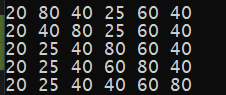
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| **Data Structures & Algorithms**  Diploma in CSF, IT  Year 2/3 (2020/21) Semester 4/6 | **Week 13** |
| **2 Hours** |
| **Tutorial 11 – Sorting** | |

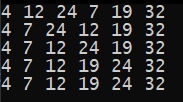
1. Trace the insertion sort as it sorts the following array into ascending order

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 20 | 80 | 40 | 25 | 60 | 40 |



1. Trace the selection sort as it sorts the following array into ascending order

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 7 | 12 | 24 | 4 | 19 | 32 |



1. Apply the selection sort and insertion sort to
2. An inverted array

|  |  |  |  |
| --- | --- | --- | --- |
| 8 | 6 | 4 | 2 |

1. An ordered array

|  |  |  |  |
| --- | --- | --- | --- |
| 2 | 4 | 6 | 8 |

What can you conclude about the differences in performance between insertion sort and selection sort based on the order of the items?

1. Trace the mergesort algorithm as it sorts the following array into ascending order.

List the calls to mergesort and to merge in the order they occur.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 20 | 80 | 40 | 25 | 60 | 30 |

1. When sorting an array by mergesort,
2. Do the recursive calls to mergesort depend on the values in the array, the number of items in the array, or both. Explain.
3. In what step of mergesort are the items in the array actually swapped (that is sorted)? Explain.
4. Discuss the performance of the mergesort algorithm.
5. Trace the quicksort as it sorts the following array into ascending order. List the calls to quickSort and to partition in the order in which they occur.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 20 | 80 | 40 | 25 | 60 | 10 | 15 |

1. You can choose any array item as the pivot for quicksort. Simply interchange items so that your pivot is in theArray[first]. One way to choose a pivot is to take the middle value of the three values theArray[first], theArray[(first + last)/2, and theArray[last]. How many recursive calls are necessary to sort an array of size n if you always choose the pivot in this way?
2. Describe the case in which quick sort has the worst performance.