

# CSE108 – Computer Programming Laboratory

## Spring 2022, May 7

### Lab #10

#### PART 1 (80 pts)

Write a complete C program that

- takes 2 numbers as strings,
- convert them into integers,
- calculate the combination of them,
- save each value in a struct and,
- print the combination as an output.

You should use 2 different structs:

- 1) First one is called `'struct number'` with 2 variables: a string of the number and the integer. Both keeps the same number. The string is the input coming from the user. The integer should be calculated via a recursive function (`parse_to_int`).  
*Sample values for the variables of the struct:*  
 string : "120"  
 int: 120
- 2) The second struct is called `'struct combination'`. It has three variables: *n*, *r* and *result*. *n* and *r* are instances of `'struct number'` and *result* is an integer. In other words, to save *n* and *r*, you should refer to the `'struct number'`, you can't save them directly in `'struct combination'`.

Functions needed:

- 1) `int factorial(int n)`  
 A recursive function which calculates and returns the factorial of an integer *n*.
- 2) `int is_number(char *number_as_str, int length_of_str)`  
 A recursive function to check if the input is proper (if it is a number that can be converted to an int).  
*For example, "1223" is a proper input while "123b2" is not.*  
 The function should return 1 if the string is a convertible number, 0 otherwise.  
 If an input is not a convertible number, the program should ask for another input.
- 3) `int parse_to_int(char *number_as_str, int length_of_str)`  
 The recursive function which converts a given string to int, and then returns it.
- 4) `int str_len(char *str)`  
 To use in 2<sup>nd</sup> and 3<sup>rd</sup> functions, write a recursive function to find the length of a given string.

Expected output of the program:

```

n: 154*97
r: 2335

Inputs are not valid. Please try again..

n: 12c2
r: 54

Inputs are not valid. Please try again..

n: 11
r: 4
Combination (11,4) = 330.000000

```

```

n: -19
r: 2

Inputs are not valid. Please try again..

n: 12
r: 7
Combination (12,7) = 792.000000

```

Notes:

- You can't use a function from an existing library to implement given tasks.
- Make sure you save every value (both inputs and output) in structs. You can't keep them in local variables where you read the input / where you make the calculations.
- Combination formula:

$$C(n, k) = \binom{n}{k} = \frac{n!}{k! (n - k)!}$$

## PART 2 (20 pts)

Write a complete C program that reads a decimal number and a base value (both as integers) and implements base conversion by using a recursive function.

Function prototype: `int base_converter (int decimal_number, int base)`

Expected output:

```

Decimal number: 65
Base: 2
65 in base 2 is: 1000001

Decimal number: 78
Base: 7
78 in base 7 is: 141

Decimal number: 32
Base: 16
32 in base 16 is: 20

```

PS: Don't forget to write a makefile and to add comments to your code.