Q3. a) The *mode* is identified as the value that occurs most frequently in a data set. For example, in the sequence 99, 86, 87, 88, 111, 86, 54, the mode is 86, occurring twice (highest number of times).

Write a function with the prototype **int** Mode(**int** ar[], **int** N);, that returns the *mode* of data set given in the array ar[ ] of size N.   [4 Marks]

Answer

```
int Mode(int ar[] , int N)
{    int mode = ar[0]; // Assume the first element as the mode initia
     int maxCount = 0;

     for (int i = 0; i < N; i++)
     {  int count = 1; // Count the frequency of the current element
        for (int j = i + 1; j < N; j++)
        {  if (ar[i] == ar[j])
           count++;
        }
        if (count > maxCount)
        { // If the frequency is greater than the previous maximum
           maxCount = count;
           mode = ar[i]; // Update mode to the current element
        }
     }
     return mode;
}
```

b) The Fibonacci series defined as

$f_n = f_{n-1} + f_{n-2}$

where $n = 1, 2, 3, 4, \ldots$ with initial values $f_1 = 0$, $f_2 = 0$

is the infinite sequence 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55,... .

The 1st and 2nd numbers are 0 and 1, respectively. Starting from the 3rd number onward, each subsequent number in the series is the sum of two preceding numbers. E.g. 8th number in the series (13) is equal to the sum of 6th and 7th numbers (5+8) in the series.

Write a function of prototype **unsigned long** nthFibonacci(**unsigned long** n); that returns the nth number in the Fibonacci series.   [4 Marks]

Answer

```
unsigned long nthFibonacci(unsigned long n)
{   if (n <= 2) return n - 1; // Base cases for first two Fb numbers

    unsigned long a = 0, b = 1, temp;
    for (unsigned long i = 3; i <= n; i++)
    {   temp = a + b;    a = b;    b = temp;
    }
    return b;
}
```