

(60-140) Lab Exercises #5

— Working with loops

October 23, 2017

1. RAPTOR: loop structures

- (a) The factorial $n!$ for a positive integer n is defined as $n! = n \cdot (n-1) \cdot (n-2) \cdots 2 \cdot 1$. In addition, it is generally agreed that $0! = 1$ when $n = 0$. Create a flowchart to continuously compute the factorial of user input n until receiving a negative integer. The following shows a typical use of the flowchart to calculate the factorial of a whole number:

```
Enter a positive integer (or -ve integer to exit): 6
Factorial of 6: 720
Enter a positive integer (or -ve integer to exit): 9
Factorial of 9: 362880
Enter a positive integer (or -ve integer to exit): 0
Factorial of 0: 1
Enter a positive integer (or -ve integer to exit): 11
Factorial of 11: 39916800
Enter a positive integer (or -ve integer to exit): -1
Thank you for using my software :) -
```

- (b) Use a structure that corresponds to the “for” statement of C when calculating $n!$, and make sure that *the loop starts from the largest to the smallest* number.
- (c) For simplicity, it is assumed that the user input is always a whole number, and therefore this is no need to check.
- (d) Refer to the following table when trying out the flowchart.

1! = 1	7! = 5,040
2! = 2	8! = 40,320
3! = 6	9! = 362,880
4! = 24	10! = 3,628,800
5! = 120	11! = 39,916,800
6! = 720	12! = 479,001,600

- (e) Save the modified flowchart to “15_Factorial.rap”, and submit it online.

2. Algorithm implementation with C programming languages:

- (a) Implement the algorithm as represented by “15_Factorial.rap”, and write an equivalent C program that not only accomplishes what the flowchart does but also follows the structure of the flowchart when choosing C loop statements.
- (b) Save your program to a file named “15_Factorial.c” in your working directory, and submit it online.

Evaluation: All online submissions must be completed before due time, which will be kept on record. In addition, every student is required to show/demonstrate his/her complete exercises to a GA/TA at the end of this lab, or at the beginning of the next lab after completing online submission. The demonstration includes showing the submitted flowchart and/or C codes, compiling the C program, and trying out the flowchart and C program with different input values. The maximum marks for this lab is 15, with 10 for the lab work (submission and demonstration) and 5 for lab attendance.