Bubble Sort

20170411

used some pictures and codes from
http://people.cs.vt.edu/shaffer/Book/C++3elatest.pdf
Data Structures and Algorithm Analysis
by Clifford A. Schaffer

$\boxed{i=0}$

0	42	42	42	42	42	42	42	$\boxed{13}$
1	20	20	20	20	20	20	13	42
2	17	17	17	17	17	13	20	20
3	13	13	13	13	13	17	17	17
4	28	28	28	14	14	14	14	14
5	14	14	14	28	28	28	28	28
6	23	15	15	15	15	15	15	15
7	15	23	23	23	23	23	23	23
	j=0	j=1	j=2	j=3	j=4	j=5	j=6	

$\boxed{i=1}$

0	13	13	13	13	13	13	$\boxed{13}$
1	42	42	42	42	42	42	$\boxed{14}$
2	20	20	20	20	20	14	42
3	17	17	17	17	14	20	20
4	14	14	14	14	17	17	17
5	28	28	15	15	15	15	15
6	15	15	28	28	28	28	28
7	23	23	23	23	23	23	23
	j=0	j=1	j=2	j=3	j=4	j=5	

$\boxed{i=2}$

0	13	13	13	13	13	13
1	14	14	14	14	14	14
2	42	42	42	42	42	15
3	20	20	20	20	15	42
4	17	17	17	15	20	20
5	15	15	15	17	17	17
6	28	23	23	23	23	23
7	23	28	28	28	28	28
	j=0	j=1	j=2	j=3	j=4	

$\boxed{i=3}$

0	13	13	13	13	13
1	14	14	14	14	14
2	15	15	15	15	15
3	42	42	42	42	17
4	20	20	17	17	42
5	17	17	20	20	20
6	23	28	28	28	28
7	28	23	23	23	23
	j=0	j=1	j=2	j=3	

$i=4$

0	13	13	13	13
1	14	14	14	14
2	15	15	15	15
3	17	17	17	17
4	42	42	42	20
5	20	20	20	42
6	28	23	23	23
7	23	28	28	28
	$j=0$	$j=1$	$j=2$	

$i=5$

0	13	13	13
1	14	14	14
2	15	15	15
3	17	17	17
4	20	20	20
5	42	42	23
6	23	23	42
7	28	28	28
	$j=0$	$j=1$	

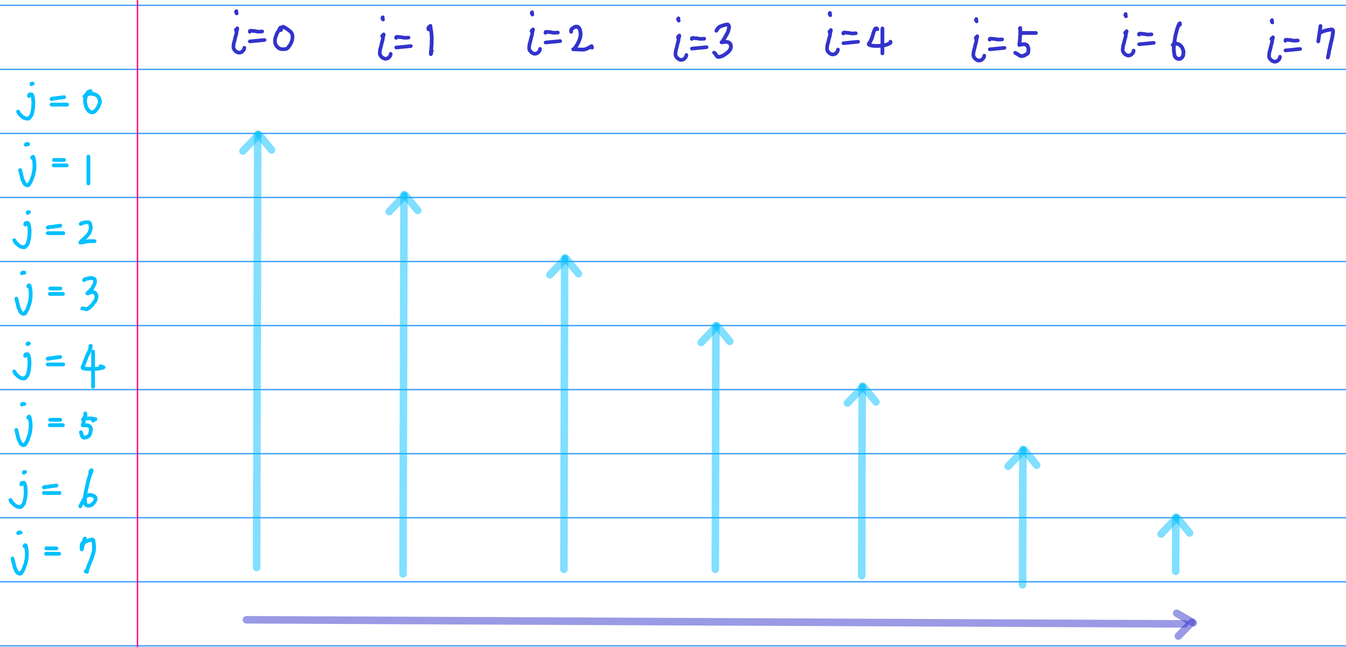
$i=6$

0	13	13
1	14	14
2	15	15
3	17	17
4	20	20
5	23	23
6	42	28
7	28	42
	$j=0$	

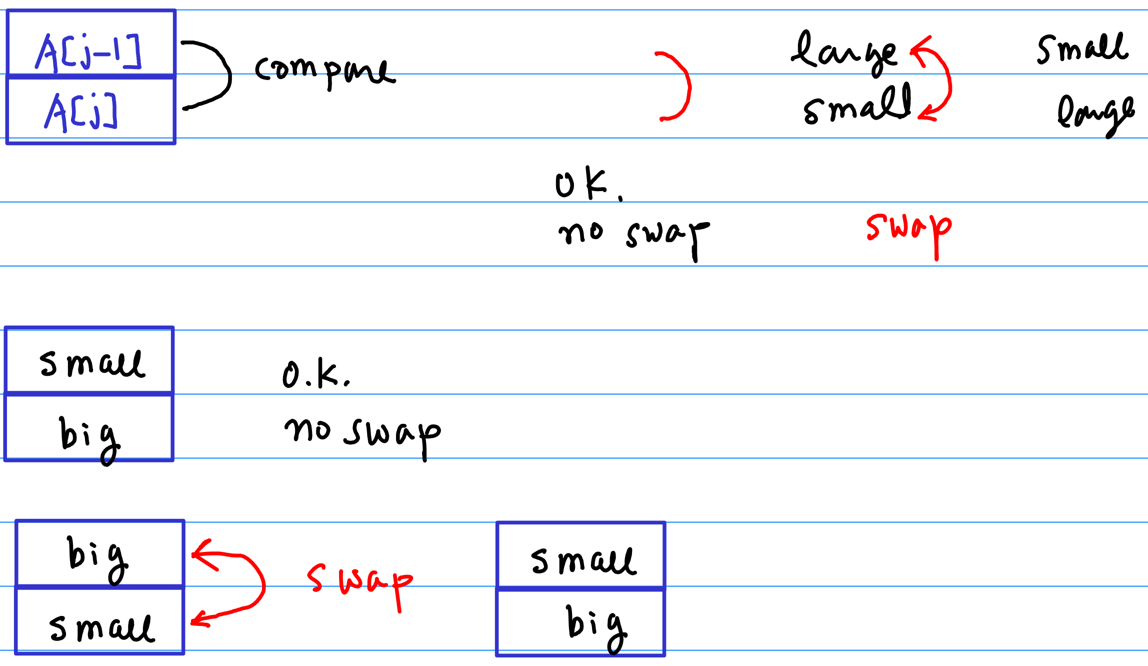
```
// Swap two elements in a generic array
template<typename E>
inline void swap(E A[], int i, int j) {
  E temp = A[i];
  A[i] = A[j];
  A[j] = temp;
}
// Random number generator functions
```

```
template <typename E, typename Comp>
void bubsort(E A[], int n) { // Bubble
  for (int i=0; i<n-1; i++)      // Bubl
    for (int j=n-1; j>i; j--)
      if (Comp::prior(A[j], A[j-1]))
        swap(A, j, j-1);
}
```

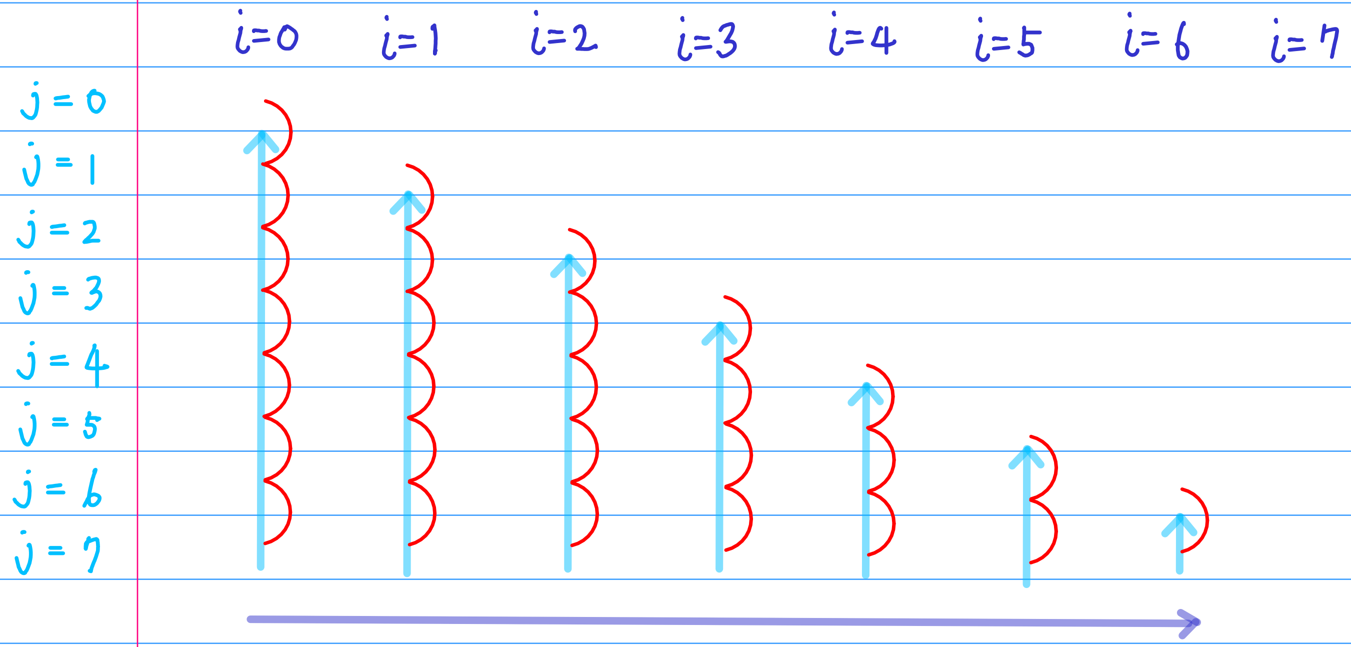
$n=8$



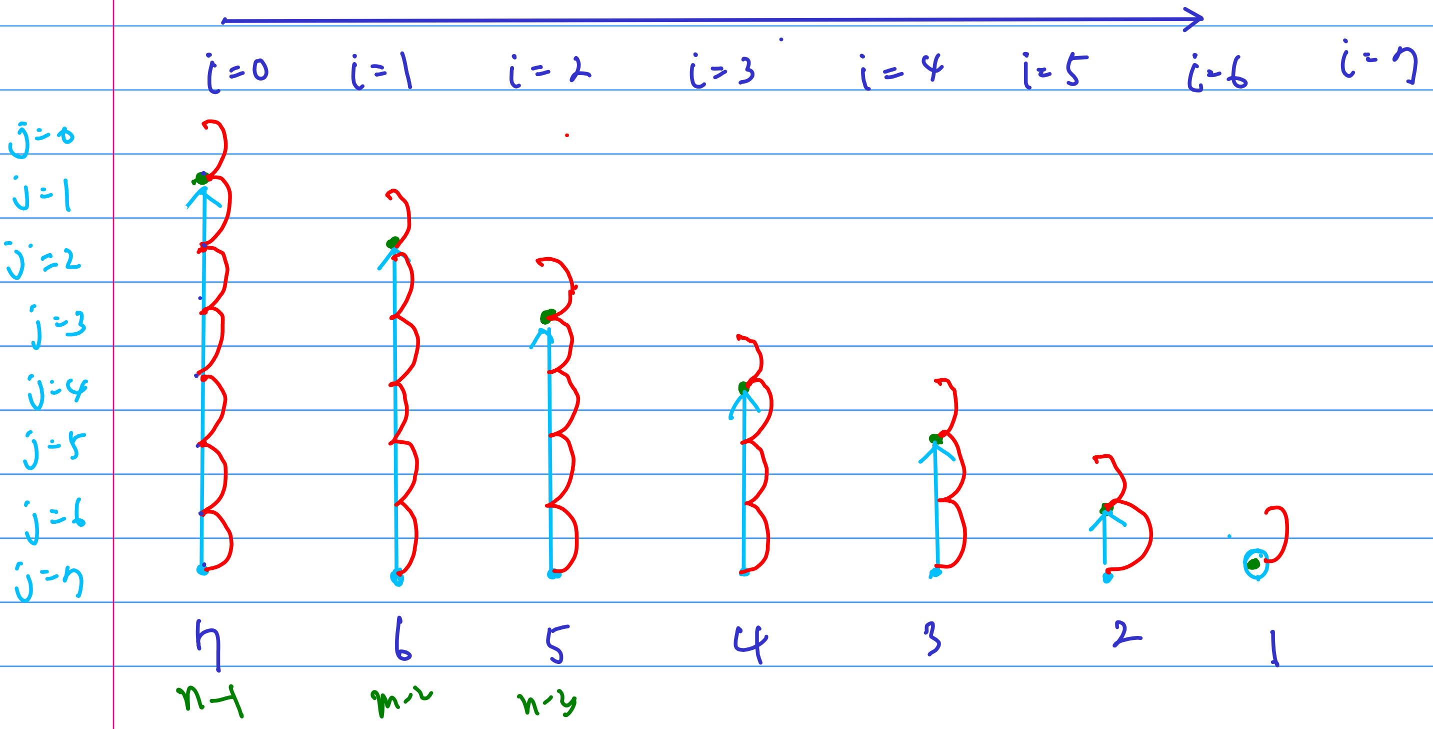
```
template <typename E, typename Comp>
void bubsort(E A[], int n) { // Bubble
  for (int i=0; i<n-1; i++)       // Bubl
    for (int j=n-1; j>i; j--)
      if (Comp::prior(A[j], A[j-1]))
        swap(A, j, j-1);
}
```

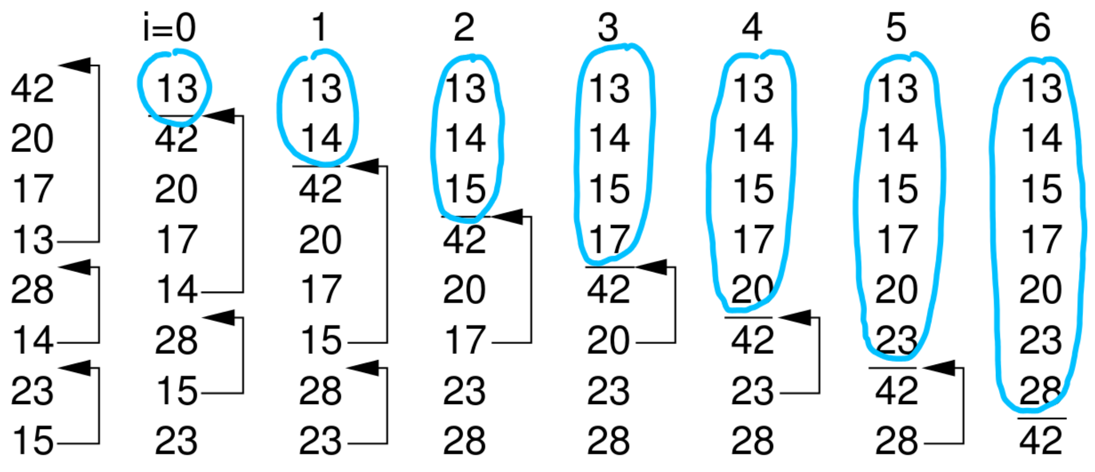


$n=8$



```
template <typename E, typename Comp>
void bubsort(E A[], int n) { // Bubble
  for (int i=0; i<n-1; i++)      // Bubl
    for (int j=n-1; j>i; j--)
      if (Comp::prior(A[j], A[j-1]))
        swap(A, j, j-1);
}
```





	i=0	1	2	3	4	5	6
42	13	13	13	13	13	13	13
20	42	14	14	14	14	14	14
17	20	42	15	15	15	15	15
13	17	20	42	17	17	17	17
28	14	17	20	42	20	20	20
14	28	15	17	20	42	23	23
23	15	28	23	23	23	42	28
15	23	23	28	28	28	28	42

References

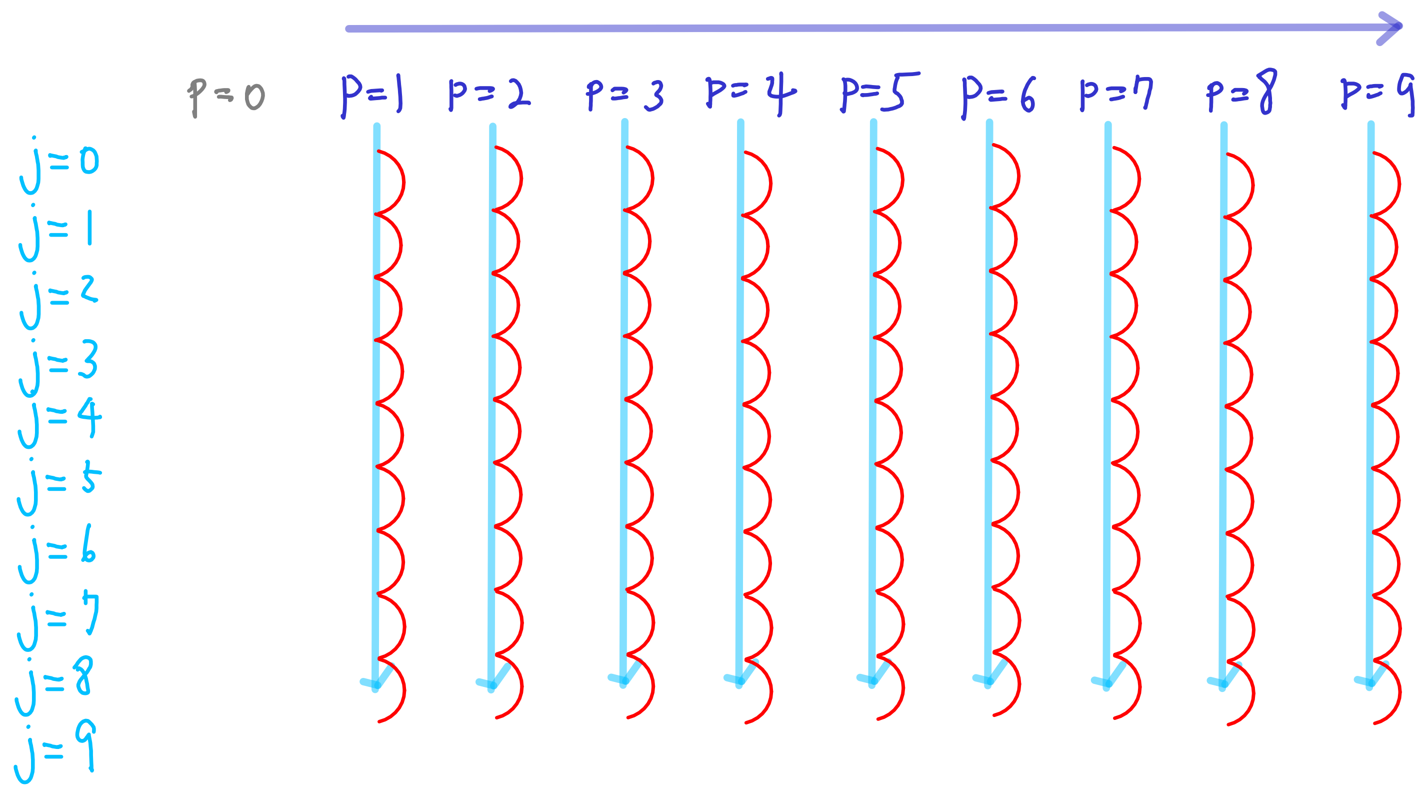
[1] http://en.wikipedia.org/
[2] http://people.cs.vt.edu/shaffer/Book/C++3elatest.pdf

```c
#include <stdio.h>

void bubbleSort(int a[], int size) {
  int p, j, tmp;

  for (p=1; p< size; ++p) {
    for (j=0; j< size-1; ++j)
       if ( a[j] > a[j+1] )  {
         tmp = a[j];
         a[j] = a[j+1];
         a[j+1] = tmp;
       }
  }
}


int main(void) {
  int i;
  int a[] = {2, 6, 4, 8, 10, 12, 89, 68, 45, 37};

  bubbleSort(a, 10);


  for (i=0; i<10; ++i)
    printf("a[%d]=%d \n", i, a[i]);

}
```

$\boxed{<}$

```
   >               <
a[0]=2          a[0]=89
a[1]=4          a[1]=68
a[2]=6          a[2]=45
a[3]=8          a[3]=37
a[4]=10         a[4]=12
a[5]=12         a[5]=10
a[6]=37         a[6]=8
a[7]=45         a[7]=6
a[8]=68         a[8]=4
a[9]=89         a[9]=2
```

```
void bubbleSort(int a[], int size) {
  int p, j, tmp;

  for (p=1; p< size; ++p) {
    for (j=0; j< size-1; ++j)
      if ( a[j] > a[j+1] )  {
        tmp = a[j];
        a[j] = a[j+1];
        a[j+1] = tmp;
      }
  }
}
```



p=0
p=1
p=2
p=3
p=4
p=5
p=6
p=7
p=8
p=9
j=0
j=1
j=2
j=3
j=4
j=5
j=6
j=7
j=8
j=9