CS 152: Operations, Input, Types

CS 152: Python for STEM

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Weekly Announcements!

TODO Reminders:

- Reading 2 (zyBooks)
- Lab 01
- Reading 3 (zyBooks)
- Lab 02
- Reading 4 (zyBooks)

Recall Activity

- Individually
  - Grab a paper and write at least three concepts that you can remember from our last class
- With your neighbor(s)
  - Discuss what each other could remember. Did you remember the same things? What did you learn from each other?
- Turn you paper to the TAs or myself at the end of the class, this will count as your participation activity for this lecture

What is missing?

- What do we need to do in order to make the following program generic, meaning that it could work for any values of x and y?

```
1   x = 10
2   print(x)
3   x = x + 10
4   print(x)
5   print(x + 10)
6   print('value of x = ', x, ' ', 'value of x + 10 = ', x + 10)
7   x = x/10
8   y = 2
9   x = x * y
10  y = x
11  print(x, end=' ')
12  print(y)
```

Input: Reading

- input() function
  - reads a string (sequence of characters) that the user typed
  - text = input()

```
print("Enter your name: ")
name = input()
print("You name is: ", name)
```

OR

```
name = input("Enter your name: ")
print("You name is: ", name)
```

Input: Reading

- Analyze the program below
  - Considering that input() reads strings, do you think we are going to have a problem when we run this program?

```
print("Enter your name: ")
name = input()
print("You name is: ", name)
print("Enter your age: ")
age = input()
print("Your age is: ", age, " In 10 years you will have: ", age + 10)
```

```
    print("Your age is: ", age, " In 10 years you will have: ",
age + 10)

TypeError: can only concatenate str (not "int") to str
```

Types in Python

- We already saw that Python uses ”implicit”/weak typing
  - figures out types for you!
- Somethings you want to specify type
  - int - whole numbers only
  - float – floating point/decimal numbers
  - str – strings (sequence of characters)
- Most useful on getting client input
  - `answer = int(input(“get the answer”))`

Input: Reading – Class Activity 1

- Discuss with your peers and change the program below in order to read an int value for age.

```
print("Enter your name: ")
name = input()
print("You name is: ", name)
print("Enter your age: ")
age = input()
print("Your age is: ", age, " In 10 years you will have: ", age + 10)
```

Arithmetic Expressions

- combination of items, like variables, literals, operators, and parentheses, that evaluates to a value

Arithmetic operator	Description
+	The ***addition*** operator is **+**, as in x + y.
-	The ***subtraction*** operator is **-**, as in x - y. Also, the - operator is for ***negation***, as in -x + y, or x + -y.
*	The ***multiplication*** operator is *****, as in x * y.
/	The ***division*** operator is **/**, as in x / y.
**	The ***exponent*** operator is ******, as in x ** y (x to the power of y).

// - returns an integer result (the floor)
% - (modulo) operator returns the remainder

Compound Operators

- provide a shorthand way to update a variable

Compound operator	Expression with compound operator	Equivalent expression
Addition assignment	`age += 1`	`age = age + 1`
Subtraction assignment	`age -= 1`	`age = age - 1`
Multiplication assignment	`age *= 1`	`age = age * 1`
Division assignment	`age /= 1`	`age = age / 1`
Modulo (operator further discussed elsewhere) assignment	`age %= 1`	`age = age % 1`

Arithmetic Expressions and Compound Operators – Class Activity 2

- Write exactly what will be printed in the program below:

```
x = 15
y = 12
print("Line 1:", x/y)
print('Line 2:', x%y)
print("Line 3:", x//y)
x = 4
y = 2
print('Line 4:',x**y)
y-=1
print('Line 5:', x**y)
print("Line 6:", 16 - 2 * 5 // 3 + 1)
x = 15
y += x
x = 22
print("Line 7:", x)
print('Line 8:', y)
```

Objects

- are used to represent everything in a Python program, including integers, strings, functions, lists, etc.
- Each object has:
  - Value: A value such as "20", "abcdef", or 55.
  - Type: The type of the object, such as integer or string.
  - Identity: A unique identifier that describes the object (address in memory).

```
x = 10
print(x)
print(type(x))
print(id(x))
```

```
10
<class 'int'>
140706803187040
```

	Memory	
140706803187039		
140706803187040	10	x
140706803187041		

Strings Basic

- Immutable sequence of characters
- name = “Marcia”

0	M
1	a
2	r
3	c
4	i
5	a

- print(name[0]) → ‘M’
- name[0] = ‘m’ → error – Strings are immutable, can’t be changed by indexes, update the variable by assigning an entirely new string

Strings Basic

- Concatenation → +

```
str1 = "CS"
str2 = "152"
str3 = str1 + str2
print(str3)
```

- Formatting → f-string, allows a programmer to create a string with placeholder expressions that are evaluated as the program executes

```
dollar = 1
reais = 5.17
print(f'To by {dollar} dollar, you need {reais} reais')
```

Formatting floating point numbers – Class Activity 3

- Write exactly what will be printed in the program below:

```
x = 4.33333339
print(f'{x:.2f}')
print(f'{x:.4f}')
```

Peer Coding – Class Activity 4

- Write a Phyton program that reads three numbers (num1, num2, num3) and calculates and prints the following:
  - Average of the numbers
  - Result of num1 divided by num2
  - Result of num1 module num2
  - Result of num1 floor num2
  - Area of a rectangle of side num1
  - Area of a triangle of base num1 and heigh num2
  - Area of a sphere with radius as num3, use math.pi for pi number

Peer Coding – Class Activity 5

- Dr. Green is looking for a bank that will give the most return on her money over the next 5 years. She has P100,000.00 into a savings account. The standard equation to calculate principal plus interest at the end of a period is:
  - amount = P * (1 + I/M) ^ (N * M)
- Where:
  - P – principal (amount of money to invest)
  - I – interest (percentage rate the bank pays to the investor)
  - N – number of years (time for which the principal is invested)
  - M – compound interval (the number of times per year the interest is calculated and added to the principal)
- Think about what problem do you need to solve, how you are doing to solve it (write in English the steps to do that), write a Python code to solve that.