

1. The following complete Python program contains no syntax errors, but does not run correctly. Explain what the problem is and how to fix it.

```
1 from turtle import *
2
3 def drawThing(N, L):
4     left(45)
5     forward(L)
6     right(45)
7
8     right(90)
9     drawThing(N-1, L/2)
10    left(90)
11
12    right(45)
13    back(L)
14    left(45)
15
16 drawThing(3, 100)
17 input("Hit enter to close...")
```

2. Explain what is wrong with the following code fragment.

```
1 from turtle import *
2
3 def draw_circle():
4     circle(radius)
5
6 def main():
7     radius = int(input("Enter circle's radius: "))
8     draw_circle()
9
10 main()
```

3. Give a substitution trace for `fib(3)` for the following:

```
1 def fib(N):  
2     """Precondition, N >= 0"""  
3     if N < 2:  
4         return N  
5     else:  
6         return fib(N-1) + fib(N-2)
```

4. Write a complete program, `crosses.py`, that takes two parameters, `S`(length) and `N`(number of iterations) and draws the following. When finished, draw a complete execution diagram for the recursive drawing function using `S=20`, `N=2`.

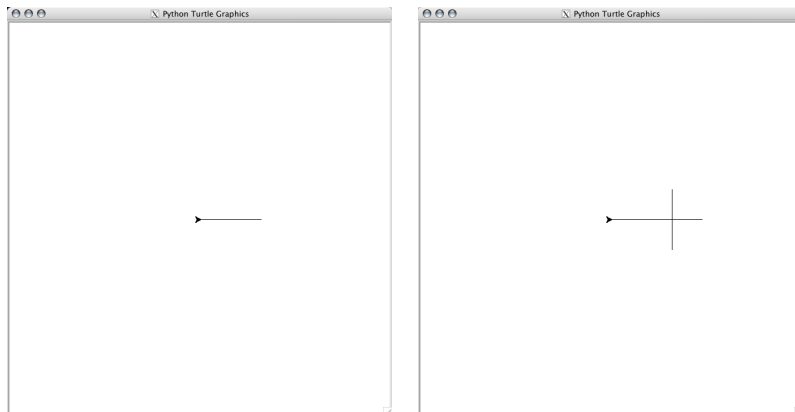


Figure 1: `S=100, N=1` (left) and `S=100, N=2` (right)

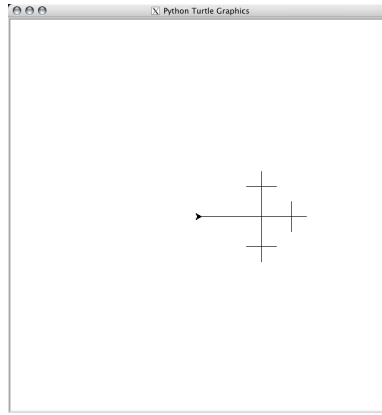


Figure 2: $S=100$, $N=3$