Programming: Writing a Program

CPSC 217: Introduction to Computer Science for Multidisciplinary Studies I
July 2024

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June 4, 2024

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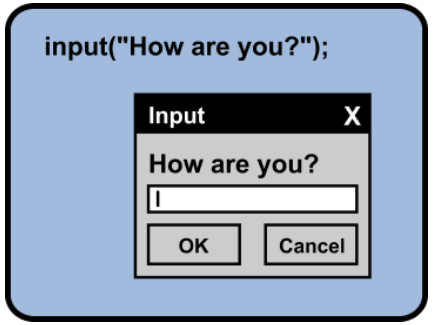
Input

- A built-in function to get an input form the user.

- **sName = input("Please enter your name: ")**

Variable Function



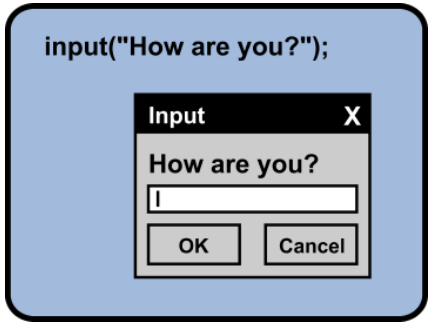
- **The obtained value will be stored in the variable in string form.**
- You need to convert the value type if necessary.

Input

```
#Changing type (this is always a string)
sInput = input(“Enter a number:”)

#Change to float
fInput = float(sInput)
print(type(fInput))

#Change to integer
iInput = int(sInput)
print(type(iInput)
```



Meaningful sentences

- Provide meaningful sentences to communicate questions and results to the user.

```
sFahrenheit  = input("Please enter the degree in fahrenheit : ")
#Program
print ("The degree in celsius is: ", fCelsius)
```

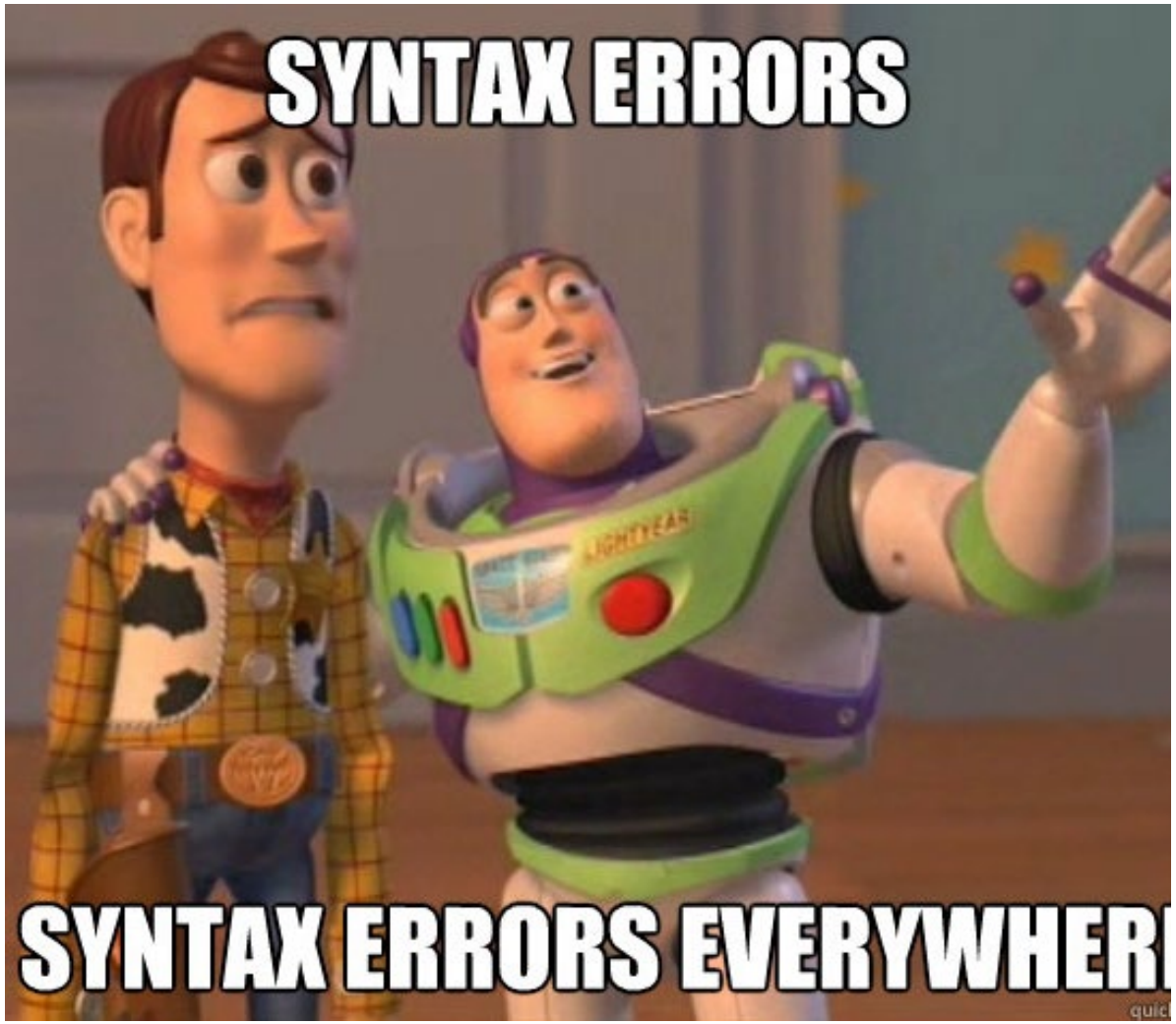
```
sFahrenheit  = input("degree")
print (fCelsius)
```

The programmer knows they need to do to complete the above program.
The user using program knows what to enter and what is output.

Errors

Types of Errors

- Three categories
  1. Syntax
  2. Runtime
  3. Logic



Syntax errors

- **Syntax** refers to the structure of a program and the rules about that structure.
- Easiest to find (**your program will not begin to execute (after compiling)**)
- Displays an error message and stops.

- The compiler/interpreter finds syntax errors
- Example:

```
name = "Jim
print(77
```

Runtime errors

Does not appear until the program is run (compiling is complete)
(harder to find)

Also called exceptions

Example:

```
callMe = "Maybe"
print(callme)
```

Semantic/Logic Errors

Program will run successfully

It does not produce the correct answer:

- It does what you told it to do
- **The hardest to find!**
- Program runs to completion, but result is wrong.

Result of a wrong algorithm

Identifying is tricky!

Example:

- **x = 3**
- **y = 4**
- **average = x + y / 2**
- **print(average)**

Remember

- Getting errors in your code does not make you a bad programmer.

- Errorless code is the goal
- You need to debug your code
- Add comments to your code
- Grading is generally setup to give you credit for the parts that are complete and correct (as long as they run and can be verified)

Explore First Program

What Does this Program Do?

```
x = float(input())
y = (x - 32) * 5/9
print(y)
```

- What's wrong with this program?

Fahrenheit to Celsius

- Examples on course website/python notebook

Comments

- Notes and explanations in natural language
- Intended only for the human reader → Completely ignored by the interpreter
- # token starts a comment

- **Commenting is necessary!**

```
#Calculating Fahrenheit to Celsius
OFFSET = 32
RATIO_CHANGE = 5/9

#Obtaining Fahrenheit degree
sFahrenheit = input ("Please enter the degree in Fahrenheit :")

#Converting the input to float
fFahrenheit = float(sFahrenheit)

#Calculating the Celsius
fCelsius = (fFahrenheit - OFFSET) * RATIO_CHANGE

#Printing the result
print("The degree in Celsius is: ", fCelsius)
```

Importing

Import

- **import <Module Name>**
- Import the packages that you need only!

- Example:

  import math

  import turtle

Math Functions

- Many additional math functions are available
- Located in the math library
  - Import the math library
    - Precede the name of the function with **math.**
  - Examples:

import math

math.sqrt(x)

math.floor(x)

math.ceil(x)

math.cos(x)

Area of a circle

Data Types

Data Types

Some operations are only well defined for certain types

- **1 + 2**
- **“Hello” + “ World”**
- **1 + “Hello”**
- **2 + “4”**
- **1 / 3**
- **2.0 / 4**
- **“Hello”*3**

Data Types

Some operations are only well defined for certain types

- **1 + 2** → GOOD
- **“Hello” + “ World”** → GOOD
- **1 + “Hello”** → TYPE ERROR (int + string)
- **2 + “4”** → TYPE ERROR (int + string)
- **1 / 3** → GOOD
- **2.0 / 4** → GOOD
- **“Hello”*3** → GOOD

Type Conversions (Casting)

Python permits you to convert from one type to another

"1.0" / "3.0"	→ Makes no sense to python
float("1.0") / float("3.0")	→ But this does
float("asdf")	→ However this doesn't

Other type conversions: int, bool, str

Type Conversions (Casting)

Python permits you to convert from one type to another

int(“1”) → 1 (string to int)

str(1) → “1” (int to string)

float(“1.0”) → 1.0 (string to float)

bool(“True”) → True (string to boolean)

Formatting

Formatting

Sometimes print doesn’t display things the way we would like

print(1 / 3.0) gives 0.333333333333

What if we want 0.33?

Formatting

Basic python format method can be used to format floats

Parts

A string	**“pi is %.2f”**
Format **float** to **2** decimals	**%.2f**
Format symbol for strings	**%**
The value(s) to format	**(math.pi)**

Example:

```
import math
print(“pi is %.2f when rounded to 2 decimal places” % (math.pi))
```

Formatting

types

f – float

g – scientific notation

s – string

d – integer

[width].[precision][type]

width – total characters in final result (“” is default) (add 0 in front to pad 0’s)

precision – how many decimal points

Ex. 05.3f

float, pad with 0s if shorter than 5 to get width of 5, but only after showing precision of 3

Turtle - Drawing

Alex the turtle

- Example in course website/python notebook

Onward to … information and data.

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