**Unit 1: Computers**

**History of Computers**

[History of Computers Website](http://www.computersciencelab.com/ComputerHistory/History.htm)

1. First computers were people! Explain.

Jobs were given to people to do repetitive calculations. They made tide charts, navigational tables, and planetary positions for astronomy

1. Blaise Pascal

At age 19 invented the Pascaline as an aid for his father who was a tax collector. A child prodigy.

1. Jacquard – how are weaving fabric and computers related?

Weaving fabric is a repetitive and long task with tedious work.

1. Charles Babbage Analytic Engine

Steam driven calculating machine the size of a room, which he called the Difference Engine. This machine would be able to compute tables of numbers, such as logarithm tables

1. Ada Byron

Ada earned her spot in history as the first computer programmer. Ada invented the subroutine and was the first to recognize the importance of looping

1. Herman Hollerith and the U.S. census

Hollerith's invention, known as the Hollerith desk, consisted of a card reader which sensed the holes in the cards, a gear driven mechanism which could count and a large wall of dial indicators to display the results of the count.

1. WWII, military willing to invest in computers. Why?

The U.S. military desired a mechanical calculator more optimized for scientific computation

1. Mark I

This was the first programmable digital computer made in the U.S. But it was not a purely electronic computer. Instead the Mark I was constructed out of switches, relays, rotating shafts, and clutches.

1. Grace Hopper

Hopper found the first computer "bug": a dead moth that had gotten into the Mark I and whose wings were blocking the reading of the holes in the paper tape. The word "bug" had been used to describe a defect since at least 1889 but Hopper is credited with coining the word "debugging" to describe the work to eliminate program faults.

1. microelectronics

Allowed the amount of hand-crafted wiring seen in the prior photo to be mass-produced as an integrated circuit which is a small sliver of silicon the size of your thumbnail .

1. “all electronic” What does this mean?

No gears, cams, belts, shafts, etc. Fully digital

1. Colossus by Britain, cryptographic codes WWII

Built during World War II by Britain for the purpose of breaking the cryptographic codes used by Germany

1. ENIAC, vacuum tubes, lab rats? :-{

Electronic Numerical Integrator and Calculator. Starved lab rats for a few days and then gave them samples of all the available types of cable to determine which they least liked to eat.

1. significance of “general protection faults” and “blue screen of death”

This introduced a new way for a program to fail: faulty logic in the program could cause it to damage itself. This is one source of the general protection fault famous in MS-DOS and the blue screen of death famous in Windows.

1. UNIVAC, magnetic tape

UNIVAC was also the first computer to employ magnetic tape. Many people still confuse a picture of a reel-to-reel tape recorder with a picture of a mainframe computer.

1. compare “IBM and the seven dwarfs”, Microsoft monopoly

IBM grew so dominant that the federal government pursued anti-trust proceedings against them from 1969 to 1982

1. mainframes – 2 ways to interact with them

The first was called time sharing because the computer gave each user a tiny sliver of time in a round-robin fashion. Perhaps 100 users would be simultaneously logged on, each typing on a teletype

1. microprocessor, Intel, “chip”

Intel didn't invent the electronic computer. But they were the first to succeed in cramming an entire computer on a single chip (IC). Intel was started in 1968 and initially produced only semiconductor memory

1. Bill Gates – what college did he graduate from?

A Harvard freshman by the name of Bill Gates decided to drop out of college so he could concentrate all his time writing programs for The Altair 8800

[Moore's Law](http://www.computerhistory.org/semiconductor/)

Transistor chip sizes double every two years

[Collapse of Moore's Law?](http://techland.time.com/2012/05/01/the-collapse-of-moores-law-physicist-says-its-already-happening/?iid=obnetwork)

It Is not sustainable. There is a limit with silicon.

**How Do Computers Work?**

A computer is comprised of a number of components. Some are very easy to identify, e.g. the keyboard, mouse or monitor. Others are internal and hidden.

The **CPU** (central processing unit) is the brain of the computer and where all decisions are made.

A **Computer’s** **Memory** is like a human’s in that they both have long-term and short-term memory. A computer’s long-term memory is called nonvolatile memory and is generally associated with mass storage devices such as hard drives, large disk arrays, optical storage (CD/DVD) and portable devices such as USB flash drives. Volatile memory, commonly referred to as **RAM** (random access memory), loses its data when power is removed from the computer. Ever lose power in the middle of a big research paper that you didn’t yet save to your hard drive?

**Data** can refer to many things, e.g. keyboard input, file contents, web server requests, any piece of information that is used by the computer. **Instructions** are a special kind of data that instruct the CPU about what to do next, e.g. add these two numbers, move this data here, jump to this instruction next. The main operation of the computer is executing these instructions, over and over again. A 1 GHz (gigahertz) CPU can execute one billion instructions per second!!!!

[The World's 500 Fastest Supercomputers](http://www.top500.org/)

Type 1 Writing: Take 3 minutes and give 3 reasons why you believe the #1 supercomputer is not found in the U.S.

I believe the #1 supercomputer is not in the U.S. because China is the heart of mass production and lots of labor. America may not have felt as if they needed tom compete with China because in history, great things are accomplished when there is a rivalry. For example the Space Race and Americans putting the first people on the moon which never would have happened if it weren’t for competition with the Soviet Union. America may have just not had enough funding either.

[How PC's Work](http://www.howstuffworks.com/pc.htm)

Core PC Components: Motherboard

Ports, Peripherals and Expansion Slots

Powering Up: BIOS

Operating Systems: Application Interface, User Interface

Future of PC’s: Moore’s Law (again), Quantum Computing, Portable Personal Computing

Type 1: Based on today’s readings and discussions, do a 3-2-1 reflection. In 5 minutes, write down 3 things you found interesting, 2 things that were a bit confusing and 1 thing you would like to know more about.

I found it interesting that there are more types of networks than just LAN. I didn’t know that the internet was called a WAN nor that a city could even connect through a network. I didn’t seem to be confused on anything. I would like to know more about

**Software vs Hardware**

**Software**  is a general term used to describe a collection of [computer programs](http://en.wikipedia.org/wiki/Computer_program), procedures, and documentation that perform some task on a computer system. Practical computer systems divide software systems into three major classes: [system software](http://en.wikipedia.org/wiki/System_software), programming software, and [application software](http://en.wikipedia.org/wiki/Application_software), although the distinction is arbitrary and often blurred. Software is an ordered sequence of instructions for changing the state of the computer hardware in a particular sequence. It is usually written in **High**-**level programming languages** that are easier and more efficient for humans to use (closer to natural language) than machine language.

**Hardware**  is best described as a device that is physically connected to the computer or something that can be physically touched. A [CD-ROM](http://en.wikipedia.org/wiki/CD_ROM), [monitor](http://en.wikipedia.org/wiki/Computer_display), [printer](http://en.wikipedia.org/wiki/Computer_printer), and video card are all examples of computer hardware. Without any hardware your computer would not exist and software would have nothing to run on. It is the physical part of a computer, including the digital circuitry, as distinguished from the computer software that executes within the hardware.

[Hardware vs Software](http://www.diffen.com/difference/Hardware_vs_Software)

**Networks**

[What is a Computer Network?](http://www.youtube.com/watch?v=ueVnSz_lXEs)

A group of computers connected to eachother. Cell phones, PC, printer. Wi-Fi, satellites.

Purpose: To share data

Types of Networks:

[LAN](http://www.youtube.com/watch?v=EcbyD_YycPA) Local Area Network

[MAN](http://www.youtube.com/watch?v=Ziypn8hVxMU) Metropolitan Area Network

[WAN](http://www.youtube.com/watch?v=1AUJctaLmKE) Wide Area Network

**LAN**: All computers in the same building. Connected through cable or wireless. Sharing devices.

**MAN**: Bigger than LAN. Often span large cities. Used to be cable now high speed fiber optics or Wi-Fi

**WAN**: Made up of multiple MANs. A network that spans larger than 30 miles at least. The internet. Nothing is bigger than a WAN. Satellite and fiber optic cable, copper cable, telephone wires.

[Internet History](http://www.computerhistory.org/internet_history/)

ARPA 1960s : Start of internet

[Cloud Computing](http://computer.howstuffworks.com/cloud-computing/cloud-computing.htm)

Significant workload shift

Security/privacy concerns???

**Intelligence of Computers**

[Computer Intelligence](http://csunplugged.org/sites/default/files/activity_pdfs_full/unplugged-20-the_turing_test_0.pdf) -- See separate document.

[What is Artificial Intelligence?](http://www-formal.stanford.edu/jmc/whatisai/whatisai.html)

Do computers know that ‘T’ is related to ‘t’ in any way?

<http://www.asciitable.com/>

Limitations of Computers -- Research this topic and post your findings (and reference to where you found it) on the “Limitations” Forum.

Type 1: In 5 minutes, write down 3 jobs that could be learned by a computer with AI. Include your reasons for selecting those jobs.

**Binary Number System**

[Overview of Decimal, Binary, Octal and Hex Number Systems](http://www.youtube.com/user/MyWhyU?v=5sS7w-CMHkU&feature=pyv)

It’s important to understand that computers use a **binary number system** (“ Click here to enter text. ”) and not our **decimal number system** (“ Click here to enter text. ”). All of these conversions get done for us but it is good to know what’s going on “behind the scenes.”

Decimal to Binary:

* Divide the decimal number by 2; record the remainder.
* Continue to divide each quotient by 2 until you reach 0.
* Write the remainders in order from bottom to top

Example – write 233 in binary notation.

Remainder

233/2 = 116 1

116/2 = 58 0

58/2 = 29 0

29/2 = 14 1

14/2 = 7 0

7/2 = 3 1

3/2 = 1 1

1/2 = 0 1

Binary result is: 11101001 (Read “Remainder” column from bottom up!)

Practice time! Convert these decimal numbers to binary.

1. 68 2. 224

3. 104 4. 253

Binary to Decimal: Converting from binary to decimal is just as simple once you remember how our decimal system works. In fact, once we re-visit that, converting to octal (base 8) or hexadecimal (“hex” or base 16) turns out to be pretty logical as well.

Example:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 |
| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
|  |  |  |  |  |  |  |  |

Convert these binary numbers to a decimal number:

1. 0011 1110 2. 0111 0100 3. 0000 1001

62 116 9

4. 1110 0100 5. 1111 1010 6. 1011 1011

228 250 187

**Activity: Create Your Own Number System!**

BASE \_4\_\_\_

1 4\_ \_16\_ \_64\_ \_256\_ \_1024\_ \_4096\_