Midterm Exam 2 on Thursday, November 10
Repetition Structures
Loops

Repeatedly execute blocks of code
Introduce nonlinearity into programs
Loops fall into two general categories
• Condition-controlled loops
• Count-controlled loops
**Condition-Controlled**

“While” Loops

Repeat a block of code while a condition is True

Must initialize variable and set incrementation

```python
i = 0

while i < 10:
    print(i)
    i = i + 1
```
Repetition Structures

Loops

↓

initialization_block

↓

Is condition true?

(yes) ↓

body_block

(no)

after_block

↓
Count-Controlled
“For” Loops

Repeat a block of code a specified number of times

Assumptions are built into for-loops so it is not necessary to initialize variables and set incrementation

```python
for i in range(n):
    print(i)
```
Count-Controlled
String Iteration

For loops can also be used to access characters in a string.

This is referred to as “iterating over a string” and can be used to access characters in text or lines in a file.

```python
for c in "example":
    print(c)
```

In this example above, for each loop c becomes the next character in the string. Therefore the loop will execute 7 times.
Loop Keywords

**break**

Let's you jump out of a loop from within the loop body

Allows you to skip over unnecessary statements

Should only be used when it makes your code simpler
Loop Keywords

continue

Related to break statement

Lets you jump to the next iteration of a currently-executing loop

Good for when you want to continue with the loop without doing anything
Introduction to Computer Programming

CSCI-UA 2

Functions
Encapsulating Logic
Functions

Groups of statements that can be run more than once in a program

Reusable chunks of code

Take input, provide output

Can be reused in a variety of contexts

Maximize code reuse, minimize code redundancy

Encapsulate logic, splitting complex systems into manageable parts
Calling Functions

\texttt{type(3.7)}

Function name
Arguments passed into function
Return Value

( ) tells Python to execute the function

Even if a function takes no input, the brackets are still required

Some functions do not return a value
Defining Functions

Just like writing a Python program but with some extra syntax

Function header:

• Begins with `def`
• Followed by name of function
• Function parameter list
• Ends with a `:`
Functions
Encapsulating Logic

Documentation String

“Doc String”

- Optionally follows function header
- Explains what function will do
- May include example(s)
- Almost always good to include for clarity and as a reminder
Function Body

All the code that follows the header

Simply an indented block of code with necessary statements

This code can use the variables from the function header

Function should return a value with the keyword `return`

After `return`, Python jumps out of the function and back to the program
Function Syntax

def name(parameters):
    statements

A return value is not required

return None

Anything besides return are called “side effects”

A print() statement is an example of a side effect
Variables
Local and Global

Variable scope is something we must pay attention to when using functions.

When and where is a variable accessible to your program?

Local variables are only usable within the function they are local to.

Global variables are usable by any function or code within your program.
Local Variables

def area(rad):
    import math
    return math.pi * rad ** 2

When this function ends, \( \text{rad} \) is automatically deleted because it is local
Global Variables

rad = 5

def area():
    import math
    return math.pi * rad ** 2

def change_rad(new_rad):
    rad = new_rad

This program will not allow rad to be changed because it is global

To change the radius variable:
global rad
Main Function

It is both common and a good idea to use a main function in your programs. This is usually the starting point of a program and is run by typing: `main()`

This simplifies rerunning programs and as well as passing input values.
**Function Parameters**

- Used to pass input into a function
- Python passes values by reference
- Default values can be set for parameters
  ```python
  def name(parameter = 'default')
  ```
A module is a group of related functions

Different from a regular Python program in that it acts like a toolbox

A module usually does not have a main() function

To use a module, simply import it
Importing Modules and Calling Functions

Calling function after importing module:

```python
import module_name

module_name.function()
```

Calling function after importing module along with all of its functions:

```python
from module_name import *

function()
```
Module Namespaces

Functions within a module are available when you import them.

Modules form namespaces.

Different modules with the same function name will not clash in the same program.

module1.function(parameter)
module2.function(parameter)

The only time functions may conflict is when you import all using `*`.
Strings

Strings and Characters

s[i]
Strings

Strings are one of Python’s primary data types.

Strings can be used to represent anything that can be encoded as text.

Examples: symbols, words, text files, Python programs, and Web pages.

We’ve already been using strings quite a bit and will now focus on accessing and processing them.
Characters
\texttt{ord('a')} \\

All characters have a corresponding character code

Python uses Unicode to assign character codes

Unicode is a common standard for encoding thousands of symbols and characters from many languages

The \texttt{ord()} function can be used to get the Unicode number for any character

The \texttt{chr()} function can be used to get the character for any Unicode number
### Strings

#### Strings and Characters

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Strings are defined as ordered collections of characters. Therefore, we can access these characters by position with “indexing.” Offsets start at 0 and end at one less than the length of the string. Offset can also be specified negatively.
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Slicing Strings

s[begin:end]

Slicing is for extracting substrings from a string.

To slice a string, indicate the first character you want and one past the last character.

First index location is always 0.

Last index location is always the length of the string minus one.
String Methods

s.method()
Escape Characters

\n
“Escape characters” are a special notation for whitespace and other unprintable characters

Used for characters without a standard symbol or symbols Python sets aside

Escape characters begin with a backslash

Escape sequences are considered one character
Introduction to Computer Programming
CSCI-UA 2

Midterm Exam 2
Review

Midterm Exam 2 on Thursday, November 10