1. Write the time complexity of each of the code segments shown below.

| int k=1;  while(k<=n){  cout<<k<<endl;  k=k\*2;  } |
| --- |

| for (int i = 0; i < n; i++)  for (int j = i; j > 0; j--)  cout << i << j; |
| --- |

| for (int i = 0; i < n; i++)  for (int j = i; j > 0; j--)  for(int k=j; k > 0; k--)  cout << i << j << k; |
| --- |

| for(int i=n/2;i<=n;i++){  for(int j=1;j<=n;j=j\*2){  cout<<i<<j<<endl;  }  } |
| --- |

| for(int i=n/2;i<=n;i++){  for(int j=1;j<=n;j=j+i){  cout<<i<<j<<endl;  }  } |
| --- |

| for(int i=1;i<=n;i++)  {  if(builtin\_popcount(i) == 1)  {  for(int j=1;j<=n;j++)  cout<<i<<j<<endl;  }  }  Note: builtin\_popcount(i) returns the number of set bits in 'i'.  For example, builtin\_popcount(5) = 2. Because, 5 = (101)2. So there are 2 set bits in 5. |
| --- |

1. WAP that takes an array of size n and q queries as input. For each query you will be given a number. For each query you have to print ‘YES’ if the number is present in the array, otherwise print ‘No’. Solve the problem in O((n+q)\*logn)

| **Sample input** | **Sample output** |
| --- | --- |
| 5  6 3 2 1 8  4  1  5  2  9 | YES  NO  YES  NO |

Explanation: You are given an array of size 5 and 4 queries. In the first query you are given 1. 1 is present in the array so we print ‘YES’. In the second query 5 is not present in the array so we print ‘NO’. Third and Fourth query are similar.

Hint: First sort the array with the STL sort function which works in O(nlogn), then for each query binary search the value in the sorted array.

1. Modify the bubble sort and insertion sort code to sort in non-increasing order.

| **Sample input** | **Sample output** |
| --- | --- |
| 5  4 5 2 4 1 | 5 4 4 2 1 |
| 3  1 2 1 | 2 1 1 |