

Problem Set 4 Exercise #28: Fast Food or Heath Food?

Reference: Lecture 12 notes

Learning objective: Recursion

Estimated completion time: 30 minutes

Problem statement:

[CS1010 AY2011/12 Semester 1 Practical Exam 2, Exercise 1]

Fabulous Hong wants to find out how many ways he can take n meals ($n > 0$), if he is only given the choice of fast-food meal or health-food meal. Being a very health-conscious person, he does **NOT** want to take two consecutive fast-food meals.

For example, if he has to take 4 meals, he can have 8 different ways of doing it, which are shown below, where 'F' stands for a fast-food meal and 'H' a health-food meal:

FHFH, FHFF, FHFF, HFHF, HFHF, HHFF, HHHF, HHHH

You are to help Fabulous. Write a program **food.c** that asks for n (the number of meals, a positive integer), and calculates how many ways Fabulous can take these n meals. You must write a recursive function:

```
int enumerate(int n)
```

to compute the number of ways to take the n meals.

You should **NOT** use any loop structures (*for*, *while* or *do-while* loop) in your program.

Some tips are given at the beginning of next page.

Sample run #1:

```
Enter total number of meals: 3
Number of combinations = 5
```

Sample run #2:

```
Enter total number of meals: 4
Number of combinations = 8
```

Useful tips:

1. There are 2 base cases here, one is $n = 1$, and the other is $n = 2$. When $n = 1$, the function should return 2 since there are 2 ways ('F' or 'H') to take one meal.
2. For the general case, you need to find out how many ways to take n meals. You can take this approach. If the first meal is a fast-food meal, how many ways are there to take the rest of the meals? On the other hand, if the first meal is a health-food meal, how many ways are there to take the rest of the meals? You then combine the answers.