Lab 05

Recursion

Revised by Tran Thanh Tung

A. Introduction:

You have learnt about Recursion. This lab will help you to apply Recursion in Java programming language.

B. Objectives

Apply Recursion in calculating mathematical expressions

C. Problems:

Use the following function puzzle(..) to answer problems 1 - 3.

```
int puzzle(int base, int limit)

{        //base and limit are nonnegative numbers

        if ( base > limit )

                return -1;

        else if ( base == limit )

                return 1;

        else

                return base * puzzle(base + 1, limit);

}
```

1. Identify the base case(s) of function puzzle(..)

2. Identify the recursive case(s) of function puzzle(..)

3. Show what would be displayed by the following calls.

    a. System.out.print(puzzle(14,10));

    b. System.out.print(puzzle(4,7));

    c. System.out.print(puzzle(0,0));

4. Complete the Java code to recursively evaluate the sum: sum = 1 + 1/2 + 1/3 +...+1/n, n > 1.

```
double sum(int n)            // n>=1

{

   if (_____)

               return _____;



   return _____ + sum(_____);
```

5. Write a recursive function that computes the sum of all numbers from 1 to n, where n is given as parameter.

```
//return the sum 1+ 2+ 3+ ...+ n

int sum(int n)
```

6. Write a recursive function that finds and returns the minimum element in an array, where the array and its size are given as parameters.

```
//return the minimum element in a[]

int findmin(int a[], int n)
```

7. Write a recursive function that computes and returns the sum of all elements in an array, where the array and its size are given as parameters.

```
//return the sum of all elements in a[]

int findsum(int a[], int n)
```

8. Write a method that receives two integers and returns the largest common divisor. Formula to calculate the Largest common divisor is shown below:

$$gcd(p, q) = \begin{cases} p & \text{if } q = 0 \\ gcd(q, p \% q) & \text{otherwise} \end{cases}$$