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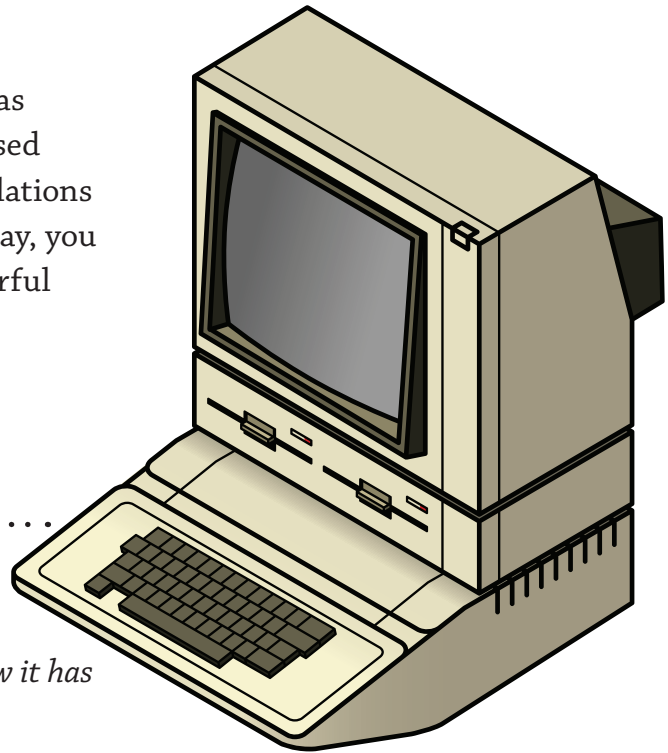
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## History of Computers

Computers! Virtually no other form of technology has become so powerful so quickly. In 1969, scientists used computers the size of entire rooms to perform calculations that helped astronauts land safely on the moon. Today, you can hold a computer in your hand that is more powerful than the room-sized machines from 1969.

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### Find It!

*Do you know how computer technology has advanced since the earliest calculating machines? Do you know how it has advanced at such an astonishing speed?*

*To calculate the answers to these questions:*

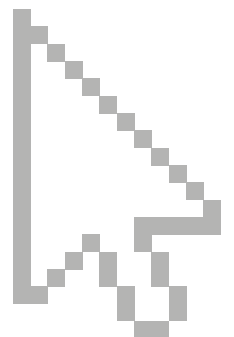
*Use the "Search" Tool to find the answers below. You'll want to start with the "Computer" article's History section, then see where history takes you!*

### Who invented what?

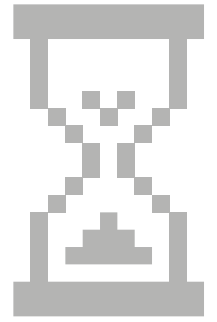
*Match each person's name with his or her invention or idea.*

- |                                   |   |
|-----------------------------------|---|
| ____ 1. Blaise Pascal             | A. Linux open-source operating system                       |
| ____ 2. Gottfried Wilhelm Leibniz | B. first computer with transistors                          |
| ____ 3. Ada Lovelace              | C. binary number system                                     |
| ____ 4. Herman Hollerith          | D. first concept of a computer program                      |
| ____ 5. Seymour Cray              | E. punched-card tabulator for the U.S. census               |
| ____ 6. Gordon Moore              | F. Intel Corporation, the first microprocessor manufacturer |
| ____ 7. Linus Torvalds            | G. World Wide Web   |
| ____ 8. Tim Berners-Lee           | H. first automatic calculating machine                      |

9. Before the 1940's, what did the term "computer" usually refer to?
10. The Jacquard loom used long belts of \_\_\_\_\_ to automate the weaving process.
11. The English mathematician Charles Babbage came up with the idea for a mechanical computer called the difference engine. When was a working version of his computer built?
12. Boolean algebra and logic uses the \_\_\_\_\_ number system to perform complex calculations and logical operations.
13. International Business Machines Corporation (IBM) is a major computer company today. What was the name of this company when it was originally founded in 1896?
14. During World War II (1939-1945), the British designed devices called the Colossus machines. What did these machines do?
15. One of the first general-purpose electronic computers, called ENIAC, became operational in 1946. What does ENIAC stand for?
16. Who were the two founders of Apple Computer, Inc.?
17. In 1976, the Apple II personal computer was released. What were some of this computer's advantages over earlier computers?
18. Who were the two founders of Microsoft Corporation?
19. Instead of manufacturing computer hardware, Microsoft Corporation became successful by making what?
20. What was the name of the forerunner of the Internet, created by the United States military in the late 1960's?



21. What is a web browser?
22. Which company released the BlackBerry smartphone in 2002?
23. Apple's iPhone was released in 2007. Name two ways that it differed from earlier smartphones.
24. What is the name of Google's smartphone operating system?
25. Name two ways a *smartwatch* differs from an ordinary digital watch.
26. Almost all computers today have a CPU, an idea developed by the Hungarian-born mathematician John von Neumann. What does CPU stand for?
27. Xerox Corporation developed the first graphical user interface in the late 1970's. What is a graphical user interface?
28. A bit is a binary digit—1 or 0. How does a transistor represent a bit?
29. Electrons are subatomic particles. What branch of physics describes the behavior of electrons in transistors?
30. What is superposition? How might computers of the future make use of superposition?



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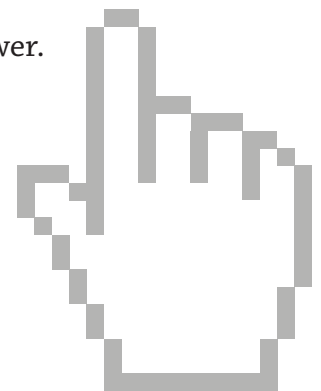
## Moore's Law

31. *The first microprocessor chip, made in 1971, had 2,500 transistors. Since then, the number of transistors on a computer chip has doubled about every two years—a trend known as Moore's Law. The more transistors on a chip, the more powerful it is. Fill in the table below to see how fast transistor counts increase. (To fill in a row, multiply the previous row's transistor count by two. Feel free to use a calculator—the numbers get pretty big!)*

<b>Year</b>	<b>Number of transistors</b>	<b>Year</b>	<b>Number of transistors</b>
1971	2,500	1995	
1973	5,000	1997	
1975	10,000	1999	
1977	20,000	2001	
1979	???	2003	
1981		2005	
1983		2007	
1985		2009	
1987		2011	
1989		2013	
1991		2015	
1993		2017	

32. Moore's law describes a/an \_\_\_\_\_ growth in computing power.

33. Do you think Moore's Law will continue forever? Why or why not?



# Teacher Page

## Answers:

1. H
2. C
3. D
4. E
5. B
6. F
7. A
8. G
9. A human who performed calculations for a business or other organization
10. punched-cards
11. 1991
12. binary
13. Tabulating Machine Company
14. They decoded German military messages.
15. Electronic Numerical Integrator And Computer
16. Steven P. Jobs and Stephen G. Wozniak
17. The Apple II was less expensive than mainframes. It was sold as an assembled unit, not as a kit, so it appealed to a wider base of consumers besides hobbyists and specialists.
18. Bill Gates and Paul Allen
19. Software, or programs (including the Windows operating system and office software)
20. ARPAnet
21. A web browser is a program. It functions as a gateway to explore the World Wide Web. It makes the Internet much easier for ordinary computer users to access and interact with.
22. Research in Motion
23. The iPhone's entire surface was covered by a touch screen. It featured a virtual keyboard rather than a physical keyboard. Users controlled the device with finger-based gestures. A year after it came out, users could easily download programs onto the iPhone wirelessly through Apple's App Store.
24. Android
25. Smartwatches are programmable and feature a touch screen.

26. central processing unit
27. A GUI represents data and programs using onscreen windows, icons, and other visual elements. It contrasts from a command line interface, in which the user must type in commands to run the computer.
28. A transistor can switch on and off, like a light switch. “On” represents 1, and “off” represents 0.
29. Quantum mechanics
30. In superposition, a quantum structure can exist in two states at once. So a quantum bit, or qubit, can exist in a superposition of the “on” and “off” states. This ability would enable quantum computers to perform certain calculations millions of times faster than classical (non-quantum) computers.
31. The completed table:

<b>Year</b>	<b>Number of transistors</b>	<b>Year</b>	<b>Number of transistors</b>
1971	2,500	1995	10,240,000
1973	5,000	1997	20,480,000
1975	10,000	1999	40,960,000
1977	20,000	2001	81,920,000
1979	40,000	2003	163,840,000
1981	80,000	2005	327,680,000
1983	160,000	2007	655,360,000
1985	320,000	2009	1,310,720,000
1987	640,000	2011	2,621,440,000
1989	1,280,000	2013	5,242,880,000
1991	2,560,000	2015	10,485,760,000
1993	5,120,000	2017	20,971,520,000

32. exponential
33. Answers may vary. Moore’s law relies on manufacturers creating smaller and smaller transistors. But in theory, transistors cannot become smaller than the size of an atom. Modern transistors are already smaller than 100 atoms wide, so they cannot shrink much further. However, computer scientists are actively researching quantum computers that make use of structures at subatomic scales.