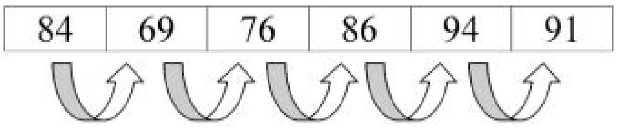
Bubble Sort

In the **bubble sort,** as elements are sorted they gradually "bubble" (or rise) to their proper location in the array, like bubbles rising in a glass of soda. The bubble sort repeatedly compares **adjacent elements** of an array. The first and second elements are compared and swapped if out of order. Then the second and third elements are compared and swapped if out of order. This sorting process continues until the last two elements of the array are compared and swapped if out of order.



When this first pass through the array is complete, the bubble sort returns to elements one and two and starts the process all over again. So, when does it stop? **The bubble sort knows that it is finished when it examines the entire array and no "swaps" are needed (thus the list is in proper order).** The bubble sort keeps track of the occurring swaps by the use of a flag.

The table below follows an array of numbers before, during, and after a bubble sort for *descending* order. A "pass" is defined as one full trip through the array comparing and if necessary, swapping, **adjacent** elements. Several passes have to be made through the array before it is finally sorted.

Array at beginning:	84	69	76	86	94	91
After Pass #1:	84	76	86	94	91	69
After Pass #2:	84	86	94	91	76	69
After Pass #3:	86	94	91	84	76	69
After Pass #4:	94	91	86	84	76	69
After Pass #5 (done):	94	91	86	84	76	69

The bubble sort is an easy algorithm to program, but it is slower than many other sorts. With a bubble sort, it is always necessary to make one final "pass" through the array to check to see that no swaps are made to ensure that the process is finished. In actuality, the process is finished before this last pass is made.

// Bubble Sort *Method* for Descending Order

```
public static void BubbleSort( int [ ] num )
{
        int j;
        boolean flag = true;   // set flag to true to begin first pass
        int temp;   //holding variable

        while ( flag )
        {
              flag= false;    //set flag to false awaiting a possible swap
              for( j=0;  j < num.length -1;  j++ )
              {
                     if ( num[ j ] < num[j+1] )   // change to > for ascending sort
                     {
                             temp = num[ j ];                //swap elements
                             num[ j ] = num[ j+1 ];
                             num[ j+1 ] = temp;
                            flag = true;              //shows a swap occurred
                    }
              }
        }
  }
```

Remember that a bubble sort will continue until no swaps have occurred, meaning that the array is in the proper sorted order.