# Worksheet 3 Bubble sort and insertion sort

**Task 1**

1. Use the girls’ name cards for Exercise 1.

Place the cards in ascending order of popularity, i.e.

**Sophie, Lily, Jessica, Isabella, Ava, Poppy, Emily, Isla, Olivia, Amelia**

Perform a manual bubble sort to get the cards in alphabetical order.

1. L, J, ISA, AV, P, E, ISL, O, AM, S
2. J, ISA, AV, L, E, ISL, O, AM, P, S
3. ISA, AV, J, E, ISL, L, AM, O, P, S
4. AV, ISA, E, ISL, J, AM, L, O, P, S
5. AV, E, ISA, ISL, AM, J, L, O, P, S
6. AV, E, ISA, AM, ISL, J, L, O, P, S
7. AV, E, AM, ISA, ISL, J, L, O, P, S
8. AV, AM, E, ISA, ISL, J, L, O, P, S
9. AM, AV, E, ISA, ISL, J, L, O, P, S
10. Amelia, Ava, Emily, Isabella, Isla, Jessica, Lily, Olivia, Poppy, Sophie

What are the last 2 names after the first pass?

Sophie is the last, Amelia is second last

What are the first two names after the second pass?

Jesisca, Isabella

What are the third and fourth names after the third pass?

Jessica, Emily

What are the seventh and eighth names after the fourth pass?

Lily, Olivia

What are the fourth and fifth names after the fifth pass?

Isla, Amelia

What are the first two names after the sixth pass?

Ava, Emily

Which names are out of sequence after the seventh pass?

Amelia still hasn’t been sorted

Are any names out of sequence after the eighth pass?

Amelia is still not sorted

How many passes were needed to sort the cards?

9 passes to sort, 10 passes to finish because a last pass needs to be carried out to make sure the list is fully sorted, n-1 for how many passes to sort the list itself, where n is the length of the list, just n for the whole sort due to 1 extra needed for double check

2. Complete the bubble sort algorithm given below.

for i = 0 to n - 2

for j = 0 to (n – i - 2)

if names [j] > names[j + 1] then

temp = names[j]

names[j] = names[j+1]

names[j+1] = temp

endif

next j

next i

**Task 2**

3. Place the name cards in ascending order of popularity:

**Sophie, Lily, Jessica, Isabella, Ava, Poppy, Emily, Isla, Olivia, Amelia**

Perform a manual insertion sort on the cards to put them into alphabetical order.

1. S, L, J, ISA, AV, P, E, ISL, O, AM
2. L, S, J, ISA, AV, P, E, ISL, O, AM
3. J, L, S, ISA, AV, P, E, ISL, O, AM
4. ISA, J, L, S, AV, P, E, ISL, O, AM
5. AV, ISA, J, L, S, P, E, ISL, O, AM
6. AV, ISA, J, L, P, S, E, ISL, O, AM
7. AV, E, ISA, J, L, P, S, ISL, O, AM
8. AV, E, ISA, ISL, J, L, P, S, O, AM
9. AV, E, ISA, ISL, J, L, O, P, S, AM
10. AM, AV, E, ISA, ISL, J, L, O, P, S
11. Amelia, Ava, Emily, Isabella, Isla, Jessic, Lily, Olivia, Poppy, Sophie

What sequence are the first four cards in after 4 moves have been made?

**Ava ,Isabella, Jesicca, Lily**

4. The following numbers are to be sorted into ascending order using an insertion sort:

15, 73, 29, 66, 35, 11, 43, 21

(a) Show the sequence of the numbers after each pass through the insertion sort algorithm

aList = [15, 73, 29, 66, 35, 11, 43, 21]

#assume first element of array is aList[0]

for j = 1 to len(aList) - 1

nextNum = aList[j]

i = j – 1

while i >= 0 and aList[i] > nextNum

aList[i + 1] = aList[i]

i = i - 1

endwhile

aList[i + 1] = nextNum

next j

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **15** | **73** | **29** | **66** | **35** | **11** | **43** | **21** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **15** | **73** | **29** | **66** | **35** | **11** | **43** | **21** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **15** | **29** | **73** | **66** | **35** | **11** | **43** | **21** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **15** | **29** | **66** | **73** | **35** | **11** | **43** | **21** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **15** | **29** | **35** | **66** | **73** | **11** | **43** | **21** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **11** | **15** | **29** | **35** | **66** | **73** | **43** | **21** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **11** | **15** | **29** | **35** | **43** | **66** | **73** | **21** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **11** | **15** | **21** | **29** | **35** | **43** | **66** | **73** |

(b) How many passes are made through the data for a dataset of n numbers?

n-1

**Extension task**

5. Write an algorithm which will compare the length of time to sort a list of n random numbers using a bubble sort and an insertion sort.

If you have time, write the program in a language of your choice and experiment with different values of n. Be prepared to wait a long time if you choose a number greater than 10,000!

Which is fastest for 10 numbers?

Which is fastest for 100 numbers? 1000 numbers?