Early Information Processing

Automated data processing, as evidenced via Adam Smith pin example, was necessary precursor to computer development.	Automation assists with 3 tasks: 1) document creation, 2) information storage and revival, and 3) quantitative analysis.
Great Britain industrialized before US, but US adopted automated machinery faster.	Before WW2, computation machines were mechanical or electromechanical, not fully electronic.
Modern computers are distinguished from earlier computation machines by: fully electronic, programmable with conditional branching, and general purpose.	Charles Babbage designed the Difference Engine (a general purpose differential calculator) and the Analytical Engine (a machine that could perform any type of calculation).

Early Information Processing (cont)

Ada Lovelace is credited with writing the first computer program (for the Analytical Engine), and popularized Babbage's work.	Herman Hollerith invented a tabulating machine used in the 1890 census, and his company eventually became IBM.
Alan Turing developed a theoretical model of what a computer can and cannot do.	Vannevar Bush created the Differential Analyzer, an early analog computer.
Howard Aiken designed the Harvard Mark I, an early electromechanical computer built by IBM.	John Atanasoff created the Atanasoff-Berry computer, an early electromechanical computer.
Konrad Zuse was an engineer who created several early computers in pre- and postwar Germany; however, though his ideas had merit, Germany rejected his proposal due to war efforts.	

General Purpose Electronic Computersf

Need for firing tables during WW2 provided the impetus to develop first fully electronic general-purpose computer, the ENIAC.	John von Neumann wrote and distributed the description for the ENIAC's successor, the EDVAC.
Many computers built after the war were built based on the "-stored program" design described by von Neumann.	ENIAC creators started the first computer company - the Eckert-Mauchly Computer Corporation.
The first commercially produced computer was the BINAC, followed by the UNIVAC.	UNIVAC predicted the 1952 presidential race on live television.
IBM passed UNIVAC in sales.	IBM's competitors were known as the "-Seven Dwarfs" and later, the "-Bunch."

General Purpose Electronic Computersf (cont)

Hardware innovations include: 1) processors - from vacuum tubes to transistors to integrated circuits, 2) memory - from vacuum tubes to delay lines to drums to core to integrated circuits, and 3) storage - from tapes to disks.	Software innovations include: 1) assemblers, 2) compilers and high-level languages (FORTRAN, COBOL, LISP).
IBM System/360 was a family of compatible computers at differing price points, and cemented IBM's industry leadership.	OS/360 was the flagship operating system for the IBM System/360, and had many bugs, and followed Brooks's Laws (adding manpower to a late software project makes it later).

General Purpose Electronic Computersf (cont)

ENIAC patent was invalidated in 1973, which placed the invention of the computer in the public domain where anyone was free to make and sell computers.

John Macuhly and J. Presper Eckert were inventors of the ENIAC (first general-purpose electronic computer).

Herman Goldstine was an Army officer who helped secure funding for the ENIAC.

John von Neumann was a famous mathematician who joined the ENIAC team as a consultant and wrote a widely distributed report on the "stored program" concept.

General Purpose Electronic Computersf (cont)

The original six programmers of the ENIAC were all women: Frances Bilas Spence, Jean Bartik, Ruth Lichterman Teitelbaum, Kathleen McNulty, Elizabeth Snyder Holberton, and Marlyn Wescoff Meltzer.

Grace Hopper was the computer programmer who invented the first compiler and promoted the use of high-level languages.

John Backus was the designer of FORTRAN, the first successful high-level programming language.

Fred Brooks was the manager of the OS/360 project and coined Brooks's Law.

Robert Noyce and Jack Kilby invented the integrated circuit. Noyce went on to become one of the founders of Intel Corporation.

Toward "Personal" Computing

Toward "Personal" Computing (cont)

Timesharing was a way of allowing common people to access computers by allowing multiple users on teletypes to be connected to a single computer, which switches rapidly between users' requests.

Notable examples of timesharing include: CTSS at MIT and BASIC at Dartmouth, which was a highly influential programming environment.

Timesharing continued on a much smaller scale, as projects like multics were over-ambitious and delivered incomplete.

Digital Equipment Corporation (DEC) created the minicomputer. The PDP-8 was the first successful minicomputer, could fit on a desk rather than take up a whole room, and led to the creation of the Original Equipment Manufacturing (OEM) industry.

Toward "Personal" Computing (cont)

PDP-11 was most popular minicomputer of all time, and led to cost-effective timesharing, the popularization of BASIC language, and led to the development of UNIX.

UNIX, used heavily at universities, was created at AT&T by former Multics programmers, was built on PDP-7 and PDP-11, and was written in C programming language made specifically for writing UNIX.

Toward "Personal" Computing

Before the 1970s, most computers were batch-oriented (programmers submit punched cards to an operator, and the computer returns output on paper)

Early interactive computing includes: 1) Project Whirlwind used display screens rather than paper output and was capable of displaying graphical shapes instead of just text, 2) SAGE which was based on Project Whirlwind technology and distributed air defense system for the US Air Force, and 3) SABRE which was an American Airlines reservation system, and was the first non-military application of interactive computing.

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ARPANET was the first long-distance computer network and was enabled by store and forward packet switching. It was used for email, remote login, and file transfer. Protocols, like TCP/IP allowed different networks to communicate.	Other networks include CS Net, BITNET, NSFNET, and they all merged into the internet. Minitel was a French computer network that predated the WWW by several years. ALOHAnet was the first wireless computer network and provided inspiration for today's Ethernet.

Toward "Personal" Computing (cont)

Xerox PARC was the pioneer of many concepts of modern computing, and had graphical user interfaces, laser printers, ethernet, and object-oriented programming. Xerox's attempts to market its technology largely failed.	Invention of microprocessor was a "computer on a chip" and enabled the creation of small, inexpensive computers.
MITS Altair 8800 was an inexpensive personal computer in 1975 and led to the ubiquity of Intel hardware and Microsoft software.	In 1977, Commodore, Radio Shack, and Apple all release personal computers, and now only Apple remains.

Toward "Personal" Computing (cont)

Video games first created for minicomputers, then as custom machines in arcades, and then as software for personal computers.	VisiCalc was the first spreadsheet and led to the acceptance of personal computers by businesses.
IBM PC was a very successful product designed quickly from off-the-shelf. It was soon supplanted by inexpensive clones and the use of MS-DOS led to Microsoft, not IBM, dominating the personal computer industry.	Macintosh was inspired by GUI research at Xerox PARC and was the first affordable GUI/mouse computer.
Jay Forrester was the leader of Project Whirlwind.	John McCarthy was a computer scientist who promoted the idea of timesharing, and created the Lisp programming language.

Toward "Personal" Computing (cont)	
Fernando Corbato was the developer of CTSS, an early timesharing system at MIT.	John Kemeny and Thomas E. Kurtz were co-developers of the BASIC programming language.
Kenneth Olsen was the founder of Digital Equipment Corporation (DEC), an influential developer of minicomputers.	Ken Thompson and Dennis Ritchie were co-developers of the Unix operating system.
JCR Licklider helped create the ARPANET, the forerunner of today's Internet.	Leonard Kleinrock, Paul Baran, and Donald Davies independently developed the concept of store and forward packet switching for computer networks.
Norm Abramson created ALOHAnet.	Robert Taylor was the director of the Xerox PARC research team.

Toward "Personal" Computing (cont)	
Douglas Englebart invented the computer mouse.	Vint Cert and Bob Kahn created the TCP/IP, the protocol on which the Internet runs.
Robert Metcalfe invented Ethernet.	Alan Kay created object-oriented programming and Smalltalk programming language.
Barbara Liskov created the CLU programming language, which, along with Smalltalk, helped popularize object-oriented programming,	Robert Noyce founded Intel and co-invented the integrated circuit.