Practice Question 1

Given an unsorted array [12,7,15,3,9,1,8], sort it in ascending order by applying the in-place heap sort algorithm. Show the steps involved.

Solution for Question 1

1. Convert the array into a max heap:
   - o **Heapify step-by-step:**
     [12,7,15,3,9,1,8]→[15,9,12,3,7,1,8]
2. Perform in-place heap sort:
   - o **Swap the root with the last element, reduce the heap size by 1, and re-heapify:**
     [15,9,12,3,7,1,8] → Swap → [8,9,12,3,7,1,15] → Re-heapify → [12,9,8,3,7,1,15]
   - o **Continue:**
     [12,9,8,3,7,1,15] → Swap → [1,9,8,3,7,12,15] → Re-heapify → [9,7,8,3,1,12,15]... Complete the solution
     Final sorted array: [1,3,7,8,9,12,15]

Practice Question 2

Given an unsorted array [20,5,18,10,15,8,12][20, 5, 18, 10, 15, 8, 12][20,5,18,10,15,8,12], use the in-place heap sort algorithm to sort the array in ascending order. Show the steps involved.

1. Convert the array into a max heap:
   o **Heapify step-by-step:**
     [20,5,18,10,15,8,12]→[20,15,18,10,5,8,12]
2. Perform in-place heap sort:
   o **Swap the root with the last element, reduce the heap size by 1, and re-heapify:**
     [20,15,18,10,5,8,12] → Swap → [12,15,18,10,5,8,20] → Re-heapify → [18,15,12,10,5,8,20]
   o **Continue:**
     [18,15,12,10,5,8,20] → Swap → [8,15,12,10,5,18,20] → Re-heapify → [15,10,12,8,5,18,20]
     … Complete the solution

   o **Final sorted array: [5,8,10,12,15,18,20]**

Practice Question 3

Given an unsorted array [11,6,9,3,7,2,5][11, 6, 9, 3, 7, 2, 5][11,6,9,3,7,2,5], sort it in ascending order by applying the in-place heap sort algorithm. Show the steps involved.

Solution for Question 3

1. Convert the array into a max heap:
    o   **Heapify step-by-step:**
        [11,6,9,3,7,2,5]→[11,7,9,3,6,2,5]
2. Perform in-place heap sort:
    o   **Swap the root with the last element, reduce the heap size by 1, and re-heapify:**
        [11,7,9,3,6,2,5] → Swap → [5,7,9,3,6,2,11] → Re-heapify → [9,7,5,3,6,2,11]
    o   **Continue:**
        [9,7,5,3,6,2,11] → Swap → [2,7,5,3,6,9,11] → Re-heapify → [7,6,5,3,2,9,11]
        … Complete the solution

    o   **Final sorted array: [2,3,5,6,7,9,11]**