Application of Generative AI: Development and Challenge in Algorithm & Programming

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Vice Chairman, HKACE

Advisory Board, HKOI

Agenda

- **5 min** — Computational Thinking & Algorithm
- **15 min** — Generative AI in Coding
- **5 min** — Opportunities & Threats
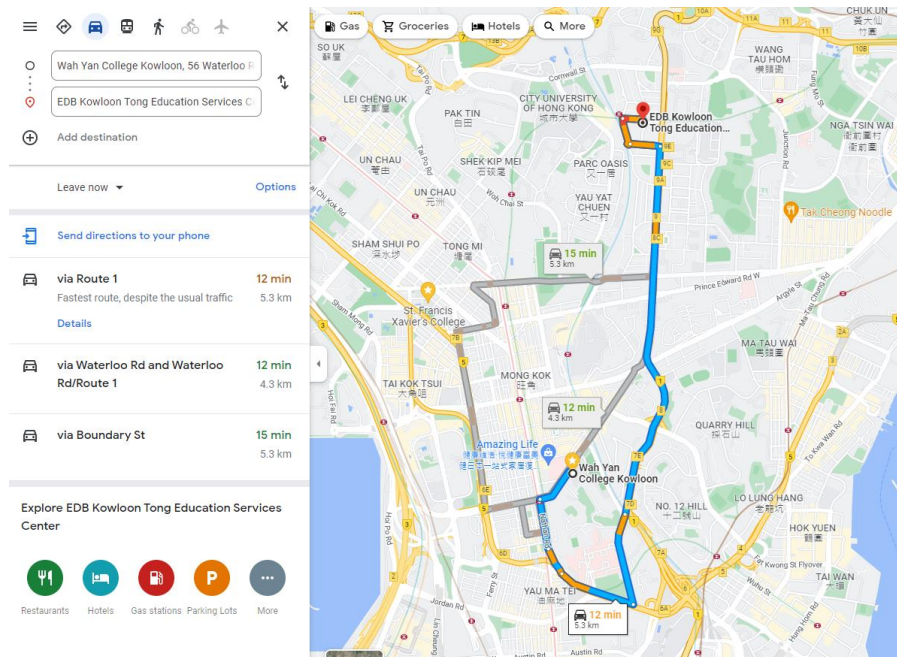- **5 min** — Tool for Coding Education — HHCI Online Judge
- **5 min** — Student Sharing

# Computational Thinking & Algorithm

Google Map
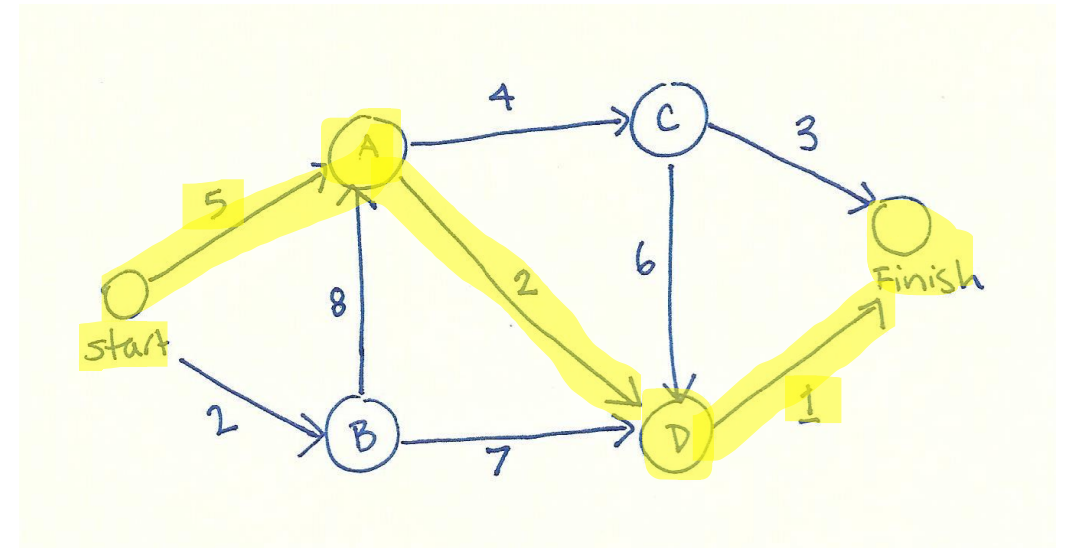
Dijkstra Algorithm

(Finding the Shortest Path)

Reference: https://medium.com/@yk392/dijkstra-algorithm-key-to-finding-the-shortest-path-google-map-to-waze-56ff3d9f92f0

HKDSE ICT Elective C

	Core (Computational Thinking & Programming)	Elective 2C (Algorithm & Programming)
Lesson time	48 hours	38 hours
Topics	• Variable & Constant • Data types • Input & Output • Selection (If-Then-Else) • ==Iteration (Single layer loop)== • ==Array (1D)== • String Manipulation • Sub-program • ==Basic Algorithms (Max & Min, Linear Search, etc.)== • Testing & Debugging	• All topics in Core • ==Iteration (Nested loop)== • ==Array (2D+)== • File handling • Sub-program with parameter passing • ==Algorithms (Binary Search, Sorting, etc.)== • ==Data Structures (Stack, Queue, Linked list)== • Event handler • Extended modules (Sensors and devices)

Generations to learn Coding / Algorithm

1. By Textbook / Lecture

3. By Video

YouTube

2. By Search Engine

Google

stackoverflow
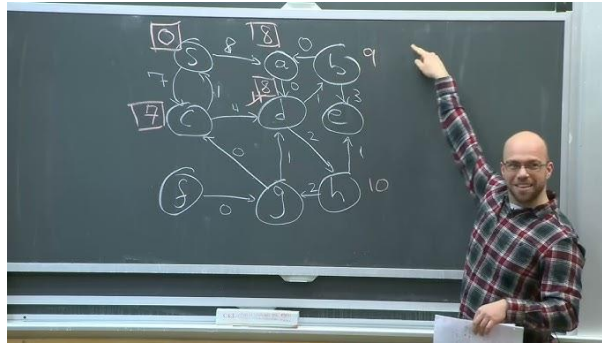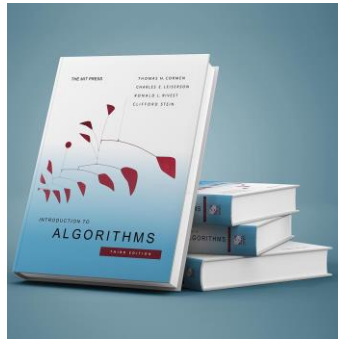
4. By Generative AI ?

Demonstration 1

Search...

- Tasks
- Your Submissions
- School Submissions
- Judge Status
- Code
- Contests
- Leaderboard
- Attendance
- School Admin

Phone number

D101 | Time Limit: 1.000 s | Memory Limit: 256 MB

Submit | Blockly | Submissions | Stats
Solution | Test Data

Code

In this exercise, you will learn how to perform basic input and output. Also, you will be able to try the HKOI Online Judge system.

Write a program to read a 8-digit Hong Kong phone number and determine whether it is a fixed line number (numbers that start with 2 or 3) or a mobile number (numbers that start with 5, 6 or 9).

INPUT AND OUTPUT

The 8-digit phone number will be provided through the standard input. The number will not start with 999.

After determining the correct type, output the word Fixed or Mobile.

Input and Output Format

No need to validate inputs. Do not output prompts. (e.g.: "Please enter a number: ")

The last line of your output should also contain the end of line character.

Pascal: `writeln(ans);` C: `printf("%d\n", ans);` C++: `cout << ans << endl;`

SAMPLE TESTS

	Input	Output
1	23382338	Fixed
2	98765432	Mobile

HKOI D101
Phone number
By Replit AI

Reference: HKOI D101

Demonstration 2

HKOI D801
Binary Search
By Replit AI

Binary search

| D801 | Time Limit: 3.000 s | Memory Limit: 256 MB | Submit | Blockly | Submissions | Stats |
| Solution | Test Data |

Given a sorted array with N integers and a list of numbers, for each of the Q numbers, check whether they exist in the array or not.

INPUT

The first line contains two integers, N and Q. ($1 \le N \le 100000$, $1 \le Q \le 100000$).

The second line contains of N distinct integers sorted in ascending order, separated by spaces.

The third line contains of Q integers, separated by spaces.

All integers are in $[-2147483648, 2147483647]$ (the range of 32-bit integer).

OUTPUT

Output Q lines, one for each number in order. Each line should be Yes or No to indicate whether it exist in the array or not.

SAMPLE TESTS

	Input	Output
1	5 6 1 3 5 7 9 3 2 8 9 12 1	Yes No No Yes No Yes
2	4 4 -12 -5 0 6 9 0 -12 7	No Yes Yes No

Reference: HKOI D101

Demonstration 3

12.   `Func(a, b)` is a function with two positive integer inputs `a` and `b`, where `a` $\geq$ `b`. It returns the integral part of `(a÷b)`. For example,

$\qquad$ `Func(6, 2)` returns 3 and `Func(7, 3)` returns 2.

(a) What will `Func(14, 3)` return?   (1 mark)

The following algorithm ALG1 processes a Boolean array `B` with indices from `1` to `n`.

ALG1

Step 1:   for `k` from `1` to `n` do Step 2

Step 2:   `B[k]` ← `True`

Step 3:   `B[1]` ← `False`

Step 4:   for `i` from `1` to `n` do Steps 5 to 7

Step 5:   if `B[i]` = `True` then do Steps 6 to 7

Step 6:   for `j` from `2` to `Func(n, i)`

Step 7:   `B[i × j]` ← `False`

(b) Suppose that `n` = `6`. Dry run ALG1. Use 'F' and 'T' to denote 'False' and 'True' respectively.

(i)   What are the values in `B` after the first pass of the loop in Step 4?   (2 marks)

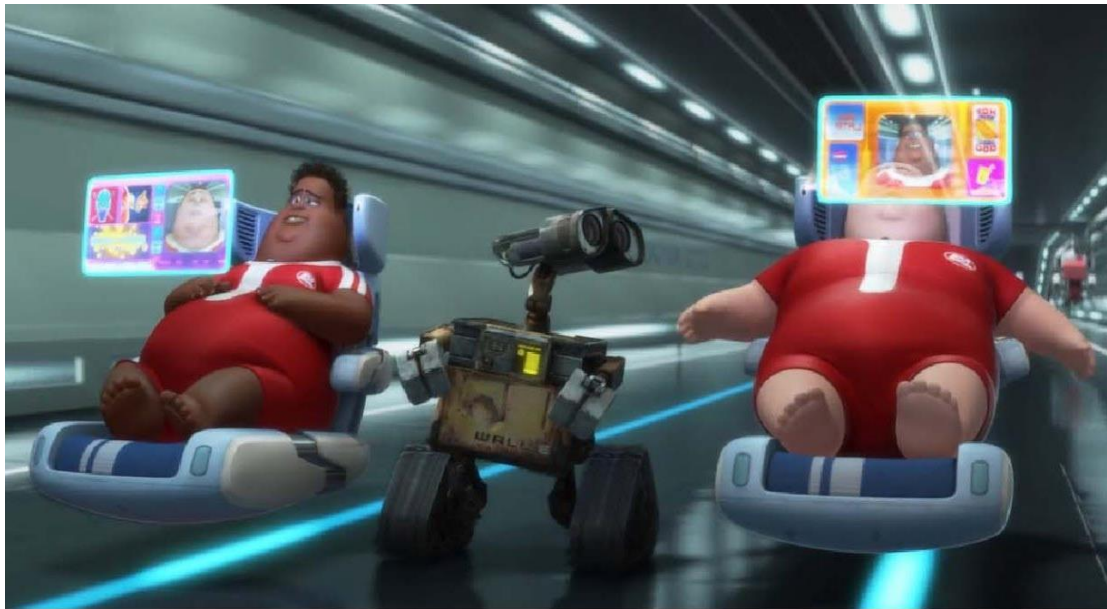(ii) What are the final values in `B`?   (2 marks)

Reference: HKEAA ICT 2025 Sample paper

HKEAA Sample ICT Paper by ChatGPT-4

Risks of Relying on Generative AI

Reference: WALL-E, Disney & PIXAR @ 2008

Math Education

Primary School

Secondary School

Programming Education

Secondary School

 ?

University / Work

 ✓

AI Ethics in ICT SBA

人工智能與校本評核 ✏️

人工智能工具發展一日千里，並迅速地與日常生活的各方面融合。學生若適當運用，人工智能工具無疑可為學習帶來新機遇；但若不當使用，則會對其他考生造成不公，此屬違規行為，可致嚴重後果。學生須注意，若在完成校本評核課業過程中曾使用人工智能工具，必須與其他參考資料一樣，清楚註明出處。

學生亦須留意，縱使人工智能工具的功能日增，但它們並不能代替真正的學習經歷。過分依賴或不當使用人工智能工具，會減少學生親身體驗學習的機會。同時人工智能工具亦有其不足之處。人工智能工具所提供的資訊來自互聯網，我們無法得知資訊的來源，而且資訊有可能是錯誤或有偏頗的。人工智能工具亦有可能於未得原作者同意下引用其作品，甚或會虛構引文及參考書目。

如何在作業中註明出處？ ✏️

學生在完成課業的過程中，可參考不同類別的資料，包括書籍、報章、雜誌、互聯網等，亦可與朋輩／家長討論，但須謹記不可觸犯抄襲行為。學生不可抄錄他人的著作或意念（包括以人工智能軟件生成的作品），視為自己的作品。學生可參考 *附錄* 中關於引用及註明資料出處的示例。

Reference: https://www.hkeaa.edu.hk/DocLibrary/Media/Leaflets/SBA_booklet_eng.pdf

Introduction to HKOI Online Judge

https://hkoi.org/

Organizer:

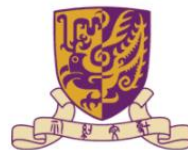Co-organizer:

教育局
Education Bureau

CityU

What is an Online Judge

- **Interactive tool to learn programming**
- Submit programs to **solve programming tasks**
- **Instant automated feedback** whether the program is correct
  – Black-box testing using test cases (input and expected output)
- Available **24/7**
- Can be used to host **contests**

Tasks recommendation by AI

National & International Competitions (TFT / NOI / IOI Tasks)

Interschool Competitions (Extended Tasks)

ICT Curriculum (HKDSE Tasks)

Professional Ladder

香港電腦奧林匹克競賽
Hong Kong Olympiad in Informatics

香港電腦教育學會
The Hong Kong Association
for Computer Education

DSE C++ / Python Tasks

ID	Theme	Tasks
D1xx	Basics, Conditionals	13
D2xx	Iterations	10
D3xx	Strings	9
D4xx	Arrays / Lists	6
D5xx	File I/O	3
D7xx	Data Structures (Queue, Stack, Linked List)	6
D8xx	Algorithms (Searching, Sorting)	8

DSE SQL Tasks

ID	Theme	Tasks
D20x	Basics, Operators, Order, Aggregation	9 x 4
D21x	Strings / Dates	3 x 4
D50x	Join Tables	2 x 5

*附設中文題目

HKOI Online Judge

1) Register for <mark>free teacher accounts</mark>   OR

2) Subscribe to the platform for students too.

2022/23 subscribers:

72 schools

Thank you - Contact HKACE

擬加入的香港學界專業社群 (WhatsApp) *可多選於一項 *

- ☐ HKACE ITCA (資訊科技挑戰獎勵計劃)
- ☐ HKACE YITAA (青年資訊科技大使獎勵計劃)
- ☐ HKACE Primary CS/IT/CT
- ☐ HKACE DSE ICT
- ☐ HKACE IT in Education
- ☐ HKACE STEM
- ☐ HKACE x JSIT InnoTech Lab
- ☐ HKACE CCF: BYOD 實踐電子學習
- ☐ HKACE Drone Education
- ☐ HKACE AI for Education
- ☐ HKACE Apple Education
- ☐ HKACE Education Technology
- ☐ HKACE Google for Education
- ☐ HKACE Media Literacy
- ☐ HKACE Micro:bit
- ☐ HKACE Minecraft Education
- ☐ HKACE Raspberry Pi
- ☐ HKACE TSS Group (Recommended by IT Coordinator Teacher)
- ☐ HKACE VR/AR/MR Education
- ☐ HKACE WebSAMS & TTL

HKACE Community
(1500+ members)

https://forms.gle/cxKFDVwrihUyuaHo8