**History of Computers**

**Student Notes Outline Answer Key**

1. **Counting boards and abaci**
	1. Humans have needed to count as long as we have been alive
	2. Until the invention of numbers humans used various objects to count for them such as stones and twigs
	3. Eventually in the times of Plutarch people created counting boards that allowed for the usage of units (10’s, 100’s etc.) in business transactions
	4. These counting boards are documented as being used as early as 500 B.C. by the Babylonians
		1. The abacus as we know it today is considered to be the ‘modern’ abacus
			1. Its appearance first occurs circa 1200 A.D. in China
			2. These were actually the first calculators and allowed people to utilize large numbers and numbering systems
2. **Jacques de Vaucanson**
	1. Son of a glove-maker who aspired to be a clock-maker
	2. Fascinated with automata.
	3. Best remembered for two machines; the Digesting Duck and the automated loom.
		1. The Digesting Duck was made up of over 400 parts and was able to flap its wings, quack, drink water, eat, and even simulate defecating
		2. Between 1745 and 1750 Vaucanson built on the work of others and built a fully automated weaving loom (called the Jacquard Loom)
3. **Charles Babbage**
	1. English mathematician, engineer, philosopher and inventor
	2. Believed that ‘computers’ should be programmable and went on to design the first two mechanical computers; the Difference Engine and the Analytical Engine
		1. Difference Engine was developed to compute the values of polynomial functions
			1. By using finite differences it was possible to avoid the need of multiplication and division
		2. Analytical Engine marked the advancement of computers into the programmable realm
			1. Using loops of Jacquards punch cards to control a mechanical calculator it implemented sequential control, branching, and looping to perform full general-purpose computations
4. **Countess of Lovelace (Augusta Ada Byron King)**
	1. Daughter of Lord Byron (yes the poet) Ada had an unusual life as an aristocratic girl in the 1800’s
	2. Mother insisted Ada’s tutors educate her in science and math
	3. Met Charles Babbage at age of 17
		1. Eventually became her mentor
	4. She was given the opportunity to see Babbage’s Difference Engine and became completely captivated by it
	5. Was asked to translate one of Babbage’s articles from French into English
		1. Adding her own notes the ‘translated’ article was significantly longer than the original
			1. Included ideas such as looping and how codes could be used to translate letters and symbols as well as numbers
	6. Considered to be the first computer programmer
5. **Konrad Zuse**
	1. German born civil engineer, inventor and computer pioneer
	2. Greatest invention, the Z3, came about in 1941
		1. Z3 was the world’s first fully programmable digital electronic computer based on a binary floating-point number and switching system
			1. Most significant difference between the Z3 and modern computers is the ability to store data
	3. Developed what is considered to be the first high-level programming language in 1945
		1. Called Plankalkül
			1. First language to utilize algorithms to solve problems
			2. Used his new language to write the world’s first computer Chess game
6. **Grace Hopper**
	1. Rear admiral in the U.S. Navy
	2. Helped program the Harvard Mark I and II
	3. Developed the first computer compiler
	4. Working on the Mark II in 1945 she discovered that the program it was running had a compiler error
		1. Upon inspection she found a moth stuck between a set of relays and logged it in the engineering book as having found a ‘bug’ in the computer.
	5. Later work led to the development COBOL
7. **John von Neumann**
	1. Austrian-Hungarian mathematician
	2. 1945 undertook a study of computation that demonstrated that a computer could have a fixed structure and that data and programs could be stored in the same place
		1. Revolutionary in terms of how we thought about computers and their usage
			1. Proposed that computers should store data alongside the programs they executed
			2. In his EDVAC report of 1945 he described the stored program by drawing an analogy between digital computers and the human brain
8. **ENIAC 1946**
	1. New York Times announced the advent of a machine that could complete complex mathematical equations
		1. ‘birth’ of ENIAC – the Electronic Numerical Integrator and Computer
		2. Introduced to the public by the US Army
			1. 18,000 vacuum tubes
			2. Eight feet tall
			3. 3-feet deep
			4. 100 feet long
			5. Weighed 30 tons
			6. First set of calculations was to compute trajectories for rocket launches and in only ten days completed a job that would have taken three months of effort by a dedicated mathematician
9. **Keyboards and RAMACs 1956**
	1. MIT researchers begin developing a method for direct input into the computer system
		1. Later became known as a keyboard
	2. Introduction of the first magnetic storage device
		1. 305 RAMAC shipped to Zellerbach Paper
		2. The Random Access Method of Accounting and Control consisted of:
			* 1. 50 magnetically coated metal platters with 5 million bytes of data (do the math, that’s 5 whole megabytes)
				2. These platters were ‘stacked’ on a common drive shaft which rotated
				3. RAMACs were the first hard disk drives
10. **Jack Kilby (1923 – 2005)**
	1. July, 1958 employed as an engineer
	2. Kilby studied the exorbitant costs of manufacturing individual components required to build computers
		1. Called the ‘tyranny of numbers’
	3. Realized that the individual transistors could be made of a single material and integrated onto a silicon wafer
	4. Encouraged by supervisor to provide a proof of concept
	5. In 1959 publically announced the concept of the integrated circuit
		1. Possibly one of the most significant accomplishments in world history

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1. **1960 – Development of Major Languages**
	1. COBOL - Once again the military comes into play
		1. Several manufacturers and the Pentagon developed Common Business Oriented Language or COBOL
			1. Aimed at making code more easily readable and machine independence they hoped COBOL would run on most computers for which a compiler existed
		2. LISP
		3. First language developed for writing Artificial Intelligence
		4. Offered programmers flexibility in organization
2. **1301 Disk Storage Unit**
	1. Announced on June 2, 1961 for use with mainframe computers
	2. Maximum storage capacity for this disk was 28 million characters
	3. Had read/write arms and heads which are still used in modern mechanical hard drives
	4. It was leased for $2100 per month or purchased for $115,000
3. **1963**
	1. Introduction of American Standard Code for Information Interchange (ASCII)
		1. Allowed for a standardized binary representation of each key on the keyboard;
			1. Alphanumeric (both upper and lower case letters)
			2. Special characters
			3. Certain functions such as return (what we now call ‘enter’)
		2. Permitted the exchange of data between manufacturers of different computer systems
4. **1964**
	1. Networking
		1. First online transaction processing
			1. SABRE reservation system
			2. Allowed flight data to be retrieved in less than 3 seconds via a telephone network system that connected 65 cities and 2000 terminals
	2. BASIC programming language
		1. Developed and released by Thomas Kurtz and John Kemeny who needed an easy to learn programming language for their students at Dartmouth
5. **1965**
	1. Kristen Nygaard and Ole-John Dahl developed Simula the first object-oriented programming language
		1. Object-oriented languages group data and instructions into blocks called objects
		2. Each object represents one facet of a system intended for simulation
6. **‘Space race’**
	1. 1960’s race against Russia to land on the moon
	2. Apollo 7 space craft was guided into Earth’s orbit by the Apollo Guidance Computer in 1968
		1. Same computer would take Neil Armstrong to the moon one year later
7. **1969**
	1. ARPANET
		1. DARPA (Defense Advanced Research Project Agency) created ARPANET (Advanced Research Project Agency Network) as an experimental environment for new networking technologies
		2. The first nodes that formed ARPANET were UCLA and Stanford Research Institute
		3. First WAN to implement packet switching and TCP/IP protocols
8. **1970**
	1. First ATM was installed in Valdosta, Ga.
	2. ARPANET expanded by adding four more universities to its network
	3. First mobile robot controlled by artificial intelligence
		1. Called Shakey
		2. Equipped with
			1. T.V. camera
			2. Range finder
			3. Bump sensors
		3. Shakey transmitted the data via sensors to a computer which then radioed back commands
9. **1972**
	1. 8008 CPU introduced
		1. 8-bit word (256 unique arrangements of binary digits)
		2. Ability to work with the majority of the ASCII system including upper and lowercase letters, all numbers (0 – 9), punctuation, and many other symbols
	2. First true video game is released
		1. Designed by Al Alcorn
		2. Very popular and revolutionized the arcade industry while launching the modern video game industry
10. **1975**
	1. 8800 computer kit appeared on the front cover of Popular Mechanics
		1. Based on the Intel 8080 CPU became wildly popular within a short period of time
			1. Invented by Ed Roberts the 8800 sold for $300.00 - $400.00.

Roberts was the first person to use the term ‘personal computer’.

* + - 1. Paul Allen and Bill Gates licensed BASIC as the software language for the Altair
1. **Steve Wozniak**
	1. Designed the a single-board computer in 1976
	2. A Mountain View, CA computer store ordered 50 machines leading Steve Wozniak and Steve Jobs to found their own computer firm
2. **1977**
	1. Personal Electronic Transistor (PET)
		1. Came fully assembled
		2. Easy to operate
		3. Built-in drive
		4. Could order it with either 4 or 8 kilobytes of memory
	2. TRS-80 was released
		1. Included a Z80 CPU
		2. Video display
		3. 4 kilobytes of memory
		4. BASIC was primary language
		5. Cassette storage
		6. Manuals
		7. Machine was considered a bargain at $600.00
			1. In the first month of release more than 10,000 units were sold
	3. 2600 Video Computer System
		1. First personal Video Computer System game console
		2. 8-bit processor
		3. Designed to be connected to a home T.V.
		4. Last of the Atari line were sold in 1990
3. **Shockwave Rider**
	1. John Brunner authored
		1. In the book a tapeworm program attacks and runs through a network of computers
	2. John Shoch and Jon Hupp that same year discover the first computer worm
		1. Initially designed to provide a more efficient use of idle processors in a network for testing purposes
		2. Unfortunately worms tend to invade all computers on a given network which ultimately creates a security threat
		3. Having read Mr. Brunner’s book Schoch adopted the term and thus the first ‘virus’ was named
4. **1981**
	1. 5150 PC
		1. Ran on a 4.77MHz 8088 processor
		2. Utilized the MS-DOS operating system
5. **1984**
	1. First mouse and GUI-driven computer introduced
6. **Bjarne Stroustrup of published “The C++ Programming Language”**
	1. Developed the language due to a desire to write event-driven simulations in a language faster than Simula
	2. C++ became dominant object-oriented programming language
7. **1990**
	1. Scientist at CERN developed HTML
		1. Allowed Internet to expand into the World Wide Web implementing things such as URL, HTTP, browsers, links, and queries to servers
	2. First OS that satisfied PC users and provided support for large graphical applications
8. **1991**
	1. Finnish student Linus Torvalds was dissatisfied with the state of the computer software industry as they became more secretive and proprietary with their code
		1. Subscribed to Usenet
		2. Wanted to work with an operating system whose code was open to the general user
		3. Wrote first widely available open source OS
9. **1993**
	1. Pentium processors released

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* 1. 5 generation of the x86 line
	2. Was the basis for the 5051 PC and its clones
1. First GUI web browser introduced
	1. Average user finally gained GUI access to the Internet
	2. Prior to this time all Internet access was through command line browsers