

# CECS 277 LAB SINGLETON PATTERN

**OBJECTIVE:** To build your own singleton class.

**INTRODUCTION:** Please remember the coding standards [here](#).

The code that we walked through in lecture today is located [here](#). Use that as an example for your lab.

You want to create a singleton pattern that will return the next Fibonacci number, no matter who asks for it. Essentially, the Fibonacci singleton needs to remember where you are in the Fibonacci number series.

Remember that the algorithm for the Fibonacci sequence is:

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

$$f_0 = 0$$

$$f_1 = 0$$

Your job is to write a Fibonacci singleton that will return the next Fibonacci number as the BigInteger return value from calling the next() method on your singleton instance of Fibonacci.

**PROCEDURE:**

1. Look up BigInteger in the Java API [here](#).
  - a. To create a new instance of BigInteger, pass the constructor a **String** that represents the integer value that you want to manage.
  - b. Adding two BigIntegers requires that you use a member method: add. result = this.prev1.add(this.prev2); will add the two BigInteger values prev1 and prev2 in the implicit parameter Fibonacci to produce the next Fibonacci number.
  - c. Bear in mind that BigInteger values are immutable. You cannot change them, just like you cannot change Strings.
2. Build a static method: getFibonacci() that will return the one and only instance of Fibonacci that you will produce.
3. Build an instance method: next() that returns the next Fibonacci number in the series.
4. Build a test program that goes into a loop, and uses getFibonacci() each time through the loop. That should always return the same exact instance of Fibonacci.
  - a. In the loop, use that instance of Fibonacci to retrieve the next Fibonacci number in the series.
  - b. Print out which number it is and the Fibonacci number.

**WHAT TO TURN IN:**

- Fibonacci.java
- FibonacciRunner.java

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- Your console output. It could look like:

```
0th Fibonacci number is: 0
1th Fibonacci number is: 1
2th Fibonacci number is: 1
3th Fibonacci number is: 2
4th Fibonacci number is: 3
5th Fibonacci number is: 5
6th Fibonacci number is: 8
7th Fibonacci number is: 13
8th Fibonacci number is: 21
9th Fibonacci number is: 34
10th Fibonacci number is: 55
11th Fibonacci number is: 89
12th Fibonacci number is: 144
13th Fibonacci number is: 233
14th Fibonacci number is: 377
15th Fibonacci number is: 610
16th Fibonacci number is: 987
17th Fibonacci number is: 1597
18th Fibonacci number is: 2584
19th Fibonacci number is: 4181
20th Fibonacci number is: 6765
21th Fibonacci number is: 10946
22th Fibonacci number is: 17711
23th Fibonacci number is: 28657
24th Fibonacci number is: 46368
25th Fibonacci number is: 75025
26th Fibonacci number is: 121393
27th Fibonacci number is: 196418
28th Fibonacci number is: 317811
29th Fibonacci number is: 514229
30th Fibonacci number is: 832040
31th Fibonacci number is: 1346269
32th Fibonacci number is: 2178309
33th Fibonacci number is: 3524578
34th Fibonacci number is: 5702887
35th Fibonacci number is: 9227465
36th Fibonacci number is: 14930352
37th Fibonacci number is: 24157817
38th Fibonacci number is: 39088169
39th Fibonacci number is: 63245986
40th Fibonacci number is: 102334155
41th Fibonacci number is: 165580141
42th Fibonacci number is: 267914296
43th Fibonacci number is: 433494437
44th Fibonacci number is: 701408733
45th Fibonacci number is: 1134903170
46th Fibonacci number is: 1836311903
47th Fibonacci number is: 2971215073
48th Fibonacci number is: 4807526976
49th Fibonacci number is: 7778742049
50th Fibonacci number is: 12586269025
51th Fibonacci number is: 20365011074
```

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52th Fibonacci number is: 32951280099  
53th Fibonacci number is: 53316291173  
54th Fibonacci number is: 86267571272  
55th Fibonacci number is: 139583862445  
56th Fibonacci number is: 225851433717  
57th Fibonacci number is: 365435296162  
58th Fibonacci number is: 591286729879  
59th Fibonacci number is: 956722026041  
60th Fibonacci number is: 1548008755920  
61th Fibonacci number is: 2504730781961  
62th Fibonacci number is: 4052739537881  
63th Fibonacci number is: 6557470319842  
64th Fibonacci number is: 10610209857723  
65th Fibonacci number is: 17167680177565  
66th Fibonacci number is: 27777890035288  
67th Fibonacci number is: 44945570212853  
68th Fibonacci number is: 72723460248141  
69th Fibonacci number is: 117669030460994  
70th Fibonacci number is: 190392490709135  
71th Fibonacci number is: 308061521170129  
72th Fibonacci number is: 498454011879264  
73th Fibonacci number is: 806515533049393  
74th Fibonacci number is: 1304969544928657  
75th Fibonacci number is: 2111485077978050  
76th Fibonacci number is: 3416454622906707  
77th Fibonacci number is: 5527939700884757  
78th Fibonacci number is: 8944394323791464  
79th Fibonacci number is: 14472334024676221  
80th Fibonacci number is: 23416728348467685  
81th Fibonacci number is: 37889062373143906  
82th Fibonacci number is: 61305790721611591  
83th Fibonacci number is: 99194853094755497  
84th Fibonacci number is: 160500643816367088  
85th Fibonacci number is: 259695496911122585  
86th Fibonacci number is: 420196140727489673  
87th Fibonacci number is: 679891637638612258  
88th Fibonacci number is: 1100087778366101931  
89th Fibonacci number is: 1779979416004714189  
90th Fibonacci number is: 2880067194370816120  
91th Fibonacci number is: 4660046610375530309  
92th Fibonacci number is: 7540113804746346429  
93th Fibonacci number is: 12200160415121876738  
94th Fibonacci number is: 19740274219868223167  
95th Fibonacci number is: 31940434634990099905  
96th Fibonacci number is: 51680708854858323072  
97th Fibonacci number is: 83621143489848422977  
98th Fibonacci number is: 135301852344706746049  
99th Fibonacci number is: 218922995834555169026  
100th Fibonacci number is: 354224848179261915075  
101th Fibonacci number is: 573147844013817084101  
102th Fibonacci number is: 927372692193078999176  
103th Fibonacci number is: 1500520536206896083277  
104th Fibonacci number is: 2427893228399975082453  
105th Fibonacci number is: 3928413764606871165730

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106th Fibonacci number is: 6356306993006846248183  
107th Fibonacci number is: 10284720757613717413913  
108th Fibonacci number is: 16641027750620563662096  
109th Fibonacci number is: 26925748508234281076009  
110th Fibonacci number is: 43566776258854844738105  
111th Fibonacci number is: 70492524767089125814114  
112th Fibonacci number is: 114059301025943970552219  
113th Fibonacci number is: 184551825793033096366333  
114th Fibonacci number is: 298611126818977066918552  
115th Fibonacci number is: 483162952612010163284885  
116th Fibonacci number is: 781774079430987230203437  
117th Fibonacci number is: 1264937032042997393488322  
118th Fibonacci number is: 2046711111473984623691759  
119th Fibonacci number is: 3311648143516982017180081  
120th Fibonacci number is: 5358359254990966640871840  
121th Fibonacci number is: 8670007398507948658051921  
122th Fibonacci number is: 14028366653498915298923761  
123th Fibonacci number is: 22698374052006863956975682  
124th Fibonacci number is: 36726740705505779255899443  
125th Fibonacci number is: 59425114757512643212875125  
126th Fibonacci number is: 96151855463018422468774568  
127th Fibonacci number is: 155576970220531065681649693  
128th Fibonacci number is: 251728825683549488150424261  
129th Fibonacci number is: 407305795904080553832073954  
130th Fibonacci number is: 659034621587630041982498215  
131th Fibonacci number is: 1066340417491710595814572169  
132th Fibonacci number is: 1725375039079340637797070384  
133th Fibonacci number is: 2791715456571051233611642553  
134th Fibonacci number is: 4517090495650391871408712937  
135th Fibonacci number is: 7308805952221443105020355490  
136th Fibonacci number is: 11825896447871834976429068427  
137th Fibonacci number is: 19134702400093278081449423917  
138th Fibonacci number is: 30960598847965113057878492344  
139th Fibonacci number is: 50095301248058391139327916261  
140th Fibonacci number is: 81055900096023504197206408605  
141th Fibonacci number is: 131151201344081895336534324866  
142th Fibonacci number is: 212207101440105399533740733471  
143th Fibonacci number is: 343358302784187294870275058337  
144th Fibonacci number is: 555565404224292694404015791808  
145th Fibonacci number is: 898923707008479989274290850145  
146th Fibonacci number is: 1454489111232772683678306641953  
147th Fibonacci number is: 2353412818241252672952597492098  
148th Fibonacci number is: 3807901929474025356630904134051  
149th Fibonacci number is: 6161314747715278029583501626149  
150th Fibonacci number is: 9969216677189303386214405760200  
151th Fibonacci number is: 16130531424904581415797907386349  
152th Fibonacci number is: 26099748102093884802012313146549  
153th Fibonacci number is: 42230279526998466217810220532898  
154th Fibonacci number is: 68330027629092351019822533679447  
155th Fibonacci number is: 110560307156090817237632754212345  
156th Fibonacci number is: 178890334785183168257455287891792  
157th Fibonacci number is: 289450641941273985495088042104137  
158th Fibonacci number is: 468340976726457153752543329995929  
159th Fibonacci number is: 757791618667731139247631372100066

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160th Fibonacci number is: 1226132595394188293000174702095995  
161th Fibonacci number is: 1983924214061919432247806074196061  
162th Fibonacci number is: 3210056809456107725247980776292056  
163th Fibonacci number is: 5193981023518027157495786850488117  
164th Fibonacci number is: 8404037832974134882743767626780173  
165th Fibonacci number is: 13598018856492162040239554477268290  
166th Fibonacci number is: 22002056689466296922983322104048463  
167th Fibonacci number is: 35600075545958458963222876581316753  
168th Fibonacci number is: 57602132235424755886206198685365216  
169th Fibonacci number is: 93202207781383214849429075266681969  
170th Fibonacci number is: 150804340016807970735635273952047185  
171th Fibonacci number is: 244006547798191185585064349218729154  
172th Fibonacci number is: 394810887814999156320699623170776339  
173th Fibonacci number is: 638817435613190341905763972389505493  
174th Fibonacci number is: 1033628323428189498226463595560281832  
175th Fibonacci number is: 1672445759041379840132227567949787325  
176th Fibonacci number is: 2706074082469569338358691163510069157  
177th Fibonacci number is: 4378519841510949178490918731459856482  
178th Fibonacci number is: 7084593923980518516849609894969925639  
179th Fibonacci number is: 11463113765491467695340528626429782121  
180th Fibonacci number is: 18547707689471986212190138521399707760  
181th Fibonacci number is: 30010821454963453907530667147829489881  
182th Fibonacci number is: 48558529144435440119720805669229197641  
183th Fibonacci number is: 78569350599398894027251472817058687522  
184th Fibonacci number is: 127127879743834334146972278486287885163  
185th Fibonacci number is: 205697230343233228174223751303346572685  
186th Fibonacci number is: 332825110087067562321196029789634457848  
187th Fibonacci number is: 538522340430300790495419781092981030533  
188th Fibonacci number is: 871347450517368352816615810882615488381  
189th Fibonacci number is: 1409869790947669143312035591975596518914  
190th Fibonacci number is: 2281217241465037496128651402858212007295  
191th Fibonacci number is: 3691087032412706639440686994833808526209  
192th Fibonacci number is: 5972304273877744135569338397692020533504  
193th Fibonacci number is: 9663391306290450775010025392525829059713  
194th Fibonacci number is: 15635695580168194910579363790217849593217  
195th Fibonacci number is: 25299086886458645685589389182743678652930  
196th Fibonacci number is: 40934782466626840596168752972961528246147  
197th Fibonacci number is: 66233869353085486281758142155705206899077  
198th Fibonacci number is: 107168651819712326877926895128666735145224  
199th Fibonacci number is: 173402521172797813159685037284371942044301