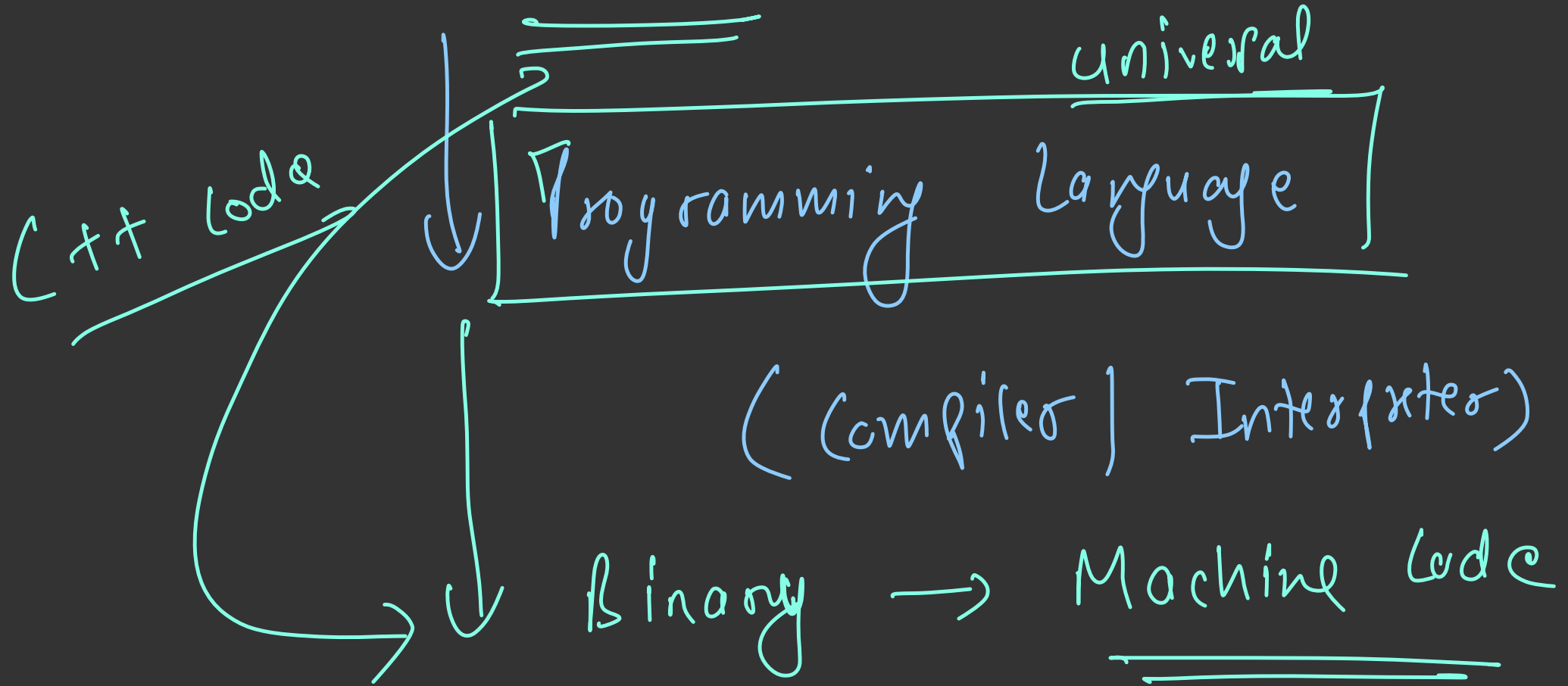# Introduction to Programming

What is programming?

- You give a set of instructions to the computer

- The computer executes all instructions in a specific order

- There should be enough information for the computer to decide what to do in all situations

- These instructions or steps are called a program or code

- Does computer understand English? → ? No

  - Programming language — Binary 0101010

  00011001100

Set of instructions (Thinking)

universal

C++ code

Programming Language

(compiler | Interpreter)

Binary → Machine Code

Tu   Tum   Aap → You

Programming Lang

Real world
Languages

Machine
Code

✗ ① Coming up with   instructions

✓ ② Converting these into Prog lang

Some Issues ‼️

- What if you don't give the instructions correctly?
- What if some instruction fails? while running (runtime error)
- What if even after correct execution you get wrong result? (logical error)
- What if it takes too long to complete the instructions? (time limit exceeded)
- What if it takes too many resources to complete the instructions?

what if the instructions don't follow a syntax

memory limit exceeded

first add

$$2 + (2 \times 3)$$

first multiply

8

12

$$4 / (4 - 4) \longrightarrow \text{runtime error}$$

$$(2 + 2) \times 3 \; \# \; ---$$

$$(2) + (2 \times 3) =$$

0 1 2 3 4 5 7 8 9 10 11 12 13

14 15 16 17 18 19

Time Complexity

$$4N = \frac{N}{2}$$

Cache → [riyaush.tret]

Cache

RAM

HARD DISK
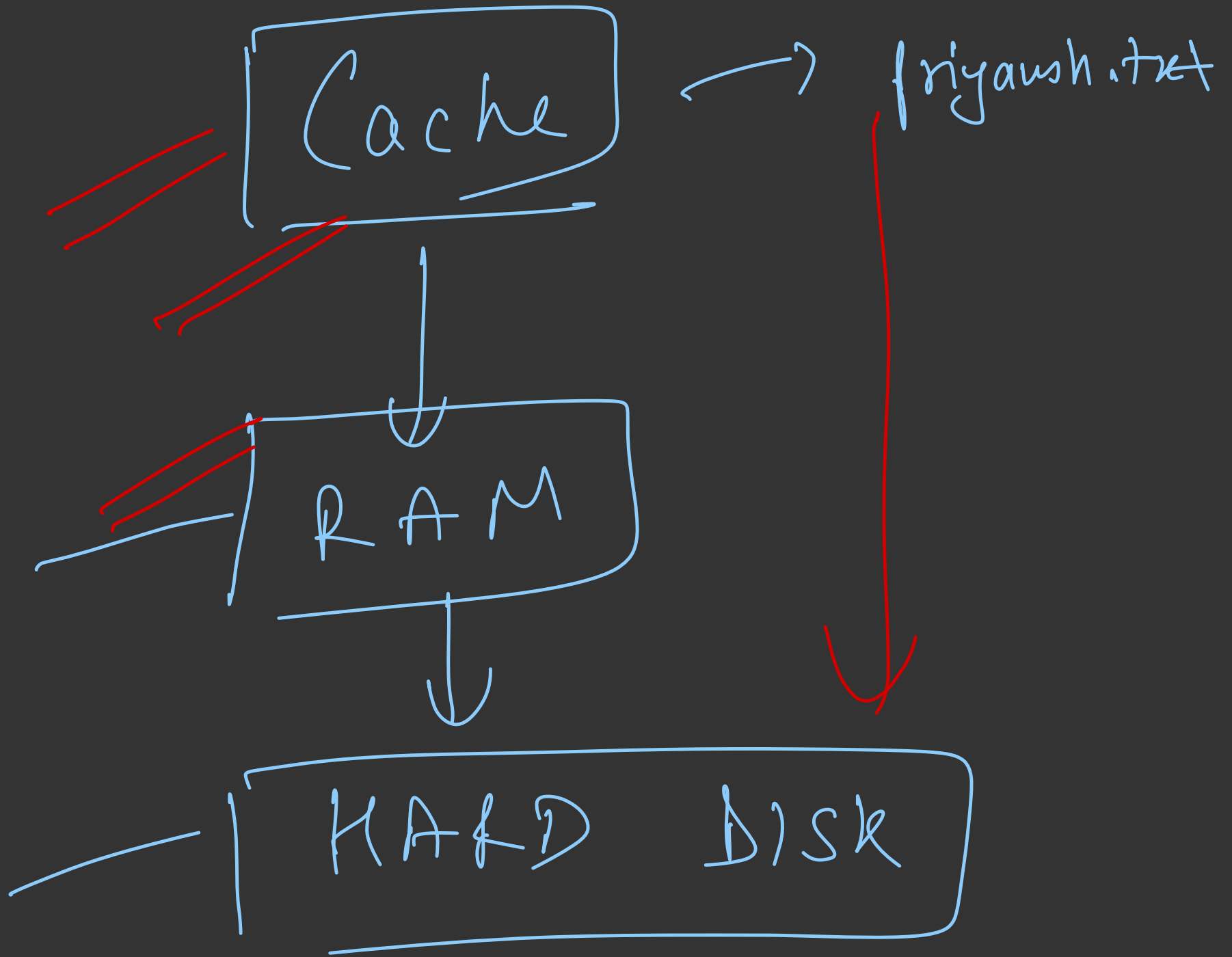
More memory / resources

lower time

$$\text{memory} \propto \frac{1}{\text{time}}$$

Programming Language

- Why so many programing languages?

- Does it matter which one you learn first?

- How easy it is to switch between languages?

C++ > Java > Python

Competitive Programming

- Many people competing to
  - Write the code that gets executed fastest (within a threshold)
  - Write the code that uses minimum resources
  - Do this faster than others
- How is it different from normal programming?
- Best programming language CP
  - C++
- How is competitive programming useful?

$$[1 \quad 2 \quad 3 \quad 4 \quad 5 \quad \text{------} \quad 10^9]$$
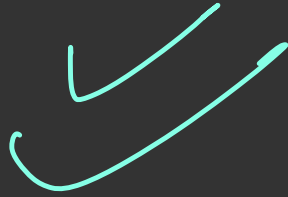
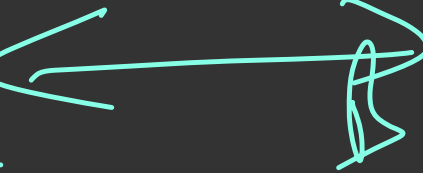6   100   120

6   is   present   or   not

Yes / No

Efficiency ✓

$\boxed{1s}$

A $\boxed{429\,ms}$ ⟷ $\boxed{450\,ms}$

10min   5min