Consider the following sequence of numbers:

5, 20, 10, 6, 7, 3, 1, 2, 7, 8, 11, 3

(a) Insert these numbers into a min-heap where each node has up to three children, instead of two.

(So, instead of inserting into a binary heap, we’re inserting into a ternary heap.)

Draw out the tree representation of your completed ternary heap.

Solution:

```
1
  /\  /
 /   \ 3
20  7
  /\  /
 /   \ 2
5  10 7
  /\  /
 /   \ 3
11 8
  /\  /
 /   \ 6
```

(b) Draw out the array representation of the above tree. In your array representation, you should start at index 0 (not index 1).

Solution:

```
1, 3, 2, 3, 20, 7, 5, 10, 7, 8, 11, 6
```

(c) Given a node at index $i$, write a formula to find the index of the parent.

Solution:

```
parent(i) = \left\lfloor \frac{i - 1}{3} \right\rfloor
```

(d) Given a node at index $i$, write a formula to find the $j$-th child. Assume that $0 \leq j < 3$.

Solution:

```
child(i, j) = 3i + j + 1
```