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Mock Exam (SIT111 Algorithms and Computer Systems)

Question 16

a) (Answer is on the *task16_a.py* file)

```
def find_thirteen():
    count = 1
    list_13 = []
    for i in range(1, 1001):
        if (i % 13 == 0):
            list_13.append(i)

    for i in list_13:
        print("item #" + str(count) + ": " + str(i))
        count += 1


find_thirteen()
```

b) (Answer is on the *task16_b.py* file)

```
def find_even(list_num):
    if (len(list_num) == 0):
        return 0
    else:
        if (list_num[0] % 2 == 0):
            del list_num[0]
            return 1 + find_even(list_num)
        else:
            del list_num[0]
            return 0 + find_even(list_num)


list_num = [1, 2, 3, 4, 5, 6, 7, 8, 9]
print("There are " + str(find_even(list_num)) + " even numbers in the list")
```

Question 17

a) The algorithmic complexity of the following knapsack algorithm is O(2^n)
b) Since the dynamic programming is reducing the time complexity compared to recursive solution.

c) (Answer is on the *task17_c.py* file)

```
capacity = 7
n_items = 4
weights = [2, 3, 4, 5]
values = [16, 19, 23, 28]

print(knapsack(capacity, weights, values, n_items))
```

Question 18

a) (Answer is on the *task18_a.py* file)

```
def inter_two_list(listReturn, listA, listB):
    if (len(listA) != 0 and len(listB) != 0):
        if (len(listA) != 0 and listA[0] not in listReturn):
            listReturn.append(listA[0])
            del listA[0]
        if (len(listB) != 0 and listB[0] not in listReturn):
            listReturn.append(listB[0])
            del listB[0]
        inter_two_list(listReturn, listA, listB)


listA = [1, 2, 3]
listB = [3, 4, 5]
listReturn = []
inter_two_list(listReturn, listA, listB)

print(listReturn)
```

b) Sorts that are perform faster than merge sort can be validated by:
    a. Looking at the time complexity
        i. Meaning if it can perform faster
    b. Looking at the space complexity
        i. Meaning it perform fasts on relative space (preferably more space)

Question 19

a) Internet needs standards since a standard makes it much easier to develop software and hardware that links different networks from different vendors, since software and hardware can be developed one layer at a time.