

Monday, January 28, 2019

- Word of the Day
 - Modularity: Splitting a problem into a series of self-contained modules
 - Benefits:
 - Modules are reusable
 - Easy to understand and maintain modules
 - World Wide Web (WWW)
 - Internet: Networks to connect devices
 - Web: Protocols for sharing info through websites
 - Webpages: A document that contains or references data
 - Uniform Resource Location (URL)
 - Hypertext Markup Language (HTML)

Wednesday, January 30, 2019

- FSB: Front Side Bus
- Word of the Day
 - Hierarchy: An organizational structure where items are ranked by importance
 - Memory Hierarchy
 - Cache (Volatile)
 - RAM (Volatile)
 - Hard Drive
 - Tape

Monday, February 4, 2019

- Computer Systems
 - Hardware: Physical parts
 - Software
- History of Computing
 - Abacus (16th Century BC)
 - Blaise Pascal
 - 17th century mathematician who made a gear-driven addition and subtraction calculator for whole numbers
 - Joseph Jacquard
 - 18th century French inventor of Jacquard's Loom which could read punch cards
 - Charles Babbage
 - 19th century English mathematician who created, but never built, an analytical engine
 - Ada Augusta
 - 19th century English mathematician/author, credited as the first programmer
 - Dr. Herman Hollerith
 - 19th century US census worker who created the electro-mechanical tabulator
 - Harvard Mk. 1

- Built by IBM, 765K components, 3M connections, 500 miles of wires and 3500 relays
- ENIAC (Electronic Numerical Integrator and Calculator)
- UNIVAC (Universal Automatic Computer 1)
- Computer Generations
 - First (1951-1959)
 - Vacuum Tubes
 - Card Readers
 - Magnetic Drum
 - Second (1959-1965)
 - Transistor
 - Magnetic Disk
 - Magnetic Cases
 - Third (1965-1971)
 - Integrated Circuits (IC)
 - Memory Transistors
 - Terminals
 - Fourth (1971-Now)
 - Large-Scale ICs

Wednesday, February 6, 2019

- Software
 - First Generation (1951-1959)
 - Machine Language
 - Binary files
 - Assembly Language and Translators
 - Code written with mnemonics which were translated into machine language
 - Programmer Changes
 - Programmers divided into systems programming and application programming
 - Second Generation (1959-1965)
 - Transistor, magnetic cores, magnetic disks
 - Third Generation (1965-1971)
 - System software, utility programs, language translator, assembler, and compiler
 - Operating System
 - Fourth Generation (1971-1989)
 - Structured programming, Pascal, C++
 - New application softwares, spreadsheet, word processing, databases
 - Fifth Generation (1990-Present)
 - Microsoft
 - Object-Oriented Design, Java
 - WWW, HTML, PHP, Javascript

- Alan Turing (1912-1954)
 - British mathematician who invented the idea of a turning machine, turing compatibility, the turing test, and turing award
- Word of the Day
 - Abstract: A model which removes complex details

Monday, February 11, 2019

- Number Systems
 - Natural Numbers: The number 0 and any number obtained by repeatedly adding 1 to it (all positive ints); $\{0, 1, 2, \dots\}$
 - Integer Number: A natural number or its negative; $\{\dots, -2, -1, 0, 1, 2, \dots\}$
 - Rational Number: An integer or the quotient of two integers
 - Irrational Number: All the real numbers which are not rational numbers
 - Prime Number: A natural number >1 with no factors other than 1 and itself
 - Base: A number which dictates the foundation of a number system
 - Positional Notation
 - Ex. $642 = 6 * 10^2 + 4 * 10^1 + 2 * 10^0$
- Word of the Day
 - Generalization: The formulation of general concepts from specific instances by abstracting common properties

Wednesday, February 13, 2019

- Positional Notation
 - Ex. $5F_{16} = 5 * 16^1 + F * 16^0 = 95$
 - Ex. $1178_{10 \rightarrow 6} = 1178/6 = 196r2, 196/6=32r4, 32/6=5r2, 5/6=0r5$ so $1178_{10}=5242_6$
- Word of the Day
 - Convention: Agreed upon way of doing things, decided by a community
 - Syntax Error: A violation of syntax (grammatical rules) of a natural or programming language
 - "You is going to the game tonight."
 - Semantics Error: A violation of the rules of the meaning of a natural or programming language
 - "My TV is driving my car to UNR."

Monday, February 18, 2019

- Presidents Day (No Class)

Wednesday, February 20, 2019

- Binary to Octal
 - Ex. $001101011101_2 \rightarrow 001\ 101\ 011\ 101 \rightarrow 1535_8$
- Binary Addition
 - Ex. $1011+1110=11001$
- Data Representation
 - Data is stored in binary as bits (b)
 - Analog vs Digital
 - Computers cannot store analog data, so it must be digitized
- Data Compression

- Reduction in the amount of space needed to store a piece of data or the bandwidth to transmit it
- Compression Ratio: The size of the compressed data over the size of the original data
- Can be lossless, data can be retrieved without loss of information, or lossy, some information may be lost

Monday, February 25, 2019

- Representing Numbers
 - Negative Numbers
 - One method is reserving the left-most bit as a sign bit
 - Complement
 - Ex. Complement of $99_{10} = -1_{10}$ assuming the number system range is $(-100, 100)$
 - 10's Complement: $\text{Complement}(i) = 10^k - i$
 - Ex. $15 - 11 = 4 \implies 15 + (10^2 - 11) = 15 + 89 = 104 \% 100 = 4$
 - 2's Complement: $\text{Complement}(i) = 2^k - i$
 - Ex. $10101 - 1010 \rightarrow 10101 + (2^5 - 1010_2) \rightarrow 10101 + (100000 - 1010) \rightarrow 10101 + 10110 = 01011$
 - Real Numbers: Numbers with a decimal
 - Ex. $1.1_{10} \rightarrow_2 = 0.1 * 2 = 0.2 * 2 = 0.4 * 2 = 0.8 * 2 = 1.6 \rightarrow 0.6 * 2 = 1.2 \rightarrow 0.2 \dots = 1.0001100011\dots_2$
 - Floating Point
 - Sign * mantissa * 10^{exponent} for base 10
 - Represented in binary as 32b:
 - $[\text{sign}(1b)][\text{exponent}(8b)][\text{mantissa}(23b)]$
 - Representing Text
 - ASCII (American Standard Code for Information Interchange)

Wednesday, February 27, 2019

- Text Compression
 - Run Length Encoding
 - Ex. bbbbbbjjjjllqqqqq+++++ \rightarrow *b8jjjjll*q6*+5 (Compression ratio = $15/25$, 15=compressed size (length in chars), 25=original size)
 - Ex. *x4*p4l*k7 \rightarrow xxxppppplkkkkkkk
 - Huffman Encoding
 - Using a variable-length binary string to represent a character so that frequently used characters have a short code
 - An example of prefix coding, no character's bit string is the prefix of any other character's bit string
 - To decode, look for a match from left to right, bit by bit

Wednesday, March 6, 2019

- Lossless Text Compression
 - Keyword encoding

- Run-length encoding
 - Huffman encoding
- Representing Audio Information
 - Analog audio signal can be digitized by sampling (measuring the voltage) and then quantizing (converting the voltage measurement to bits) it
 - 40,000 samples per second is standard
 - Analog data is a continuous representation while digital is discrete
- Representing Images and Graphics
 - Color is expressed as an RGB value

Wednesday, March 13, 2019

- Digitizing Photos
 - Pixels
 - Resolution
 - Raster Graphics
 - Vector Graphics
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