HO CHI MINH UNIVERSITY OF SCIENCE
FACULTY OF INFORMATION TECHNOLOGY
SOFTWARE ENGINEERING DEPARTMENT
ADVANCED PROGRAM IN COMPUTER SCIENCE
COURSE: **KTLT – CS162**
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WEEK 08

RECURSION

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1 Problem 1

1. S(n) = 1 + 2 + 3 + … + n
2. S(n) = 1 + 1/2 + 1/3 + … + 1/n
3. T(n) = n!
4. T(n) = x^n
5. S(n) = x^2 + x^4 + … + x^2n
6. Fibonacci:
    a. f(0) = f(1) = 1
    b. f(n) = f(n-1) + f(n-2), n>1
7. Find x(n), y(n):
    a. x(0) = 1
    b. y(0) = 0
    c. x(n) = x(n-1) + y(n-1)
    d. y(n) = 3*x(n-1) + 2*y(n-1)
8. Find x(n):
    a. x(0) = 1
    b. $x(n) = n^2x(0) + (n-1)^2x(1) + \dots + (n-i)^2x(i) + \dots 2^2x(n-2) + 1^2x(n-1)$
9. C(n, k) = 1, if k = 1 or k = n

   C(n, k) = C(n, k – 1) + C(n – 1, k – 1), if 1 < k < n.

2 Problem 2 - Palindrome

You are given the following prototype:

```
bool is_palindrome(int l, int r, char* s).
```

Please implement this recursive function in order to check if a given string is palindrome or not.

You should not use any local variable inside the function.

A string is palindrome if and only if it reads the same when reading forwards and backwards.

Ex: “123321” is a palindrome

“apqfwfa” is not a palindrome

“quanggnauq” is a palindrome

3 Problem 3

1. You are given the following prototype:

```
void toBinary(int x)
```

Please implement this recursive function in order to print x in the binary representation.

2. You are given the following prototype:

```
void sumOfDigits(int x)
```

Please implement this recursive function in order to calculate the sum of all digits in the decimal representation of x.

4 Problem 4

1. Allow user to enter an array of integer values (non-recursive method).
2. Output the array of integer values to screen.
3. Output the array of integer values to screen in reversed order.
4. Find the sum of positive numbers in the array.
5. Count all distinct values in the array.
6. Check whether the array only contains odd numbers.
7. Find the maximum value in the array.
8. Sort the array in the ascending order.

5 Problem 5

8-queen problem

6 Problem 6

Knight's tour problem

7 Problem 7

Implement a Sudoku solver!!!
For those who do not know the rule of this game, please read it here:
http://en.wikipedia.org/wiki/Sudoku
Your program should read from the file "input.txt" a matrix 9 by 9 that represents the playing board.

All empty cells will have a special value: -1.
You should solve the game by replacing all -1's cells by numbers from 1 to 9, and then write your solution into the file "output.txt".

8 A08

Problem 1, 2, 3, 4

9 H08

Problem 1 – 7