Lab 5

- Review Lab 4
- Prepare for Lab 5

Build Bugs

- Happy to see
  - You using some creativity within the problem specifications
  - You recognizing the power of what we can do with our building blocks (e.g., using functions already implemented, loops, …)

Refactoring: Displaying Fibonacci Sequence

- What part of this code needs to go into the function that displays the first 20 Fib numbers?
- What is the input to the function?
- What is the output from the function?

```
print("Displays the first 20 Fib nums…")

prevNum2 = 0
prevNum = 1

print(prevNum2)
print(prevNum)

for i in range(18) :
   fibNum = prevNum + prevNum2
   print(fibNum)
   prevNum2 = prevNum
   prevNum = fibNum
```

Refactoring: Displaying Fibonacci Sequence

```
print("Displays the first 20 Fib nums…")
```

Unintended side effect

This should go into `main`

```
prevNum2 = 0
prevNum = 1

print(prevNum2)
print(prevNum)

for i in range(18) :
   fibNum = prevNum + prevNum2
   print(fibNum)
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```
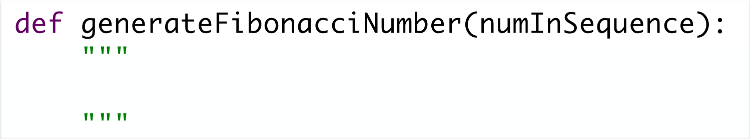

Code that displays the Fibonacci sequence

Doc String for Fibonacci Sequence Function

- How should we describe this function?
  - What is a good precondition for the function?
    - What info does a good precondition include?



```
def generateFibonacciNumber(numInSequence):
    """

    """
```

Doc String for Fibonacci Sequence Function

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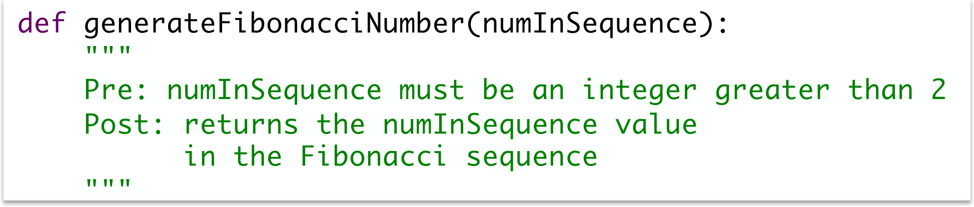
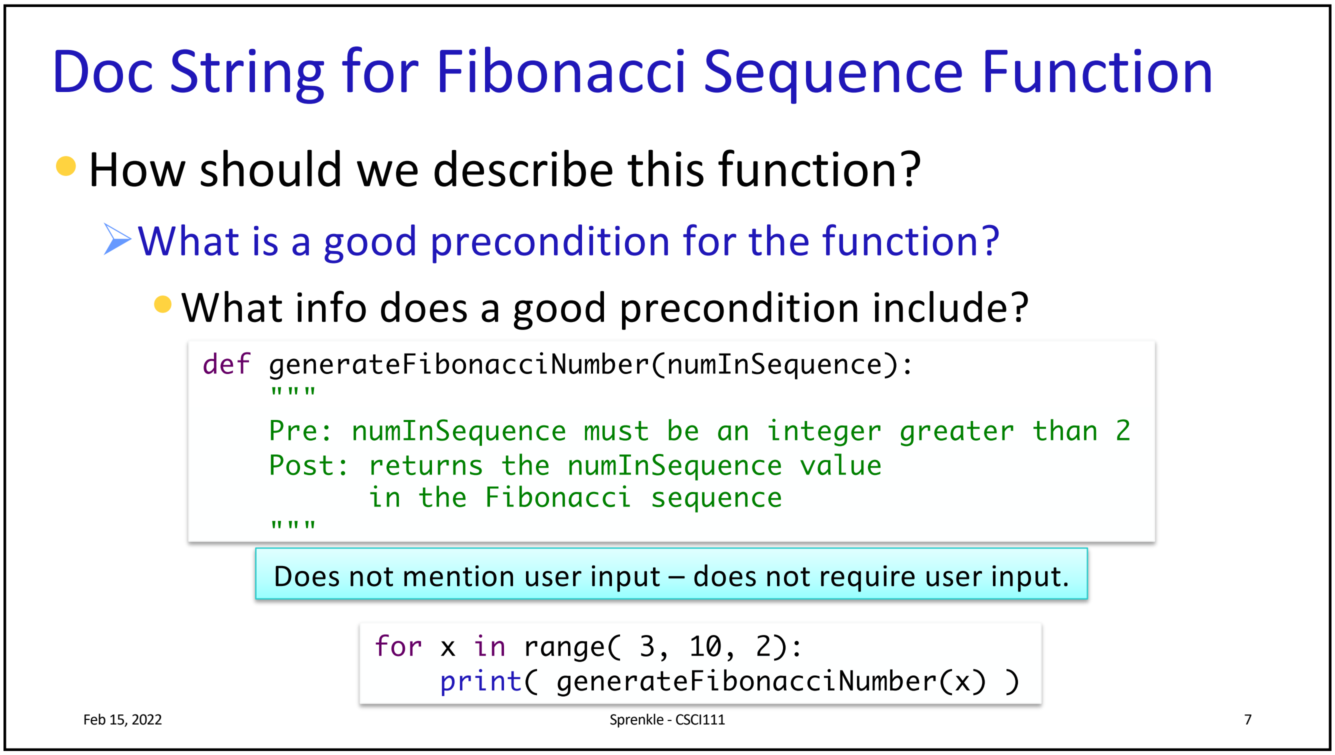


```
def generateFibonacciNumber(numInSequence):
    """
    Pre: numInSequence must be an integer greater than 2
    Post: returns the numInSequence value
          in the Fibonacci sequence
    """
```

Does not mention user input – does not require user input.



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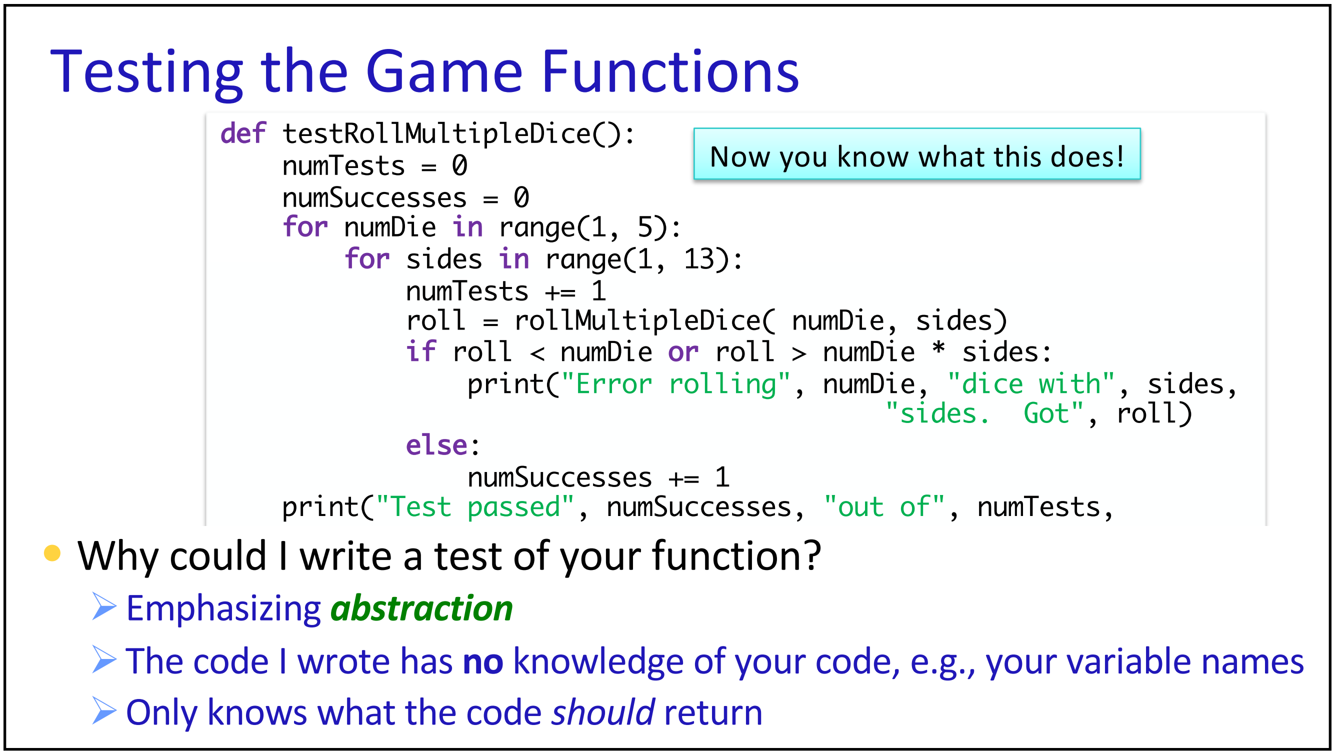
```
for x in range( 3, 10, 2):
    print( generateFibonacciNumber(x) )
```



Testing the Game Functions

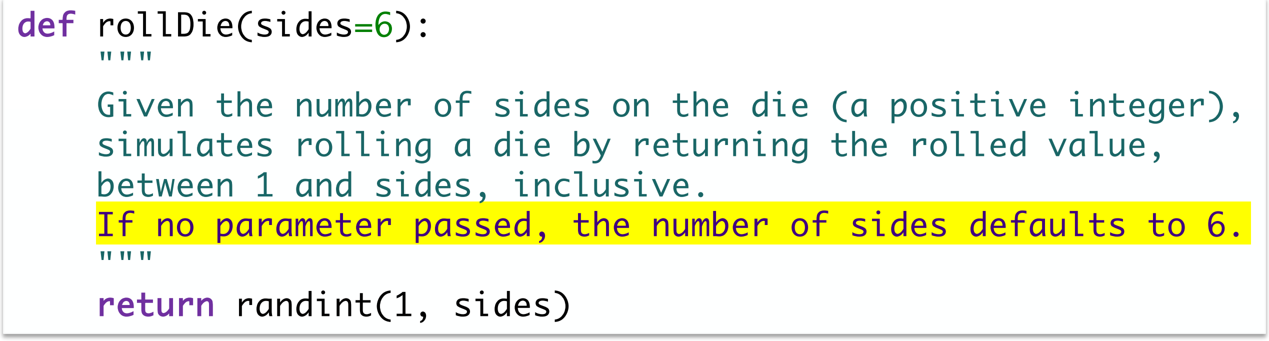
```
def testRollMultipleDice():
    numTests = 0
    numSuccesses = 0
    for numDie in range(1, 5):
        for sides in range(1, 13):
            numTests += 1
            roll = rollMultipleDice( numDie, sides)
            if roll < numDie or roll > numDie * sides:
                print("Error rolling", numDie, "dice with", sides,
                                            "sides.  Got", roll)
            else:
                numSuccesses += 1
    print("Test passed", numSuccesses, "out of", numTests,
```

Now you know what this does!

- Why could I write a test of your function?
  - Emphasizing ***abstraction***
  - The code I wrote has **no** knowledge of your code, e.g., your variable names
  - Only knows what the code *should* return

Giving Parameters Default Values

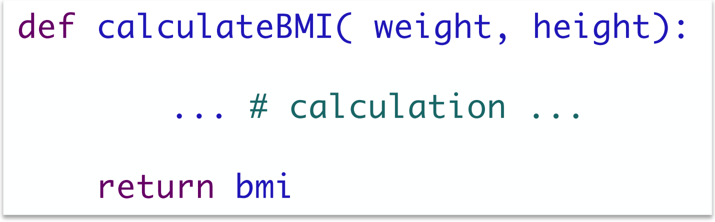
- Can assign a default value to parameters
- We've seen this with other functions
  - Example: range has a default start of 0 and step of 1 when called as range(stop)



```
def rollDie(sides=6):
    """
    Given the number of sides on the die (a positive integer),
    simulates rolling a die by returning the rolled value,
    between 1 and sides, inclusive.
    If no parameter passed, the number of sides defaults to 6.
    """
    return randint(1, sides)
```

BMI

- Given a non-negative weight (in pounds) and height (in inches, calculate the BMI



```
def calculateBMI( weight, height):

        ... # calculation ...

    return bmi
```

Rounding should ***not*** be done in this function
→ Reduces the reusability of the function

Function in Us

```
def main():

    # get user input …

    bmi = calculateBMI(...)

    print("The bmi is", round(bmi, 3))
```

If rounding already performed in function, would only round to 1 place.

Discussion

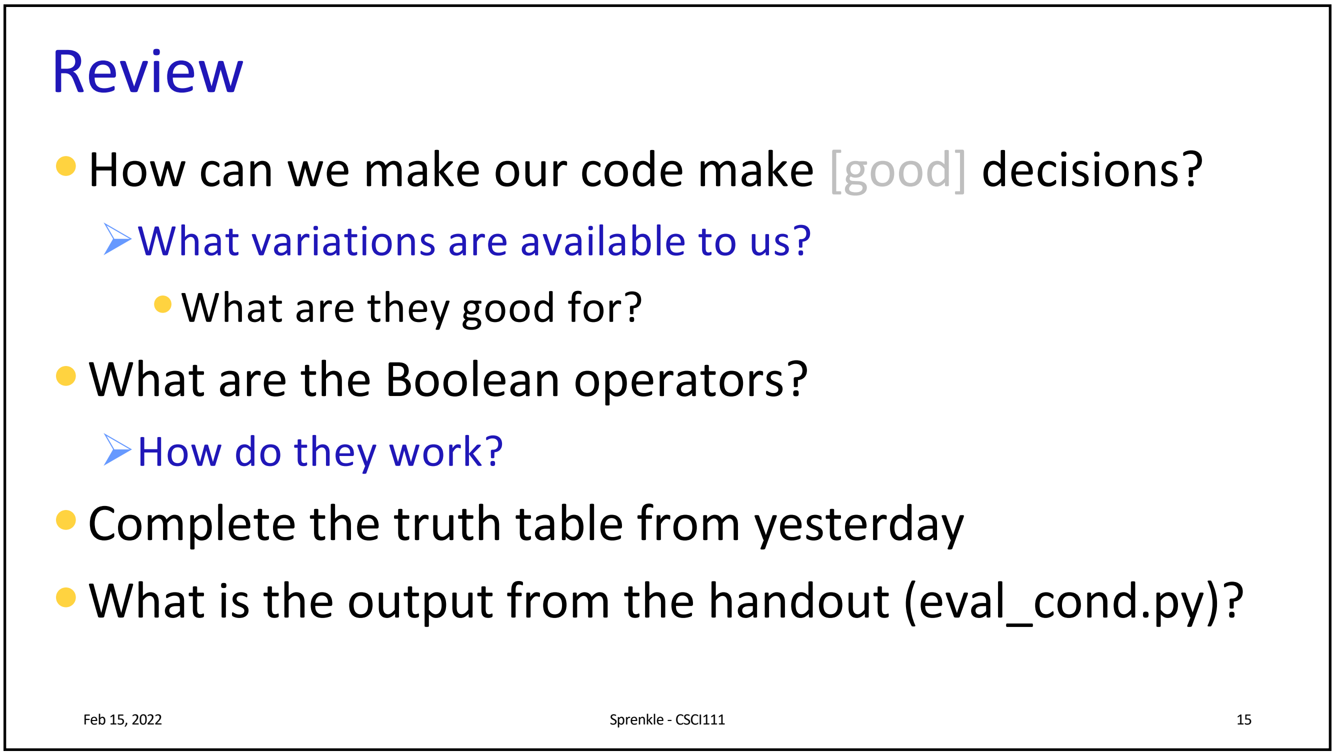
- Why do we need to test/run our program multiple times if we already tested our function programmatically?

Discussion

- Why do we need to test/run our program multiple times if we already tested our function programmatically?
  - Need to test the user interface too

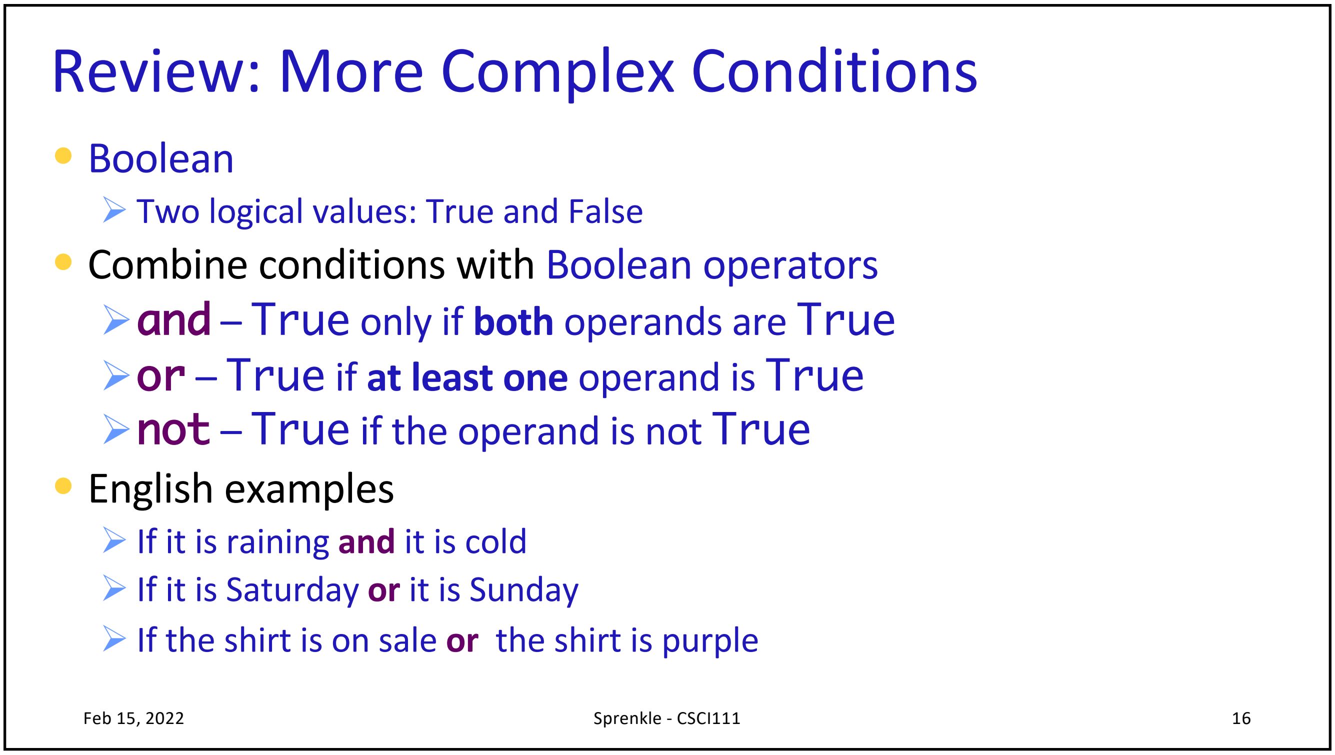
General Reminders

- Read instructions carefully
  - Example 1: **Write a test function** that tests that your function works correctly. After you have verified that your tests work, **comment out the *call* to your test function**. Now, modify the `main` function to prompt a user for which Fibonacci number they want and then **display that Fibonacci number**.
  - Example 2: After verifying that your function works, create a main function. Your program should prompt the user for the weight (in pounds) and height (in inches) and display the BMI, **rounded to 1** decimal place.
- Review example programs on the course web site



Review

- How can we make our code make [good] decisions?
  - What variations are available to us?
    - What are they good for?
- What are the Boolean operators?
  - How do they work?
- Complete the truth table from yesterday
- What is the output from the handout (eval_cond.py)?



Review: More Complex Conditions

- Boolean
  - Two logical values: True and False
- Combine conditions with Boolean operators
  - **and** – True only if **both** operands are True
  - **or** – True if **at least one** operand is True
  - **not** – True if the operand is not True
- English examples
  - If it is raining **and** it is cold
  - If it is Saturday **or** it is Sunday
  - If the shirt is on sale **or** the shirt is purple

Truth Tables

operands

A	B	A and B	A or B	not A	not B	not A and B	A or not B
T	T	T	T				
T	F	F	T				
F	T	F	T				
F	F	F	F				

Truth Tables

operands

A	B	A and B	A or B	not A	not B	not A and B	A or not B
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T	F	F	T	F	T	F	T
F	T	F	T	T	F	T	F
F	F	F	F	T	T	F	T

What is the output?

Focus: how operations work
Not good variable names

```
x = 2
y = 3
z = 4

b = x==2
c = not b
d = (y<4) and (z<3)
print("d=",d)
d = (y<4) or (z<3)
print("d=",d)

d = not d
print(b, c, d)
```

Because of precedence, we don't *need* parentheses

eval_cond.py

Practice: Numeric Grade Input Range

- Enforce that user must input a numeric grade between 0 and 100
  - In Python, we can't (always) write a condition like 0 <= num_grade <= 100, so we need to break it into two conditions
- Write an appropriate condition for this check on the numeric grade
  - Using **and**
  - Using **or**

Focus on the ***condition***
Then, we'll block out the code

Practice: Numeric Grade Input Range

- Enforce that user must input a numeric grade between 0 and 100
  - Using **and**

```
if num_grade >= 0 and num_grade <= 100:
        computation
else:
        print error message
```

  - Using **or**

```
if num_grade < 0 or num_grade > 100:
        print error message
else:
        computation
```

Short-circuit Evaluation

- Don’t necessarily need to evaluate all expressions in a compound expression
- A **and** B
  - If A is `False`, compound expression is `False`
- A **or** B
  - If A is `True`, compound expression is `True`
- No need to evaluate B
  - Put more important/limiting expression first
  - Example:

```
if count != 0 and sum/count > 10:
        do something
```

Lab 5 Overview

- Focus on conditionals
  - **Functions only in last problem**
- More building blocks to draw from
  - More use cases we can “handle nicely”
    - More tests for you to think of/write/pass!
    - Think about if you’ve covered all execution paths
  - Break problems into smaller pieces
  - Think, write your algorithm outline, write a few lines of code, then try them out.