Lesson Two Notes

Computer Generations

1945 to the Present

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(*Note: Click on the thumbnail picture to view a larger picture. When done use your browser's return button.*)

First Generation - Vacuum Tubes 

General Features of First Generation Computers

1. The First Generation was from 1946 to 1956
   - Computers in this generation did from 2,000 to 16,000 additions per second
   - Had main memory from 100 bytes to 2 kilobytes (2,000 bytes)
2. All computers of this generation used vacuum tubes to perform calculations
   - Vacuum tubes are expensive because of the amount of materials and skill needed to make them.
   - Vacuum tubes get hot and burn out light an incandescent light bulb.
3. All computers in this generation where very large machines
   - Needed special rooms to house them with air conditioning because of the heat generated by the vacuum tubes
   - All required specially trained technicians to run and maintain them

ENIAC (Electronic Numerical Integrator and Computer) 

1. First all-electronic computer
   - Used no moving parts to performed calculations - used vacuum tubes instead of gears or mechanical switches

- Developed by John William Mauchly  and John Presper Eckert 
- Finished in 1946

2. Paid for by the US Army
   - Needed a faster way to calculate ballistic tables for large artillery
   - Was part of the effort for World War II, but was finished too late
   - Used after the WWII by military and scientists
3. Problems with ENIAC
   - Was externally programmed
     - Had to move wires and switches outside the machine
     - ENIAC was basically rebuilt every time the program was changed
     - Was very slow to program - could take days to weeks
   - Was very large
     - Had 19,000 vacuum tubes - one burned out ever 5 seconds on average
     - Was 20 feet by 40 feet in size
4. Was 1000 times faster than the Mark 1
   - Could do 5000 additions per second
   - Could do 300 multiplications per second

UNIVAC (Universal Automatic Computer) 

1. First commercial computer to be built
   - Built by a company started by Mauchly and Eckert in 1946
   - First one was delivered to the US Bureau of Census in 1951
   - 48 UNIVAC computers were built and sold
2. Features of the UNIVAC
   - Stored programs internally
   - Used magnetic tape to input programs and data
   - Had only 5,400 vacuum tubes - much more reliable than ENIAC

John von Neuman 

1. Developed the idea of the Central Processing Unit (CPU)
   - Store programs in the computer memory
   - Programs coded as numbers
   - Both data and programs stored in the CPU - faster processing of information
2. Suggested that binary be use to store programs in a computer
   - Zero would turn the circuit off
   - One would turn the circuit on
3. Help develop many of the early computers, including ENIAC and UNIVAC

Grace Murray Hopper 

1. One of the early computer programmers - programmed the Mark 1 and other computers

2. Invented the concept of the compiler
    - Converts a high level programing language in to machine language
    - Machine language is a series of 0's and 1's that the computer can understand
3. Invented one of the first high level programming languages.
    - COBOL (Common Business Oriented Language)
    - Still used today
4. Found the first bug in a computer 
    - A moth was found stuck to the relays on the Mark II computer
    - Today, a bug is a mistake in a program or other unexplained problem with a computer

First Generation	Second Generation
Third Generation	Fourth Generation
Future Computer Generations	

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Second Generation - Transistors 

General Features of the Second Generation

1. From 1959 to around 1965
2. Smaller, faster, and more reliable than the First Generation of computers
    - Used transistors instead of vacuum tubes for performing calculations
    - 6,000 to 3,000,000 operations per second
    - 6 kilobytes to 1.3 megabytes of main memory
    - Contained in four cabinets about 6 feet high by 4 feet wide, each weighing 250 pounds
3. Cost about one-tenth the price of a First Generation computer
4. Computers become common in larger businesses and universities

Transistors

1. Invented in 1947 by William Shockley, John Bardeen, and William Brattain
    - Picture of the first transistor 
    - Was made of silicon
    - Lead solid state to solid state electronics
2. Advantages of a transistor when compared to a vacuum tube
    - 200 transistors are about the same size as one vacuum tube in a computer
    - Much less expensive than a vacuum tube
    - A transistor can work 40 times faster than a vacuum tube
    - Do not get hot and burn out like a vacuum tube

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Third Generation - Integrated Circuits 

General Features of The Third Generation

1. Form 1965 to around 1972
2. Used integrated circuits - many transistors on one piece of silicon
3. Computers become smaller, faster, more reliable, and lower in price
    - Size of a stove or refrigerator, some can fit on desktops
    - Can do 100,000 to 400,000,000 operations per second
    - Cost about one-tenth the amount of second generation computers
4. Computers become very common in medium to large businesses

Integrated Circuits

1. The concept of the IC was developed by Jack St. Clair Kilby in 1958
2. First IC was invented in 1961 separately by Jack Kilby and Robert Noyce
    - Picture of the first IC 
    - IC were incorporated from 1961 in computers
3. An IC is called a silicon chip
4. An IC was about 1/4 inch square and can contain thousands of transistors

The Space Race

1. The Space Race that started in the late 1950's between the United States and the former Soviet Union help to lead to the development of third generation computers
2. Needed a computer small enough to fit in a space capsule

Minicomputer Invented

1. Much smaller and lower in price than previous computers
2. Was really the first general purpose computers used by many businesses

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Fourth Generation - Microprocessors 

General Features of Fourth Generation Computers

1. Form 1972 until now
2. Used large scale to very large scale integrated circuits
    - Put more than one IC on a silicon chip
    - Can do more than one function
3. Computers become smaller, faster, more reliable, and lower in price
    - Size of a television or much smaller
    - Can do 500,000 to 1,000,000,000 operations per second
    - Cost one-tenth, or less, the amount of third generation computers
4. Computers become very common in homes and business

The Microprocessor

1. The microprocessor is a complete computer on a chip
    - Can do all the functions of a computer - input, process, and output data
    - The first microprocessor was produced by Ted Hoff for Intel in 1971 - the Intel 4004 
2. Modern microprocessors are usually less than one inch square and can contain million of electronic circuits (picture of a Pentium II circuits )
3. Used in many electronic devices today, from wrist watches to microwave ovens to cars

The Microcomputer is Invented

1. A microcomputer is any general purpose computer that uses a microprocessor for a CPU
2. In 1972 the first microcomputer was introduced - the MITS 816 - with no keyboard or display.
3. In 1976, the first real assembled and complete computer was produced - the Apple II 
    - Used by schools and colleges
    - Apple Corporation founded at this time by Steve Jobs and Steve Wozniak

The Personal Computer

1. The PC was introduced by IBM in 1981 
2. Use the DOS operating system developed by Microsoft Corporation
3. Changed the public's view of computers
    - Wanted computers that could do useful tasks

- Wanted a computer that was easy to use
- Could do work at home that would be transferable to the company's computer

The Macintosh Computer

1. Introduced in 1984 by the Apple Corporation 
2. First home and small business computer to use a Graphic User Interface (GUI)
   - Used a mouse as a pointing device
   - Used icons (small pictures) to represent disks, files, and programs
   - Based on ideas from Xerox PARC Alto system
3. With the invention of the Laser Printer by Apple a year later, desktop publishing took off

The Internet

1. The Internet was started in 1969 as ARPAnet by the US military to connect research facilities together
2. The Internet went public in 1991
   - Connects computers together by using phone lines and other networks
   - Allows for the rapid sharing of information and resources
3. Because of small powerful computers, the Internet is rapidly changing our society

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Future Computer Generations

Hard to Predict

1. Most inventions or technologies that have changed computers are not usually predicted to far in advance of when they are first used
2. Most likely the following will happen to computer technology
   - It will become lower in price
   - Computers will become smaller and faster
   - Computers will have larger memories and more storage space
3. Computers will become an integral part of everyone's life

People Will Become More Interconnected

1. Computer technology and the World Wide Web will greatly reduce the distance between people and cultures in the world
2. People will connect to information at any place or time
   - Libraries and other information sources will always be open
   - Cell phone technology will let you connect to information and people any where

Computers Will Become Small Enough to Wear

1. The technology is already being developed
   - Eyeglasses with a display 
   - Research is being done to find the best place to put computers so they will not interfere with the body's movement 
2. The computer will always be with you to help you in tasks, communicate, and find information

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