CSCI 3333 Practice Quiz HEAP

**Problem 1.** Suppose you’re given a class `Heap` implementing a min-heap and containing the following instance variables:

- An array `A` containing floats.
- A `capacity` variable storing the length of `A`.
- A `count` variable storing the number of elements in the heap.

Write a method that returns the largest element in the heap and has the following prototype:

```cpp
float Heap :: max()
```

Give the worst-case and best-case running times of this method in terms of `n` (the number of elements in the heap).
Problem 2. Fill in the array corresponding to the min-heap in Figure 1:

\[
\begin{array}{cccccccccc}
0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\
\end{array}
\]

Do the same, but for the array after calling \texttt{push(1)} on the heap:

\[
\begin{array}{cccccccccc}
0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\
\end{array}
\]

Do the same, but for the array after calling \texttt{pop()} on the heap:

\[
\begin{array}{cccccccccc}
0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 \\
\end{array}
\]

Do the same, but for the array after calling \texttt{pop()} \texttt{twice} on the heap:

\[
\begin{array}{cccccccccc}
0 & 1 & 2 & 3 & 4 & 5 & 6 \\
\end{array}
\]

Figure 1: The heap for Problem 2.
Problem 3. Fill in the blanks regarding a heap implemented via a ternary approach (each node has up to three children):

For a node at index $p$, $p$’s children are at indices $\text{function of } p$, $\text{function of } p$, and $\text{function of } p$.

For a node at index $c$, $c$’s parent is at index $\text{function of } c$.

Index 10 of the array corresponds to a node at depth $\text{number}$.

The leftmost index corresponding to a node at depth 2 is $\text{number}$.