```
#include <stdio.h>
int bin_search(int arr[],int n,int x)
{
   int low=0,high=n-1,mid;
   while(low<=high)
   {
      mid=(low+high)/2;
      if(arr[mid]==x)
         return mid;
      if(x>arr[mid])
         low=mid+1;
      else
         high=mid-1;
   }
   return -1;
}
int main()
{
int arr[]={10,34,56,78,99,101};
printf("Loc of 78 is %d",bin_search(arr,sizeof(arr)/sizeof(int),78));
printf("\nLoc of 88 is %d",bin_search(arr,sizeof(arr)/sizeof(int),88));
return 0;
}
```

$C(n) = O(1)$

$C(n) = n, \frac{n}{2}, \frac{n}{4} \ldots n/2^k$

$\frac{n}{2^k} = 1$

$n = 2^k$

$\boxed{k = \log_2 n}$

$\log_2^{30} \approx 5$

$n = 8 \quad \log_2 8 = 3$

$n = 16 \quad \log_2 16 = 4$

$n = 32 \quad \log_2 32 = 5$

Bubble Sort

15, 7, 10, 12, 3, 18, 5

7, 15, 10, 12, 3, 18, 5

7, 10, 15, 12, 3, 18, 5

7, 10, 12, 15, 3, 18, 5

7, 10, 12, 3, 15, 18, 5

7, 10, 12, 3, 15, 18, 5

7, 10, 12, 3, 15, 5, 18

↑ Right pos

7, 10, 12, 3, 15, 5, 18

7, 10, 12, 3, 15, 5, 18

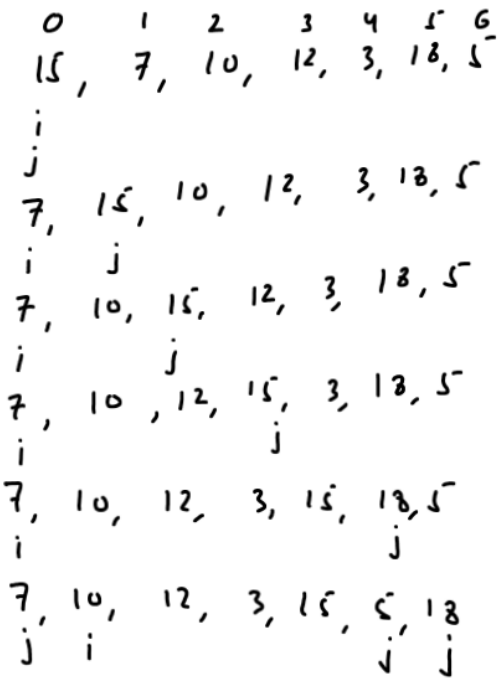
7, 10, 12, 3, 15, 5, 18

7, 10, 3, 12, 15, 5, 18

7, 10, 3, 12, 5, 15, 18

.
.
.
.
.
.
.

```
void bubble_sort(int arr[],int n)
{
   int i,j,temp;
   for(i=0;i<n-1;i++)
   {
      for(j=0;j<n-i-1;j++)
      {
         if(arr[j]>arr[j+1])
          {
            temp=arr[j];
            arr[j]=arr[j+1];
            arr[j+1]=temp;
          }
      }
  }
}
```



$$C(n) = (n-1) + (n-2) + \ldots + 2 + 1$$

$$C(n) = \frac{n(n-1)}{2}$$

$$\boxed{C(n) = O(n^2)}$$

n	n^2
4	16
8	64
16	256

```
void bubble_sort(int arr[],int n)
{
   int i,j,temp;
   int sorted;
   for(i=0;i<n-1;i++)
   {
     sorted=1;
      for(j=0;j<n-i-1;j++)
      {
         if(arr[j]>arr[j+1])
          {
            temp=arr[j];
            arr[j]=arr[j+1];
            arr[j+1]=temp;
            sorted=0;
          }
      }
     if(sorted)
         break;
  }
}
```

SELECTION SORT

0	1	2	3	4	5	6
15,	7,	10,	12,	3,	18,	5

i=0, min=0

min = 4

Swap arr[i] with arr[min]

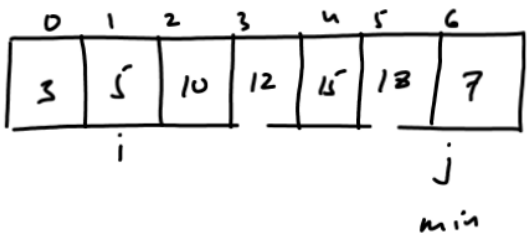
3	7	10	12	15	18	5

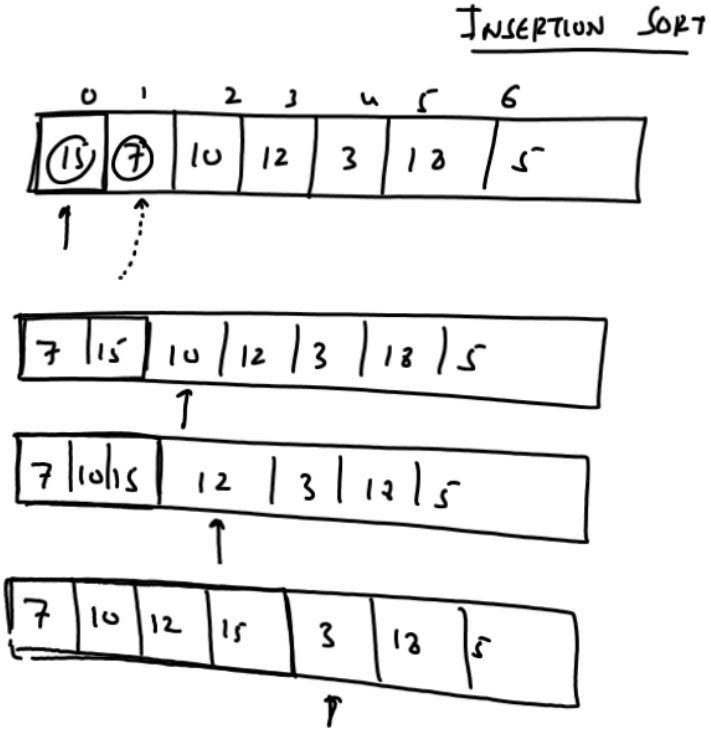
i=1, min=1

min=6

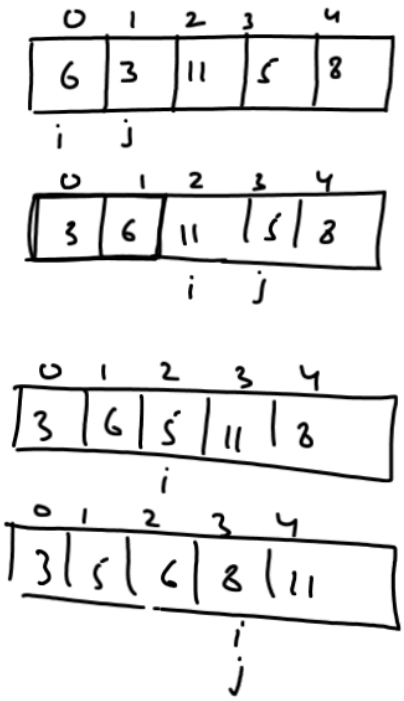
Swap arr[1] with arr[6]

```
void sel_sort(int arr[],int n)
{
   int i,j,temp,min;
   for(i=0;i<n-1;i++)
   {
         min=i;
         for(j=i+1;j<n;j++)
         {
             if(arr[j]<arr[min])
                   min=j;
          }
     if(min!=i)
      {
         temp=arr[i];
         arr[i]=arr[min];
        arr[min=temp;
      }
  }
}
```





```
void ins_sort(int arr[],int n)
{
    int i,j,temp;
    for(i=0;i<n-1;i++)
    {
        for(j=i+1;j>0;j--)
        {
            if(arr[j]< arr[j-1])
            {
              temp=arr[j];
              arr[j]=arr[j-1];
              arr[j-1]=temp;
            }
            else
               break;
        }
}
```



$$C(n) = 1 + 2 + \ldots + n-1$$

$$C(n) = \frac{n(n-1)}{2}$$

$$C(n) = O(n^2)$$