Computer Science Mid-Term Note

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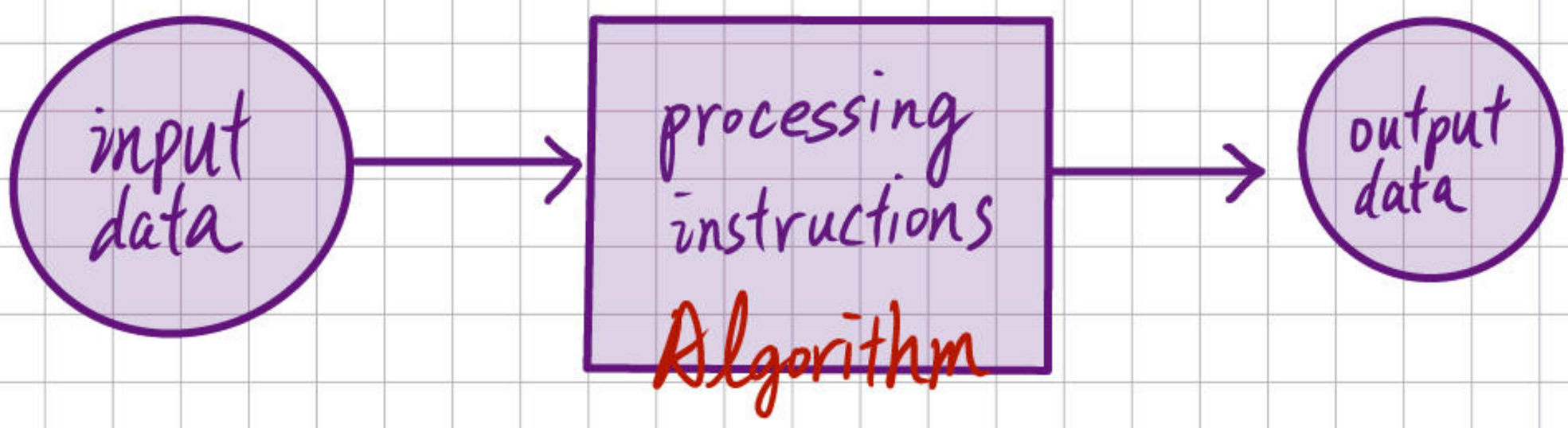
Chapter 8 : Algorithms

Definition :

An order of set of unambiguous steps that produces a result and terminates in a finite time.



※ Three constructs for an algorithm

```
step 1
step 2
  ⋮
step n
```

sequences

```
if (condition) {
  // true actions
} else {
  // false actions
}
```

decision

```
while (condition)
{
  // actions
}
```

repetition

Rrepresentations :

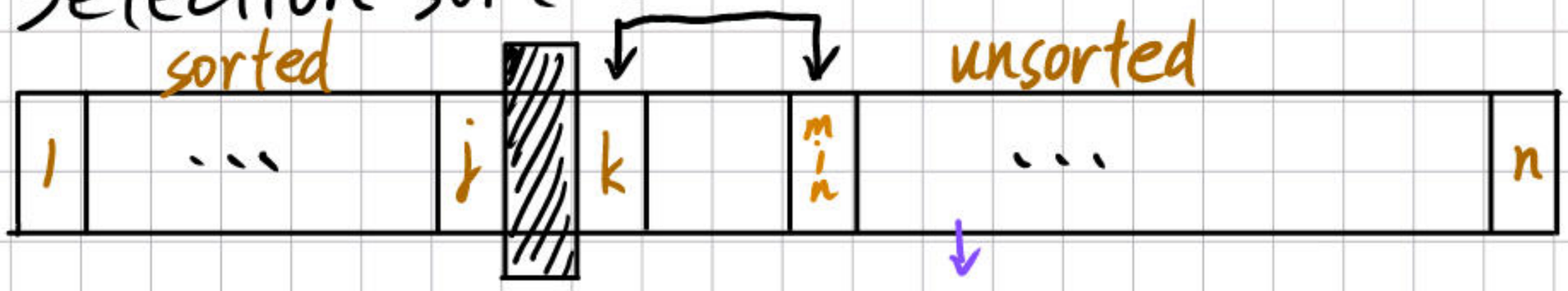
1. UML diagram
2. Pseudocode

Basic Algorithms :

summations / products / smallest and largest/
sorting / searching

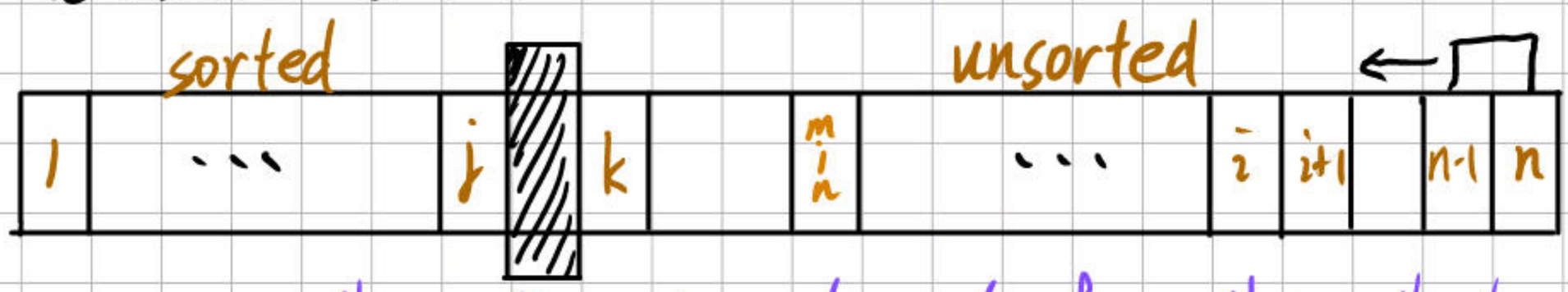
Sorting Algorithms :

1. Selection sort :



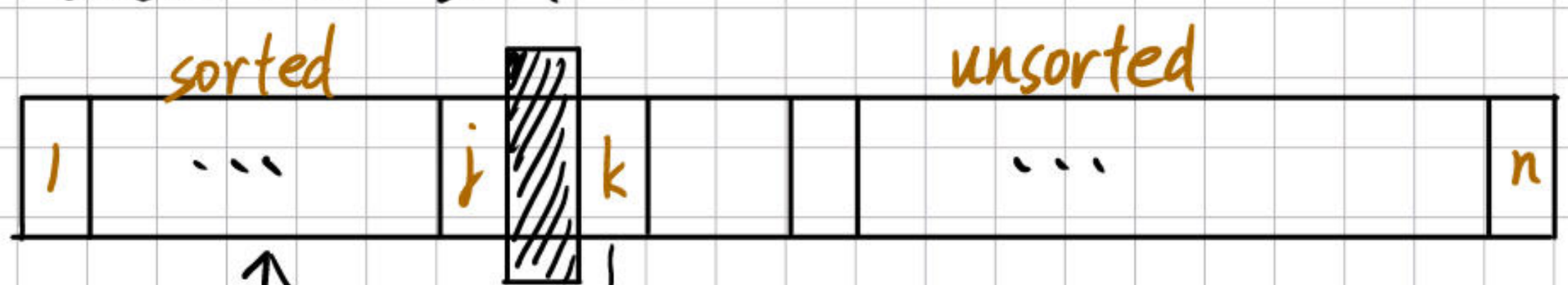
swap the smallest element in the unsorted array with the kth element and move the wall one element ahead

2. Bubble sort :



compare the adjacente elements from the nth element in the unsorted array, if the i th element is greater than the i+1 th element, swap them and move down to the i-1 th and i th element. If hit the wall, the minimal will be moved to the k th position.

3. Insertion sort :



Insert the first element of the unsorted array to the proper position in the sorted array.

Searching Algorithms:

1. Sequential search:

Traverse the entire array until reaching the target or the end of the array.

2. Binary search: (the array must be sorted)

Test the element at the middle of the array. If it's larger than the target, discard half the array on the right, otherwise, discard the other. Then binary search the remaining.

Recursion:

Recursion is a process in which an algorithm calls itself.

eg. Binary search

Chapter 9 : Programming Languages

Machine Languages :

Machine language is the only language understood by a computer.

It is binary code representing electronic switches with two states : on (1) / off (0).

Different hardware has its own machine language, and it's tedious to write and difficult to find errors.

Assembly Languages :

Assembly replaces the binary code for instructions and addresses with symbols or mnemonics.

High-Level Languages :

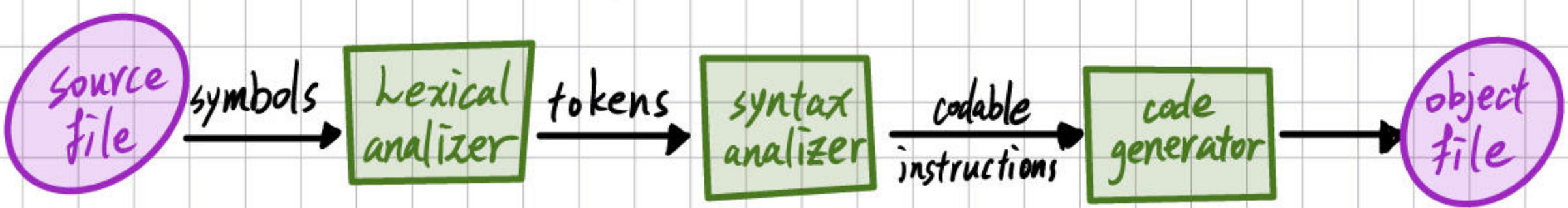
High-level languages are English-like languages that are portable to different devices.

The process of translating high-level languages to machine code is called interpretation or compilation.

Compilation transfer the source code to the object code.

Interpretation translate and execute one line of the source code at a time.

Translation Process :



Language Styles :

1. Procedural : define procedures and call (invoke) it to execute the pre-defined actions

2. Object-Oriented : define classes and their methods. Make instances and manipulate them as objects that have methods.

Common concepts :

identifiers, data types, variables, literals, constants, I/O, expressions, statements, subprograms (functions).....

Chapter 10 : Software Engineering

Analize → Design → Implementation → Testing

Analize what the software will do.

Designment how it should be done.

Write code.

Test the program and maintain.

Chapter 11 : Data Structure

Arrays :

An array is a sequence of elements of the same data type.

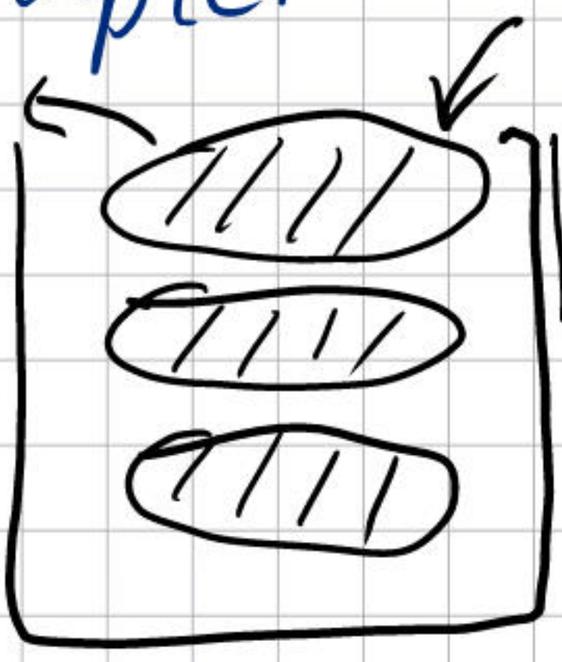
Records :

A record is a collection of related elements, possibly of different types.

Linked-Lists :

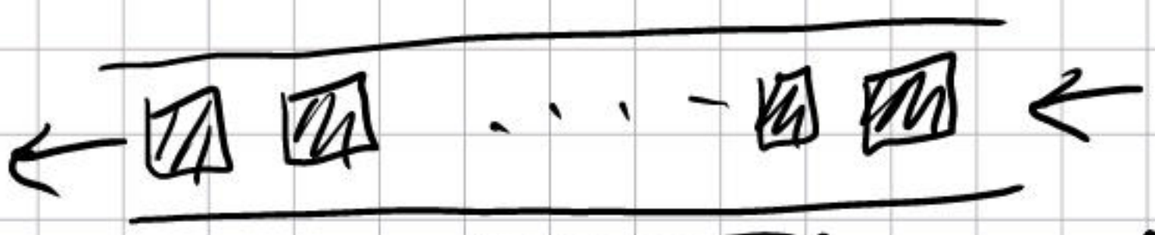
A linked-list is a collection of data in which each element contains the address of the next element.

Chapter 12 : Abstract Data Types



LIFO → last in, first out.

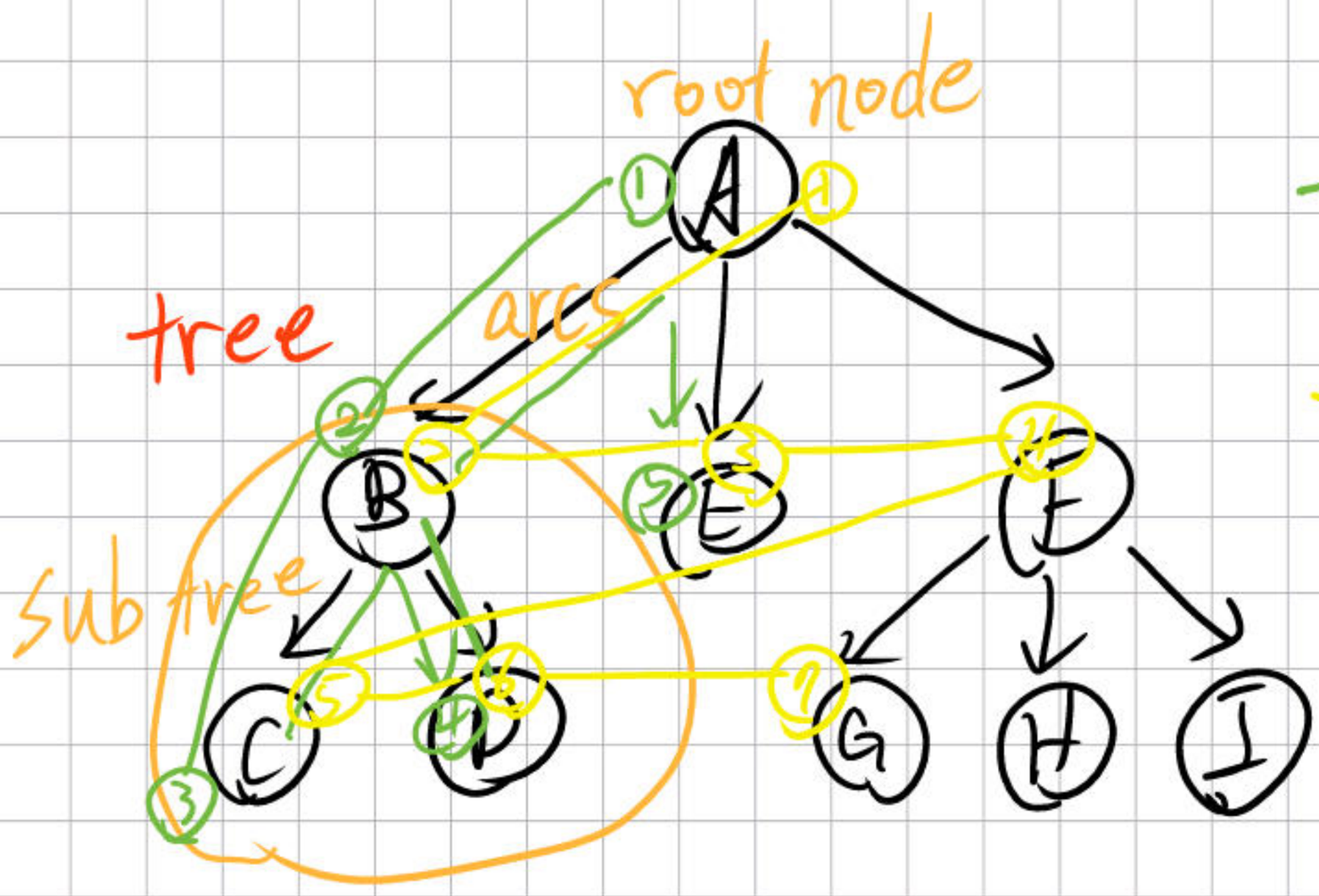
stack

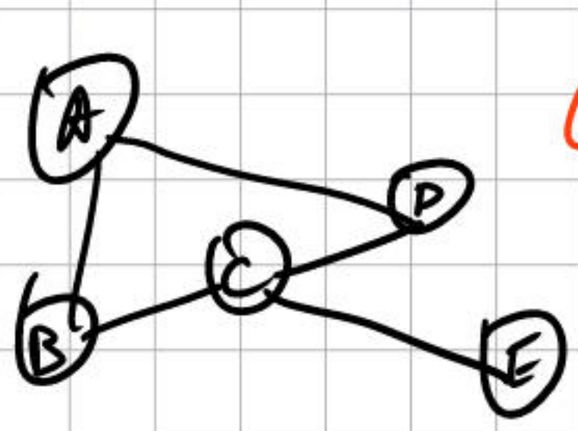


queue FIFO → first in, first out.

[①, ②, ③, ..., ⓝ] (sorted)

general linear list datas of the same type





Graph Direction. Weight