Actividad 09
Análisis y Diseño de Algoritmos
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1. Usa programación dinámica para resolver el problema de encontrar el máximo conjunto independiente con mayor peso. Usa el archivo MWIS.txt para obtener los datos, cada dato es el peso de un vértice en un grafo camino. Contesta los siguiente: ¿Cuáles de los vértices 1, 2, 3, 4, 17, 117, 517, y 997 forman parte de la solución óptima?

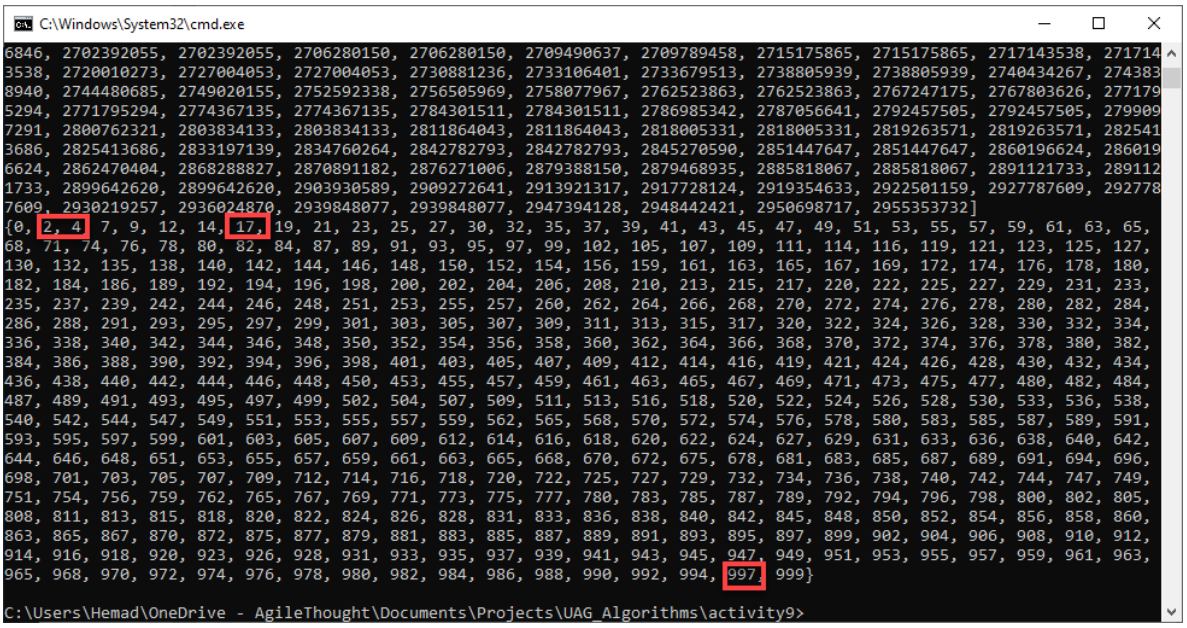
```python
def mwis(w):
    # Obtiene el valor optimo
    n = len(w)
    a = [0, w[0]]
    for i in range(2, n+1):
        a.append(max(
            a[i-1],
            a[i-2] + w[i-1]
        ))

    # Reconstruir la solucion
    i = n
    s = set()
    while i >= 1:
        if a[i] == a[i-1]:
            i -= 1
        else:
            s.add(i-1)
            i -= 2
    print(s)


w = []

with open("MWIS.txt", "r") as f:
    for line in f:
        line = line.strip()
        w.append(int(line))

mwis(w)
```



2. Usa programación dinámica para resolver el siguiente problema de la mochila. Suponga una capacidad máxima de 140 unidades. ¿Cuál es el valor óptimo de la mochila?, ¿Cuáles son los objetos que debemos tomar?

	1	2	3	4	5	6	7	8	9	10
Valor	79	32	47	18	26	85	33	40	45	59
Peso	85	26	48	21	22	95	43	45	55	52

```
import numpy as np



object_dict = {
    0:{"value":79, "weight":85},
    1:{"value":32, "weight":26},
    2:{"value":47, "weight":48},
    3:{"value":18, "weight":21},
    4:{"value":26, "weight":22},
    5:{"value":85, "weight":95},
    6:{"value":33, "weight":43},
    7:{"value":40, "weight":45},
    8:{"value":45, "weight":55},
    9:{"value":59, "weight":52}
    }

number_of_values = len(object_dict)
item_values_list = range(number_of_values + 1)
```

```
max_weight = 140
weights_list = range(max_weight + 1)
cells = [[0 for w in weights_list] for i in item_values_list]

for i in item_values_list:
    for w in weights_list:
        if i == 0 or w == 0:
            cells[i][w] = 0
        elif object_dict[i-1]["weight"] <= w:
            current_item_value = object_dict[i-1]["value"]
            current_item_weight = object_dict[i-1]["weight"]
            cells[i][w] = max(cells[i-1][w], current_item_value + cells[i-
1][w-current_item_weight])
        else:
            cells[i][w] = cells[i-1][w]

most_value = cells[number_of_values][max_weight]

print(np.matrix(cells))
print('Most optimal value stolen:', most_value)

remaining_weight = max_weight
for i in range(number_of_values, 0, -1):
    if most_value <= 0:
        break
    if most_value == cells[i - 1][remaining_weight]:
        continue
    else:
        print('Item included: ', list(object_dict.keys())[i - 1])
        most_value = most_value - object_dict[i - 1]["value"]
        remaining_weight = remaining_weight - object_dict[i - 1]["weight"]
```

```
[[  0   0   0 ...   0   0   0]
 [  0   0   0 ...  79  79  79]
 [  0   0   0 ... 111 111 111]
 ...
 [  0   0   0 ... 137 138 138]
 [  0   0   0 ... 137 138 138]
 [  0   0   0 ... 138 138 143]]
Most optimal value stolen: 143
Item included:  9
Item included:  7
Item included:  4
Item included:  3
```