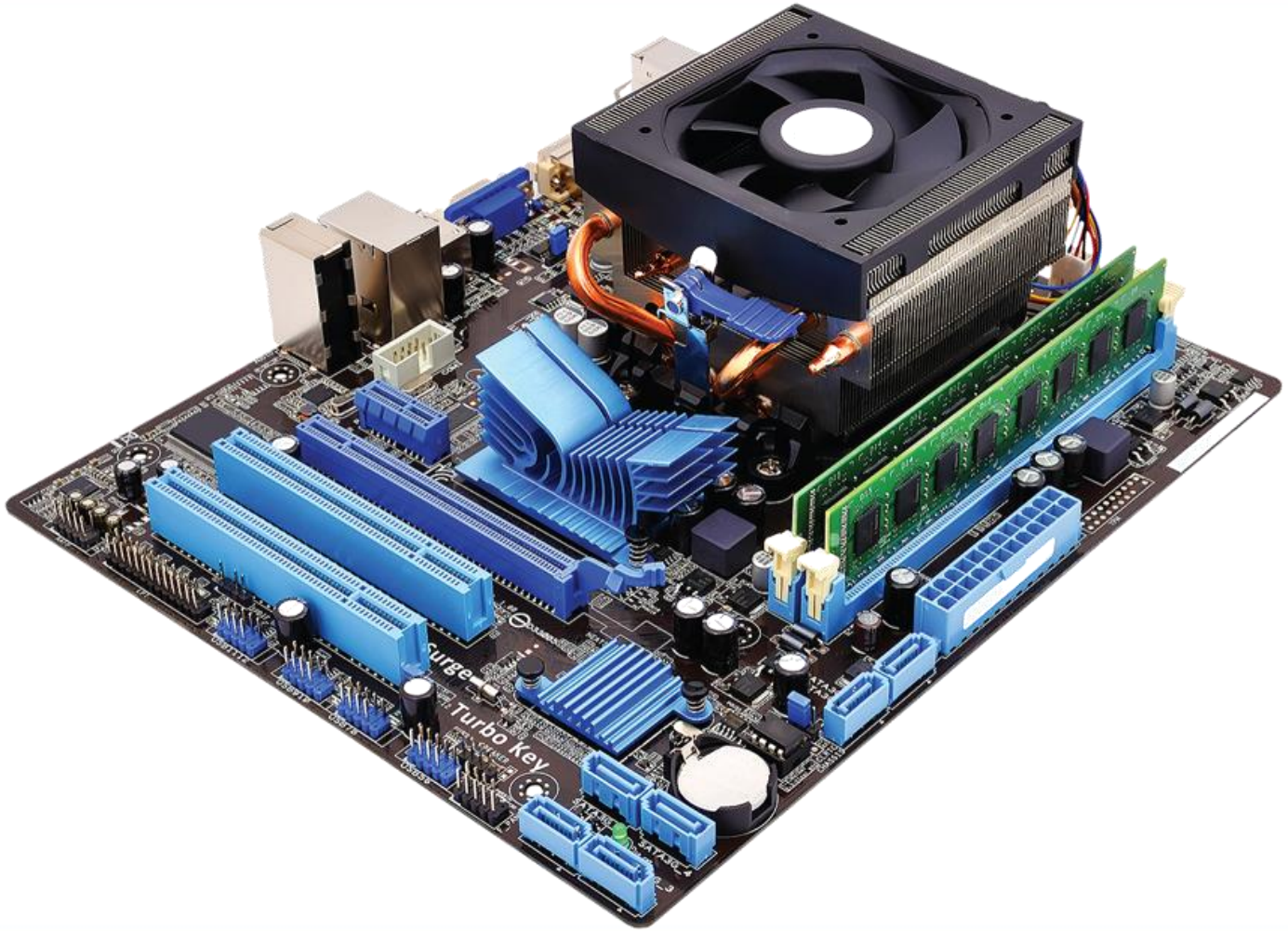
# Basic Parts and Functions of a Computer

- Processing
  - **Clock speed** is the speed rating of a CPU
    - Measured in hertz
    - Currently in the range of gigahertz
  - **Motherboard** connects all of the hardware in the computer
    - **Port** is a point of interface between the motherboard and external devices
    - **Universal serial bus (USB)** is an industry standard for communication between devices and the computer

# Basic Parts and Functions of a Computer

- **Output**
  - Data provided to the user
  - Monitor, speakers, printer, external storage device

# Basic Parts and Functions of a Computer

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# Operating System

- **Operating system (OS)** is software that manages all of the devices, as well as locates and provides instructions to the CPU
- **Booting**, or *bootstrapping*, describes using a small program to get the computer running and the OS loaded
- **Firmware** is a mix of circuitry and software that holds instructions for initializing the hardware and loading the main OS

# Operating System

- Six events occur when a computer running a Windows OS boots up
  1. Power light comes on, fan starts up, electricity is sent throughout the hardware components
  2. CPU follows instructions set up in ROM
  3. CPU performs tests on the computer's internal systems

# Operating System

- Six events occur when a computer running a Windows OS boots up
  4. CPU finds all connected peripheral devices, checks their settings, and alerts the user if there is a problem
  5. CPU loads the OS from the hard drive into RAM
  6. OS reads a file containing configuration data to tell it what windows to open, icons to display, or programs to run

SECTION

# 2.2

# Input and Output Devices

# Essential Question

- Why is it important for input and output devices to be accessible to people with disabilities?

# COMPETENCIES

- 6670.49 Describe characteristics and functions of CPUs, motherboards, random access memory (RAM), expansion connections, hard drives, and CD-ROM drives.

# Section 2.2 Learning Goals

After completing this section, you will be able to:

- Discuss input devices and their functions.
- Describe output devices and their functions.

# Terms

- audio-input devices
- audio-output device
- data projector
- image-input devices
- keyboard
- monitor
- mouse
- optical-character recognition (OCR)
- output device
- pointing device
- printer
- ripping
- stylus
- text-input devices
- touch screen
- user interface (UI)
- webcam

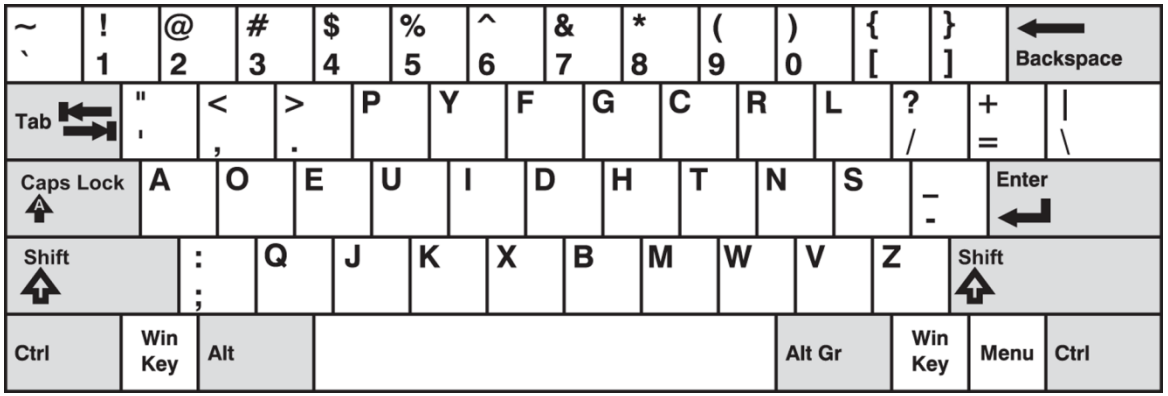
# Input Devices and Their Functions

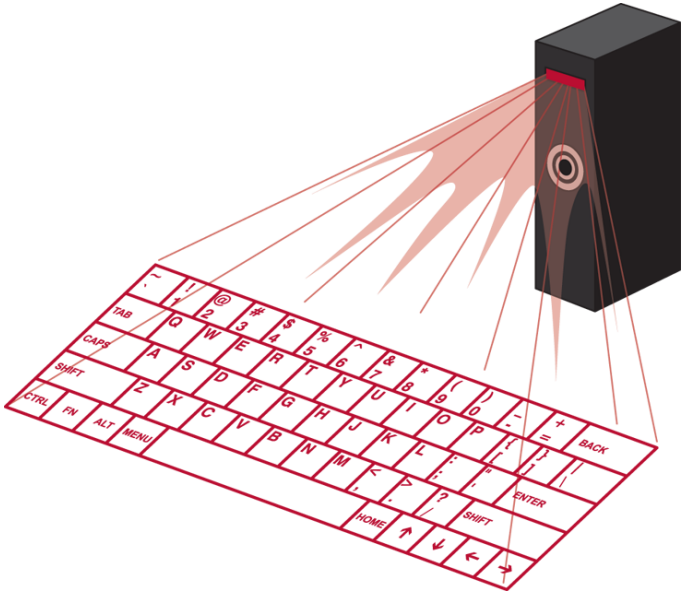
- The means by which the user enters data and receives feedback is the **user interface (UI)**
- **Keyboards**
  - Device for inputting textual and numeric data
  - Most basic input device
  - Actions of Keyboards
    - Electrical signal is sent to CPU
    - CPU processes signal and provides to software

# Input Devices and Their Functions

- Keyboards
  - Types of Keyboards
    - QWERTY
    - Dvorak
    - Virtual
  - Factors in Evaluating Keyboards
    - Choose a keyboard that supports the intended use
    - Maintain comfort

# Input Devices and Their Functions

# Input Devices and Their Functions

- **Pointing Devices**
  - Allows the user to control the movement of the cursor on the screen
  - Mouse is most common type
  - Actions of Pointing Devices
    - Pointing
    - Clicking
    - Dragging
    - Double-clicking

# Input Devices and Their Functions

- Pointing Devices
  - Types of Pointing Devices
    - **Mouse** is a device with one or more buttons that can be moved on a flat surface to control the cursor
    - Touchpad
    - Graphics tablet
    - **Stylus** is a pen-like pointer, but without ink
  - Factors in Evaluating Pointing Devices
    - Should support the intended use of the computer
    - Wired or wireless

# Input Devices and Their Functions

- **Touch Screens**
  - Device that senses applied pressure and sends signals to the CPU
  - Actions of Touch Screens
    - Finger or stylus is used to apply pressure
    - Provides the four basic functions of a pointing device
  - Types of Touch Screens
    - Tablets, smartphones, portable gaming devices
    - Interactive kiosks

# Input Devices and Their Functions

- Touch Screens
  - Factors In Evaluating Touch Screens
    - Accuracy of the pressure response
    - Size of areas for touching

# Input Devices and Their Functions

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# Input Devices and Their Functions

- **Image-Input Devices**
  - Used to digitize images so they can be used by the computer
  - Actions of Image-Input Devices
    - Use electronics to create electrical signals to represent data
    - Scanners and digital cameras digitize images based on light

# Input Devices and Their Functions

- Image-Input Devices
  - Types Of Image-input Devices
    - Digital camera
    - **Webcam** is an image-input device that can be mounted on top of a monitor or built into a laptop computer
  - Factors in Evaluating Image-Input Devices
    - Higher pixel density
    - Page feeder on scanner

# Input Devices and Their Functions

- **Text-Input Devices**
  - Generally image-input devices used with software to convert the image to text that can be used by the computer
  - Actions of Text-Input Devices
    - **Optical-character recognition (OCR)** is software used with image scanners to digitize text
    - Checks, typewritten documents, hand-written notes

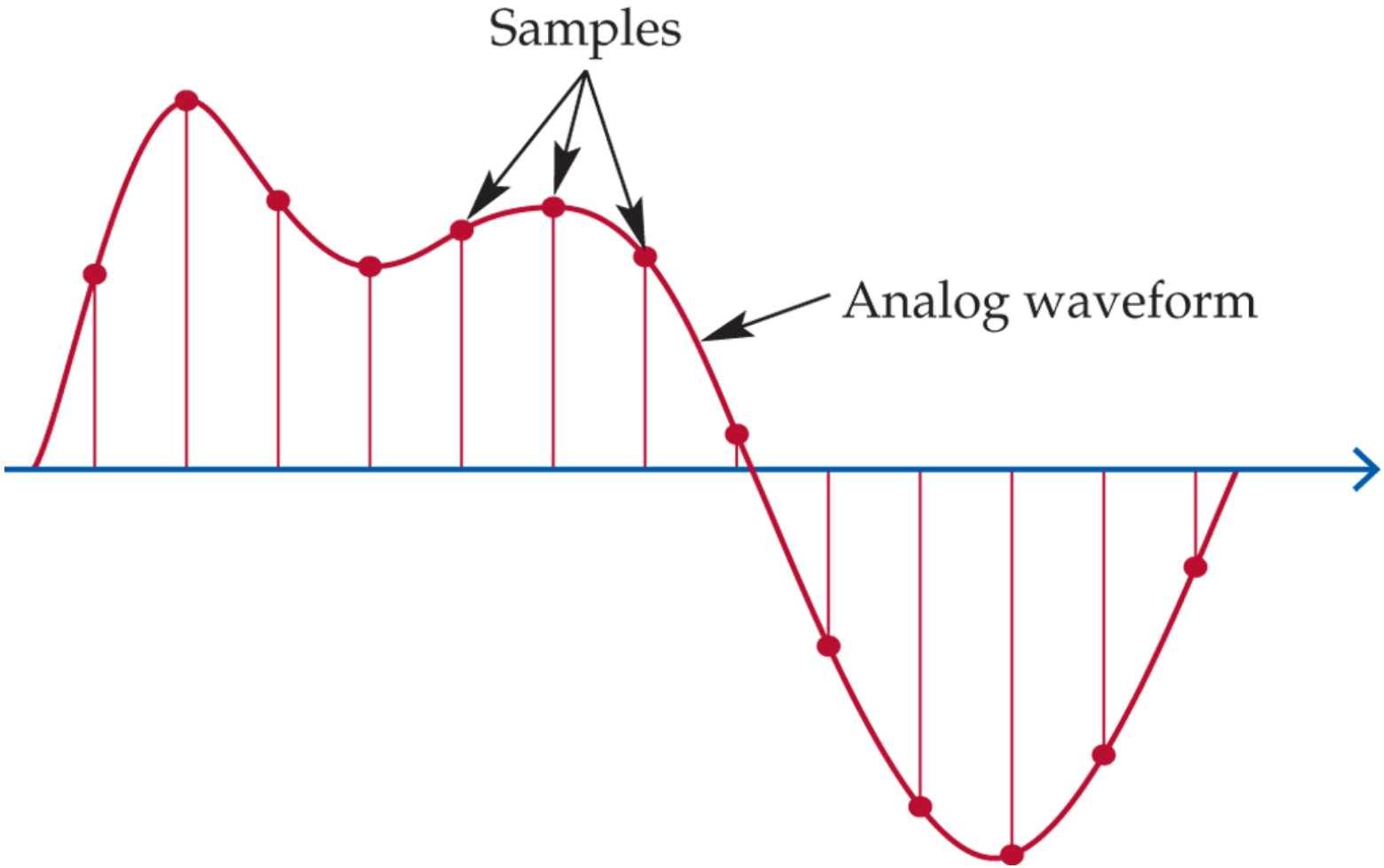
# Input Devices and Their Functions

- Text-Input Devices
  - Types of Text-Input Devices
    - Scanner with OCR software
    - Smartphones
  - Factors in Evaluating Text-Input Devices
    - Supports intended use
    - Resolution and speed
    - OCR software

# Input Devices and Their Functions

- **Audio-Input Devices**
  - Convert sounds into data that can be used by the computer
  - Actions of Audio-Input Devices
    - Sampling
    - Typical sampling rate for CD quality is 44,100 times per second

# Input Devices and Their Functions



# Input Devices and Their Functions

- Audio-Input Devices
  - Types of Audio-Input Devices
    - Microphone
    - **Ripping** is the process of extracting audio from a CD, DVD, or video file
  - Factors in Evaluating Audio-Input Devices
    - Supports intended use
    - Tonal qualities

# Input Devices and Their Functions

- Input Devices for Users with Disabilities
  - Actions of Accessible Input Devices
    - Depends on the nature of the disability
    - Purpose is the same as any other input device
  - Types of Accessible Input Devices
    - Voice-recognition technology
    - Enlarged keyboard and touch-screen devices
  - Factors in Evaluating Accessible Input Devices
    - Simple and intuitive
    - Error rate

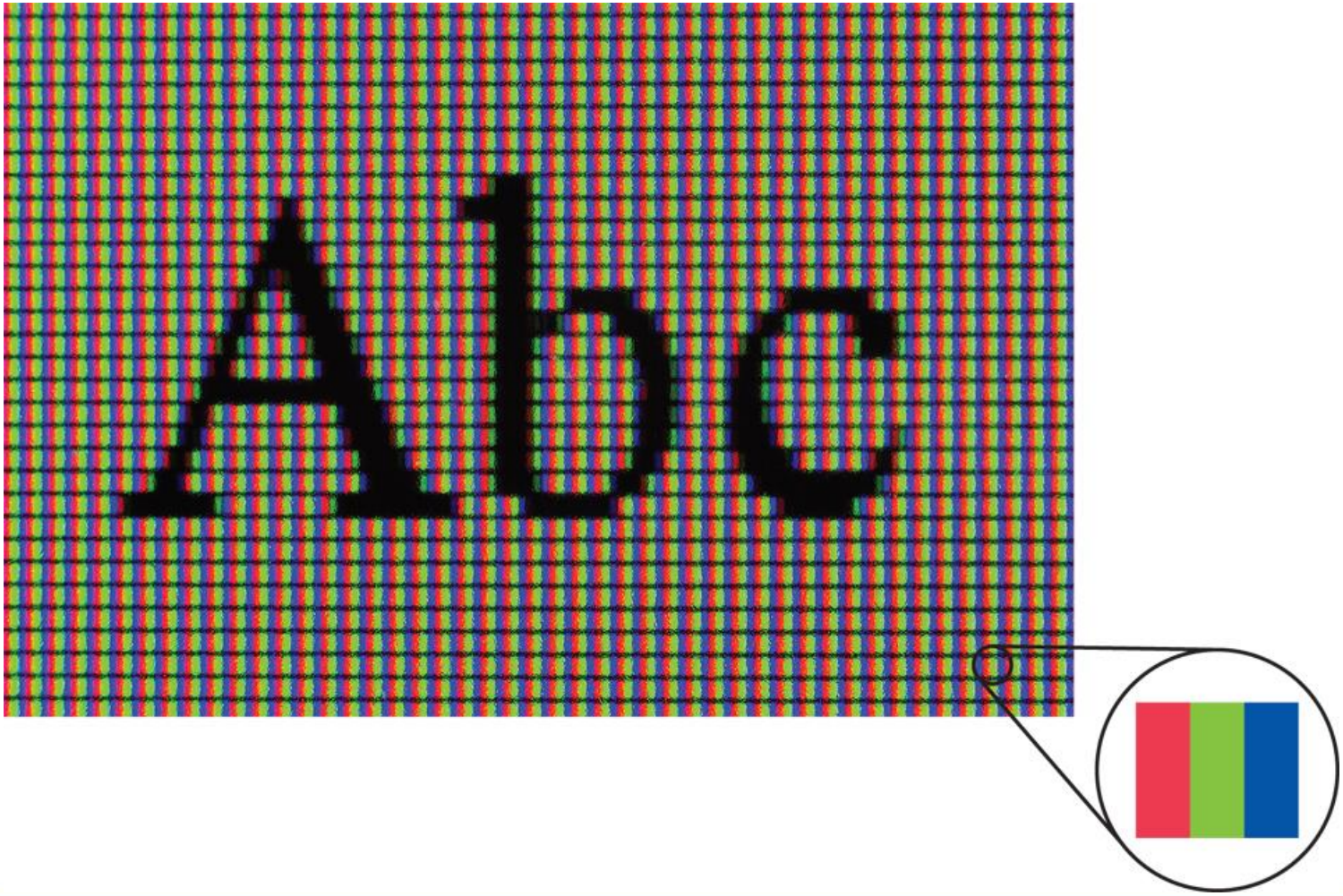
# Output Devices and Their Functions

- **Output device** makes it possible for the user to receive communication from the computer
- **Monitors**
  - Provide display outputs
  - Displays graphical interface
  - Actions of Monitors
    - Each pixel is a tiny point of light
    - Current comes from CPU via the video card

# Output Devices and Their Functions

- Monitors
  - Types of Monitors
    - Liquid crystal display (LCD)
    - Light-emitting diode (LED)
    - Cathode-ray tube (CRT)
  - Factors in Evaluating Monitors
    - Screen size
    - Contrast ratio
    - Dot pitch
    - Resolution

# Output Devices and Their Functions



# Output Devices and Their Functions

- Projectors
  - **Data projectors** collect video data from a computer and projects the images onto a separate screen
  - Actions of Projectors
    - Works like a monitor
    - Signal passes through a prism to separate signal into RGB, then recombine into a single beam projected onto a screen

# Output Devices and Their Functions

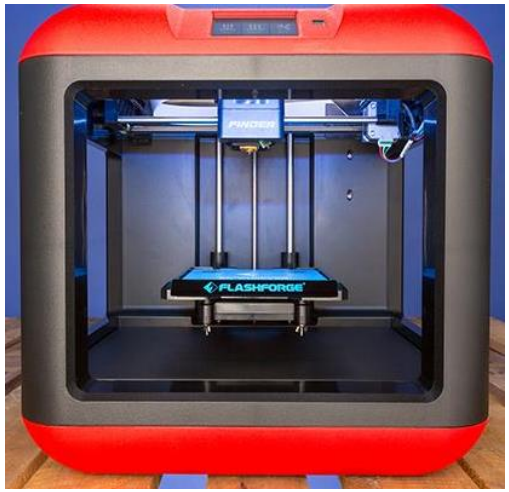
- Projectors
  - Types of Projectors
    - LCD, DLP, LCoS, LED
    - Choose type that best serves purpose
  - Factors in Evaluating Projectors
    - Size
    - Weight

# Output Devices and Their Functions

- **Printers**
  - Transform computer information into a physical form
  - Actions of Printers
    - Formats page based on the output from another software program
    - Deposits ink or toner onto paper based on instructions from driver

# Output Devices and Their Functions

- Printers
  - Types of Printers
    - Ink-jet and laser are widespread
    - Solid-ink, 3-D
  - Factors in Evaluating Printers
    - Speed
    - Resolution
    - Duty cycle
    - Cost



# Output Devices and Their Functions

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# Output Devices and Their Functions

- **Audio-Output Devices**
  - Convert data in the computer into sounds
  - Actions of Audio-Output Devices
    - Uses decompression instructions to create the file
    - Replicated by hardware of device
  - Types of Audio-Output Devices
    - Basic speakers, headphones, earbuds
    - Mixing board and advanced stereo systems

# Output Devices and Their Functions

- Audio-Output Devices
  - Factors in Evaluating Audio-Output Devices
    - Should support intended use
    - Cost

# Output Devices and Their Functions

- Output Devices for Users with Disabilities
  - Actions of Accessible Output Devices
    - Depends on nature of disability
    - Purpose of device is same as noncompliant device
  - Types of Accessible Output Devices
    - Larger monitors, magnification program, screen reader
    - Braille printer, closed captioning

# Output Devices and Their Functions

- Output Devices for Users with Disabilities
  - Factors in Evaluating Accessible Output Devices
    - Simple and intuitive
    - Error rate

SECTION

# 2.3

# Storage Devices

# Essential Question

- Why is it important to rename storage devices?

# COMPETENCIES

- 6670.50 Demonstrate the use of connectivity devices and peripheral equipment (e.g., portable storage devices, printers, cable modem, and wireless technologies).

# Section 2.3 Learning Goals

After completing this section, you will be able to:

- Identify types of storage devices.
- Assign names to storage devices.

# TERMS

- flash drives
- hard disk drive
- magnetic media
- optical storage
- solid-state drives (SSDs)
- volume label

# Types of Storage Devices

- **Magnetic Media**
  - Made of iron oxide-coated disks that can be selectively magnetized to store on-off signals (1s and 0s)
  - Volatile storage, can be rewritten
  - **Hard disk drive**, or *hard drive*, is a sealed unit that contains a stack of individual disks which are magnetic media that rotate at a very high speed
  - 5 TB currently

# Types of Storage Devices


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# Types of Storage Devices

- **Optical Storage**
  - Involves saving data as tiny pits in foil on a plastic disc
  - Some are ROM, most currently read/write
  - CD
    - Designed to replace cassette tapes and records
    - 700 MB
    - Two basic types: minus (–) and plus (+)

# Types of Storage Devices

- Optical Storage
  - DVD
    - Originally designed to replace videotapes
    - 4.5 GB
  - Blu-ray
    - Designed to replace DVDs
    - 25 GB

# Types of Storage Devices

- **Solid-State Drives**
  - Similar to RAM, but have an integrated circuit to store data as involatile memory
  - **Flash drives** are removable peripheral devices and most recognized examples of SSDs
  - Most are removable devices, portable, small
  - Range in size

# Naming Storage Devices

- Device drive name
  - Automatically assigned by OS
  - May change for removable devices
  - Used in file pathname
- The name of the device itself is called the **volume label**
  - Assigned by user
  - Meaningful name for easy ID of contents