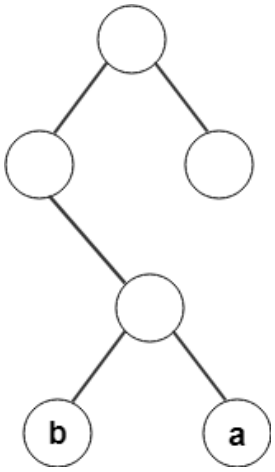
Greedy Algorithm Questions

1. How many printable characters does the ASCII character set consist of?
A) 120
B) 128
C) 100
D) 98

Answer: C)
Explanation: Out of 128 characters in an ASCII set, roughly, only 100 characters are printable while the rest are non-printable.
(related to Huffman Coding)

2. From the following given tree, what is the code word for the character ‘a’?



A) 011
B) 010
C) 100
D) 101

Answer: A)
Explanation: By recording the path of the node from root to leaf, the code word for character ‘a’ is found to be 011.
(related to Huffman Coding)

3. Suppose you have coins of denominations 1, 3 and 4. You use a greedy algorithm, in which you choose the largest denomination coin which is not greater than the remaining sum. For which of the following sums, will the algorithm NOT produce an optimal answer?
A) 20
B) 12
C) 5
D) 6

Answer: D)
Explanation: Using the greedy algorithm, three coins {4,1,1} will be selected to make a sum of 6. But, the optimal answer is two coins {3,3}.
(coin change problem)

4. You are designing an algorithm to sort a large list of numbers. However, you know that in the worst-case scenario, the list will already be sorted in reverse order. How can you modify your sorting algorithm to make the worst-case scenario more optimal?
A) by using Bubble Sort
B) by using Insertion Sort
C) by using Heap Sort
D) None of the above

Answer: B)
Explanation: Insertion sort is one of the best algorithms to use in such a scenario, as it can sort the list in O(n) time. On the other hand, quicksort and mergesort can take O(n^2) time in the worst case scenario. Heapsort and selection sort can take O(n log n) time, which is better than O(n^2), but not as optimal as O(n). Therefore, the correct answer is B) Use insertion sort instead of merge sort.

5. Greedy algorithms work best when there is only one objective to optimize.
A) False
B) True

Answer: B)
Explanation: Greedy algorithms work best when there is a single objective to optimize, as they make locally optimal choices that lead to the globally optimal solution. If there are multiple objectives, a different algorithm may be more suitable.

6. Which of the following is not an essential step of a greedy algorithm?
A) Combine Solutions
B) Reduce the Problem
C) Assume Optimal Solution
D) Identify the Optimal Subproblem

Answer: C)
Explanation: However, not all greedy algorithms follow the same steps, and some may have additional steps, but the A, B and D are essential steps.

7. Fill in the blank to complete the code.

```
#include<stdio.h>
int main()
{
      int coins[10]={1,3,4},lookup[100000];
      int i,j,tmp,num_coins = 3,sum=100;
      lookup[0]=0;
      for(i = 1; i <= sum; i++)
      {
           int min_coins = i;
           for(j = 0;j < num_coins; j++)
           {
                tmp = i - coins[j];
                if(tmp < 0)
                 continue;
                if(lookup[tmp] < min_coins)
                ____________;
           }
           lookup[i] = min_coins + 1;
      }
      printf("%d",lookup[sum]);
      return 0;
}
```

A) lookup[tmp] = min_coins
B) min_coins = lookup[tmp]
C) break
D) continue

Answer: B)
Explanation: min_coins = lookup[tmp] will complete the code.

8. Greedy algorithms always provide the optimal solution for any problem.
A) True
B) False

Answer: B)
Explanation: Greedy algorithms usually provide a locally optimal solution, which may or may not be the globally optimal solution.

9. Given items as {value,weight} pairs {{40,20},{30,10},{20,5}}. The capacity of the knapsack=20. Find the maximum value output assuming items to be divisible.
A) 60
B) 80
C) 100
D) 40

Answer: A)
Explanation: The value/weight ratio are-{2,3,4}. So we include the second and third items wholly into the knapsack. This leaves only 5 units of volume for the first item. So we include the first item partially.
Final value = 20+30+(40/4)=60.

10. Match the following algorithms to their respective problem domains:

A) Kruskal's Algorithm	1) Minimum Spanning Tree
B) Huffman Coding	2) Shortest Path
C) Activity Selection	3) Data Compression
D) Dijkstra's Algorithm	4) Scheduling

Answer:
A - 1
B - 3
C - 4
D - 2