FUNCTIONS

CS 3030: Python

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Previous lesson – Flow control

- Boolean data type >>> True, False
- Comparison operators >>> ==, !=, <, >, <=, >=
- Boolean operators >>> and, or, not >>> All evaluate to conditions
- Blocks of code
- Statements >>> if, else, elif, while loop, for loop, break and continue
- “Truthy” and “Falsey” values >>> 0, 0.0, and '' are considered False
- Importing modules >>> import random
- Terminate the program >>> sys.exit()

Functions

- A major purpose of functions is to group code that gets executed multiple times.

```
print('Howdy!')
print('Howdy!!!')
print('Hello there.')
print('Howdy!')
print('Howdy!!!')
print('Hello there.')
print('Howdy!')
print('Howdy!!!')
print('Hello there.')
```

Functions

- A **function** is like a mini-program inside a program.
- We create a function by using the **def** statement.
- This code inside the function is executed when the function is called, not when the function is first defined.

```
def hello():
    print('Howdy!')
    print('Howdy!!!')
    print('Hello there.')

hello()
hello()
hello()
```

Functions with arguments

- The value stored in a parameter is forgotten when the function returns.

```
def hello(name):
    print('Hello ' + name)

hello('Alice')
hello('Bob')
```

Return statement

- When creating a function using the **def** statement, you can specify what the return value should be with a **return** statement

```
def getAnswer(answerNumber):
    if answerNumber == 1:
        return 'It is certain'
    elif answerNumber == 2:
        return 'Ask again later'
    elif answerNumber == 3:
        return 'My reply is no'
    elif answerNumber == 4:
        return 'Yes'
    elif answerNumber == 5:
        return 'Very doubtful'
    else:
        return 'Number not accepted'


r = random.randint(1, 5)
fortune = getAnswer(r)
print(fortune)
```

Return statement

- When creating a function using the **def** statement, you can specify what the return value should be with a **return** statement

```
def getAnswer(answerNumber):
    if answerNumber == 1:
        return 'It is certain'
    elif answerNumber == 2:
        return 'Ask again later'
    elif answerNumber == 3:
        return 'My reply is no'
    elif answerNumber == 4:
        return 'Yes'
    elif answerNumber == 5:
        return 'Very doubtful'
    else:
        return 'Number not accepted'


r = random.randint(1, 5)
fortune = getAnswer(r)
print(fortune)
```

We can pass return values as an argument to another function call. How could you shorten these three lines?

Return statement

- When creating a function using the **def** statement, you can specify what the return value should be with a **return** statement

```
def getAnswer(answerNumber):
    if answerNumber == 1:
        return 'It is certain'
    elif answerNumber == 2:
        return 'Ask again later'
    elif answerNumber == 3:
        return 'My reply is no'
    elif answerNumber == 4:
        return 'Yes'
    elif answerNumber == 5:
        return 'Very doubtful'
    else:
        return 'Number not accepted'


print(getAnswer(random.randint(1, 9)))
```

None value

- Represents the absence of a value.
- Other programming languages might call this value null, nil, or undefined.
- Behind the scenes, Python adds return **None** to the end of any function definition with no return statement

Keyword arguments

- Keyword arguments are identified by the keyword put before them in the function call.
- Keyword arguments are often used for optional parameters.

```
print('Hello’)
print('World’)
```

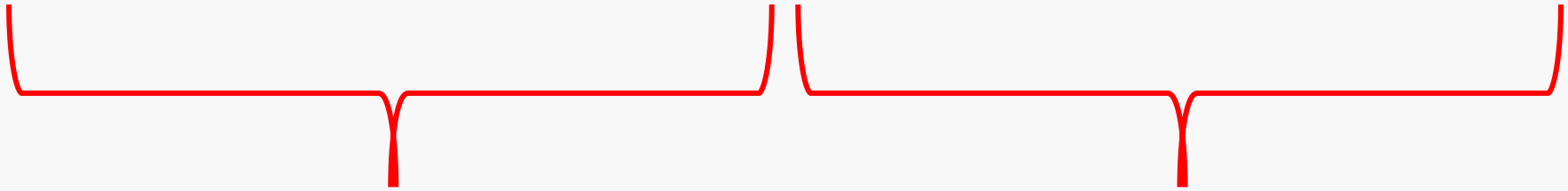
```
print('Hello', end=”)
print('World')
```

```
print('cats', 'dogs', 'mice’)
```

```
print('cats', 'dogs', 'mice', sep=',’)
```

Positional arguments vs keyword arguments

```
print('cats', 'dogs', 'mice', sep=', ', end = '.\n')
```



Positional arguments

Keyword arguments

Keyword arguments

```
fun sum(a, b):
      return a + b


sum(5, 10)                # As positional arguments
sum(a = 5, b = 10)        # As keyword arguments
sum(b = 10, a = 5)
```

Default arguments

- Default values indicate that the function argument will take that value if no argument value is passed during function call.

```
def student(firstname, lastname ='Mark', standard ='Fifth'):
     print(firstname, lastname, 'is in', standard, 'grade')



student('John’)
```

Default arguments

- Default values indicate that the function argument will take that value if no argument value is passed during function call.

```
def student(firstname, lastname ='Mark', standard ='Fifth'):
     print(firstname, lastname, 'is in', standard, 'grade')



student('John’)                          # John Mark is in Fifth grade
student('John', 'Gates', 'Seventh’)
```

Default arguments

- Default values indicate that the function argument will take that value if no argument value is passed during function call.

```
def student(firstname, lastname ='Mark', standard ='Fifth'):
    print(firstname, lastname, 'is in', standard, 'grade')


student('John’)                          # John Mark is in Fifth grade
student('John', 'Gates', 'Seventh’)      # John Gates is in Seventh grade
student('John', 'Seventh’)
```

Default arguments

- Default values indicate that the function argument will take that value if no argument value is passed during function call.

```
def student(firstname, lastname ='Mark', standard ='Fifth'):
    print(firstname, lastname, 'is in', standard, 'grade')
```

```
student('John’)                          # John Mark is in Fifth grade
student('John', 'Gates', 'Seventh’)      # John Gates is in Seventh grade
student('John', 'Seventh’)               # John Seventh is in Fifth grade
student('John’, standard = ‘Seventh’)
```

Default arguments

- Default values indicate that the function argument will take that value if no argument value is passed during function call.

```
def student(firstname, lastname ='Mark', standard ='Fifth'):
    print(firstname, lastname, 'is in', standard, 'grade')
```

```
student('John’)                          # John Mark is in Fifth grade
student('John', 'Gates', 'Seventh’)      # John Gates is in Seventh grade
student('John', 'Seventh’)               # John Seventh is in Fifth grade
student('John’, standard = ‘Seventh’)    # John Mark is in Seventh grade
```

Default arguments

- Default values indicate that the function argument will take that value if no argument value is passed during function call.

```
def student(firstname, lastname ='Mark', standard ='Fifth'):
    print(firstname, lastname, 'is in', standard, 'grade')

student()
```

Default arguments

- Default values indicate that the function argument will take that value if no argument value is passed during function call.

```
def student(firstname, lastname ='Mark', standard ='Fifth'):
     print(firstname, lastname, 'is in', standard, 'grade')

student()                                  # Error: required argument missing
student(firstname ='John', 'Seventh’)
```

Default arguments

- Default values indicate that the function argument will take that value if no argument value is passed during function call.

```
def student(firstname, lastname ='Mark', standard ='Fifth'):
     print(firstname, lastname, 'is in', standard, 'grade')

student()                                  # Error: required argument missing
student(firstname ='John', 'Seventh’)      # Error: positional argument
                                           # after a keyword argument
student(subject ='Maths’)
```

Default arguments

- Default values indicate that the function argument will take that value if no argument value is passed during function call.

```
def student(firstname, lastname ='Mark', standard ='Fifth'):
     print(firstname, lastname, 'is in', standard, 'grade')

student()                                  # Error: required argument missing
student(firstname ='John', 'Seventh’)      # Error: non keyword argument
                                           # after a keyword argument
student(subject ='Maths’)                  # Error: unknown keyword argument
```

Local and Global scope

- Parameters and variables that are assigned in a called function are said to exist in that function's **local scope** >>> **Local variable**
- Variables that are assigned outside all functions are said to exist in the **global scope** >>> **Global variable**
- When a scope is destroyed, all the values stored in the scope's variables are forgotten.
- A local scope can access global variables.
- Code in a function's local scope cannot use variables in any other local scope.
- You can use the same name for different variables if they are in different scopes.
- While using global variables in small programs is fine, it is a bad habit to rely on global variables as your programs get larger and larger.

Global statement

- If you need to modify a global variable from within a function, use the **global** statement.

```
def spam():
    global eggs
    eggs = 'spam'


eggs = 'global'
spam()
print(eggs)
```

Function attributes

```
def say_whee():
    say_whee.count += 1
    print("Whee!")

say_whee.count = 0
say_whee()
say_whee()

print(say_whee.count) # 2
```

Exception handling

```
def spam(divideBy):
    return 42 / divideBy

print(spam(2))
print(spam(12))
print(spam(0))
print(spam(1))
```

Exception handling

```
def spam(divideBy):
    return 42 / divideBy

print(spam(2))
print(spam(12))
print(spam(0))    # ZeroDivisionError: division by zero
print(spam(1))
```

Exception handling

- You want the program to detect errors, handle them, and then continue to run.
- Errors can be handled with **try** and **except** statements.
- The code that could potentially have an error is put in a try clause.
- The program execution moves to the start of a following except clause if an error happens.
- After running that code, the execution continues as normal.

Exception handling

```
def spam(divideBy):
    return 42 / divideBy


print(spam(2))
print(spam(12))
print(spam(0))
print(spam(1))
```

```
def spam(divideBy):
    try:
        return 42 / divideBy
    except ZeroDivisionError:
        print('Error: Invalid argument.')


print(spam(2))
print(spam(12))
print(spam(0))
print(spam(1))
```

Time to code - Guess the number

Exercise of homework 2

- Set a random number in a variable using randint.
- Ask the player to guess 6 times and print if the guess is low, higher or the correct guess.
  - *For or while?*

- Once that works. Complicate it by printing random lower and upper bounds:
  - *'I am thinking of a number between 20 and 53'*

- Finally, instead of user input, make the code guess it automatically.