ICT Fundamentals

Lesson 1: Computing Fundamentals

LESSON SKILLS

After completing this lesson, you will be able to:

- Define "computer" and explain how computers work. Describe functions of the computing cycle (i.e. input, processing, output, storage).
- Describe uses of computers (i.e. home, school, business).
- Identify the main types of computers (i.e. supercomputer, mainframe, microcomputer, notebook, tablet, handheld).
- Describe the four parts of a computer (i.e. hardware, software, data, user).
- List computer input and output devices (i.e. monitor, printer, projector, speakers, mice, keyboards) and describe their uses.
- Define "network," and explain network usage (i.e. home, school, work).
- Identify types of networks (i.e. LAN, WAN, MAN, VPN, intranet, extranet, the internet).

KEY TERMS

computer	intranet	server
computer network	mainframe computers	software
data	microcomputers	storage
extranet	notebook computers	supercomputers
handheld computers	output	tablet computer
hardware	processing	user
input		

Overview

In this lesson, you will explain computing functions, systems and devices. You will also explain networking types and uses at home, school and work.

What Is a Computer?

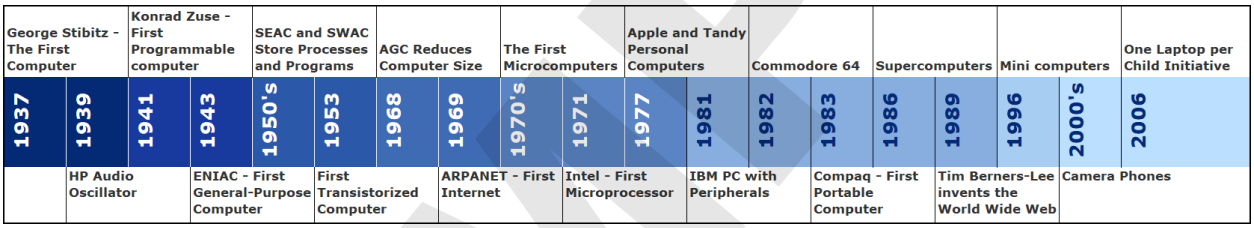
Objectives

1.1.1: Define "computer" and explain how computers work.

1.1.2: Describe functions of the computing cycle (i.e. input, processing, output, storage).

According to Dictionary.com (2016) a **computer** is, "a programmable electronic device designed to accept **data**, perform prescribed mathematical and logical operations at high speed and display the results of these operations. Mainframes, desktop and laptop computers, tablets, and smartphones are some of the different types of computers." As we can see from this definition, there are many different kinds of computers that are used in today's world.

You might be asking yourself, "When did computers begin? How have they changed the world we live in?"



Now, we have computers everywhere we look; from our smartphones to our e-readers (Kindles and Nooks), to parts of our car engines, to refrigerators. Computers have truly changed the way we do almost everything. It is because computers are everywhere and a part of almost everything we do, it is important that we have an understanding of what they are, what they are capable of doing and how to work with them. In this course, we will do just that.

Link to Learn More

Visit Timeline of Computer History for an overview of how computers have changed

The computing cycle

There are basically four major functions of the computing cycle; input, **processing**, output and **storage**, as shown in Figure 1-1.

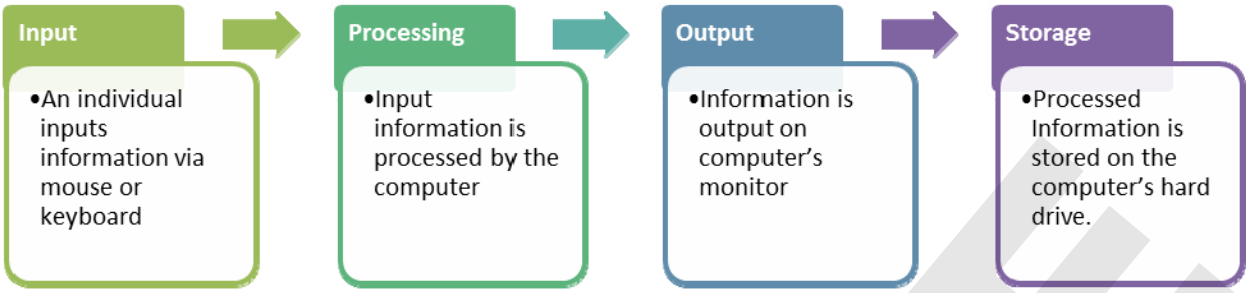
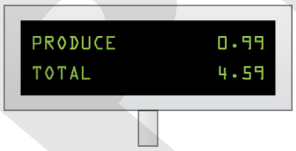


Figure 1-1: Four functions of the computing cycle

Let's see how that works in our everyday world.

Input	Processing	Output	Storage
You go to a grocery store and the store clerk scans an item's barcode. 	A computer processes the barcode. 	The computer **outputs** the price and description of the item. 	Transaction information is stored on the computer for inventory purposes. 

That's much faster than the clerk having to ring up each item after looking up the price tag, isn't it?

Link to Learn More

Input, Processing, Output and Storage: Information System Components (YouTube video, 3 mins)

Suggested activity

- Reviewing the Computer Cycle (Hands-on)
- The Computer Cycle (Online)

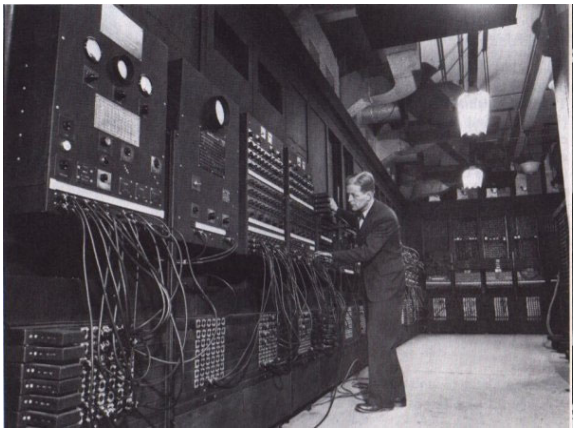
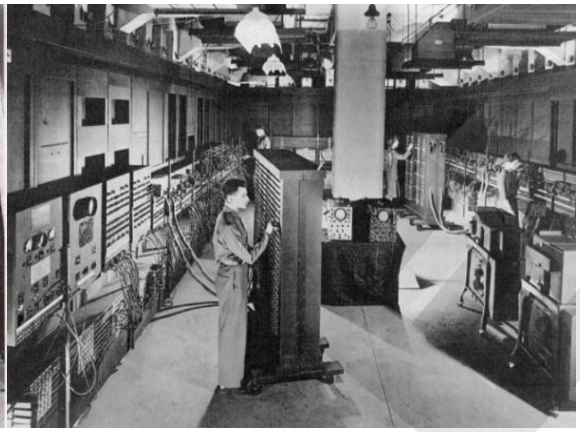
How Computers Are Used

Objectives

1.1.3: Describe uses of computers (i.e. home, school, business).

We have seen how computers began as very large, very expensive tools for large scale agencies and research centers. In the beginning, computers were used almost exclusively for calculations to help those people in their related fields. The cost and size of early computers limited who could use them as they were very expensive and the size of rooms.

Take a look at the following figure of some first generation computers:

Over time, computers have become smaller and more versatile. Their uses have moved from the lab to the home, to our cars, to our washing machines and watches. With each new breakthrough in computer technology, we have managed to find new and creative ways to harness their power.

Think about your home, your friends, family, business and school. Where do you see computers in use every day? Can you think of a place where they are not in use?

Computers at Home	**Computers at School**	**Computers at Work**
• car GPS • appliances (such as washing machines, refrigerators, thermostats, garage doors or home security.) • watches/fitness tracker • streaming TV shows, movies, and music • shopping • social networking • remote jobs • email • surfing the Internet	• research • homework • standardized tests • collaboration on group projects • multimedia • communication between teachers, students, parents and school administrators • online schools • keep student records	• accounting and payroll • marketing • e-commerce • email customers • scheduling • track inventory • track orders and sales • research • presentations

Obviously, if you have advanced computer skills you could be looking at some very high paying jobs from software developers (you'll need to learn how to program for that), network engineers, security specialists and data analysts. Every profession requires computer literacy and skills.

Suggested activities

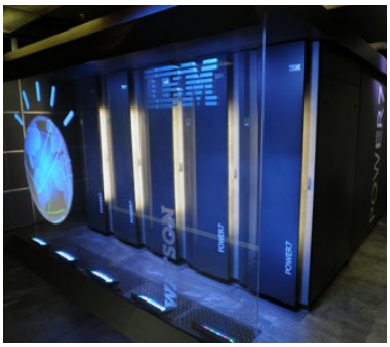
- Listing the Ways Computers Are Used (Hands-on)
- Comparing the Ways Computers Are Used (Hands-on)

Types of Computers

Objectives

1.1.4: Identify the main types of computers (i.e. supercomputer, mainframe, microcomputer, notebook, tablet, handheld).

When it comes to classifying computers, we general break them down by purpose, size, speed and cost.

Example Image	Type of Computer	Purpose
	**Supercomputer**	**Supercomputers** are high performing, extremely fast and often cost millions of dollars. They are often used more for calculations and problem solving.
	**Mainframe**	**Mainframe computers** are like supercomputers in that they are high-performance very fast computers. They are often used for high volume and intense processing such as credit card transactions and scientific research. One of the biggest differences between a mainframe and a supercomputer is their **hardware** and the types of tasks they perform. Many mainframes cost hundreds of thousands of dollars.
	**Microcomputers**	Personal computers (PC) are **microcomputers**, designed for personal and home use. Sometimes these computers are known as "desktop computers" but they can also be referred to as a **server**, microcomputer or laptop. Most of these computers use a keyboard, mouse, monitor and of course the system unit itself.

Example Image	Type of Computer	Purpose
	**Notebook Computers**	**Notebook computers**, often called "laptops" are small and very portable. However, laptops are more like portable PCs that weigh somewhere between 2-8 lbs. whereas notebooks are smaller, lighter in weight and generally have less processing power than a laptop.
	**Tablet Computers**	A **tablet computer** is even smaller and lighter than a laptop or notebook. They are used primarily for inputting information. Many tablets do not have a keyboard and rely solely on a touchscreen that reacts to either a finger or special pen called a "stylus". Almost all tablets come with a camera, speakers and microphone making them ideal for video conferences or chatting with friends.
	**Handheld Computers**	There are many different kinds of **handheld computers**, including smartphones, GPS devices, Nintendo DS, iPod and Sony PSP. Smartphones are like tablets except that they are also a phone. Many people use their smartphone as a Personal Information Manager (PIM) and even synchronize their device with their computer. They will use their smartphone to check e-mail, make phone calls, keep their list of contacts, connect with social media, browse the Internet and play games.

Link to Learn More

What Is a Supercomputer? (YouTube video, 2mins)

Suggested activities

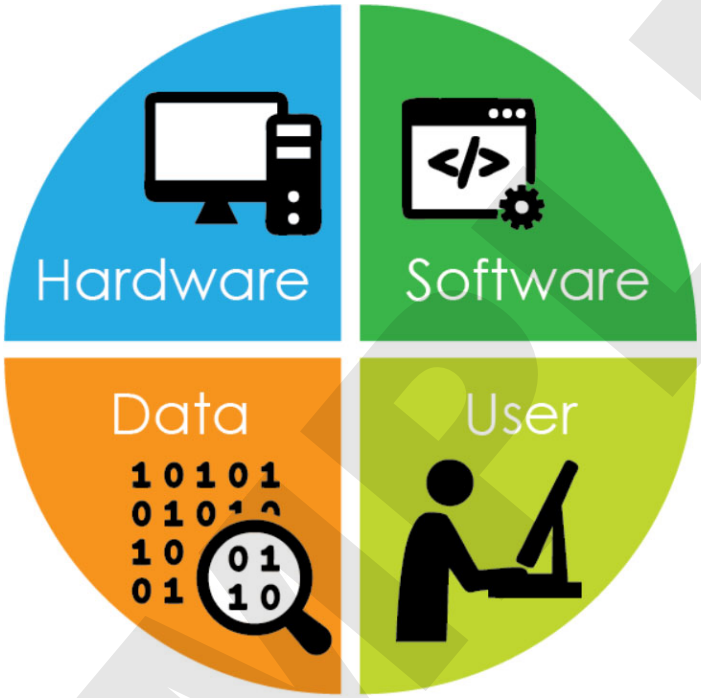
- Researching Computer Types (Hands-on)
- Researching Computer Types (Online)

Computer Systems

Objectives

1.1.5: Describe the four parts of a computer system (i.e. hardware, software, data, user).

There are four parts to a computer system: hardware, software, data and user.



Suggested activity

- Finding Computer Terms (Hands-on)

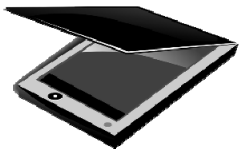
Input Devices

Objective

1.1.6: List computer input and output devices (i.e. monitor, printer, projector, speakers, mice, keyboards) and describe their uses.

An **input device** is used to provide information to a computer. When you type on your keyboard you are sending information to your computer to perform a task, most often in a software application. You use your mouse to make selections and navigate, sending those instructions to your computer. Scanners allow you to take something on paper (analog) and convert it to a digital format that can be viewed, changed and shared through your computer.

Input devices and their functions

Example Image	Input Device	Purpose
	**Keyboard**	Enables user to input text and numbers into a computer
	**Mouse**	Enables user to click, highlight and drag graphical representations (icons) of resources on a computer
	**Scanner**	Enables user to copy and save printed images and documents as digital files
	**Digital camera**	Enables user to transfer digital picture files to a computer User can then open, edit and save digital photographs
	**Microphone**	Enables user to transfer audio (sounds, music) to a computer as digital files User can then open, edit and save digital audio files

There are also some input devices that are highly specialized such as a stylus for drawing, game controllers, finger print scanners and bar code readers. These devices are often designed for use with very specific applications whereas your keyboard and mouse are general input devices capable of interacting and sending information to many different applications.

Specialized input devices and their functions

Example Image	Input Device	Purpose
	**Gamepad or game controller**	Enables user to control movements on the screen when playing video games
	**Stylus**	A digital pen that enables users to write directly on a touch screen

Example Image	Input Device	Purpose
	**Barcode reader**	Enables user to scan and read information from printed barcodes
	**Fingerprint scanner**	Enables user to verify a person's identity by copying, saving and matching digital images of a fingerprint Used to prevent unauthorized access to a computer or device
	**GPS device**	Determines the global position (that is, the location) of the device Used to monitor location of device and/or its user

Some devices need separate installations and drivers (computer programs designed to operate and/or control devices attached to your computer) that must be installed and sometimes updated to keep your devices operating correctly.

Output Devices

Objective

1.1.6: List computer input and output devices (i.e. monitor, printer, projector, speakers, mice, keyboards) and describe their uses.

An **output device** displays or produces data that has been processed by the computer. Imagine working on a computer without a monitor or printer to provide you a way of seeing the information you are either accessing or working on. You'll need speakers or a headset to hear the music you're streaming or the video you're watching. Projectors perform the job of a monitor, and sometimes speakers, for presentations to multiple people at once.

Example Image	Output Device	Purpose
	**Monitor**	Displays the text or graphics processed by the computer
	**Projector**	Displays text or graphics processed by the computer by projecting content onto a large screen or wall
	**Printer**	Places digital content (such as text or images) on paper by printing it with ink, producing a "hard copy"
	**Speakers**	Plays audio files processed by a computer

What Is a Network?

Objectives

1.2.1: Define "network," and explain network usage (i.e. home, school, work).

1.2.2: Identify types of networks (i.e. LAN, WAN, MAN, VPN, intranet, extranet, the internet).

Imagine you want to share a file with a friend that you just finished in a word processing program. How do you get that file to them? You'd probably e-mail it or place it on a shared network drive at work or school, or maybe in a cloud based storage location. That's because your computer and theirs are on a **computer network**. When two or more computers are connected they form a network.

The figure below gives you an example of a network:

Computer network example

Link to Learn More

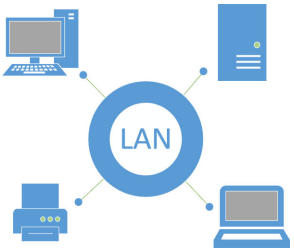
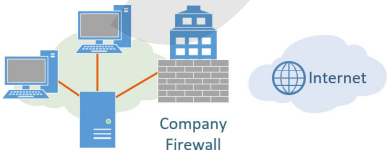
To see a visual depiction of networking's evolution, visit A Brief History of Computer Network Technology.

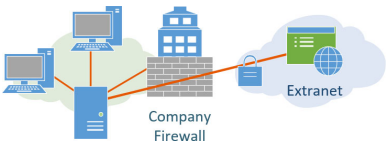
Not all networks are the same size. Some examples are home networks (which are traditionally smaller and less complex) to large corporate networks (which are extremely complex). Even this course being delivered to you via the Internet (perhaps the largest network of all) relies on the same basic principles that are used to share files at home or send a document around the globe.

Networks at Home	Networks at School	Networks at Work
• streaming movies • playing multiplayer video games • sharing a printer with other computers and devices • email • home automation • smart speakers (Google Home, Amazon Echo, Apple HomePod, etc.)	• standardized tests • collaboration on group projects • communication between teachers, students, parents and school administrators • keep student records • share computers, printers and other devices	• share documents, reports and other materials • Shared applications and work processes for accounting and payroll, marketing and other departments • Web development • Communicating with customers, vendors and employees • scheduling

Types of Networks

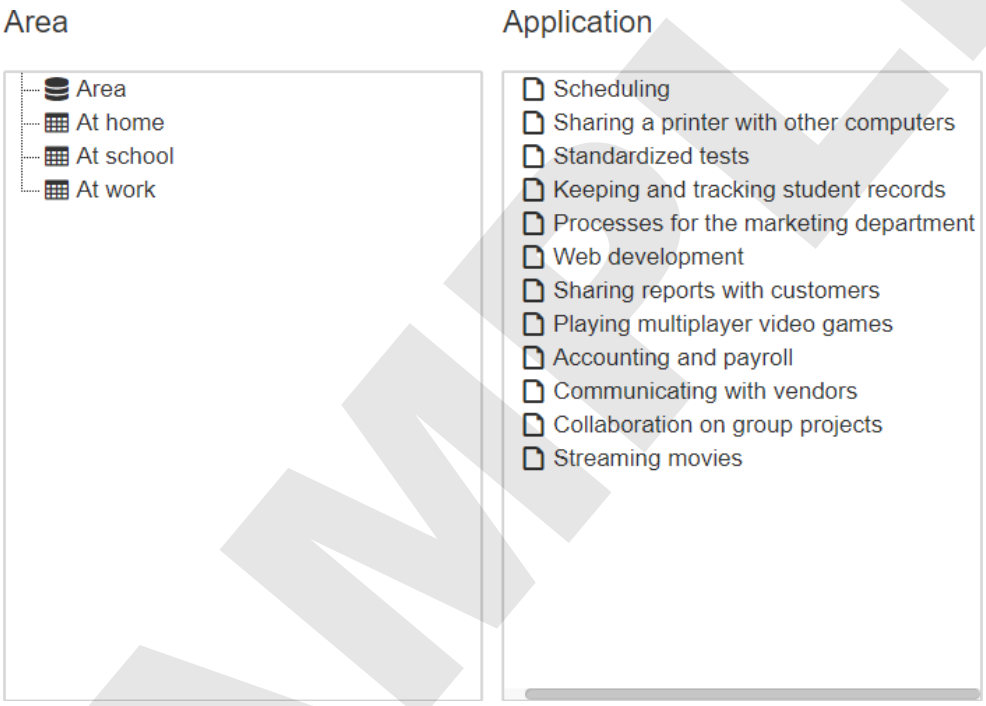
There are many different kinds of networks and they are categorized by their size and scale. The table below gives you a quick and easy way to compare three major kinds. What kinds of networks do you interact with on a daily basis?

Network Type	Description
Local area network (LAN) 	• A group of connected computers confined within a small geographic area • LANs can range in size and scale based on their use • Examples include a home network, a school's network or a small office's network • Many homes and businesses use wireless local area networks (WLANs) to provide wireless connectivity within a small geographic area
Metropolitan area network (MAN) 	• Designated for a network connection within a large city or multiple small cities • A MAN is much larger than a LAN because it covers a large geographic area • MANs are commonly operated by local governments or private companies
Wide area network (WAN) 	• The largest network type • Connects two or more LANs together • A WAN is typically owned and maintained by the owner of the LANs that it connects • The largest WAN in existence is the Internet
Virtual Private Networks (VPNs) 	• Secured networks designed to allow access to a private network (such as one owned by a school) across a public network (such as the Internet). • Users have a special login, using specialized software, which allows them to access a company's LAN remotely and securely. • Allow employees to work from home, or to allow contractors or business partners to access files.
Intranet 	• An **intranet** is generally behind a company or organization's firewall. • Unless you are a part of the organization and inside of where the network resides (for example, inside of the office building for a company) you cannot access any of the files.

Network Type	Description
Extranet 	• An **extranet** can be accessed from outside of the physical location of the organization. • Requires a login using a username and password.

Exercise

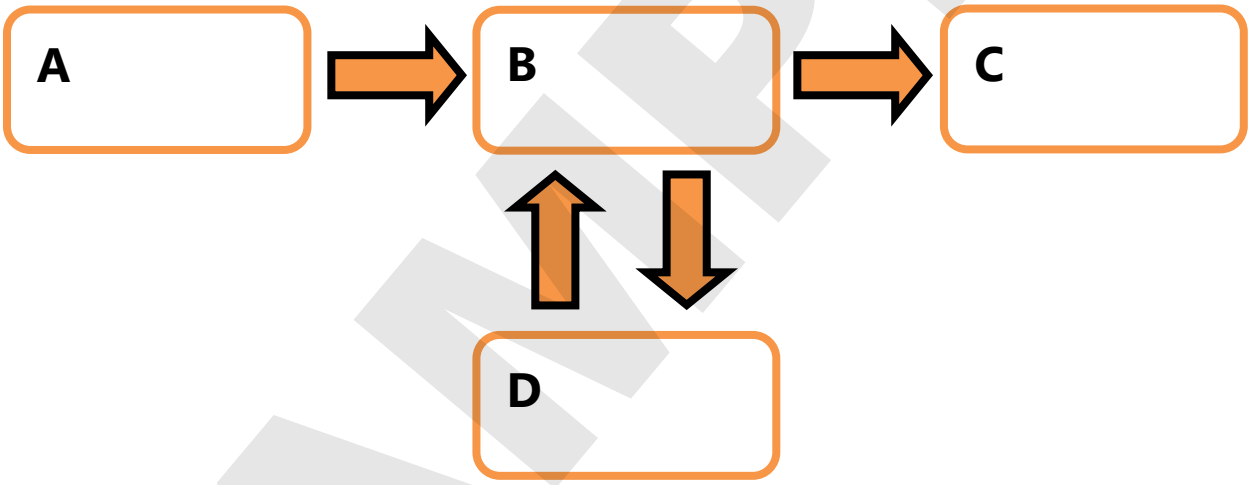
Drag and drop the application of networks that belong to the given area where networks are used.



Reviewing the Computing Cycle

In this activity, you will identify the various functions in the computing cycle.

1. Read the following list of computer functions:
   - Processing
   - Output
   - Input
   - Storage
2. Study the diagram below, which represents the computing cycle of a computer system.
3. Write the name of each function into the correct section of the diagram.



Listing the Ways Computers Are Used

In this activity, you will list various ways that computers are used.

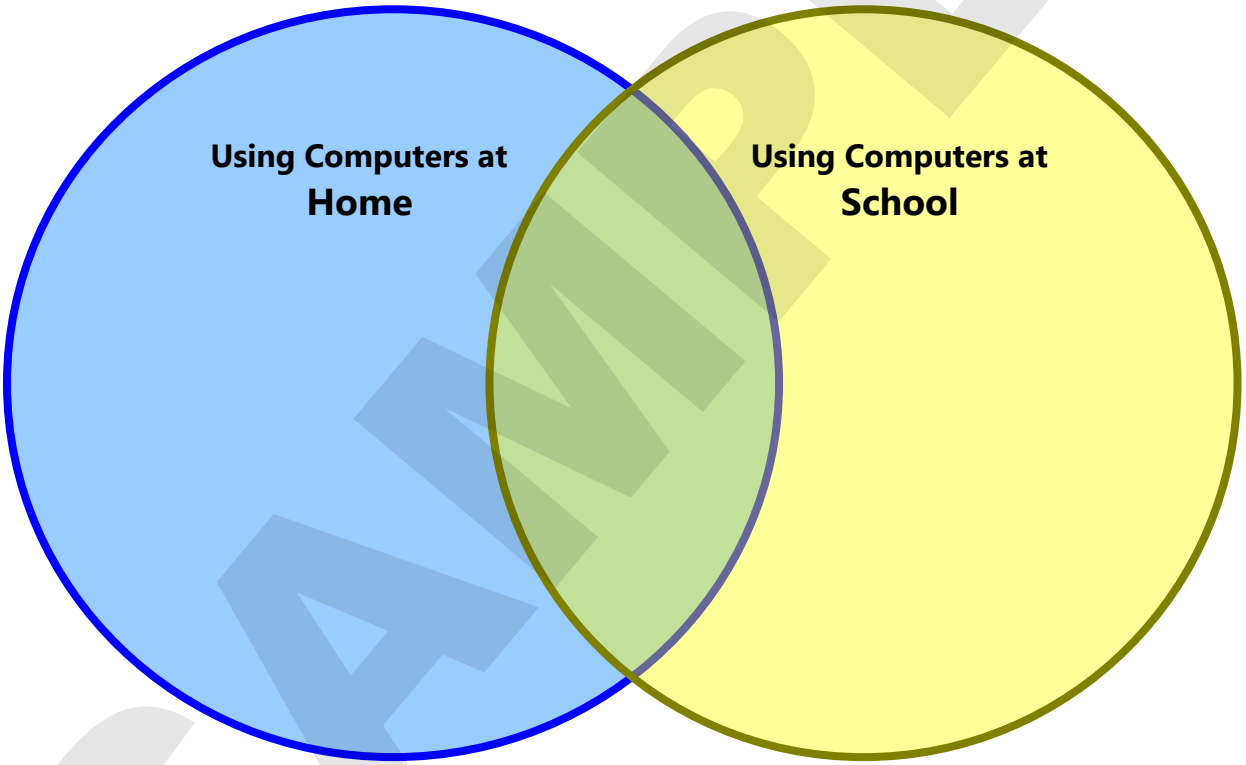
1. In the Home box below, write a list of ways that people use computers at home. What tasks do people perform with their home computers?
2. In the School/Office box below, write a list of ways that people use computers at school or their office.

Home	School/Office

Comparing the Ways Computers Are Used

In this activity, you will list and compare various ways that people use computers at home and at school.

1. Study the Venn diagram below.
2. Think of ways that people use computers at home. Write examples in the Home area.
3. Think of ways that people use computers at school or the office. Write examples in the School area.
4. Can you think of any ways that people use computers at both home and school or offfice? Write these examples in the area where the two circles overlap.



Researching Computer Types

In this activity, you will describe each type of computer. Use the Internet to research the various types of computers. Write a description of each computer type in the spaces provided below.

1. Supercomputer

2. Mainframe computer

3. Microcomputer (desktop)

4. Notebook computer

5. Tablet computer

6. Handheld computer (smartphone)

Finding Computer Terms

In this activity, you will identify various terms related to computer basics.

1. Read the list of introductory computer terms at the bottom of the page.
2. Find each term hidden in the word search and circle them.
3. Find terms for types of computers first. Then find terms for computer components. Then find terms for computer processes.

S N S B H J D R S T E V O G M
T O J U D A R E Q E S L K L H
O T W W T G U T G L Y K O F T
R E S A X S G U N B E T X U X
A B O C G D Z P I A R S X Q J
G O F I B N U M S T A Z L E M
E O T U M W X O S W W O B M H
Z K W Q V D T C E F D S H A C
X V A M M U G O C I R R E R O
P Z R T P B Y R O O A V V F M
R D E T T C C C R P H N W N P
U R U X X K B I P J W R C I U
E O I N P U T M U S E R Z A T
R E T U P M O C R E P U S M E
D L E H D N A H R A V Y J N R

DATA	HANDHELD	MICROCOMPUTER	PROCESSING	SUPERCOMPUTER
COMPUTER	INPUT	NOTEBOOK	SOFTWARE	TABLET
HARDWARE	MAINFRAME	OUTPUT	STORAGE	USER

