Grade 6 Math Circles

November 24, 2021

Computer Science Part 2 - Problem Set

1. Let $a =$ "cleveland", $b =$ "level" and $c =$ "thousand". Determine the following.
   (a) $\text{len}(a + b)$
   (b) c not in b
   (c) $a[6:9] == c[5:8]$
   (d) (b in a) and (c in a)

2. The grading system for public schools in Ontario is given below:

Percent (%)	Letter Grade
$0 - 49$	F
$50 - 52$	D-
$53 - 56$	D
$57 - 59$	D+
$60 - 62$	C-
$63 - 66$	C
$67 - 69$	C+
$70 - 72$	B-
$73 - 76$	B
$77 - 79$	B+
$80 - 86$	A-
$87 - 94$	A
$95 - 100$	A+

   Write a program called *letter_grade* that inputs an integer percent (between 0 and 100), and outputs the corresponding letter grade.

3. Suppose we want a program called *find_sevens* that inputs a positive 4-digit integer and outputs the number of times that 7 appears in the integer.

   (For example: *find_sevens*(7017) outputs 2, *find_sevens*(1234) outputs 0)

(a) Write the program using exclusively conditional statements (no loops or recursion).

(b) Write the program using loops.

(c) Write the program using recursion.

4. A **divisor** is an integer that divides into another integer with a remainder of 0 (e.g. 3 is a divisor of 12, but 5 is not). Write a program called *divisors* that inputs a positive integer and individually prints each of its positive divisors. (Hint: Use loops)

5. Write a program called *number_of_vowels* using a **for** loop, that inputs a string of any length, and outputs the number of vowels within the string. For this program, we are not counting "y" as a vowel, just "a", "e", "i", "o" and "u". Note, that if we wanted to count "y" as a vowel, then the changes would be quite simple.

   (For example: *number_of_vowels*("math circles") outputs 3)

Bonus Question

6. The Fibonacci sequence is a sequence of numbers beginning with 0 and 1, where each following number in the sequence is the sum of the previous two numbers. For example, the third number in the sequence would be $0 + 1 = 1$, the fourth number in the sequence would be $1 + 1 = 2$, and so on. The first 10 numbers in the sequence are given below:

   $$0, 1, 1, 2, 3, 5, 8, 13, 21, 34, \ldots$$

   Suppose we want a program called *fibonacci* that inputs a positive integer, n, and outputs the n^{th} number in the Fibonacci sequence.

   (For example: *fibonacci*(1) outputs 0, *fibonacci*(7) outputs 8)

   (a) Write the program using **while** loops.

   (b) Write the program using recursion.