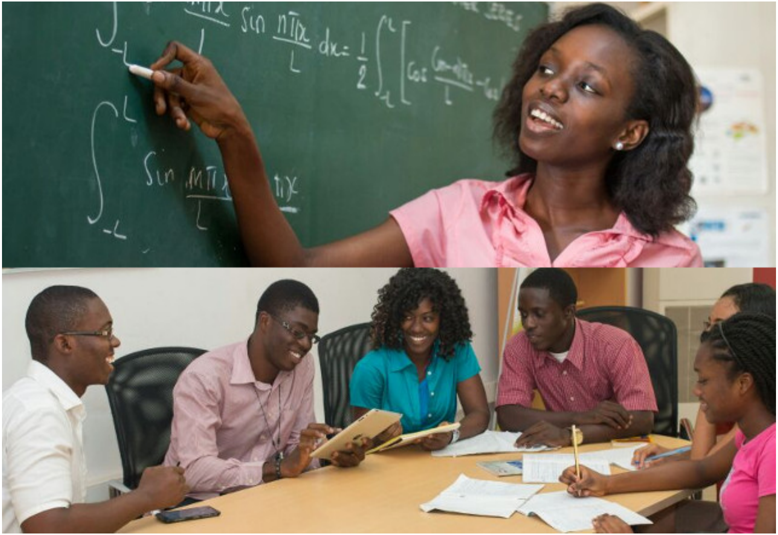

SMR3821: C and Linux for Science Engineering:

Introduction to C Programming

Functions

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Outline

1. Introduction
2. Notes on Functions
3. Prototype
4. Recursion

where are we?

1. Introduction
2. Notes on Functions
3. Prototype
4. Recursion

Defintion & Syntax: Function

A function is a self-contained block of statements that perform a coherent task of some kind.

```
[data_type] fxn_name([data_type arg1,..,data_type argk]
{
        [statement_1;
        statement_2;
        statement_k;]
}
```

Example: Function

```
#include<stdio.h>

int main()
{
        int a=100;
        int b=200;
        int result=0;

        result=sum(a,b);

        printf("\n%d + %d = %d\n",a,b,result);
}

int sum(int num1, int num2)
{
        return num1+num2;
}
```

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- A function returns one and only one value at a time.
- The default return type of a function in C is int
- When void is used as a return type, the function does not return anything.
- A function can be invoked from any other function. If function A is invoked from function B, then function A is refered to as the CALLED FUNCTION and function B is refered to as the CALLING FUNCTION
- A function may be called any number of times.
- A function may call itself, a process refered to as recursion
- The two categories of functions in C are:
    1. Library Functions . e.g. scanf(),printf()
    2. User Defined Functions e.g. sum(),factorial()

- The function *name*, *number of arguments*,*type of arguments* and the *order of arrangement of the the arguments* constitutes the signature of the function.
- Functions in C must have unique signatures!
- The return statement of a function transfers control to the calling function. It thus terminates the called function.
- Arguments within the definition of a function are refered to as FORMAL ARGUMENTS.
- Arguments passed during the invokation of a function are refered to as ACTUAL ARGUMENTS

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Function Prototype

A FUNCTION PROTOTYPE is a declaration of a function to the compiler indicating the data type of parameters to be passed to it and the data type of the return value.

Syntax

```
data_type fxn_name(data_type arg1,...,data_type argk);
```

OR

```
data_type fxn_name(data_type,...,data_type);
```

1. Function prototypes enable the compiler to check for any mismatch in data type and number of arguments between function invokation and function definition.
2. Function prototypes help the compiler to perform type conversions on function parameters.

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Recursion

A function is said to be recursive if a statement within the body of the function calls the function.

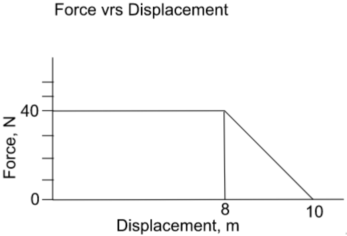
ILLUSTRATION: Factorial

```
#include<stdio.h>
int fact(int);
int main()
{
        int number=0;
        printf("\nEnter Number = ");
        scanf("%d",&number);
        printf("Answer = %d\n",fact(number));
}

int fact(int num)
{
        if(num==0 || num==1)
        {
                return 1;
        }
        else
        {       //recursion occurs here
                return num*fact(num-1);
        }
}
```

Speed Byte

Question 1 :



The diagram above shows a force vrs displacement curve to asses **work done(area under the curve)** by a particle in motion.

$$\text{Work done} = \text{Area of rectangle} + \text{Area of triangle}$$
$$\text{WD} = 40\text{ N x }8\text{ m} \quad + \quad 0.5\text{ x }2\text{ m x }40\text{ N}$$

Speed Byte

QUESTION 1 - CONTINUE :

Write a C program to compute the work done.
The C code should have a function called, *area_triangle* that computes and returns a floating point as the area of a right-angled triangle. and a function *area_rectangle* that computes the area of the rectangle.
Your program should also have a void function called *work* that evaluates or computes the work done and prints results to screen.
Design and write your program such that:

1. You use function prototypes.
2. The function, *area_triangle* and *area_rectangle* are both CALLED by the function, *work*.

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