Lab #3  
Wednesday, June 9  
Due at the end of the lab hour

Computing Fibonacci Numbers:  Background

In the year 1202 Fibonacci investigated how fast rabbits could potentially breed. Suppose a newly-born pair of rabbits, one male, one female, are put in a field. Rabbits are able to mate at the age of one month so that at the end of its second month a female can produce another pair of rabbits. Suppose that our rabbits never die and that the female always produces one new pair (one male, one female) every month from the second month on.

To see how many pairs there will be we can use the following logic:

At the start of the first month, there is 1 pair of rabbits.

At the start of the second month, there is 1 pair of rabbits. The rabbits now mate.

At the start of the third month, there are 2 pairs of rabbits. The rabbits that mated last month produce a new pair.

At the start of the fourth month, there are 3 pairs of rabbits. The original pair has produced a new pair. The pair born in month three now mate and will give birth next month.

At the start of the fifth month, there are 5 pairs of rabbits. The original pair and the female born two months ago produces her first pair, bringing the total to five.

The following picture shows a family tree of rabbits, where the number of pairs is the number of pairs at the start of each month:

![Rabbit Family Tree](image)
This sequence, the number of pairs of rabbits, is the Fibonacci sequence. It is described as the sequence of numbers:

1, 1, 2, 3, 5, 8, 13, 21, 34, ... (add the previous two numbers to get the next)

The Fibonacci sequence describes many phenomena in nature, such as spirals on sea shells, branching in plants, cow and honeybee reproduction.

**Lab Programming Assignment**

Your task in this lab is to write a program to determine and output the number of months it would take to have at least \( n \) pairs of rabbits using the reproductive scenario described above. You should allow the user to input the number \( n \), either via an inputbox or textbox. Your program should verify that \( n \) is a positive number and output an error message if the number is negative. You can output your answer in a textbox, msgbox, console window, or anyplace else you prefer.

To compute the Fibonacci numbers we can work our way up starting at Fib(3). We must remember the previous two numbers were 1 and 1 to produce 2. To compute Fib(4), we must remember the previous two numbers were 1 and 2 to produce 3. To compute Fib(5) we must remember the previous two numbers were 2 and 3 to produce 5. To compute Fib(6) we must remember the previous two numbers were 3 and 5 to produce 8. Etc.

Use a loop to produce the numbers. Here is some pseudocode to help you get started:

```
input n, number of pairs
if n <= 0 output error message
else if n = 1 output “1 month”
else
    lastFib = 1    ' Variables to remember the last two fibs
    currentFib = 1    ' Where lastFib = Fib(1), currentFib = Fib(2)
    month = 2    ' The current month
    Repeat the following as long as currentFib < n
        nextFib = lastFib + currentFib    ' Compute next fib number
        month = month + 1    ' Increment month
        lastFib = currentFib    ' Set last and current
        currentFib = nextFib    ' to the most recently computed
        ' pair of fib numbers
    Output month “months”
```

For example, if the user inputs 2 as the number of rabbit pairs, the program should output “3 months”. If the user inputs 8 as the number of rabbit pairs, the program should output “6 months”. If the user inputs 1000000 as the number of rabbit pairs, the program should output “31 months.”

Show your working program to your instructor to receive credit for this lab.