

QUESTION 13/9 SOLUTION (Cantele Alberto/Cancelliere Biagio)

To define this question's solution let's make one assumption: We pick the largest defence item (weight:3 & survival:20) that allow us to maximize the survival points with the minimum weight.

After that we define 6 arrays and 1 list. 3 of the arrays are used to store items' weight (one array for each types) and 3 are used to store items' survival points (one array for each types). The list is used to store items choice's candidates that have a total weight less than 25 kg.

The algorithm used is defined down below with a python code:

```
1  import array as arr
2
3  foodWeight= arr.array( _typecode: 'i', _initializer: [5,8,12])
4  waterWeight= arr.array( _typecode: 'i', _initializer: [3,5,8])
5  shelterWeight= arr.array( _typecode: 'i', _initializer: [5,8,12])
6  foodPt= arr.array( _typecode: 'i', _initializer: [10,20,25])
7  waterPt= arr.array( _typecode: 'i', _initializer: [10,20,25])
8  shelterPt= arr.array( _typecode: 'i', _initializer: [5,15,20])
9  total=[]
10 coordinateI=[]
11 coordinateJ=[]
12 coordinateK=[]
13
14 for i in range(3):
15     for j in range(3):
16         for k in range(3):
17             if foodWeight[i]+waterWeight[j]+shelterWeight[k]+3<=25:
18                 total.append(20+foodPt[i]+waterPt[j]+shelterPt[k])
19                 coordinateI.append(i)
20                 coordinateJ.append(j)
21                 coordinateK.append(k)
22
23 maxElement= max(total)
24 maxIndex=total.index(maxElement)
25 print("points: ",maxElement,"food: ",
26       foodPt[coordinateI[maxIndex]],"water: ",
27       waterPt[coordinateJ[maxIndex]],"shelter: ",
28       shelterPt[coordinateK[maxIndex]],"defense: 20")
```

To define a further optimization, is possible to not consider the food's heighest weight, because there isn't any permutation that maximize the total points without having less than 25kg in the backpack. This approach reduces the first vector dimation by 1 and algorithm's permutations.

The final result is: 75pts (24kg-> FOOD:8kg| WATER: 5kg| SHELTER: 8kg| DEFENCE: 3kg)