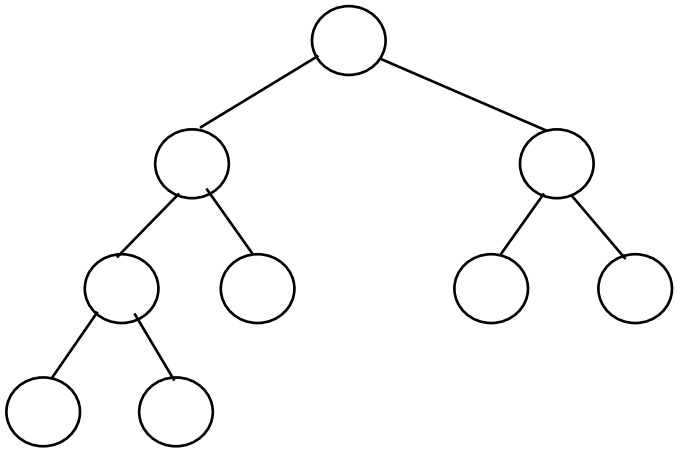
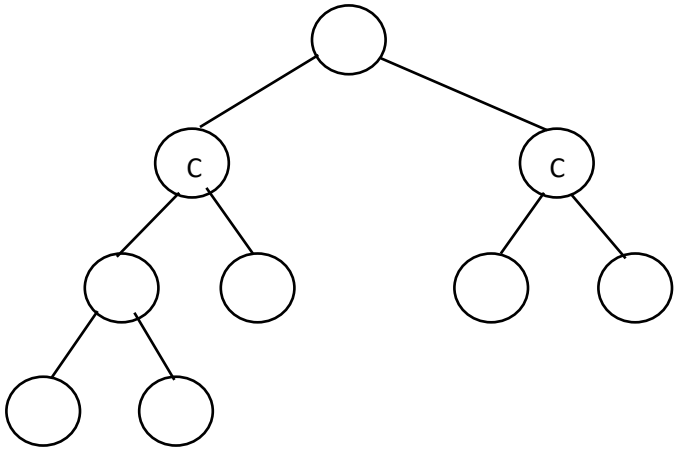
Min-heaps

1. Draw the tree shape for a heap with nine elements. Don't put any numbers inside the vertices.



2. The smallest element in a heap must appear in position 1 and the second smallest element must be in position 2 or 3. In your drawing above, mark vertices in where the third smallest element can appear with a 'C'.



Priority Queue Worksheet

1. Suppose that the sequence of operations

   P R I O * R * * I * T * Y * * * Q U E * * * U * E

   (Where a letter means “insert” that letter and an asterisk means “remove the maximum”) is applied to an initially empty priority queue. Give the sequence of values returned by the remove the maximum operations.

   OUTPUT: R R P I T Y I I U Q E U

2. Repeat for the scenario where the asterisk means “remove the minimum”.

   OUTPUT: I O P I R R T Y E Q U U

Quicksort Analysis

Suppose that the pivot at each stage of the quicksort algorithm is the first quartile; i.e., it partitions the array into a left subarray of one-fourth the size and a right subarray of three-fourths the size of the original array.

1. At approximately what level of the quicksort recursion tree will you find the deepest leaves.

$$\frac{3^k}{4} \times n = 1$$

$$n = \frac{4^k}{3}$$

$$log_{4/3}\, n = k$$

2. At approximately what level of the quicksort recursion tree will you find the shallowest leaves.

$$\frac{1^k}{4} \times n = 1$$

$$n = 4^k$$

$$log_4\, n = k$$