# Tutorial 9

COMP 2611

1. Consider the code to find the $n^{\text{th}}$ smallest element in a sequence in the sorting slides. Write pseudocode for an $n^{\text{th}}$ largest function. (Hint: you can use the *smallest* function to write your *largest* function)

2. Write pseudocode for a function called *median* that uses the *partition*, *smallest*, or *largest* functions to find the median of an array.

3. Consider the following array that represents a heap $H$:

$$H = \big[@,\ \ 4,\ \ 5,\ \ 6,\ \ 8,\ \ 8,\ \ @,\ \ @,\ \ @,\ \ @\big]$$

   where @ represents *NIL*

   (a) Illustrate $H$ as a binary tree

   (b) Suppose that we insert the value a value 7 into $H$. Illustrate $H$ in both its array form and as a binary tree

4. Consider the graph $G = (V, E)$ where

$$V = \{1, 2, 3\}$$

and

$$E = \{(1, 2), (1, 3), (3, 3)\}$$

   (a) Illustrate $G$ when $G$ is

      i. An undirected graph

      ii. A directed graph

   (b) Give the adjacency matrix of $G$ when $G$ is

      i. An undirected graph

      ii. A directed graph

5. Suppose that are given an undirected graph $G$ (that can be weighted or unweighted) stored an adjacency matrix $M$. You are given a sequence of vertices $S$. Write pseudocode that accepts $M$ and $S$ and determines if it is possible of visit the vertices in $S$ in sequence.

6. Recall that the degree of a vertex is the number of edges incident to it. Write pseudocode that takes the adjacency matrix of an unweighted undirected graph $M$, a vertex $v$, and calculates the degree of vertex $v$.