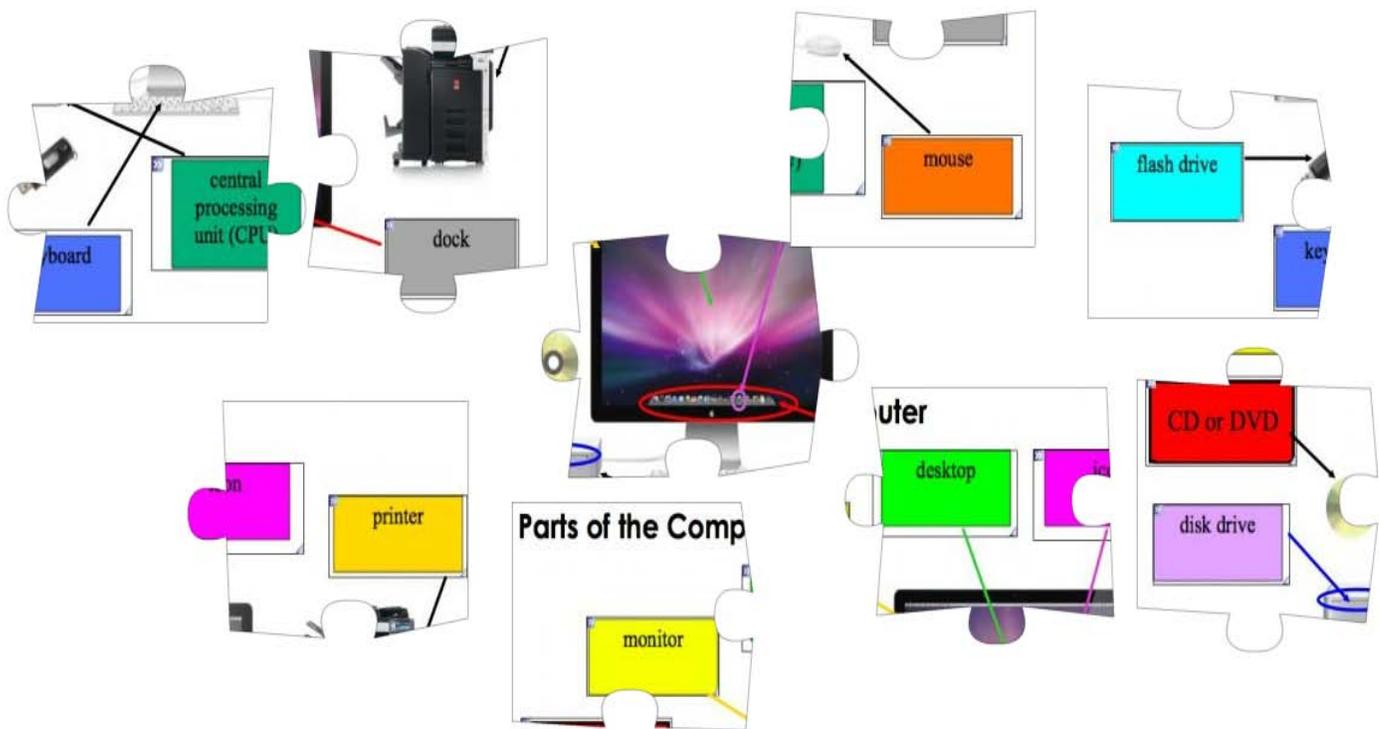


HANDOUT: COMPUTER PARTS

Because computers are so important to our lives, there is a constant need to design and develop new hardware, software, and systems. Have you used a computer before? I'm sure you have. But have you seen the inside of a computer? What is all that! Actually the parts of the computer are similar to a big puzzle.

Put these puzzle parts together



The puzzle solution shows the outside parts of the computer. Now we want to explore the inside parts of the computer. While we learn the parts we will also explore the four functions of a computer: input, process, output, and storage. The individual parts are not much use by themselves, but when assembled together they allow you to play games, write papers, search the Internet, communicate with friends and much more.

HANDOUT: COMPUTER PARTS

The motherboard helps to connect all the parts so they function together as a unit. Like a puzzle many parts fit together on the motherboard. The CPU (Central Processing Unit) or brains of the computer and other parts like ports, expansion slots, and memory chips that control functions like video and networking, all connect to the motherboard. The main power source is also plugged in on the motherboard. These individual slots, ports, and chips on the motherboard allow for input, storage, processing, and output to take place.



Input

Every day you encounter and process “tons” of information. You get input or stimulus, for example, someone speaking to you or bright lights flashing at you. When someone speaks to you the words are translated from the dictionary or word bank that you have recorded in your head. Other stimulus like the facial expression or body language adds to the translation of the messages.

The computer uses a similar process. Information must somehow get into the computer and then the information must be translated into digital form. Just like humans get input from touch, taste, hearing and smelling, computers get

input from a variety of devices, such as the keyboard, mouse, scanner, microphone, camera, and graphic tablet. For the computer, texts, graphics, sounds, video, music, are all transformed into binary code.



Over the years, different coding schemes have been developed to represent characters in computer memory. Historically, the most important of these coding schemes is ASCII, which stands for the American Standard Code for Information

Interchange. ASCII is a set of 128 numeric codes that represent the English letters, various punctuation marks, and other characters. For example, the ASCII code for uppercase letter A is 65 or binary 01000001.

Letters, words, numbers, even colors all use the universal ASCII language. A computer speaks in zeros and ones. Every character that a person types on a keyboard is translated into zeros and ones and then forms the character that you see. Even spaces in a sentence have a binary code of 00100000. Capital “A” for example in computer talk is = to 01000001.

The zeros and ones stand for electrical pulses with one being a positive charge and zero being no charge at all. The transistors are what allow the charges to flow, like an on/off switch. Each character is a mix of charges and no charges. Each zero or one is a bit, and 8 bits make up a single byte. A byte is a single letter, number, symbol, or sound. This code system is called ASCII.

Use the ASCII Binary Table on the next page to write your name in Computer Talk”.

Your Name

In Binary

Picture Source –
Creative Commons

ASCII BINARY TABLE

| Decimal | Binary | Symbol | Description |
|---------|----------|--------|--|
| 32 | 00100000 | | Space |
| 33 | 00100001 | ! | Exclamation mark |
| 34 | 00100010 | " | Double quotes (or speech marks) |
| 35 | 00100011 | # | Number |
| 36 | 00100100 | \$ | Dollar |
| 37 | 00100101 | % | Procenttecken |
| 38 | 00100110 | & | Ampersand |
| 39 | 00100111 | ' | Single quote |
| 40 | 00101000 | (| Open parenthesis (or open bracket) |
| 41 | 00101001 |) | Close parenthesis (or close bracket) |
| 42 | 00101010 | * | Asterisk |
| 43 | 00101011 | + | Plus |
| 44 | 00101100 | , | Comma |
| 45 | 00101101 | - | Hyphen |
| 46 | 00101110 | . | Period, dot or full stop |
| 47 | 00101111 | / | Slash or divide |
| 48 | 00110000 | 0 | Zero |
| 49 | 00110001 | 1 | One |
| 50 | 00110010 | 2 | Two |
| 51 | 00110011 | 3 | Three |
| 52 | 00110100 | 4 | Four |
| 53 | 00110101 | 5 | Five |
| 54 | 00110110 | 6 | Six |
| 55 | 00110111 | 7 | Seven |
| 56 | 00111000 | 8 | Eight |
| 57 | 00111001 | 9 | Nine |
| 58 | 00111010 | : | Colon |
| 59 | 00111011 | ; | Semicolon |
| 60 | 00111100 | < | Less than (or open angled bracket) |
| 61 | 00111101 | = | Equals |
| 62 | 00111110 | > | Greater than (or close angled bracket) |
| 63 | 00111111 | ? | Question mark |
| 64 | 01000000 | @ | At symbol |
| 65 | 01000001 | A | Uppercase A |
| 66 | 01000010 | B | Uppercase B |
| 67 | 01000011 | C | Uppercase C |
| 68 | 01000100 | D | Uppercase D |
| 69 | 01000101 | E | Uppercase E |
| 70 | 01000110 | F | Uppercase F |
| 71 | 01000111 | G | Uppercase G |
| 72 | 01001000 | H | Uppercase H |
| 73 | 01001001 | I | Uppercase I |
| 74 | 01001010 | J | Uppercase J |
| 75 | 01001011 | K | Uppercase K |
| 76 | 01001100 | L | Uppercase L |

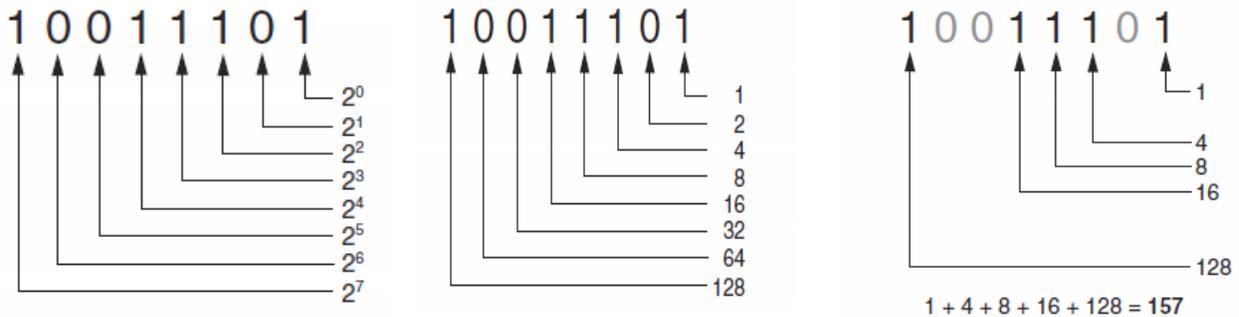
| Decimal | Binary | Symbol | Description |
|---------|----------|--------|--------------------------|
| 77 | 01001101 | M | Uppercase M |
| 78 | 01001110 | N | Uppercase N |
| 79 | 01001111 | O | Uppercase O |
| 80 | 01010000 | P | Uppercase P |
| 81 | 01010001 | Q | Uppercase Q |
| 82 | 01010010 | R | Uppercase R |
| 83 | 01010011 | S | Uppercase S |
| 84 | 01010100 | T | Uppercase T |
| 85 | 01010101 | U | Uppercase U |
| 86 | 01010110 | V | Uppercase V |
| 87 | 01010111 | W | Uppercase W |
| 88 | 01011000 | X | Uppercase X |
| 89 | 01011001 | Y | Uppercase Y |
| 90 | 01011010 | Z | Uppercase Z |
| 91 | 01011011 | [| Opening bracket |
| 92 | 01011100 | \ | Backslash |
| 93 | 01011101 |] | Closing bracket |
| 94 | 01011110 | ^ | Caret - circumflex |
| 95 | 01011111 | _ | Underscore |
| 96 | 01100000 | ` | Grave accent |
| 97 | 01100001 | a | Lowercase a |
| 98 | 01100010 | b | Lowercase b |
| 99 | 01100011 | c | Lowercase c |
| 100 | 01100100 | d | Lowercase d |
| 101 | 01100101 | e | Lowercase e |
| 102 | 01100110 | f | Lowercase f |
| 103 | 01100111 | g | Lowercase g |
| 104 | 01101000 | h | Lowercase h |
| 105 | 01101001 | i | Lowercase i |
| 106 | 01101010 | j | Lowercase j |
| 107 | 01101011 | k | Lowercase k |
| 108 | 01101100 | l | Lowercase l |
| 109 | 01101101 | m | Lowercase m |
| 110 | 01101110 | n | Lowercase n |
| 111 | 01101111 | o | Lowercase o |
| 112 | 01110000 | p | Lowercase p |
| 113 | 01110001 | q | Lowercase q |
| 114 | 01110010 | r | Lowercase r |
| 115 | 01110011 | s | Lowercase s |
| 116 | 01110100 | t | Lowercase t |
| 117 | 01110101 | u | Lowercase u |
| 118 | 01110110 | v | Lowercase v |
| 119 | 01110111 | w | Lowercase w |
| 120 | 01111000 | x | Lowercase x |
| 121 | 01111001 | y | Lowercase y |
| 122 | 01111010 | z | Lowercase z |
| 123 | 01111011 | { | Opening brace |
| 124 | 01111100 | | Vertical bar |
| 125 | 01111101 | } | Closing brace |
| 126 | 01111110 | ~ | Equivalency sign - tilde |
| 127 | 01111111 | | Delete |

HANDOUT: COMPUTER PARTS

Another puzzle piece

Binary to Decimal:

First write out the binary number and then put the power of 2's under that number in ascending order from right to left. Next, calculate the values of the binary digits. For example: the binary number 10011101



To determine the value of a binary number you simply add up the position values of all the 1s. For example, in the binary number 10011101, the position values of the 1s are 1, 4, 8, 16, and 128. The sum of all of these position values is 157 which equal that number in decimal.

If you type the letter "C" with the keyboard, what binary does that equal?

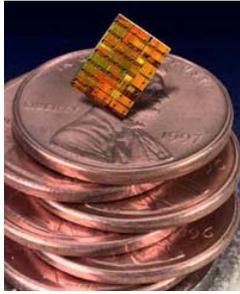
Now calculate the decimal number the computer remembers from that binary number. NO cheating! Don't just copy from the sheet. Instead calculate it out and see if you get the same number.

The *ASCII character set* was developed in the early 1960s, and was eventually adopted by most all computer manufacturers.

ASCII is limited however because it defines codes for only 128 characters. To remedy this, the *Unicode character set* was developed in the early 1990s. Unicode is an extensive encoding scheme that is compatible with ASCII, but can also represent characters for many of the languages in the world.

Today, *Unicode* is quickly becoming the standard character set used in the computer industry.

Process



How does the computer process the input so you understand or get the information you need? How does it know when you press the letter “c” on your keyboard to produce a letter “c” on the monitor?

A microprocessor, also known as a **CPU** or central processing unit serves as the brains for the computer, processing all the information. It coordinates all of the actions of the machine like carrying out instructions, performing calculations, and interacting with all the components used to operate the computer. The microprocessor is the primary work area where information is processed. Software, including your favorite games and other programs you use to write school papers, are actually sets of instructions that you give to the processor.

More importantly, the microprocessor handles the *fetch, decode, and execute* steps of the computer system. To understand how a computer’s processing system works, you will become the parts of the computer and perform the three functions.

Let’s pretend we are a computer! We will need 5 volunteers. Each volunteer will label themselves with one of the five labels below.

| | | | | |
|------|--------------|-----|-----|--------|
| USER | Input/Output | BUS | CPU | MEMORY |
|------|--------------|-----|-----|--------|

First the Rules

1. Each person must follow the rules. If the rules are not followed the computer must be turned off.
2. If an incorrect process is executed, the computer will have to be turned off and restarted over again.
3. All “parts”/processes must stay where they are except for BUS—they are the transporting part so they will be able to move around to deliver the information.
4. USER
 - a. The USER can *receive* information only from Input/Output
 - b. USER can give information only to Input/Output
5. Input/Output
 - a. Input/Output can *receive and give* information from the USER or BUS
6. BUS
 - a. BUS must do whatever *Input/Output* or *CPU* tells them and then returns to their position
 - b. BUS can give information to everyone except the USER
7. MEMORY
 - a. MEMORY can receive and get information only from BUS

READY!

HANDOUT: COMPUTER PROCESS

HUMAN COMPUTER PROCESSING SCRIPT

Start with small groups of five forming either a line or in small groups at desks. If in a line you can start in the "computer off" position by knelling on the floor. If at your desks, they you can start with your heads down. Next, the instructor will give you a piece of information (for example, $2 + 6$).

| | |
|--|--|
| Turning on | <ol style="list-style-type: none"> 1. USER touches Input/Output (softly) to turn on the computer 2. Everyone stands up or picks up head from desk |
| Entering in the first character (for example the number 2) | <ol style="list-style-type: none"> 3. USER picks up a card representing the information (for example the number 2) and gives it to Input/Output 4. Input/Output gives it to BUS 5. BUS gives it to CPU 6. CPU looks at and gives back to BUS 7. BUS runs to Memory and gives MEMORY the information and then runs back to his/her station |
| Entering in the function you want the computer to carry out (for example, +) | <ol style="list-style-type: none"> 8. USER picks up the information function card (for this example the "+" card) and gives it to Input/Output 9. Input/Output gives it to BUS 10. BUS gives it to CPU and goes back to his/her station 11. CPU keeps the card |
| Entering in the Second character (for example the number 6) | <ol style="list-style-type: none"> 12. USER picks up another card representing the information (for example the number 6) and gives it to Input/Output 13. Input/Output gives it to BUS 14. BUS gives it to CPU 15. CPU this time keeps the information 16. BUS runs to Memory and gets the first card of information (the number 2) 17. BUS gives the card of information (the number 2) to CPU |
| Carrying out the function (answering the equation) | <ol style="list-style-type: none"> 18. CPU looks at both cards of information (2 and 6) and the function card (+) and writes the answer down on another card 19. CPU gives the answer card to BUS 20. BUS gives the answer card to MEMORY and goes back to his/her station |

*Which computer part or process determines the next step?
 Which computer part or process does all the "running around"?
 Which computer part or process does the calculations?*



HANDOUT: COMPUTER PARTS

Storage

Computers have two types of storage: temporary and long-term storage.

Look at the storage parts found with your computer kit.

Output

After the input, processing and storage, the computer is finally ready to display the information that it has been processing-the output. A computer outputs information by using tools like a monitor, printer, and speakers.



An 8 GB Flash Drive is equal to 8000 thick books or 4,000,000 pages.



Long Term Memory

Hard drives, CD-ROMs, floppy disks, and Flash drives are examples of long-term storage devices that keep information whether the computer is on or off.

ROM or Read Only Memory holds important information that the computer needs each time it runs.

Short Term Memory

RAM or Random Access Memory is a type of temporary storage that stores

How would you explain to your friend or parent the statement, “a computer processes information similar to how a human processes information”?

Information Security Analysts, Web Developers, and Computer Network Architects

Information security analysts, web developers, and computer network architects all use information technology (IT) to advance their organization's goals. Security analysts ensure a firm's information stays safe from cyberattacks. Web developers create websites to help firms have a public face. Computer network architects create the internal networks all workers within organizations use.



EDUCATION

Most of these jobs require a bachelor's degree in a computer-related field. Information security analysts and network architects usually need experience in a related occupation, and additional knowledge of web programming languages can be helpful for web developers.

WHERE THEY WORK

Many are employed in computer systems design and related services firms. Most information security analysts, web developers, and computer network architects work full time.

Information security analysts plan and carry out security measures to protect an organization's computer networks and systems. Their responsibilities are continually expanding as the number of cyberattacks increase.

Computer network architects, or network engineers, design and build data communication networks, including local area networks (LANs), wide area networks (WANs), and intranets. These networks range from a small connection between two offices to a multinational series of globally distributed communications systems. Network architects must have thorough knowledge of an organization's business plan to design a network that can help the organization achieve its goals.

Web developers design and create websites. They are responsible for the look of the site. They are also responsible for the site's technical aspects, such as performance and capacity, which are measures of a website's speed and how much traffic the site can handle. They also may create content for the site.

WHERE TO FIND OUT MORE

United States Department of Labor, Bureau of Labor Statistics <http://www.bls.gov/home.htm>

WHAT'S THE SALARY?

2010 Median Pay is \$75,660/year

JOB OUTLOOK, 2010-2020?

22% (Faster than average)

WHAT COURSES DO I TAKE?

- Programming (C & C++, Java, Perl)
- Cyber Security
- Network Security
- Computer Forensics
- Operating Systems/UNIX/Linux
- Database Administration/Oracle
- Number Theory

Computer Science
Engineering
Cybersecurity/IA
Networking
Certification Training