

2: hardware

Thursday, January 6, 2022 10:51 PM

Announcements:

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Intro

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Goals (1)

- Appreciate the value of an inclusive learning environment, and the steps you can take to maintain it.
- Gain a basic understanding of the components of a computer, and how they interact:
 - Input and output devices
 - Central Processing Unit
 - Storage
 - Programs
- Know the definition and purpose of **algorithms** and **pseudocode** and how they fit into the software development process.

This course: basics of programming is a new way of thinking and solving problems

Useful as a CS professional

Useful as a citizen of a digitally connected world

Filling out Grid

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Let's focus on these parts for today's class: (fill out blank copy in breakout rooms)

Type	How it works by itself	How it interacts with other parts	Measured
Memory RAM	Electricity or no electricity allows binary (1 and 0). Everything erased when power gone. That's why you lose your work if power goes out	Really fast! Used as a 'whiteboard' short term scratch pad	GB (gigabytes) GiB (Gibibytes) where One gibibyte equals 1.074 gigabytes. (amount) Megahertz MHz (speed) 16 Gb typical (what do some of you have?) (actually really interesting story! Not enough time in class but google it.)
Storage HDD	Two kinds: Platters that use magnets to store information Solid State Drives (SSD) electron traps Each space in storage has a numbered name Storage is persistent - even if computer turned off	Slow, but permanent. Like a notebook. Most work done in RAM and saved to disk periodically (that's why you can lose your work when you don't save) Files which are deleted are flagged for overwriting (that's why you can sometimes recover a deleted file)	GB (gigabytes) GiB (Gibibytes) where One gibibyte equals 1.074 gigabytes. Or Terabytes where 1000GB = 1TB (also TiB)
Processor CPU	Central Processor Unit. Uses electricity to do math and logic. Enough math and logic and you can do anything.	Uses RAM to hold working memory, sends stuff to HDD as needed	Gigahertz, where each hertz is one math operation a clock cycle GHZ and Cores (2 to 8 common)

Type	How it works by itself	How it works with other parts	Measured (bigger? Faster?)
Memory RAM (random access memory)	Electricity or no electricity No power? No data!	REALLY fast! Use as a whiteboard	GB (gigabyte) GiB (Gibibytes) One GiB = 1.074 GB MHz Megahertz (speed)
Storage HDD (Hard disk drive) SSD (solid state drive)	HDD magnetic platters SSD electron traps	Slow but persistent	GB or GiB TB TiB 1000 GB == 1 TB
Processor CPU Central processing unit	Uses electricity to do math and logic	Brain : uses RAM to hold working memory and sends stuff to HDD as needed	GHz Cores

Exploring parts

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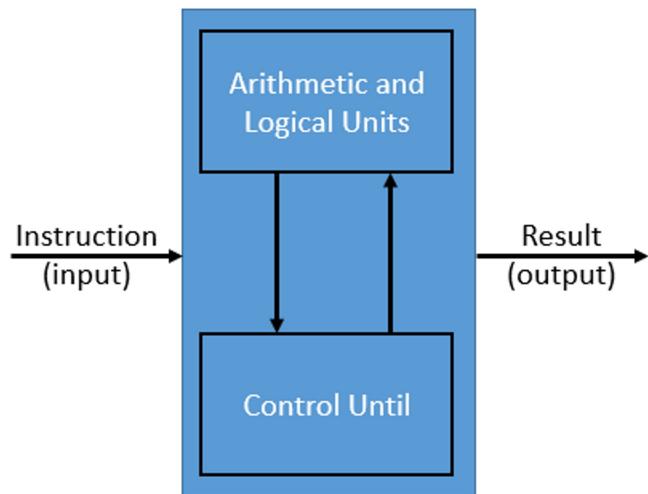
Pc part picker. com/ list

5-10 min to build a computer in breakout rooms

CPU

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CPU – The “brain” of the computer



Q: What does a CPU “do”?
Q: How does a CPU work?

The hardware/circuitry component of “how” a computer does “stuff” you’ll learn about when you take CSCI247 ... for the time being, just appreciate that there’s lots of “stuff” going on

Multiply 3 by 4, save in total

add 2 to total
print total to screen

- 1. fetch next instruction
 - 2. decode instruction (CSCI247)
 - 3. Execute instruction
- repeat
- (Yes this is a Simplification)

(Yes this is a Simplification)

CPU processes strictly in order

Data in memory may change with each instruction!
(More super interesting details in future classes!)

Art and Science

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Programming is an art and a science

Art

Creatively crafted
People's experiences
Many different solutions

Create new things



(in breakout room slides)

AB poll

Science

Science

Strict rules

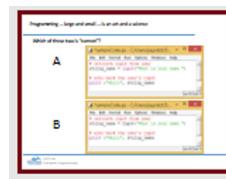
Correctness

Some Solutions

are better

(efficient, less buggy)

Explore existing things



(in breakout room slides)

AB Poll

Both
understand a problem
design a solution
in 14L with writing code

Syntax review

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#ignore

hashtag ignore?

No: Comment

#comment

Notes, explanations, code that doesn't work that you don't want active

Print("Hello world!")

input ("tell me a secret")

Print("I'll never tell!")

asked for input without saving it (so secret is safe!)

Computer does things } How?
Saves things }

doing things → we tell it what with

Code

Programs

Software

which runs on hardware

So we need to understand it!

what do you know about hardware?

(link to grid) ok if you can't fill this out yet!

Breakout rooms of 3 for 3 min

Breakout rooms or 3 for 3 min

Look at computers at costco.com for help

Algorithms and Pseudocode

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Alice Gorilla Rhythm
(explain each part)

AI - Gor - Ithms (spell on board)

Tell story of ALice, who wanted to dance with a powerful GORilla, but to do it she needs RITHM. She needed to follow certain steps very carefully. All Algorithms are careful sets of steps.



Before careful series of steps
(syntax)

You have a rough plan

#Pseudocode

↳ draft outline

blueprint

Human readable

Multiply 3 by 4, save in total

```

# Multiply 3 by 4 , Save in total
total = 3 * 4
# add 2 to total
total = total + 2
# Print total to screen
Print(total)

```

Always start w/ pseudocode!

Decide what you
want to do
Before figuring out
the syntax

Task : Write pseudocode for a program that prompts a user for non-negative integers. If a user inputs a negative number, the program ends and outputs the sum of the input positive integers

As "humans" this is an "easy" task ... but remember that a computer program is executed on a computer that follows instructions EXACTLY as they are supplied to the CPU

Pseudocode exercise

(3 minutes)

Possible pseudocode

1. Prompt user to enter first number
2. Save the first number into "memory"
3. Set sum to be the first number
4. Prompt user to enter another number
5. Save the number into "memory"
6. Increment the sum by the number in memory
7. Repeat Steps 4-6 until user enters -1
8. Print the sum

(work
this)

We'll learn all
this syntax!

How to do well in the class

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ABCD Cards - practice

Q1 : Which of the following statements is TRUE

- A. Attending lecture and listening to Dr. Hardin talk about this-and-that awesome CS stuff is enough to guarantee an A in CSCI141 ... and besides the lecture slides are self contained
- B. Practice, Practice, Practice makes imperfect
- C. $1 + 1 = 3$
- D. In order to succeed in CSCI141, I should attend lecture, labs, form study groups, start homework assignments as soon as they are made available, practice, practice, and practice, and ... yes, ... , more practice

Computers are Hardware and Software

Processing and Storage
(do “something” with the data)



CPU



Main memory



Secondary Storage Devices

Q: The CPU is the _____ of the computer?

A	B
C	D

- A : offspring
- B : stomach
- C : brain
- D : circulatory system

Computers are Hardware and Software

Processing and Storage
(do "something" with the data)



CPU



Main memory



Secondary Storage Devices

Q: CPU is an acronym for _____?



- A : Computer Person User
- B : Central Pituitary Unit
- C : Central Processing Unit
- D : Central Processing Under

Next class

Lab 1

What is plagiarism in
programming, anyway?

Variables

Data types

Etc.