

COMP4019 - Solutions Session 7 – Binary Heaps

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1 Implicit Data Structures

1. The array should be initialized to be the size of the maximum number of node in such a tree. That is, $n_{\max} = 1 + m + m^2 + \dots + m^d = \sum_{i=0}^d m^i$. This is a *geometric series*, so this simplifies to $n_{\max} = \frac{m^d - 1}{m - 1}$.
2. and 3. See Python code below

```
1 def path_to_idx(L, m):  
2     k = len(L)  
3     return (m**k-1)/(m-1) + sum([L[i]*m**(k-i-1) for i in xrange(k)])  
4  
5 def idx_to_path(i, m):  
6     L = []  
7     while i > 0:  
8         L.append((i-1)%m)  
9         i = (i-1)/m  
10    return L[::-1] # reversed list, to have root -> node
```

2 Binary Heaps

1. The heap property is reversed, the key of a node must now be larger than of its children. In your code that most likely represents swapping < and >.