

**Question - 1**
Knuth Shuffle

SCORE: 5 points

When shuffling a deck of cards [2,3,4,5,6,7,8,9] with "Knuth shuffle", which of the following could possibly be the situation after the first (i.e. 0th) iteration?

- ☒ 2,3,4,5,6,7,8,9
- ☐ 3,2,4,5,6,7,8,9
- ☐ 9,3,4,5,6,2,8,7
- ☐ 2,4,3,5,6,7,8,9

Question - 2
Shell sort

SCORE: 5 points

Regarding Shell sort: given the following list of numbers: [5, 16, 20, 12, 3, 8, 9, 17, 19, 7], which answer illustrates the contents of the list after all swapping is complete for a gap size of 3?

- ☐ [3, 7, 5, 8, 9, 12, 19, 16, 20, 17]
- ☒ [5, 3, 8, 7, 16, 19, 9, 17, 20, 12]
- ☐ [5, 16, 20, 3, 8, 12, 9, 17, 20, 7]
- ☐ [3, 5, 7, 8, 9, 12, 16, 17, 19, 20]

Question - 3
Merge Sort

SCORE: 5 points

The time complexity required to merge two sorted arrays of size m and n is

- ☐ $O(mn)$
- ☒ $O(m+n)$
- ☐ $O(m \log n)$
- ☐ $O(n \log m)$

Question - 4

SCORE: 5 points

Stable Sort

Consider an employee database where people are added based on hire date and then sorted based on last name. If two people in the employee database have the same last name, which sorting method(s) will not change their order relative to each other? (*Hint: this concept is known as stability*)

- ☐ Selection sort
- ☒ Insertion sort
- ☐ Shell sort
- ☐ All of the above

Question - 5

Merge Sort

SCORE: 30 points

Implement merge sort without using recursion.