

Digital Technology



Dr. Raymond W. Ritch

ritch.net

email: ray@ritch.net

775.527.7870



Before We Start...

Read the Merit Badge Pamphlet
Print out the Worksheet

1. Show your current, up-to-date Cyber Chip.





Cyber Chip

cyberCHIP
THIS IS TO CERTIFY THAT THE BEARER

Has read the Internet safety rules at www.scouting.org/cyberchip.
He knows how to be responsible online and what to do if he discovers unsafe Internet practices. He accepts this responsibility and is hereby granted Cyber Rights.

UNIT LEADER

BOY SCOUTS OF AMERICA

INTERNET SAFETY PLEDGE

1. I will think before I post.
2. I will respect other people online.
3. I will respect digital media copyright.
4. I won't meet face-to-face with anyone I meet in the digital world unless I have my parent's permission.
5. I will protect myself online.

BOY SCOUTS OF AMERICA

INTERNET SAFETY PLEDGE

1. I will tell my trusted adult if anything makes me feel sad, scared, confused, or uncomfortable.
2. I will ask my trusted adult before posting photos or sharing information like my name, address, current location, or phone number.
3. I won't meet face-to-face with anyone I meet in digital world.
4. I will respect the online property of others.
5. I will always use good "netiquette" and not be mean online.

BOY SCOUTS OF AMERICA

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CUBMASTER

BOY SCOUTS OF AMERICA

The Cyber Chip pocket card and patch can be purchased in Scout Shops or downloaded free online (pocket card only) in June 2012.

Get a jump start and earn it now!
The Cyber Chip is under consideration as a requirement in merit badges and more.





History of Computers

2. Do the following:

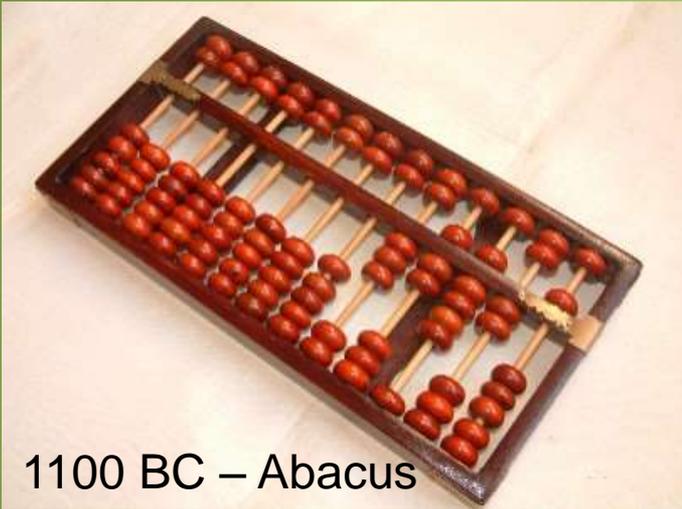
- a. Give a brief history of the changes in digital technology over time. Discuss with your counselor how digital technology in your lifetime compares with that of your parent's, grandparent's, or other adult's lifetime.

- b. Describe the kinds of computers or devices you imagine might be available when you are an adult.





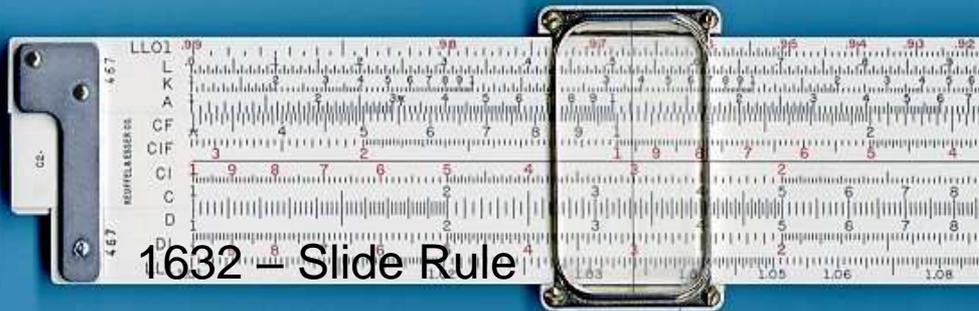
History of Computers



1100 BC – Abacus



1617 – Logarithms



1632 – Slide Rule



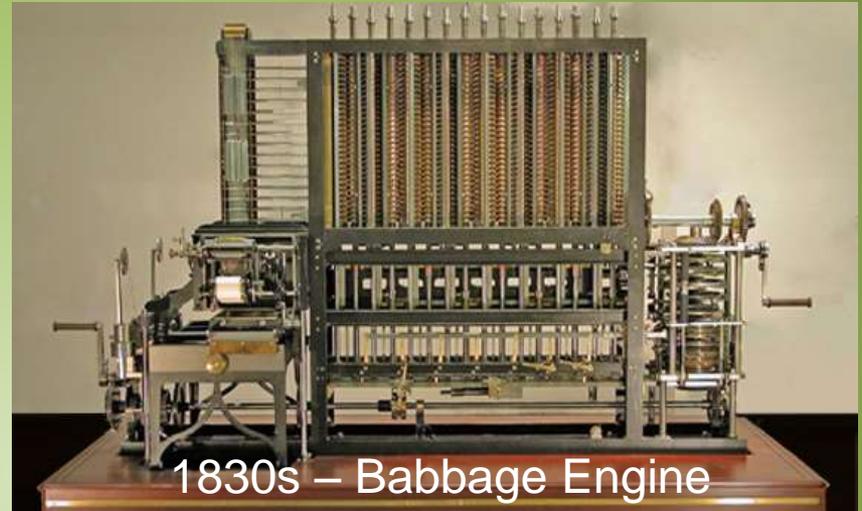
1642 Pascaline



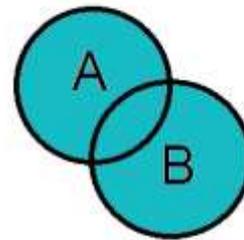
History of Computers



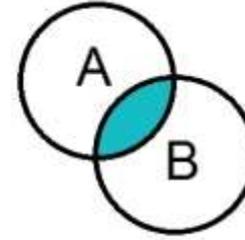
1804 Automatic Loom



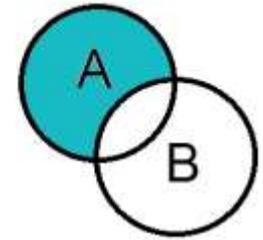
1830s – Babbage Engine



A OR B



A AND B



A NOT B

1840s Boolean Logic



History of Computers

Edison's Vacuum Tube

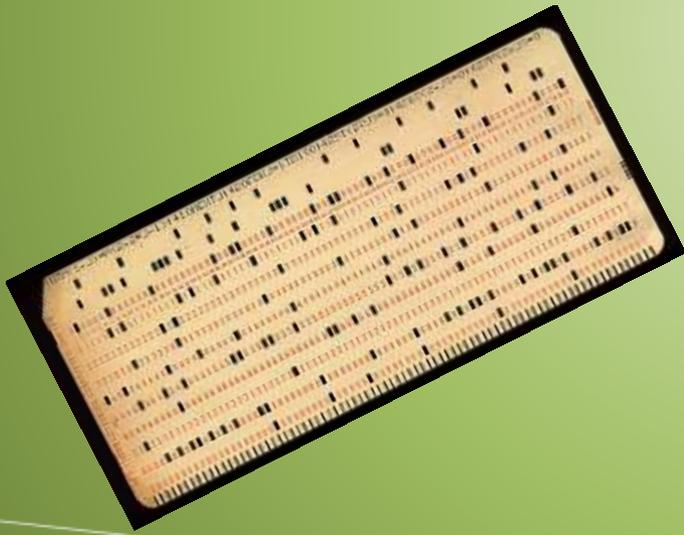
In 1883, a few years after Thomas Edison invented the electric light bulb, he noticed something peculiar about how electricity flowed inside it. To protect the brightly glowing filament, air had been removed from the bulb, creating a vacuum tube. Surprisingly, if he placed a metal plate inside the bulb, electricity would flow across the vacuum from the filament to the plate. Edison patented the discovery of how electrons flowed across a vacuum, now known as the Edison Effect, though he made little use of it.





1890 – Hollerith Machine

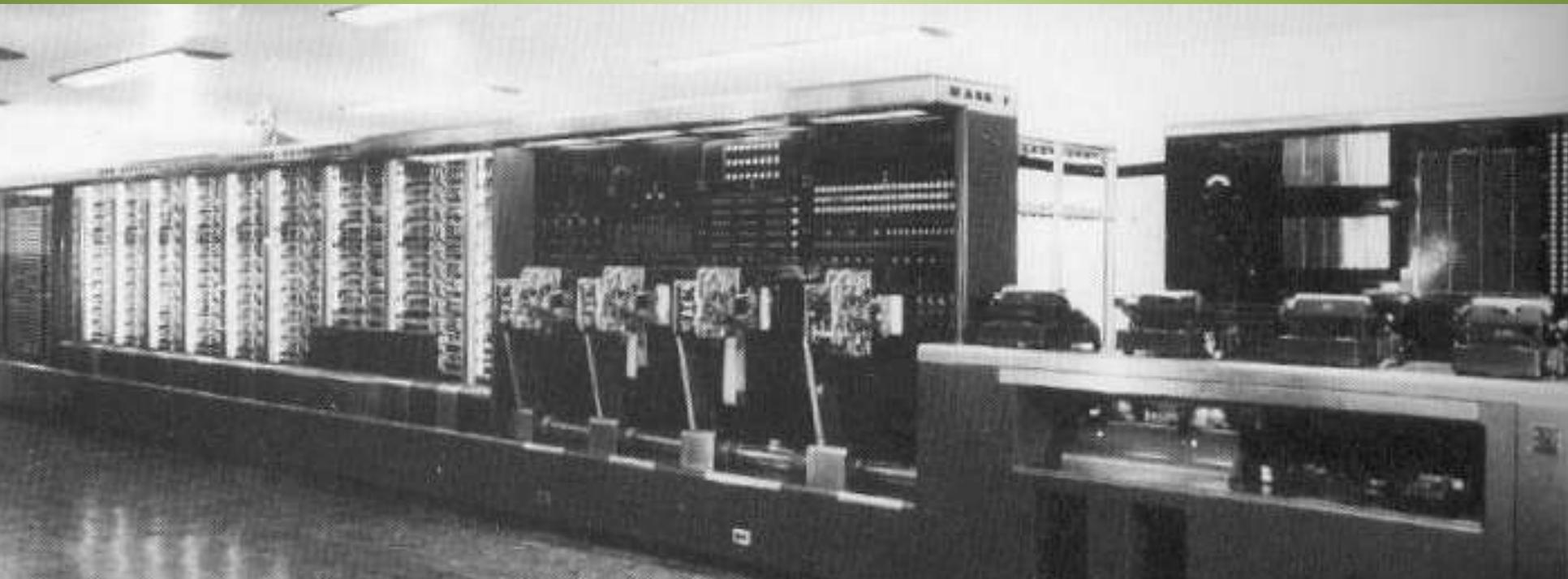
- Used electrical connections to trigger a counter, recording information
- Data could be encoded by the locations of holes in a card
- Hollerith determined that data punched on a card, could be counted or sorted mechanically





1944 – Colossus Mark I

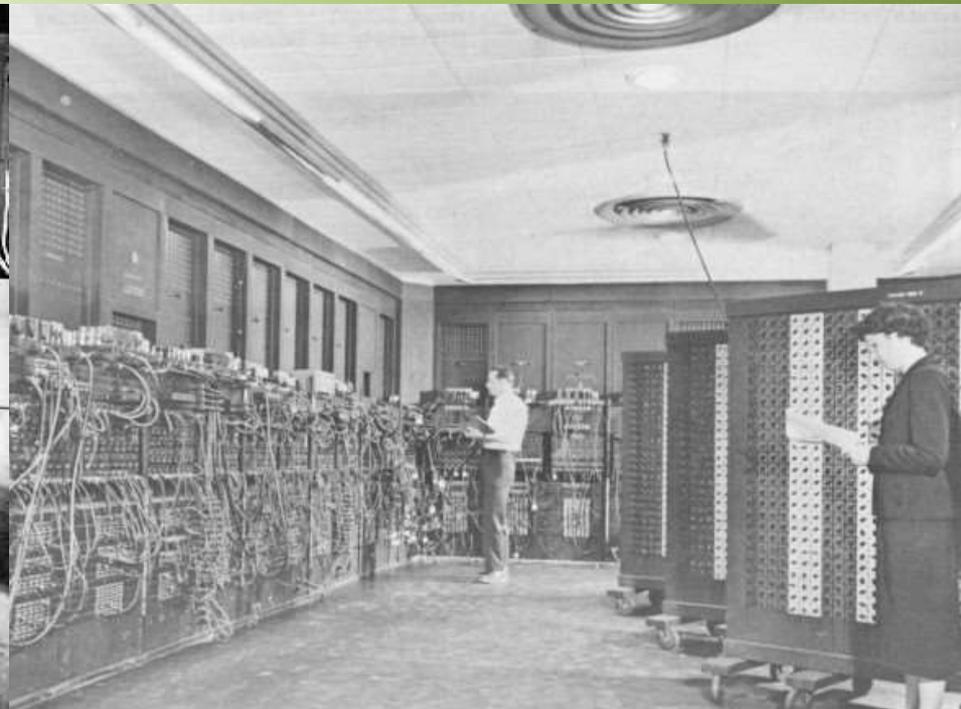
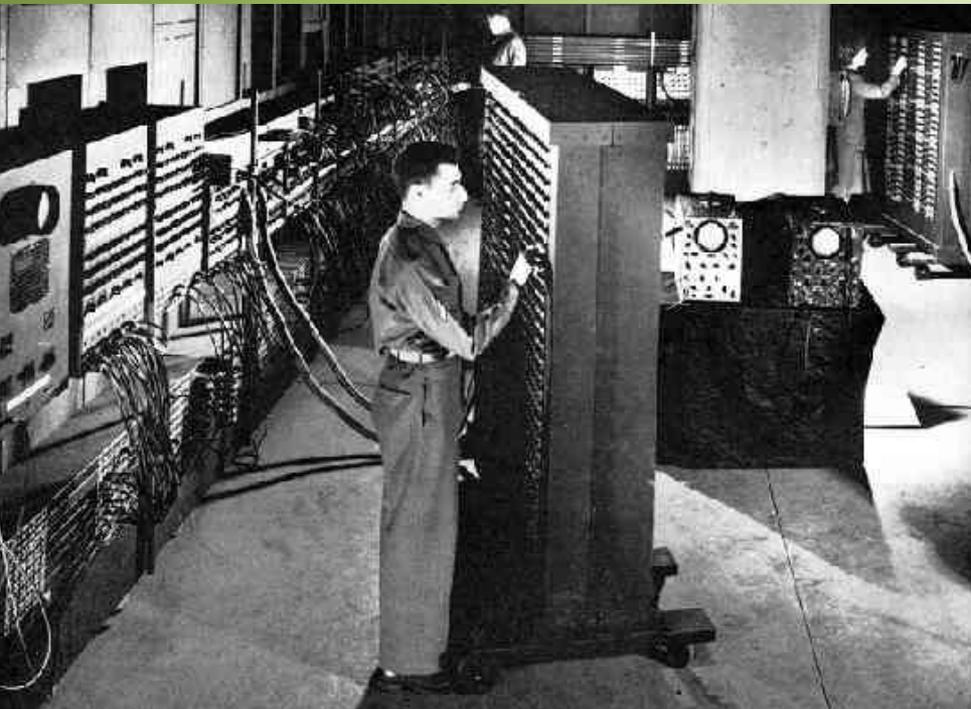
- 1st programmable digital computer
- 5 tons, 500 miles of wire, 8 feet tall & 51 feet long
- Ran non-stop for 15 years





1945 – ENIAC

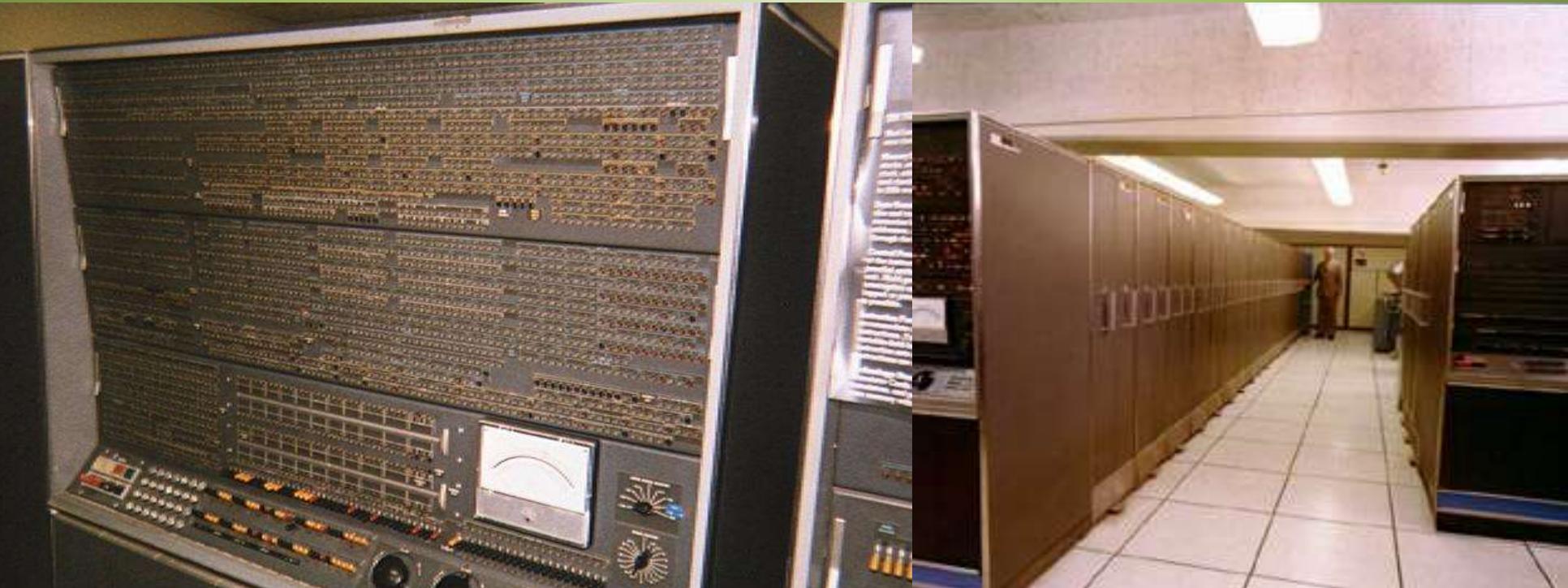
- Electronic Numerical Integrator And Computer
- 20 by 40 foot room
- Weighed 30 tons
- Used more than 18,000 vacuum tubes





1959 – IBM Stretch

- The IBM 7030, or Stretch, was IBM's first transistorized supercomputer
- Failed to meet aggressive performance estimates so price dropped from \$13.5 million to only \$7.78 million
- It was the fastest computer in the world until 1964





1970s – IBM Mainframes

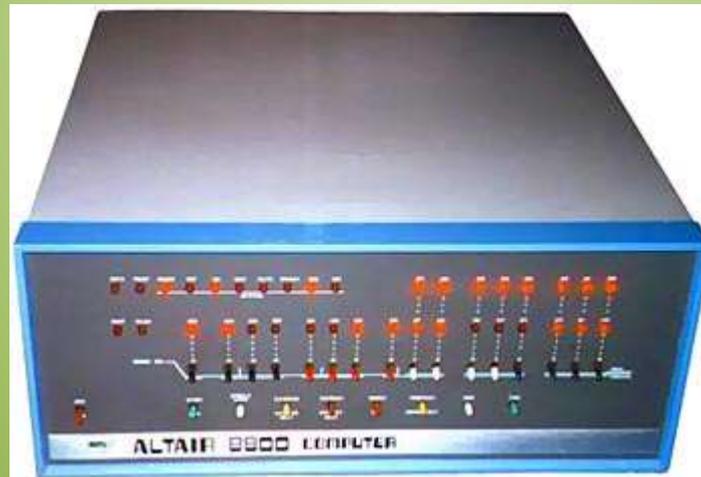
- Standard dual-processor capability
- “Monolithic main memory” based on integrated circuits
- Full virtual memory through a new microcode floppy disk
- 128-bit (hexadecimal) floating point arithmetic





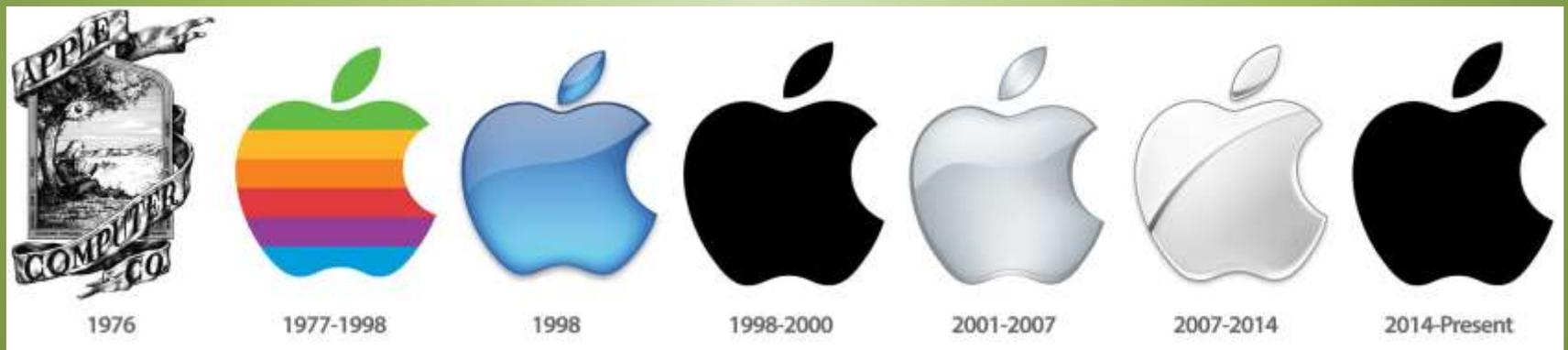
1975 – Altair 8800

- Name comes from Star Trek!
- Mail order kit, assemble it yourself
- No video output, LEDs instead
- No keyboard, switches on the front





Microsoft & Apple





Moore's Law

1 The accelerating pace of change ...



2 ... and exponential growth in computing power ...

Computer technology, shown here climbing dramatically by powers of 10, is now progressing more each hour than it did in its entire first 90 years

COMPUTER RANKINGS

By calculations per second per \$1,000

Analytical engine
Never fully built, Charles Babbage's invention was designed to solve computational and logical problems



Colossus
The electronic computer, with 1,500 vacuum tubes, helped the British crack German codes during WW II



UNIVAC I
The first commercially marketed computer, used to tabulate the U.S. Census, occupied 943 cu. ft.

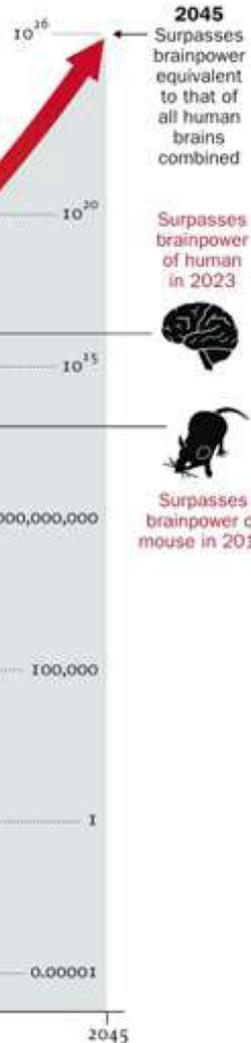


Apple II
At a price of \$1,298, the compact machine was one of the first massively popular personal computers

3 ... will lead to the Singularity



Power Mac G4
The first personal computer to deliver more than 1 billion floating-point operations per second





Computer Speak

“A” →

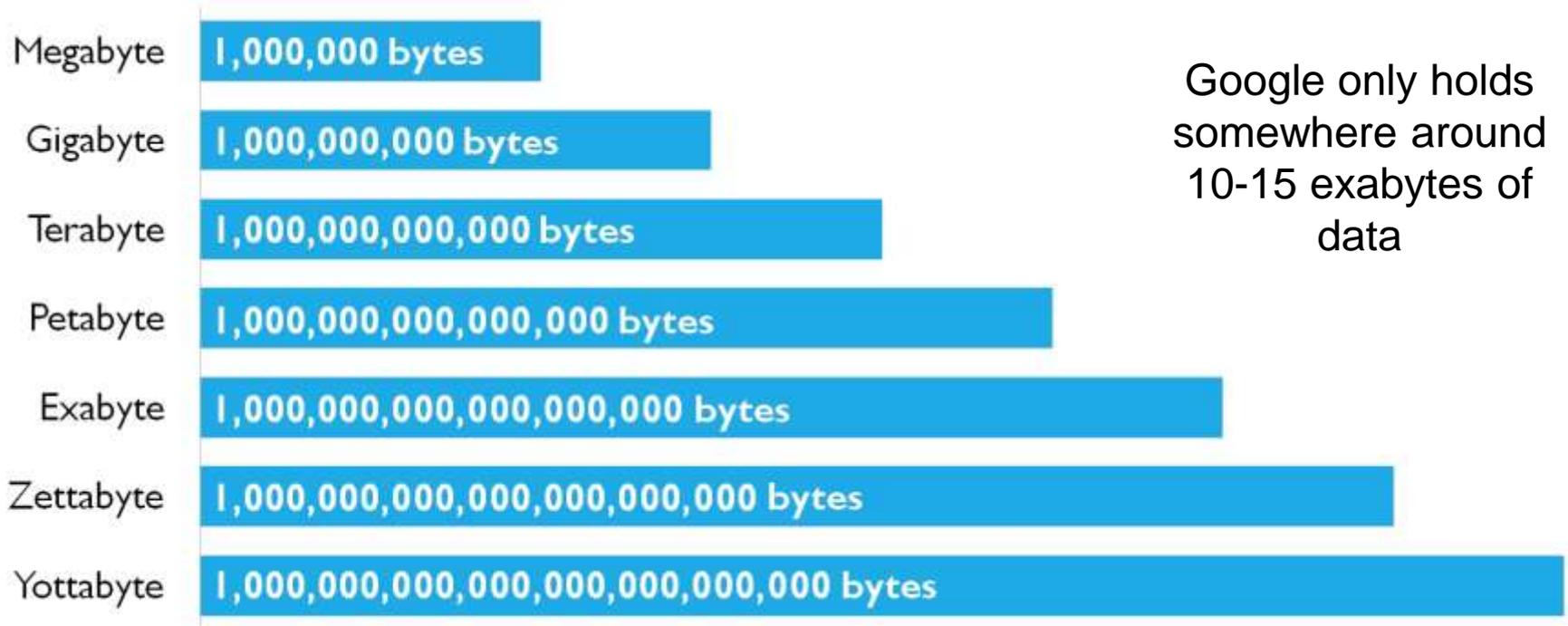
65 (ASCII) →

01000001 (Binary) →





Storage



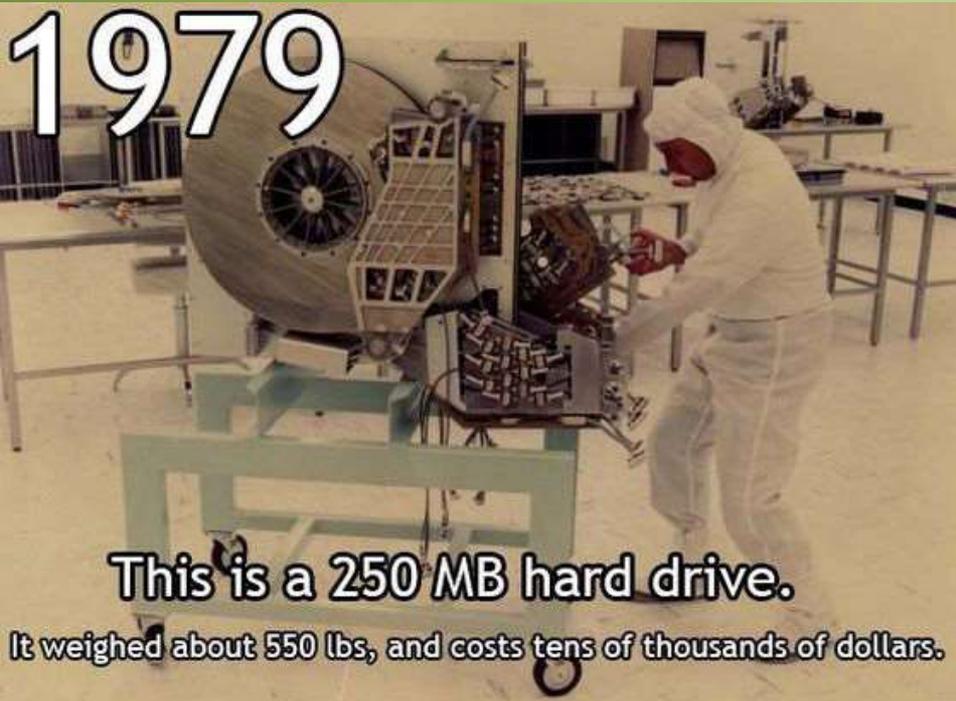
Google only holds somewhere around 10-15 exabytes of data





Storage

1979



This is a 250 MB hard drive.

It weighed about 550 lbs, and costs tens of thousands of dollars.

2013



This is a 16 GB microSD card.

It holds about 64x the data as the HD above.

It weighs about 4/10 of 1 gram,
and costs about \$11.



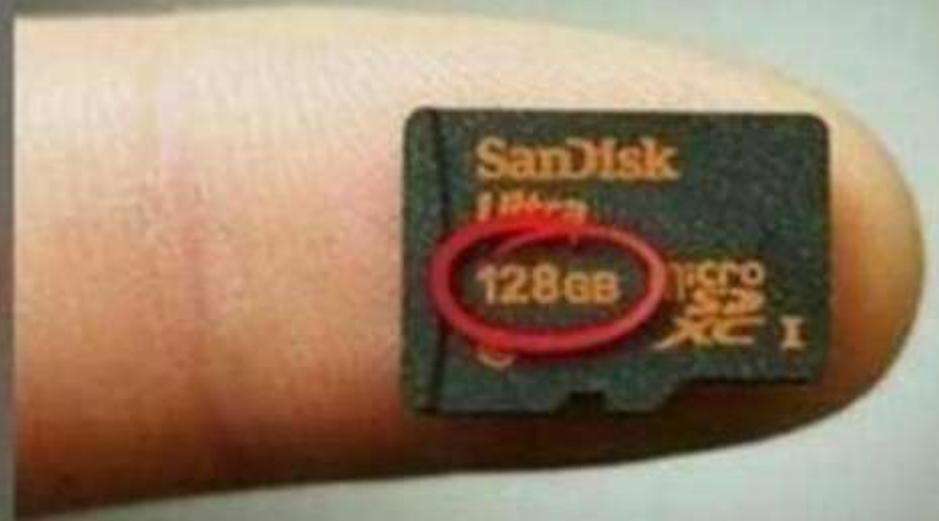
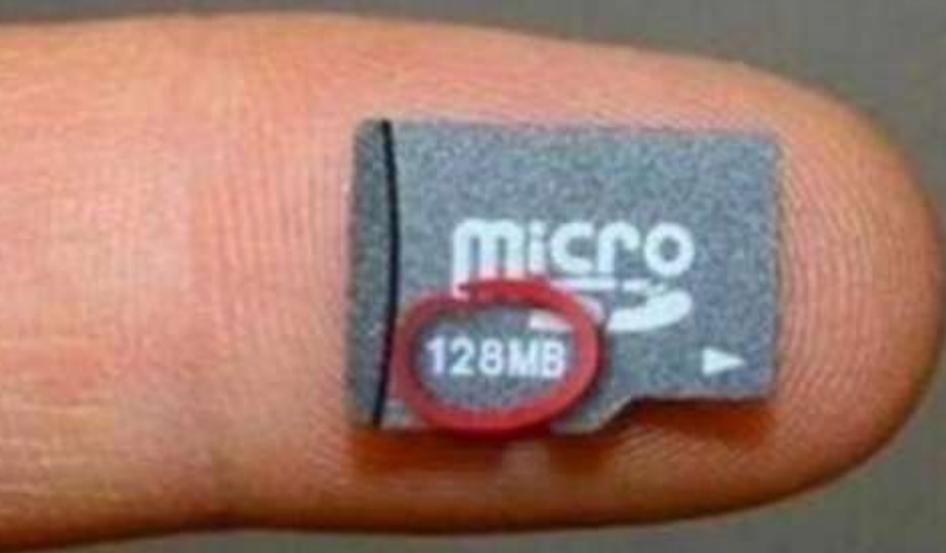


Storage

2005

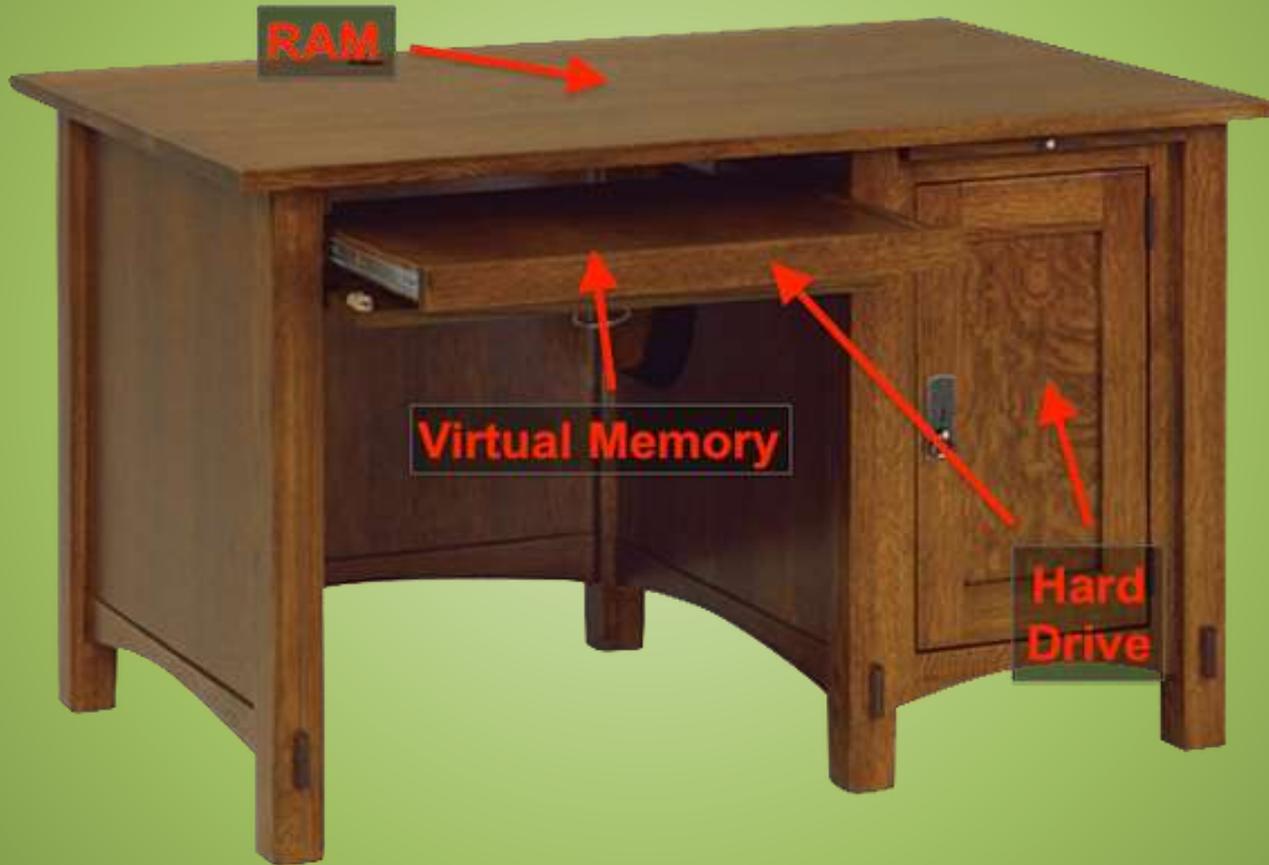
Digital Technology

2014





Memory, or RAM





Speed



How high can you count
in 10 seconds?





Speed



An average computer chip can count (by ones) to over 20 billion (20,000,000,000) in this same time. It is this mind-boggling speed of computer chips that has been harnessed in digital devices to do the incredible things they do.





The Future



SELF-DRIVING CAR



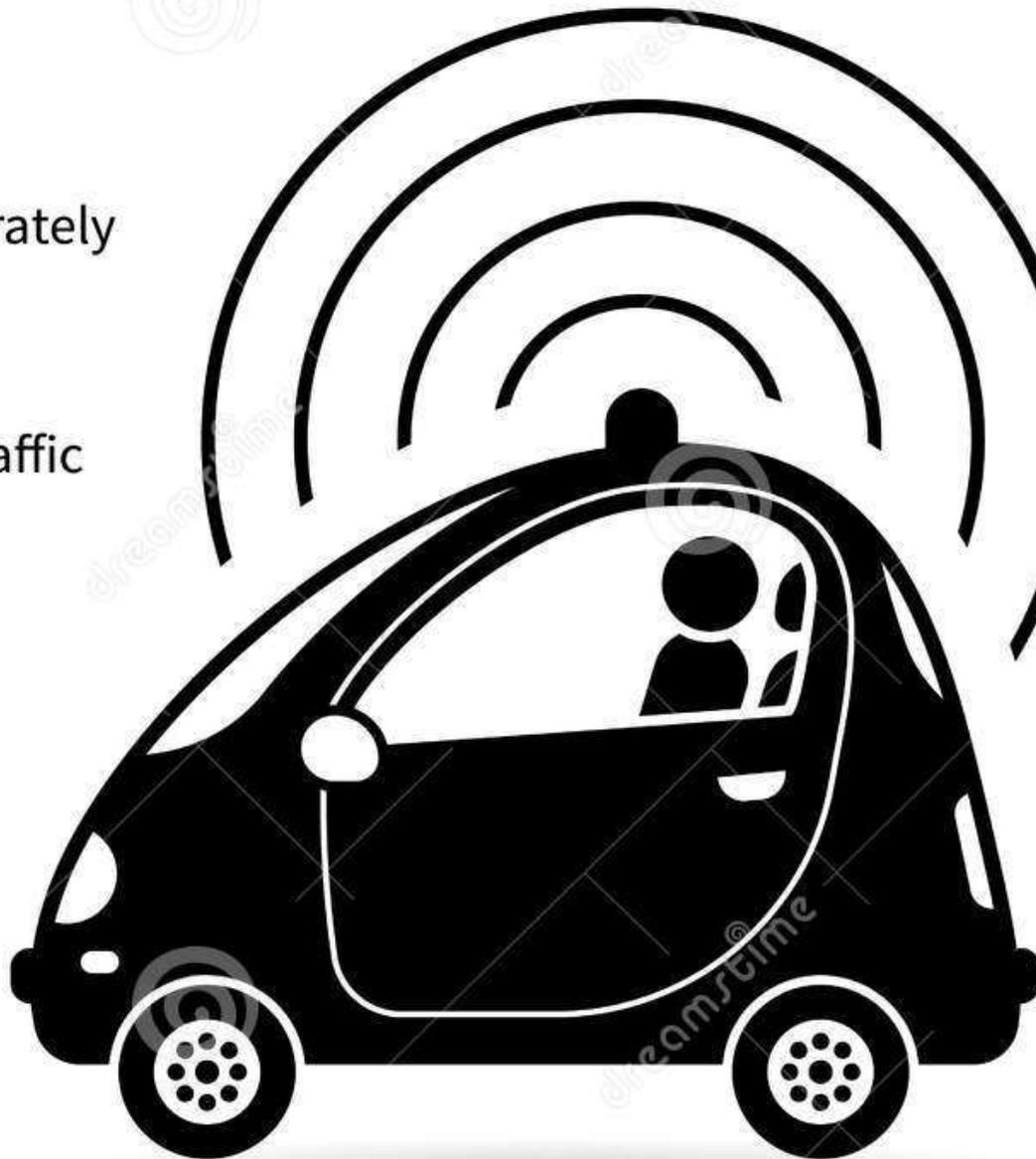
safe



accurately



no traffic





The Future

The Internet of Things





The Future

MACHINE
LEARNING





Digital Technology

3. Do the following:

- a. Explain to your counselor how text, sound, pictures, and videos are digitized for storage.
- b. Describe the difference between lossy and lossless data compression, and give an example where each might be used.
- c. Describe two digital devices and how they are made more useful by their programming.
- d. Discuss the similarities and differences between computers, mobile devices, and gaming consoles.
- e. Explain what a computer network is and describe the network's purpose.





File Formats

Text (ASCII)

txt, doc, docx, pdf

Sound (waves)

mp3, wma, aiff, au, raw, wav

Pictures (pixels)

jpg, gif, png, tiff, eps

Videos (key frames + changes)

avi, mpeg, flv, mov



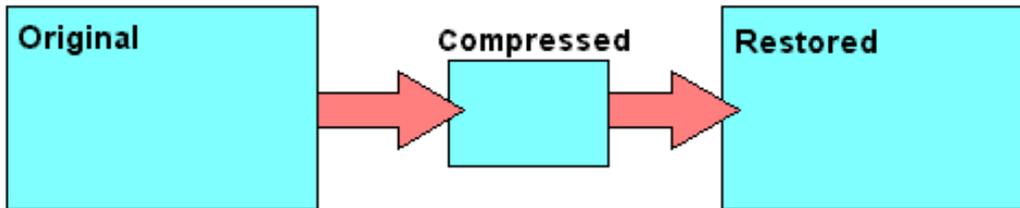


Lossy vs. Lossless Compression

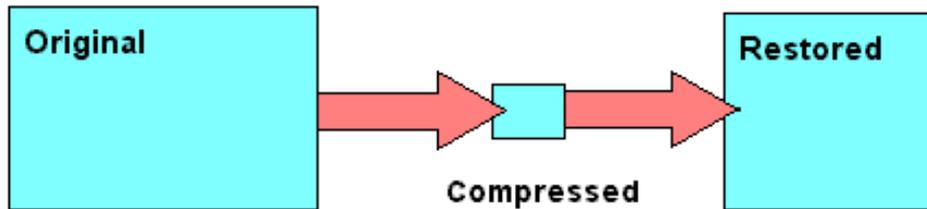
Lossless allows the original to be recreated

Lossy eliminates some data, can't get it back

LOSSLESS

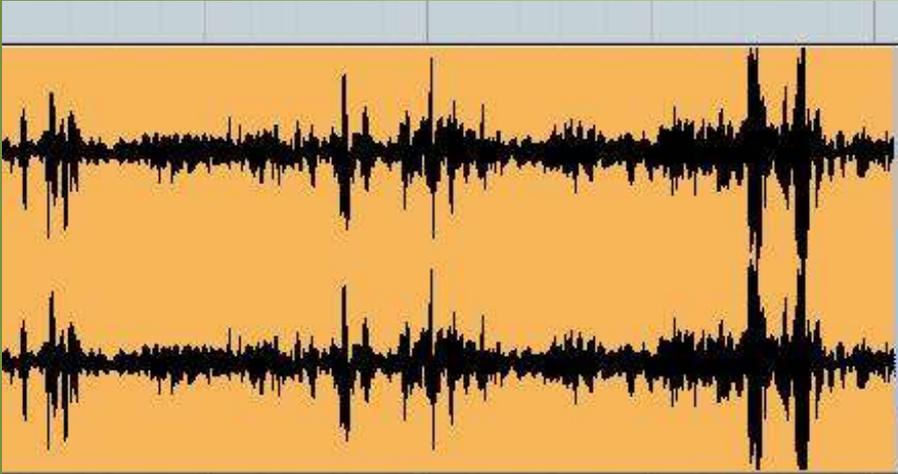


LOSSY

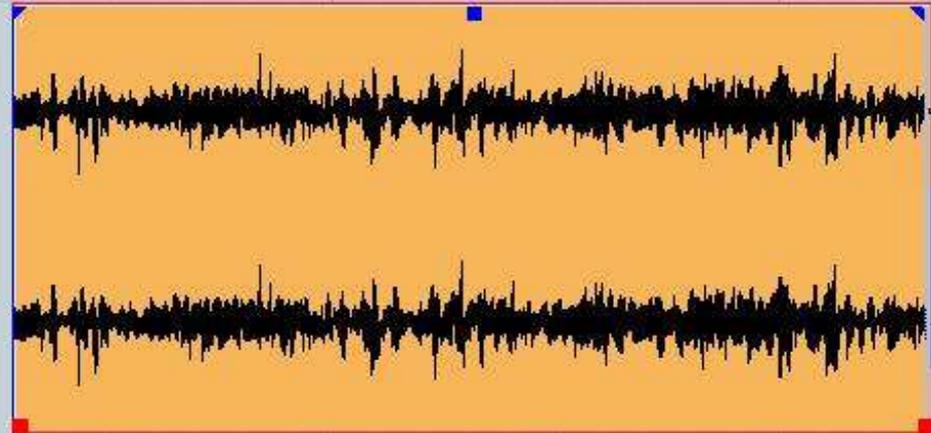




Lossy vs. Lossless Compression



Uncompressed Audio



Compressed Audio





More Useful With Technology?





Computers, Mobile Devices & Gaming Consoles

Similarities

- Digital processing
- Programs
- Connectivity
- Displays

Differences

- Input – keyboard, screen, controller
- Functionality
- Versatility
- Single Purpose
- Proprietary software
- Portability





Network





Digital Technology

4. Do the following:
 - a. Explain what a program or software application or “app” is and how it is created.
 - b. Name four software programs or mobile apps you or your family use, and explain how each one helps you.
 - c. Describe what malware is, and explain how to protect your digital devices and the information stored on them.





Programs or “Apps”

Series of commands or set of instructions for a processor to complete a task

- Word Processing
- Games
- Utilities (calendar, calculator)
- Photo/Video Editor

Coded or scripted with a special language



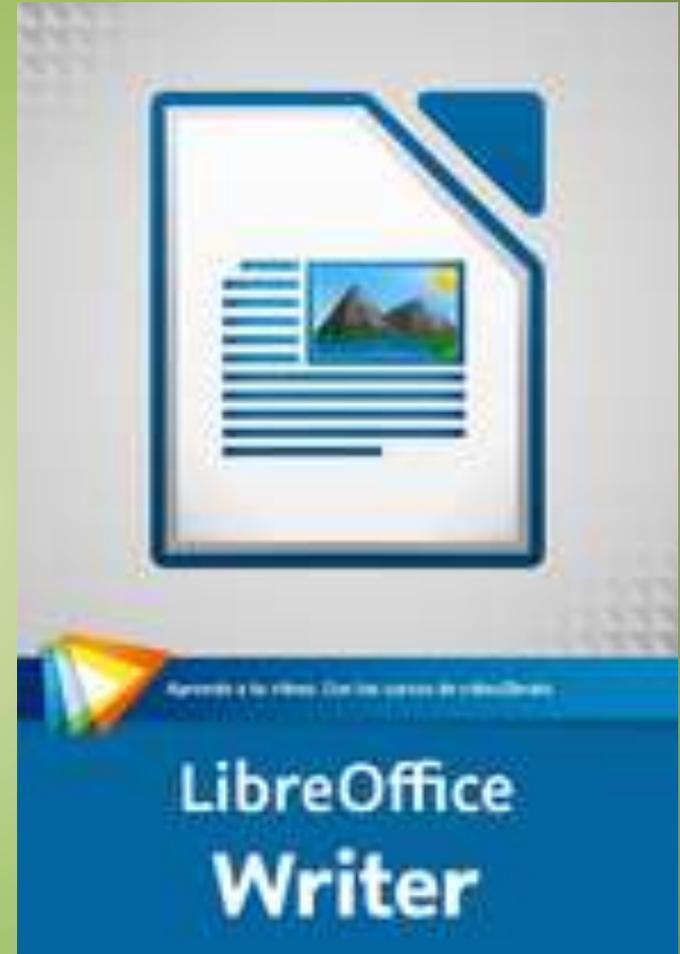


Word Processing



Microsoft
Word

Google docs



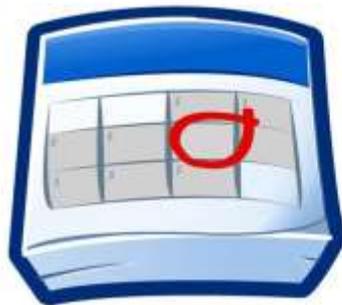


Games





Utilities



Google™
Calendar



Photos Editors



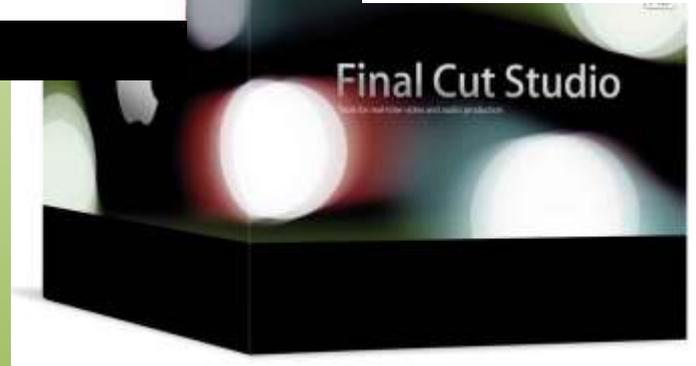


Photos Editors





Video Editors





Video Editors





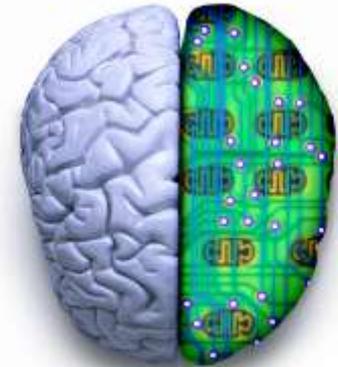
Malware

- Malicious code in the form of viruses, worms, Trojan horses, spyware, adware, scareware, or ransomware
- Any software used to disrupt computer operation, gather sensitive information, or gain access to private computer systems
- Defined by its malicious intent, acting for the interests of the malware owner, rather than the user





Protect Against Malware





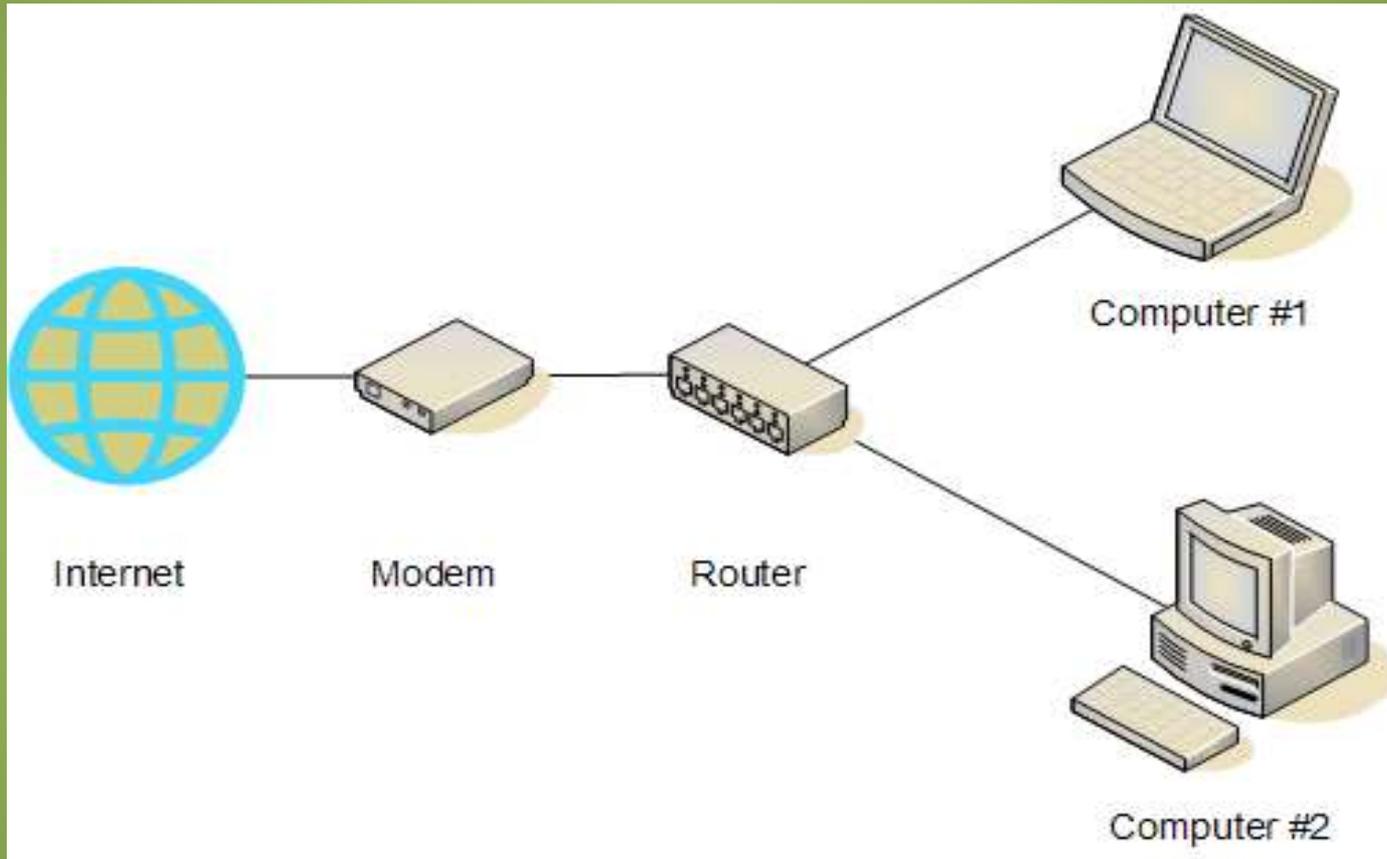
Digital Technology

5. Do the following:
 - a. Describe how digital devices are connected to the Internet.
 - b. Using an Internet search engine (with your parent's permission), find ideas about how to conduct a troop court of honor or campfire program. Print out a copy of the ideas from at least three different websites. Share what you found with your counselor, and explain how you used the search engine to find this information.
 - c. Use a Web browser to connect to an HTTPS (secure) website (with your parent's permission). Explain to your counselor how to tell whether the site's security certificate can be trusted, and what it means to use this kind of connection.





Connect to the Internet





Connect to the Internet

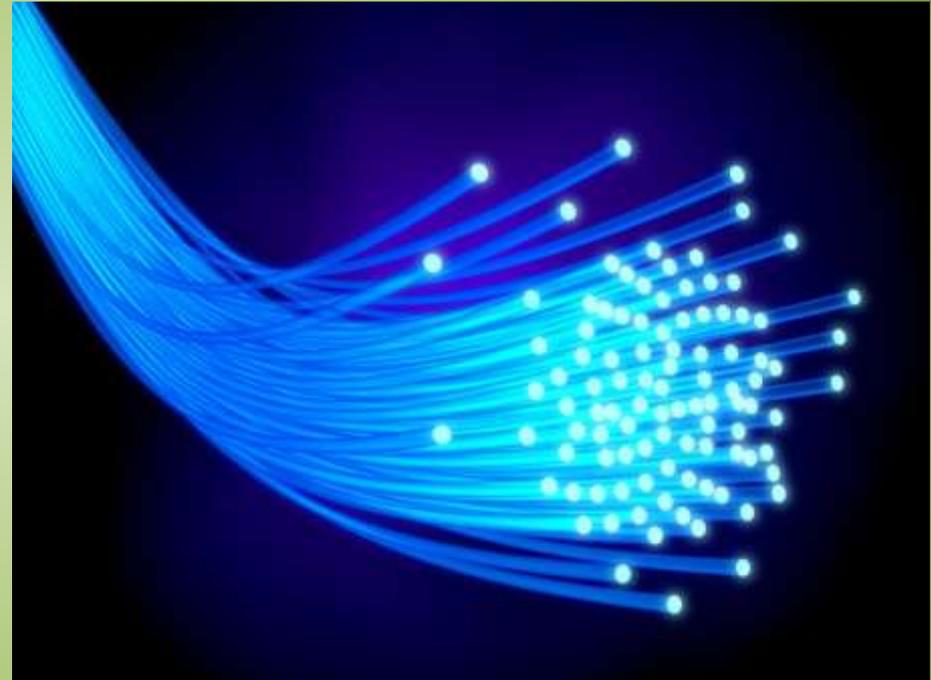




Connect to the Internet

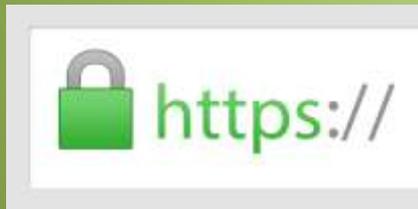
The Incredible Optical Fiber

Optic and photonic devices help make today's Internet work. Lasers, fiber optics, photonic switches, and photonic displays allow digital devices anywhere in the world to connect to each other, exchange information, and visually display that information. All information, like movies, phone calls, and emails, are converted into binary data, or ones and zeros, similar to the dots and dashes of Morse code on a telegraph line.





HTTPS





HTTPS



This is probably not the site you are looking for!

You attempted to reach _____ but instead you actually reached a server identifying itself as _____
This may be caused by a misconfiguration on the server or by something more serious. An attacker on your network could be trying to get you to visit a fake (and potentially harmful) version of _____

You should not proceed, **especially** if you have never seen this warning before for this site.

▶ [Help me understand](#)



Passwords





Digital Technology

6. Do THREE of the following. Provide me with a copy.
 - a. Food budget OR roster spreadsheet for campout.
 - b. Letter to troop's parents, inviting them to a troop event.
 - c. Campsite plan for your troop OR create a flier for an upcoming troop event, incorporating text and photographs.
 - d. Five slide presentation, with photographs.
 - e. Photos of a troop activity.
 - f. Record your voice and transfer the file to a different device.
 - g. Blog 5 of your scouting activities.
 - h. Create a web page for your troop, patrol, school, or church.





Digital Technology

7. Do the following:

- a. Explain to your counselor each of these protections and why they exist: copyright, patents, trademarks, trade secrets.
- b. Explain when it is permissible to accept a free copy of a program from a friend.
- c. Discuss with your counselor an article or a news report about a recent legal case involving an intellectual property dispute.





Copyrights



Legal right created by the law of a country, that grants the creator of an original work exclusive rights to its use and distribution, usually for a limited time, with the intention of enabling the creator to receive compensation for their intellectual effort.





Trademarks



A recognizable sign, design or expression which identifies products or services of a particular source from those of others.

The trademark owner can be an individual, business organization, or any legal entity.

A trademark may be located on a package, a label, a voucher or on the product itself.





Patents



A set of exclusive rights granted by a sovereign state to an inventor or assignee for a limited period of time in exchange for detailed public disclosure of an invention.

An invention is a solution to a specific technological problem and is a product or a process.





Trade Secrets



An invented formula, practice, process, design, instrument, pattern, commercial method, or compilation of information which is not generally known or reasonably ascertainable by others, and by which a business can obtain an economic advantage over competitors or customers.





Give Software to Friend

PUBLIC-DOMAIN-PHOTOS.com
Large collection of public domain photos and cliparts

Photos **Cliparts**

5,000 free photos
8,000 free cliparts

FREE FOR PERSONAL AND COMMERCIAL USE

Search



5000 Free Stock Photos

All photos on this web site are **public domain**. You may use these images for any purpose, including commercial. But if some photo contains logos and products you need to be careful. Using someone else's trademark commercially can get you sued.





Give Software to Friend

**Just Because you pay for it,
Doesn't mean it's better..!!**

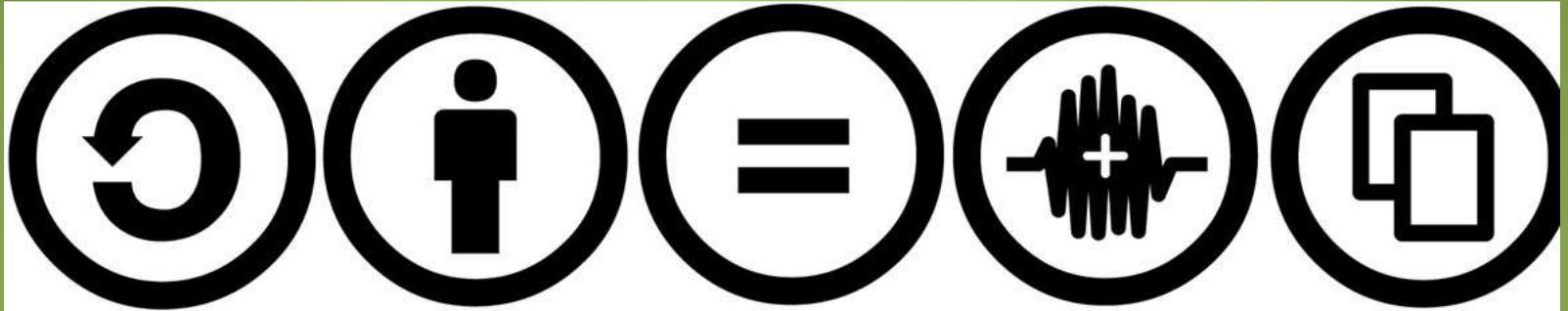
		
Secure	Fast	Free

**Welcome to Open Source,
The future of Computer Software.**





Give Software to Friend



**creative
commons**





Digital Technology

8. Do TWO of the following:
 - a. Why proper disposal of digital technology is important. List at least three dangerous chemicals that could be used to create digital devices or used inside a digital device.
 - b. What is a certified recycler of digital technology hardware.
 - c. Research an organization that collects discarded digital technology hardware for repurposing or recycling.
 - d. Visit a recycling center that disposes of digital technology hardware.
 - e. Find a battery recycling center near you and find out what it does to recycle batteries.





Proper Disposal

Electronic devices are a complex mixture of several hundred materials. A mobile phone, for example, contains 500 to 1,000 components. Many of these contain toxic heavy metals such as lead, mercury, cadmium and beryllium, as well as hazardous chemicals, such as brominated flame retardants. Polluting PVC plastic is also frequently used.



High Tech Lifestyle VS A Clean Environment

We Can Have BOTH!

**Action can help and save
you money at the same time.**





Health Hazards

- Some **brominated flame retardants**, used in circuit boards and plastic casings, do not break down easily. Long-term exposure can lead to impaired learning and memory functions. They can also interfere with thyroid and estrogen hormone systems.
- The cathode ray tubes (CRT) in monitors contain **lead**. Exposure to lead can cause intellectual impairment and damage the nervous, blood and reproductive systems.
- **Cadmium**, used in rechargeable computer batteries, contacts and switches and in older CRTs, is highly toxic, primarily affecting the kidneys and bones.
- **Mercury**, used in lighting devices for flat-screen displays, can damage the brain and central nervous system, particularly during early development.
- Compounds of **hexavalent chromium**, used in the production of metal housings, are highly toxic and carcinogenic to people.
- **Polyvinyl chloride (PVC)** is a chlorinated plastic used in some electronics products and for insulation on wires and cables. Chlorinated dioxins and furans are released when PVC is burned. These chemicals are highly persistent in the environment and many are toxic even in very low concentrations.





Recyclers

Two Recognized by EPA

- Responsible Recycling Practices (R2)
sustainableelectronics.org
- e-Stewards®
e-stewards.org





Recyclers





Battery Recyclers

Staples
Lowes
Home Depot
Radio Shack
AutoZone
Best Buy
Batteries +





Eagle Project?





Digital Technology

9. Do ONE of the following:
 - a. Investigate three career opportunities that involve digital technology. Pick one and find out the education, training, and experience required for this profession. Discuss this with your counselor, and explain why this profession might interest you.
 - b. Visit a business or an industrial facility that uses digital technology. Describe four ways digital technology is being used there. Share what you learned with your counselor.

