PROGRAM 19:

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#include<stdio.h>
void heapify(int*,int, int);
void heapsort(int*, int);
void print_array(int*, int);
int main()
{
   int arr[] = { 10, 30, 5, 63, 22, 12, 56, 33 };
   int n = sizeof(arr) / sizeof(arr[0]);
   printf("\nArray before sorting:\n");
   print_array(arr, n);
   heapsort(arr, n);
   printf("\n\nArray after sorting:\n");
   print_array(arr, n);
   return 0;
}
void heapsort(int* arr, int n)
{
   for (int i = n / 2 - 1; i >= 0; i--)
   {
      heapify(arr, n, i);
   }

   // sort the max heap
   for (int i = n - 1; i >= 0; i--)
   {
      int temp = arr[i];
      arr[i] = arr[0];
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        arr[0] = temp;
        heapify(arr, i, 0);
    }
}
void heapify(int* arr, int n, int i)
{
    int largest = i;
    int left = 2 * i + 1;
    int right  = 2 * i + 2;
    if (left < n && arr[left] > arr[largest])
    {
        largest = left;
    }

    if (right < n && arr[right] > arr[largest])
    {
        largest = right;
    }
    if (largest != i)
    {
        int temp = arr[i];
        arr[i] = arr[largest];
        arr[largest] = temp;
        heapify(arr, n, largest);
    }
}

void print_array(int* arr, int n)
{
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    for (int i = 0; i < n; i++)
    {
        printf("%d  ", arr[i]);
    }
}
```

Output: