"Algorithmics and computer programming"- Lab 2

We want to compute the quantity of each component of a meal, with the following constraints:
- a meal should bring a target number K of kcal,
- a meal should contain a quantity $q_{\text{prot source}}$ of a protein source, a quantity $q_{\text{carb source}}$ of a carb source, a quantity $q_{\text{fat source}}$ of a fat source, 125g of vegetable, 50g of fruit, and a quantity q_{extra} of an extra,
- each extra comes with a constant, predefined quantity (eg. 8g of coffee beans for an espresso).

1. Do a quick search to find the recommended fraction of calories that should be brought by proteins, carbohydrates, and fat, in a healthy diet. Pick values for the three fractions.

2. Knowing that 1g of protein brings 4 kcal, 1g of carbohydrate also brings 4 kcal and 1g of fat brings 8.8 kcal, write down the equations that express all the constraints (pen-and-paper !).

3. Define the typical serving size for each extra. In your code, store them in the data structure you find the most appropriate.

4. Write a function that computes and returns the list $[q_{\text{prot source}}, q_{\text{carb source}}, q_{\text{fat source}}, q_{\text{vegetable}}, q_{\text{fruit}}, q_{\text{extra}}]$ for a given list of ingredients.

5. Write a function that produces an output like the one below (no unit test required for this one, as it does not return anything -- just make sure that you get the expected screen output, with the numbers nicely aligned).

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The meal is composed of :
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-     27 g of           Poultry Meat, contributing    33 kcal,   3.3 g protein,    0.3 g carb,    2.1 g fat
-    198 g of  Wheat & Rye (Bread), contributing   493 kcal,  16.2 g protein,  101.8 g carb,    2.4 g fat
-     14 g of              Olive Oil, contributing   115 kcal,   0.0 g protein,    0.0 g carb,   13.1 g fat
-    125 g of        Root Vegetables, contributing    48 kcal,   1.1 g protein,   10.2 g carb,    0.2 g fat
-     50 g of       Berries & Grapes, contributing    26 kcal,   0.2 g protein,    5.9 g carb,    0.2 g fat
-      8 g of                 Coffee, contributing     4 kcal,   0.6 g protein,    0.5 g carb,    0.0 g fat
--------------------------------------------------------------------------------------------
TOTAL:                                              720 kcal,  21.6 g protein,  118.8 g carb,   18.0 g fat
```

6. Write a function that returns all possible meals, along with the corresponding quantities, that would bring 40% of the daily energetic target of the user. Are all meals nutritionally feasible? Make sure that your function returns only nutritionally valid meals.

To do for next week: finish this lab if necessary + read the slides on git.