COMP10001

Foundations of Computing

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Tutorial 7

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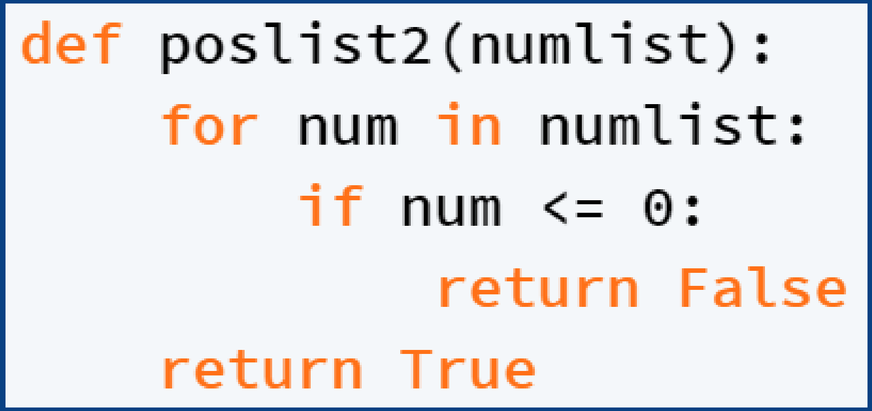
Outline

- Returning Early
- Short circuiting
- Helper functions
- Debugging strategies
- Exercises

Returning Early

- ❖ Also known as “Lazy Evaluation”
- ❖ Where during a long-running computation the answer is returned as soon as it is known
- ❖ Example:
  - ❖ Find whether or not a list contains all positive numbers



```python
def poslist2(numlist):
    for num in numlist:
        if num <= 0:
            return False
    return True
```

Returning Early

- Avoids unnecessary computation. E.g.,
  - `numlist = [-1,1,1,…,1]`
- Increases efficiency of our program

- This principle is also used in “Short Circuiting” in Boolean tests

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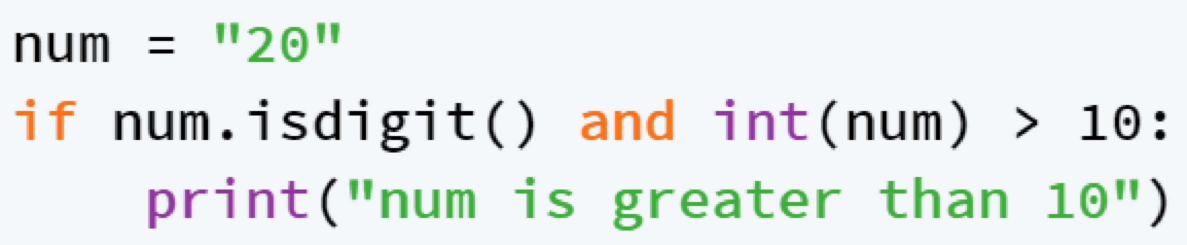
Short circuiting

- Typically used in if statements
- Consider this ->

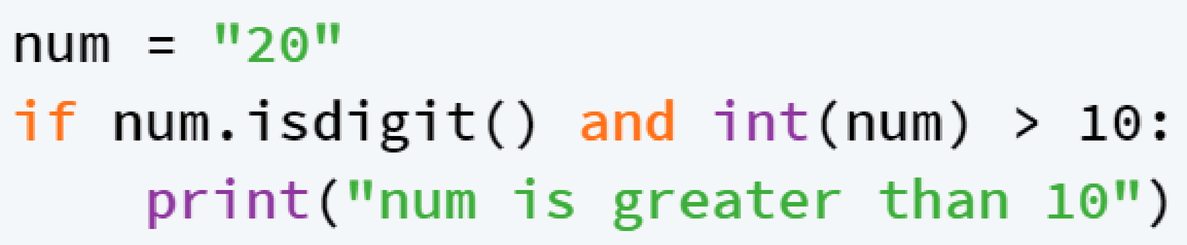


```python
num = "20"
if num.isdigit() and int(num) > 10:
    print("num is greater than 10")
```

- Python will test if num can be converted to a digit via the first test (.isdigit()) before it attempts the conversion (int(num))
- For and: Will not proceed to the second test if the first test is False
- For or: Will not proceed to the second test if the first test is True

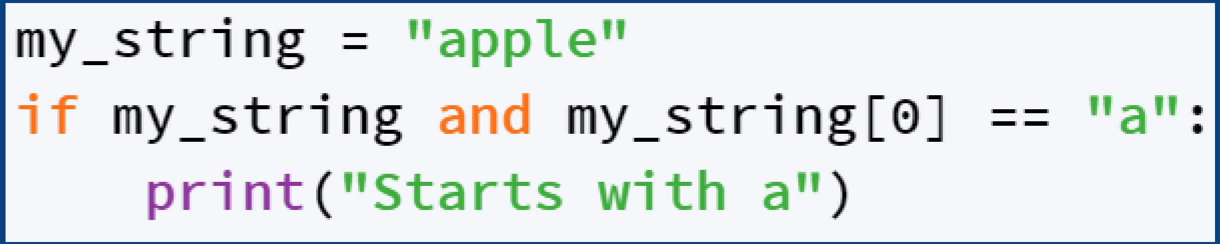
Short circuiting

- This means our code is safer against potential errors. Suppose:
  - num = “twenty”
  - If not for the first test (short circuiting), we would get a ValueError



```
num = "20"
if num.isdigit() and int(num) > 10:
    print("num is greater than 10")
```

- Another typical use case:



```
my_string = "apple"
if my_string and my_string[0] == "a":
    print("Starts with a")
```

Helper functions

- A function that performs part of the computation of another function
- Often make programs more readable because we reduce the complexity (and length) of a function
- E.g. finding the top 5 most frequent words in a paragraph.
- By placing this computation in a helper function, it can be re-used whenever we need to that computation again

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Debugging strategies

- Two distinct ways to debug a program:
  - 1. Running test cases
  - 2. Using diagnostic print() statements

Test cases

- These allow us to compare the actual output with the expected output
- Three categories:
  - Normal data (inputs that should be accepted)
  - Boundary/Extreme data (inputs on upper and lower boundaries of what should be accepted)
  - Error data (inputs that should be rejected)

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Diagnostic print() statements

- To insert print() statements in parts of our code to check the value of variables during execution
- Where values are unexpected or code is not running in the way we intended, we have found where the error is and can write new code to fix the problem

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Exercises