# Introduction

Heejin Park

Hanyang University

#### **Professor**

Heejin Park

2220-1986

hjpark@hanyang.ac.kr

Information & Communication Building 810

### **Textbook**

# Introduction to Algorithms, 3<sup>rd</sup> Ed. MIT Press

T. Cormen, C. Leiserson, R. Rivest, and C. Stein

## **Evaluation**

Exam 70%
Assignment 30%

#### Entrance rule

4:30pm – 4:40pm: Review time

4:40pm – 5:00pm: Teaching starts; no entrance.

5:00pm: Late students can come in.

5:00pm - 6:00pm: No entrance.

### **Entrance rule**

If you want to go out during class, you need permission from the T/A.

When you go out, close the door silently.

# What is an algorithm?

- What is a problem?
  - A well-specified input and output.

- What is an algorithm?
  - A well-defined procedure to solve a problem.

# A problem example

- Cooking instant noodles
  - Input
    - chinese noodles,
    - pouder soup,
    - o an egg,
    - green onions,...
  - Output
    - Cooked instant noodles

# An algorithm example

- Algorithm
  - Boil 500cc of water.
  - Put chinese noodles and powder soup.
  - Boil for 5 minutes.
  - Put an egg and green onions.
  - Boil for 1 minute.

# A computer algorithm

- A computer algorithm
  - A well-defined *computational* procedure to solve a computational problem
- A computational problem example
  - Computing the sum of integers from 1 to *n*

• 
$$S = 1 + 2 \dots + n$$

# Computer algorithm examples

## Elementary school algorithm

• Compute each addition one by one from the left.

• 
$$S = (...(((1+2)+3)+4)...)+n$$

## High school algorithm

• 
$$S = n(n+1)/2$$

# • Are the algorithms above correct?

# Correctness of algorithms

## Elementary school algorithm

Obvious

## High school algorithm

- S = n(n+1)/2
  - 2S = 2(1 + 2 + ... + n)
  - $2S = (1 + 2 + \dots n-1 + n) + (n + n-1 + \dots 2 + 1)$
  - 2S = n(n+1)
  - S = n(n+1)/2

# Comparison of algorithms

#### • Which one is better?

- Elementary school algorithm
- High school algorithm

# Performance of algorithms

# Performance of algorithms

- Running time
- Space consumption

# Performance of algorithms

## Performance of algorithms

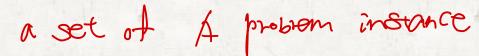
- Running time
  - Elementary school algorithm?
  - High school algorithm?
- Space consumption
- - Elementary school algorithm?
  - High school algorithm?

```
n+1 addition
```

```
| addition + | Multiple + | division
```

#### **Problem instance**

#### Problem



• Computing the sum of integers from 1 to *n* 

• 
$$S = 1 + 2 \dots + n$$

## A problem instance

1=100

• Computing the sum of integers from 1 to 100

#### Class outline

#### Problem

- Why the problem?
- Problem definition.

## Algorithm

- Description
- Correctness
- Performance