Unit 4: Loops **Skill Builder 3: The Repeat…End loop**

In this third lesson for Unit 4 you will learn about the **Repeat…End** loop. We'll compare it to the **For…** loop and even show why it is more powerful.

Objectives:

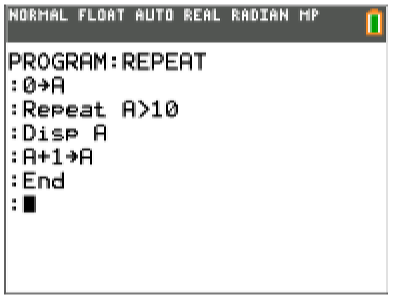
- Learn the structure and logic of the **Repeat…End** loop.
- Compare it to the **While…End** loop.
- See how **Repeat…End** is used in programming the Fibonacci sequence.

The Repeat… End Loop

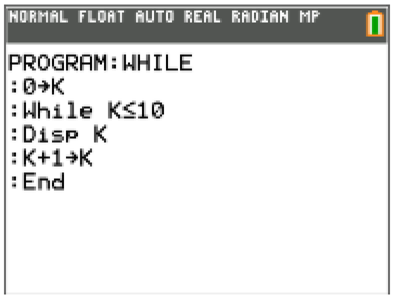
The **Repeat…End** loop will continue looping as long as its <condition> is False. This is the exact *opposite* if the **While** loop behavior and that's not the only difference! It looks like this, which looks pretty much the same as the **While** structure:

```
Repeat <condition>
  <loop body>
End
```

The programs on the right have the same output. What are the differences?



```
NORMAL FLOAT AUTO REAL RADIAN MP
PROGRAM:REPEAT
:0→A
:Repeat A>10
:Disp A
:A+1→A
:End
:
```



```
NORMAL FLOAT AUTO REAL RADIAN MP
PROGRAM:WHILE
:0→K
:While K≤10
:Disp K
:K+1→K
:End
```

The <condition> is a logical expression such as **X>0.**
The <loop body> is any set of statements, including other loops and **If** structures. It **is processed once** and then continues **until** the <condition> is true so it behaves more like this:

```
Repeat
<loop body>
until <condition> is true End
```

But there's no 'until' keyword in TI Basic. It's implied. Even if the <condition> is true to start with, the loop body is still processed once because the condition is tested at the bottom of the loop.

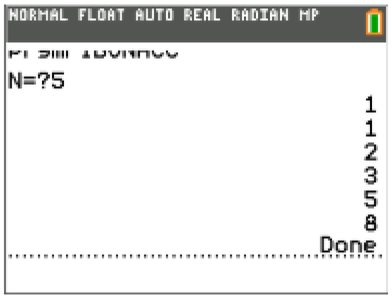
In a **While** loop it's a great idea to 'initialize' the variable(s) that your loop relies upon. In a **Repeat** loop this will happen inside the loop body so initializing is not necessary.

As with **While**, somewhere in the <loop body> there should be a statement that will have an effect on the <condition> so that the loop will eventually end and statements after the loop can be processed. Usually this statement is near the bottom of the <loop body>.

Programming the Fibonacci Sequence

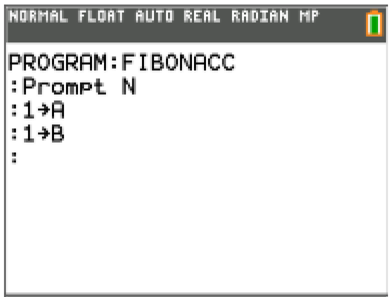
Let's write a program that displays the *Fibonacci* sequence up to a certain value. You can research the *Fibonacci* sequence if you've never heard of it.

The output of the program is shown to the right. Can you write this program without peeking below?



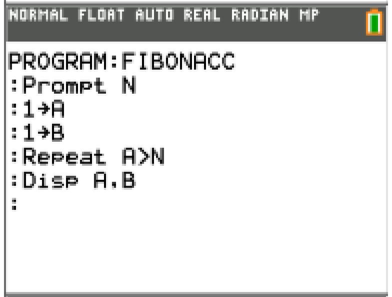
```
NORMAL FLOAT AUTO REAL RADIAN MP
prgmFIBONACC
N=?5
                              1
                              1
                              2
                              3
                              5
                              8
                           Done
```

We start with a **Prompt** statement to get an upper bound value from the user. The first two Fibonacci numbers are 1 and 1 so we'll store those values in the variables **A** and **B**. These variables are going to be used to calculate the rest of the Fibonacci numbers (up to **N**).



```
NORMAL FLOAT AUTO REAL RADIAN MP
PROGRAM:FIBONACC
:Prompt N
:1→A
:1→B
:
```

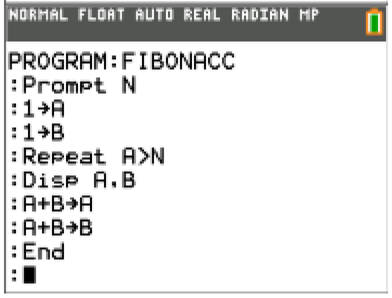
Then we begin the **Repeat** loop using the condition **A>N**, meaning '*until* **A** is greater than **N'**. In the loop we first display the current two numbers.



```
NORMAL FLOAT AUTO REAL RADIAN MP
PROGRAM:FIBONACC
:Prompt N
:1→A
:1→B
:Repeat A>N
:Disp A,B
:
```

Finally, we calculate the next two Fibonacci numbers and **End** the loop.

These last two loop statements show that A+B is being stored in both A and B and it appears that A and B are getting the same value. **This is not the case!** Try it with 1 and 1. The first statement stores 1+1 in A, making A 2. The second statement stores 2+1 in B making it 3. Try it yourself - 'play computer'!



```
NORMAL FLOAT AUTO REAL RADIAN MP
PROGRAM:FIBONACC
:Prompt N
:1→A
:1→B
:Repeat A>N
:Disp A,B
:A+B→A
:A+B→B
:End
:█
```

Run the program with several different input values. Does it behave as planned?

Try changing the **Repeat** condition to **B>N**. What is the effect? How can we modify the program to display the 'correct' set of numbers, stopping when exactly the largest Fibonacci number less than **N** has been displayed?