



Computer Parts and Performance

Lecture Objectives:

- 1) List the 5 classical components of a computer and show their relationships graphically.
- 2) Define instruction set architecture. *A*
- 3) Define throughput and response time. *-*
- 4) Explain the relationship between user CPU time and System CPU time.
- 5) Define the relationship between CPU execution time, CPU clock cycles, and Clock rate.
- 6) Given the average CPI for instruction classes, determine which implementation will execute faster.
- 7) Given an instruction profile, calculate the average CPI for the program.

Cycles Per Instruction

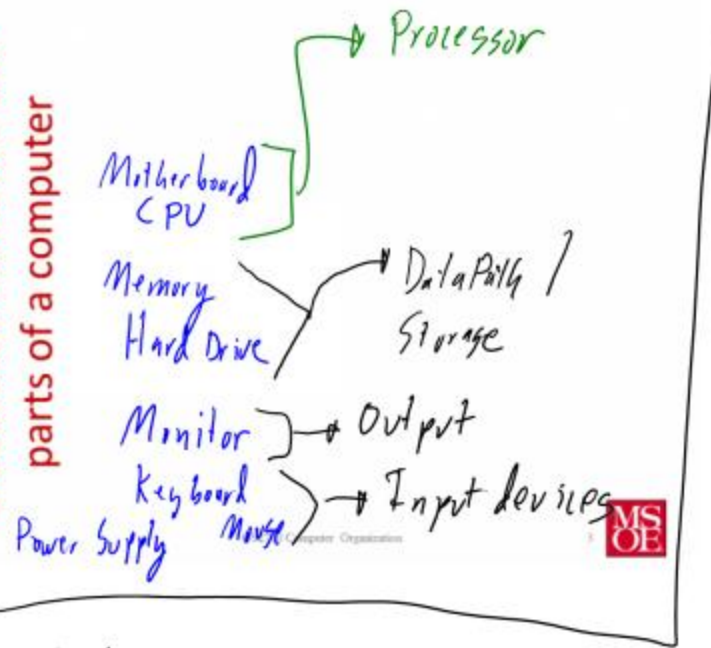
Homework Problems

- Exercise 1.3
- Exercise 1.4
- Exercise 1.5

*Submit
on Friday @
Start of class.*

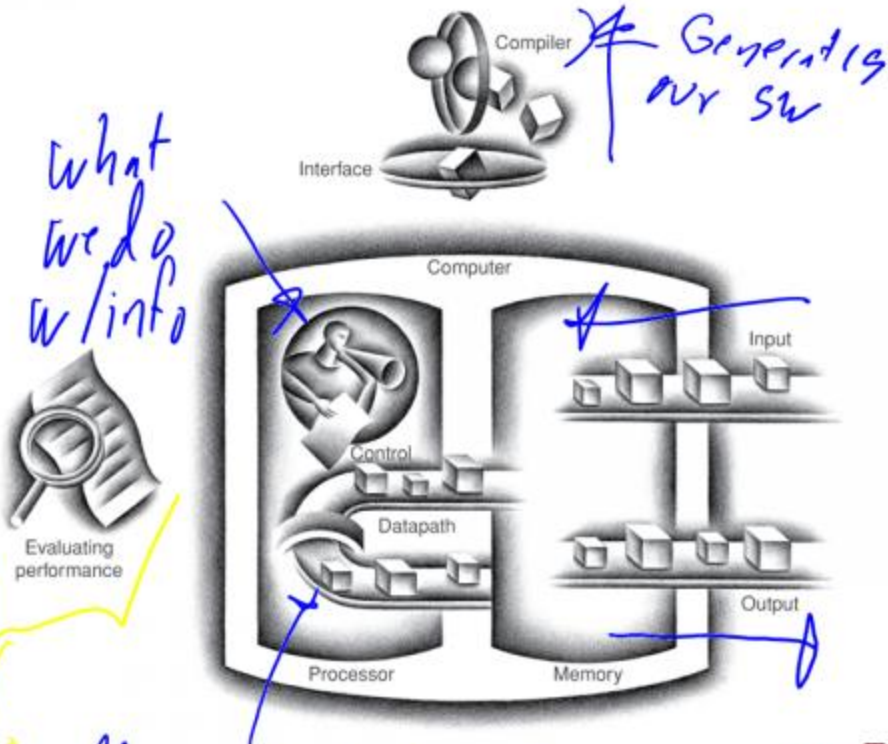


Discussion: What are the parts of a computer



Software \Rightarrow Programs that run on
the computer \Rightarrow Control

The organization of a computer



What we do w/info



What do we need?

Movement of info in the computer

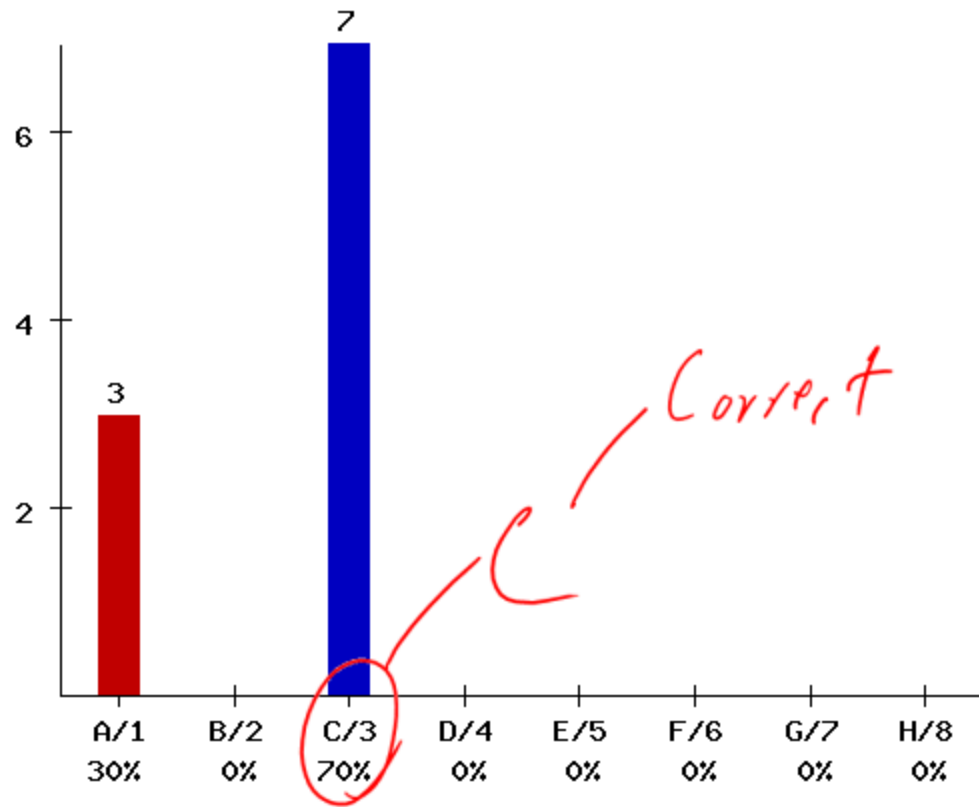


Survey Question

- The smallest individual element of a picture is called a

- a) Bit *Smallest storage unit in memory.*
- b) Bit map
- c) Pixel *Defines the resolution of an image.*
- d) Coordinate
- e) Liquid crystal

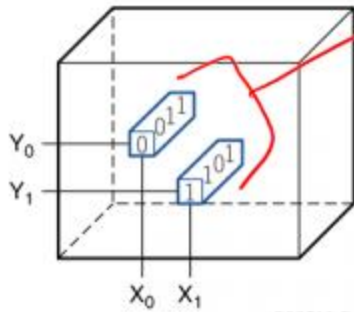
Location on a screen



An LCD screen

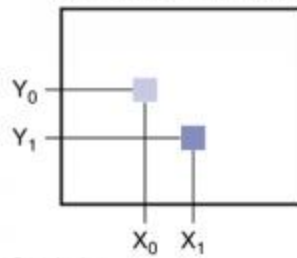


Frame buffer



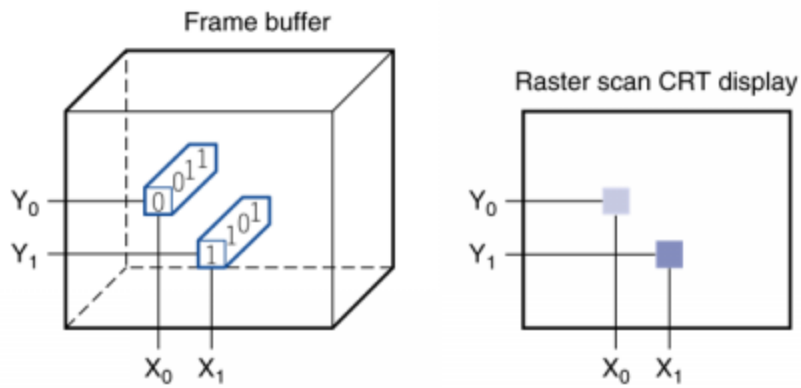
Represent the color being shown

Raster scan CRT display



LCD screen: picture elements (pixels)

- Mirrors content of frame buffer memory



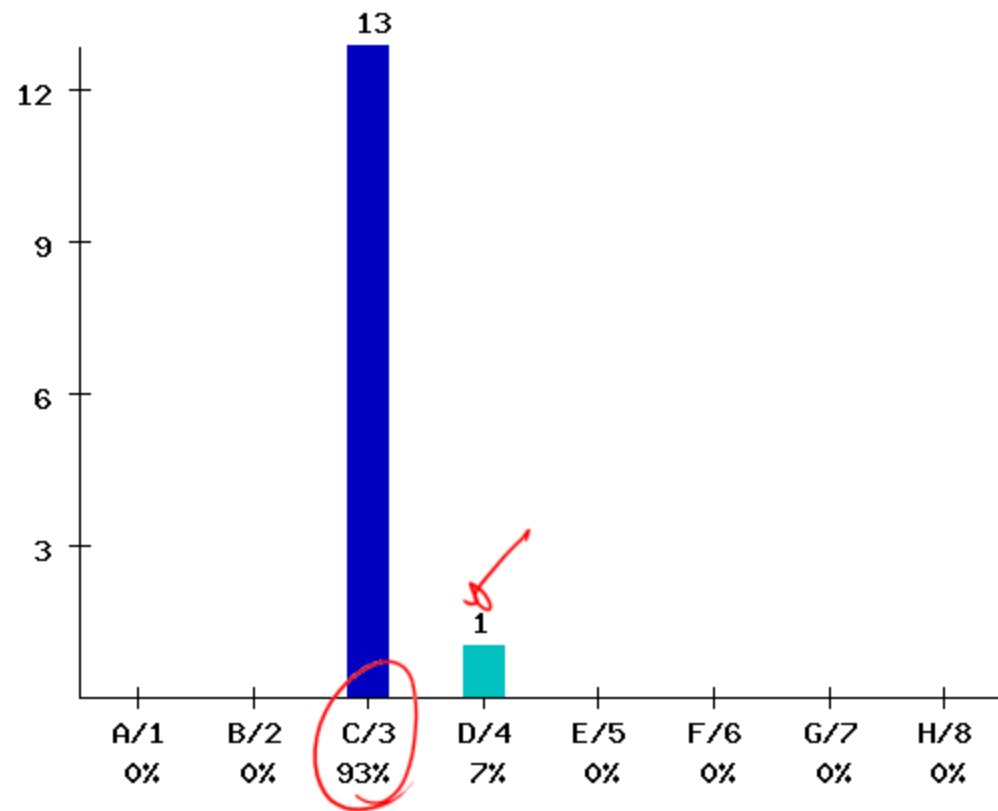
Survey Question

- The _____ is where the programs are kept when executing and also contains the data necessary to execute the program.

Lives on

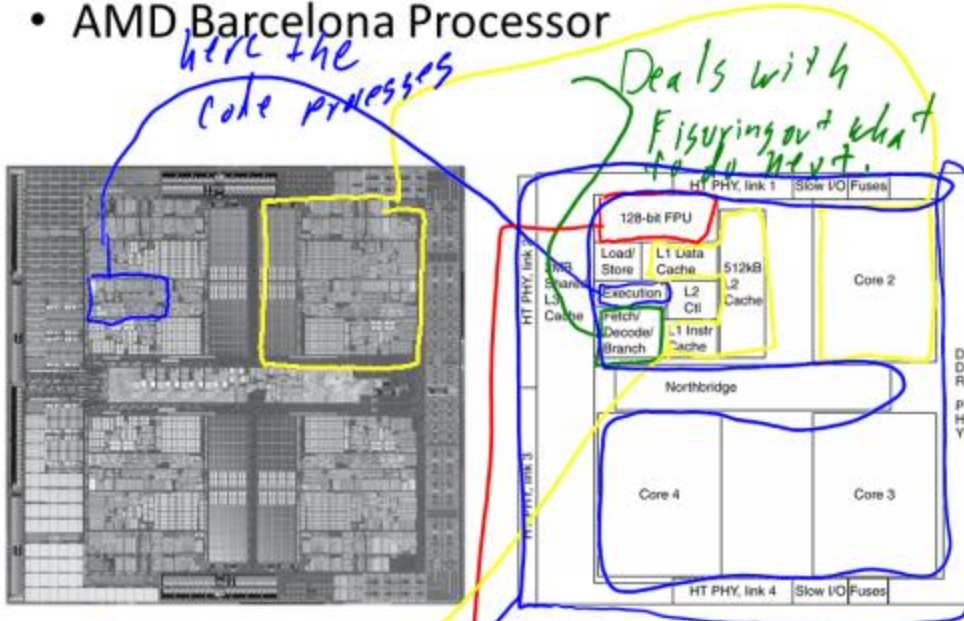
- a) Motherboard
- b) Active matrix display
- c) Memory
- d) CPU
- e) controlpath

Where the program is processed.



Inside of the processor

- AMD Barcelona Processor



here the code processes

Deals with figuring out what to do next

"Memory Interfacing"

Floating point Unit



Instruction set architecture

- An abstract interface between the hardware and the low level software

↳ How do write
the lowest level of
code.

$y = y + 2;$

load R1, y

load R2, 2

Add R1, R2

Store y, R1

Load R1, y

Addi R1, 2

Store y, R1

Measuring Performance

- You are evaluating lawn cutting. Which are you more concerned about, how long it takes to cut a lawn or how many lawns can be cut in a given amount of time?

↳ Maybe...



Throughput and Response

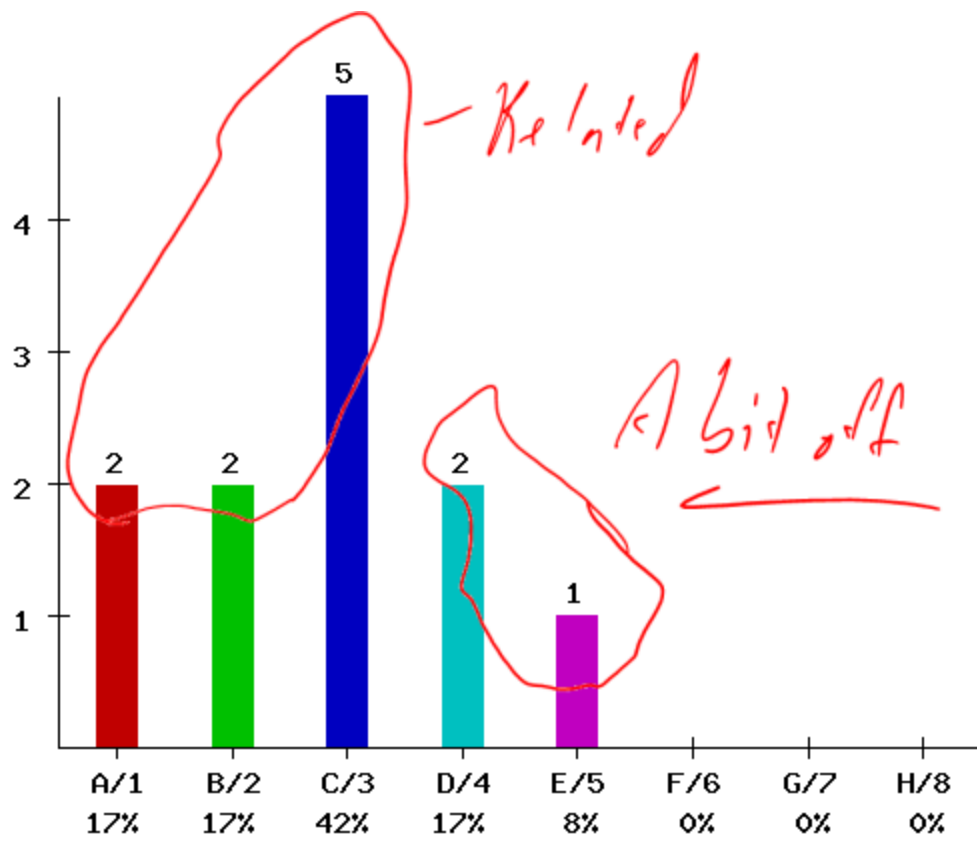
Time

- Response Time (Execution Time)
 - The total amount of time required for a computer to complete a task
- Throughput
 - The number of tasks completed per unit of time.

Amazon.com

Measuring Performance

- The time the CPU spends executing a specific program is
 - a) CPU time
 - b) User CPU Time
 - c) System CPU Time
 - d) Elapsed time
 - e) Wall time



What governs CPU performance?

$$CPU_{ExecutionTime} = CPU_{ClockCycles} \times ClockCycleTime$$

↑
Time to run a program

↑
of cycles for the instruction

↑
inverse of the clock frequency



CPI

- CPI
 - Clock Cycles per instruction ✓
 - The average number of clock cycles a given instruction takes to complete
 - Allows us to compare two different implementations of a system

