CLASS 01

Class Atendence

16h10

submission of work done at the end of class

IMPORTANT

1st project delivery 9th April

- mathematical formulation
- pseudocode

IMPORTANT

2nd project delivery 21st May

- implementation
- analysis

Other evaluation points:

- Exam (Theoretical + Practical Components)
- Kahoot! (Theoretical Questions)
- HackerRank (Programming Exercises/Competition)

TP Class 1

1. Input: T, selected[3]

```
for i ← 1 to T do
    for j ← 1 to i do
        for K ← 1 to j do
            if i+j+K == T then
                selected[0] ← i
                selected[1] ← j
                selected[2] ← K
                return true
            end if
return false
```

7.

a) Consider:

set $T = \{a_1, a_2, \dots, a_n\}$ of tasks

a_i requires t_i units to be completed

c_i completion time of task a_i

Restrictions:

one task at a time

Objective:

$$\min \frac{1}{n} \sum_{i=1}^{n} c_i$$

b) <u>proof</u> (non rigorous):

Consider an ordered set of tasks $T=\{a_1,\dots,a_K\}$

$$\boxed{C_{K=0}=0\ ;\ C_K = t_K + C_{K-1}}$$

Example: $K \in \{0,3\}$

substitution

$$\begin{aligned}
K=0 &\rightarrow C_{K=0}=0\\
K=1 &\rightarrow C_{K=1}=t_{K=1}\\
K=2 &\rightarrow C_{K=2}=t_{K=2}+\underline{C_{K=1}}=t_{K=2}+\underline{t_{K=1}}\\
K=3 &\rightarrow C_{K=3}=t_{K=3}+C_{K=2}=t_{K=3}+t_{K=2}+t_{K=1}
\end{aligned}$$

$$\min (1/n) \times \sum_{i=1}^{n} c_i = \min \sum_{i=1}^{n} c_i \quad (\text{minimise sum})$$

$$= \min \Big(\underbrace{0}_{C_{K=0}} + \underbrace{\underline{t_{K=1}}}_{C_{K=1}} + \underbrace{t_{K=2} + \underline{t_{K=1}}}_{C_{K=2}} + \underbrace{t_{K=3} + t_{K=2} + \underline{t_{K=1}}}_{C_{K=3}}\Big)$$

It is trivial to see that we need to choose tasks, a_i, with the lowest t_i first since their terms will be <u>propagated</u> through the summation.

A greedy algorithm will give an optimal solution, with selection criteria <u>lowest t_i</u>.