BLG458E

Functional Programming

Spring 2017-2018

Bonus Assignment #1

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1. Answers to question #2

a) What does the helper function (sundays') calculate?

The helper function **sundays'** takes two integers, year and month, as its parameters. It is a recursive function that checks if the given month's first day is Sunday or not. If the statement is true, it adds 1 to the final result. If the end year is reached it returns 0.

b) What if you don't define a "rest" and use its expression where it's needed?

It can be used in this way as well. For answering this question in an example, in Question 3.hs the expression itself is used instead of rest.

```
19            | otherwise = if dayOfWeek(y, m, 1) == 1 then sundays' nextY nextM (acc + 1)
else sundays' nextY nextM acc
```

2. Answers to question #5

(math question) Is the number of weeks in 400 years an integer value? In other words, is the number of days in 400 years a multiple of 7? If so, what is the possibility that a certain day of a month (such as 1 Jan, or your birthday) is a Sunday (or some other day)? Are all days equally possible?

To answer this question we need to find how many days are there in 400 years. If we say that a year includes 365 days, there are also 97 leap years that add 97 days to the result. And that makes,

$$400 * 365 + 97 = 146097$$

146097 is divisible by 7 ($146097 \; mod \; 7 = 0$). This indicates that in 400 years period the days in the week repeat themselves equally.

However if we select any date but the leap day, there are 400 of them in 400 years. Since $400 \; mod \; 7$ is not equal to 0 each day are not equally possible. When we consider selecting the leap days, again $97 \; mod \; 7$ does not gives us the result 0. Eventually, possibilities of weekdays being a certain day of a month are not equal.

In table 1, it is shown that for the first 4 days of the year the occurences are not equal. The statistical data for table 1 is generated via the java code at https://github.com/Bgiris/Functional-Programming-Assignments/blob/master/Assignment%201/DaysInYears.java.

Table 1

Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 Jan	58	56	58	57	57	58	56
2 Jan	56	58	56	58	57	57	58
3 Jan	58	56	58	56	58	57	57
4 Jan	57	58	56	58	56	58	57