

# 210CT Week 4 Coursework Tasks

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### LEARNING OUTCOMES

1. Understand how searching and sorting methods work.
2. Reason about the complexity of algorithms and apply the BigO notation in doing so.

### BASIC/INTERMEDIATE TASKS

1. Adapt the binary search algorithm so that instead of outputting whether a specific value was found, it outputs whether a value within an interval (specified by you) was found. Write the pseudocode and code and give the time complexity of the algorithm using the Big O notation.

Example input:  $L = [2,3,5,7,9,13]$  low= 10 high = 14 Output: True

### ADVANCED TASK

1. Let's consider a labyrinth as a  $n \times m$  matrix, where the corridors are denoted by 1s situated in consecutive positions on the same line or column. The rest of the elements are 0. Within the labyrinth, a person is considered to be in position  $(i, j)$ . Write a program that lists all exit routes which do not pass the same place twice. Input:  $n, m$ , the rows of the matrix, the coordinates of the exit and the coordinates of the person (row, column). Output: a sequence of row/column pairs representing the person's successive position.
2. Adapt the quick sort algorithm to find the  $m$ th smallest element out of a sequence of  $n$  integers.

### READING

Perl Y., Itai A., Avni H. (1978). Interpolation Search – A  $\log \log N$  Search. *Communications of the ACM*. Volume 21, Issue 7.