Recursion

IN 1101 PROGRAMMING FUNDAMENTALS

Recall of Functions

- C language provides an approach in which you need to declare and define a group of statements once and that can be called and used whenever required.
- A function is a self contained block of statements that perform a coherent task of some kind.
- Is it possible to call the functions it self?

Recursion

- In C, it is possible for the functions to call themselves.
- A function is called ‘recursive’ if a statement within the body of a function calls the same function.
- E.g. : Calculating the factorial of an integer.
  - The factorial of a number is the product of all the integers between 1 and that number.
  - For example, 4 factorial is 4 * 3 * 2 * 1.
  - This can also be expressed as 4! = 4 * 3! where ‘!’ stands for factorial.
  - Thus factorial of a number can be expressed in the form of itself.
  - Hence this can be programmed using recursion

Non-Recursive Program

Let’s write a non-recursive program to calculate the factorial of an integer.

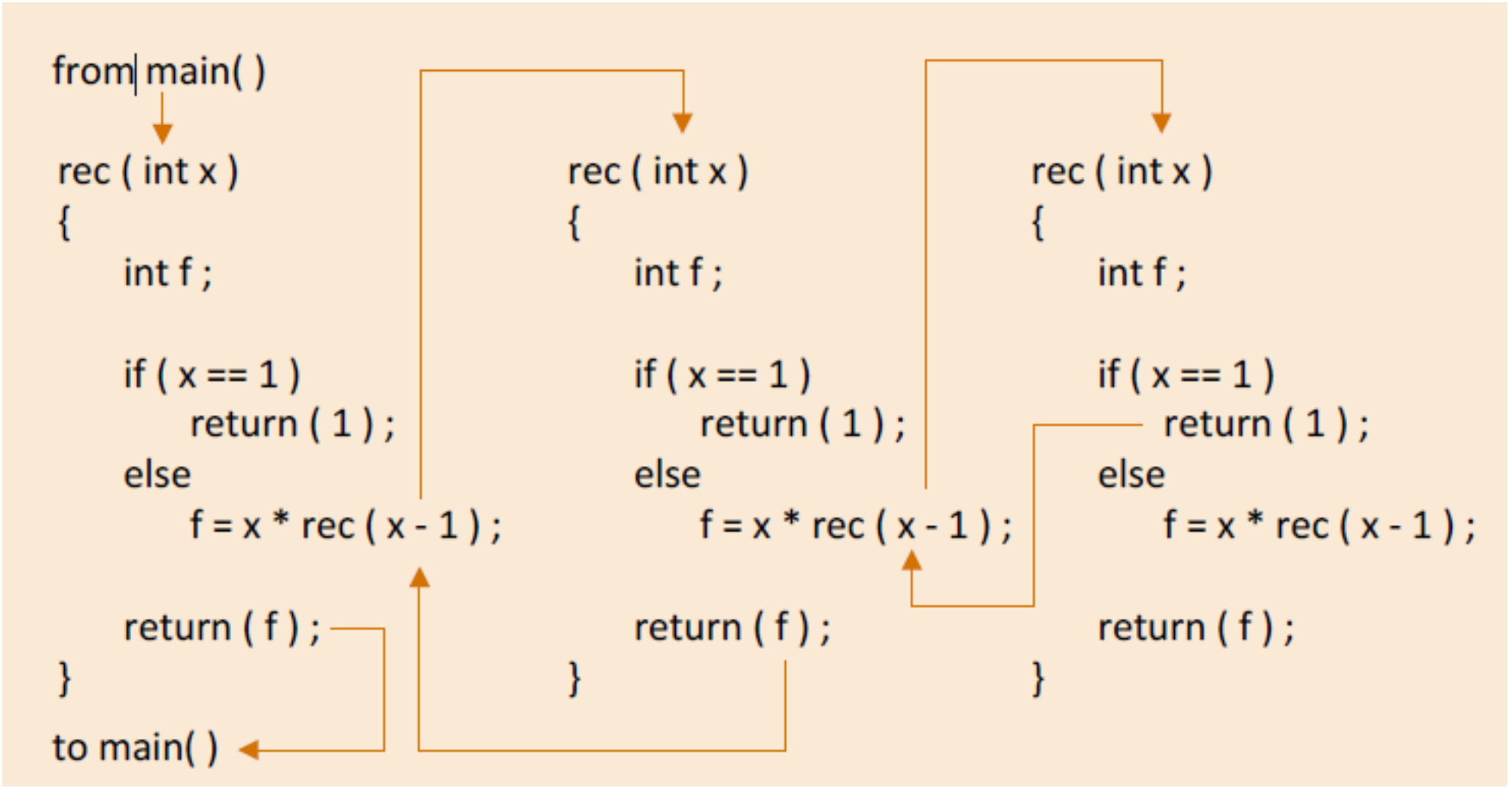
```
#include <stdio.h>
int factorial ( int ) ;
int main( )
{
   int a, fact ;
   printf ( "Enter the number :" ) ;
   scanf ( "%d", &a ) ;
   fact = factorial ( a ) ;
   printf ( "Factorial value = %d\n", fact ) ;
   return 0 ;
}
```

```
int factorial ( int x )
{
   int f = 1, i ;
   for ( i = x ; i >= 1 ; i-- )
      f = f * i ;
   return ( f ) ;
}
```

Recursive Program

```
# include <stdio.h>
int rec ( int ) ;
int main( )
{
   int a, fact ;
   printf ( "Enter any number " ) ;
   scanf ( "%d", &a ) ;
   fact = rec ( a ) ;
   printf ( "Factorial value = %d\n", fact ) ;
   return 0 ;
}
```

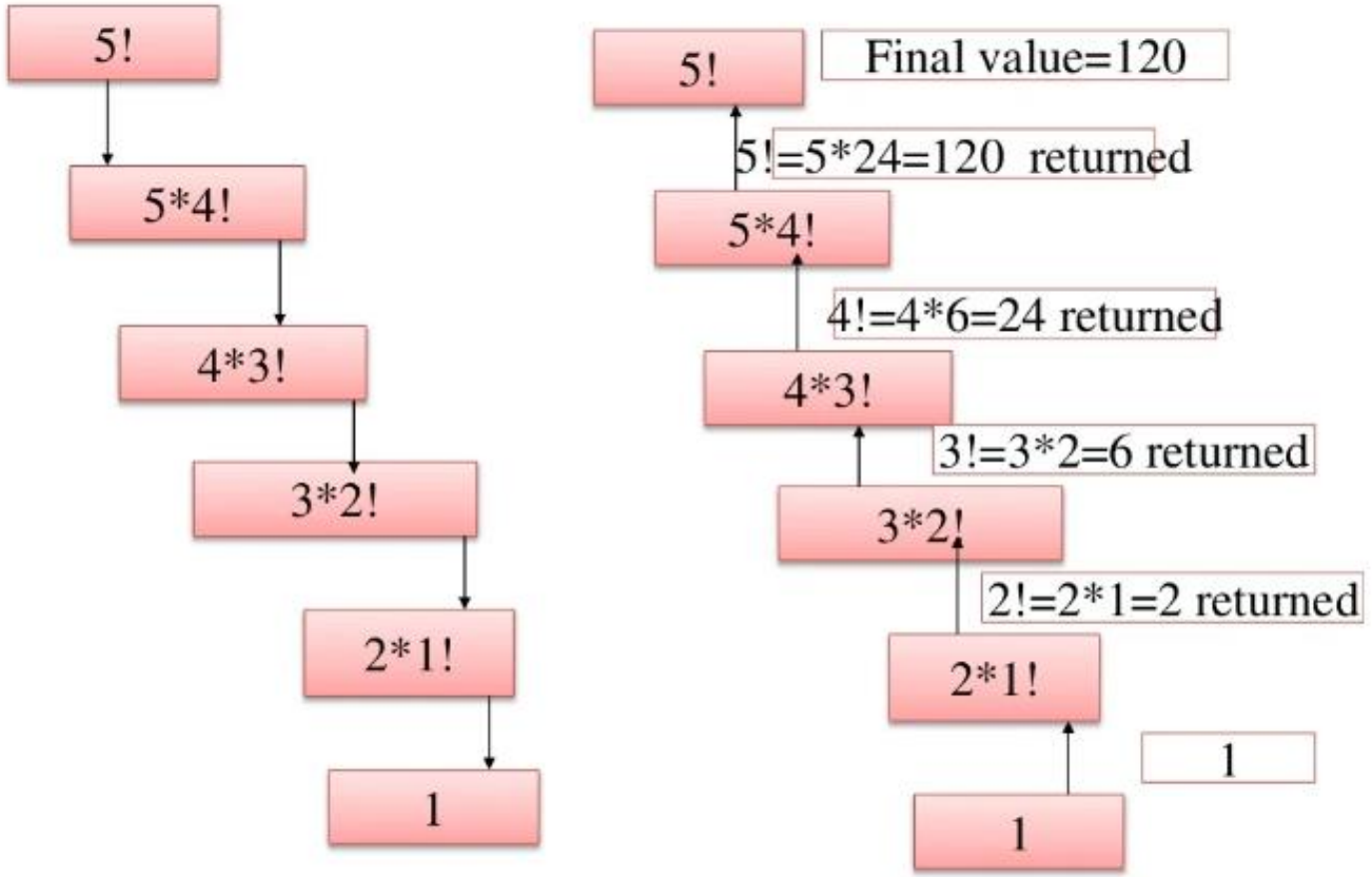
```
int rec ( int x )
{
   int f ;
   if ( x == 1 )
      return ( 1 ) ;
   else
      f = x * rec ( x - 1 ) ;
   return ( f ) ;
}
```



Source: *Yashavant P. Kanetkar. 2016. Let Us C – 14th Edition (14th. ed.). BPB Publications.*

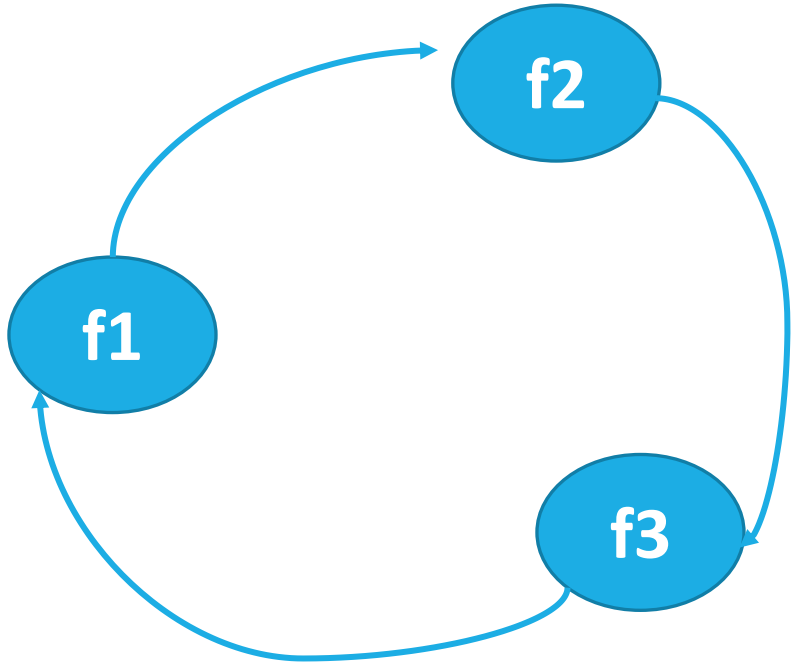
Recursive Programs Cont.

5!



Direct and Indirect Recursion

- Direct Recursion : A recursive function that involves itself is said to be have direct recursion.
- Indirect Recursion: A function f1 involves f2 which inturn involves f3 involves f1 is said to have indirect recursion.



Questions?