UNSW Business School
COMM5007 Coding for Business

Lecture 2
Python Fundamentals Part 2

Jan 2024

A quick review

- Write Python code
- Data types - Integer, Float, String, Boolean
- Type conversions
- Variables
- Assignment/Print Statement

Reminder on Quiz 1

- Quiz 1 **at the beginning** of Lab 3 on Wed, Jan 10 and Thurs, Jan 11
- What to bring
  - **2B pencil and eraser**
  - Any printed material (Open book, but not open laptop)
  - Student card (tutor will verify)
- Each lab will use different questions, but at the same difficulty level
- The content in lecture 1 and 2 is covered
- No collaboration
- 7 Multiple choice questions
- 15 minutes
- 7.5% of final grade

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UNSW Business School. (2023, August 18). *Acknowledgement of Country* [online video]. Retrieved from https://vimeo.com/369229957/d995d8087f

At UNSW you are free to...

- Respectfully disagree about anything
- Express different opinions
- Write your beliefs
- Show your beliefs
- Leave any club or organisation

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It's not acceptable to...

- Attempt to censor opinions
- Use hate speech
- Make threats or instil fear
- Make false accusations
- Access or share others private information without consent

We are here to help...

- Tell a teacher
- Tell UNSW Psychology and Wellness
- Report to UNSW Complaints
- Report to UNSW Security
- Report a crime to police

Find out more

Outline

- **Arithmetic Operators**
- Relational Operators
- Logical Operators
- String and Escape Characters
- String Operations

Overview of operators

- **Operators** are special symbols that represent computations like *addition, subtraction, division, and multiplication*.
- The values that an operator is applied to are called **operands**
- `20 + 32` is a computation with
  - operator +
  - two operands 20 and 32
- Types of Operators
  - Arithmetic Operators
  - Relational Operators
  - Logical Operators

Arithmetic Operators

Operator	Operation	Description	Example
+	**Addition**	Adds two values or variables	2 + 3
-	**Subtraction**	Subtracts right hand operand from left hand operand.	5 - 2
*	**Multiplication**	Multiplies values	2 * 3
/	**Division**	Divides left hand operand by right hand operand	5.0 / 2.0
%	**Remainder**	Divides left hand operand by right hand operand and returns the remainder	5 % 2 (result is 1)
**	**Exponentiation**	Performs exponential (power) calculation	2**3 (result is 8)
//	**Floor/Integer Division**	The division of operands where the result is rounded down to the nearest whole number.	9//2 = 4 (9/2 = 4.5) -11//3 = -4 (-11/3 = -3.67)

We can use operators to construct expressions

What is an expression?

- A combination of values, variables, and **operators** that the interpreter can evaluate to produce a value
- Returns a value always
- A value by itself is also considered an expression, and so is a variable

```
17
x
x + 17
```

What operator shall we use to build an expression for this example?

If you have 51 candies and want to share them **equally** between 6 kids

- How many does each kid get? (The result should be integer)
- Is there any candy left? (The result should be boolean)
- How many candies are remaining? (The result should be integer)

Division operator’s result is always of type float

In division, the result would always be a **float** in Python, no matter whether the operands are both integer, float or a combination of integer and float.

```
print(6/2)
print(5/2)
print(6.0/2.0)
print(5.0/2.0)
print(2/6.0)
print(2/6)
```

Operation precedence rules

- When more than one operator appears in an expression, the order of calculation depends on the **rules of precedence**.

- Operation precedence:
    1. The subexpression within parentheses/brackets
    2. Exponentiation (powers and square roots)
    3. Multiplication, division, and remainder, performed from left to right
    4. Addition and subtraction, performed from left to right

Highest

Lowest

E.g.,

```
3 * (1 + 2) / 4**2
```

Outline

- Arithmetic Operators
- **Relational Operators**
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Relational Operators (1/2)

Relational operators, i.e., comparison operators, are used to compare the values of two expression.

Syntax	Semantics	Description	Example
==	Equal to	If the values of two operands are equal, then the condition becomes true.	5 == 6 (False) 5 == 5 (True)
!=	Not equal to	If values of two operands are not equal, then condition becomes true.	5 != 6 (True)
>	Greater than	If the value of left operand is greater than the value of right operand, then condition becomes true.	5 > 6 (False) 6 > 5 (True)

Relational Operators (2/2)

Syntax	Semantics	Description	Example
<	Less than	If the value of left operand is less than the value of right operand, then condition becomes true.	6 < 5 (False) 5 < 6 (True)
>=	Greater than or equal to	If the value of left operand is greater than **or** equal to the value of right operand, then condition becomes true.	5 >= 5 (True) 5 >= 4 (True) 5 >= 6 (False)
<=	Less than or equal to	If the value of left operand is less than **or** equal to the value of right operand, then condition becomes true.	5 <= 5 (True) 5 <= 6 (True) 5 <= 4 (False)

Exercise

Try the code below:

```
print (1 > 1)
print (1 >= 1)
print (2 == 1)
print (2 != 1)
print("a" != 1)
```

Outline

- Arithmetic Operators
- Relational Operators
- **Logical Operators**
- String and Escape Characters
- String Operations

Logical Operators

- Logical operators include `and, or, not`
- Sometimes we want to check **more than one condition at once**, e.g., we might want to check **if condition1 and condition2 are both True**
- The semantics (meaning) of these operators is similar to their meaning in English, e.g., `x > 0 and x < 10` is true only if x is greater than 0 ***and*** less than 10.
- **Precedence rules**: not > and > or

How to evaluate logical operators

- The `and` statement is only True when both conditions are true

`and`

x	y	x and y
False	False	False
False	True	False
True	False	False
True	True	True

- The `or` statement is True if one condition, or both are True

`or`

x	y	x or y
False	False	False
False	True	True
True	False	True
True	True	True

- The `not` statement outputs the opposite truth value

`not`

x	not x
False	True
True	False

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Exercise

Try below the statements:

```
a = True
b = True
c = False

print(a and b)
print(a or b)
print(not a)
print(not b)

print(a or b and c)
# Do we go from left to right?
# What's the best way to avoid confusion?
```

Outline

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- **String and Escape Characters**
- String Operations

Strings

- A string is a *sequence* of characters, e.g., `'banana'`
- Strings in python are surrounded by single quotation marks, or double quotation marks

```
'hello' or "hello"
```

- A string can include spaces or digits

```
'hello1'
'hello hello'
```

- A string can also include special characters

```
'hello, world'
'hello !!!'
```

- You can display a string literal with the print() function

```
print("Hello")
print('Hello')
```

Single vs. Double Quotes

- The most common use of single and double quotes is to represent strings.

```
quotes_single = 'a string'
quotes_double = "a string"
```

- As shown in the code, we create two strings using single and double quotes, respectively.

- The strings created by using single and double quotes are the same.

Illegal characters in a string

- An example of an **illegal** character is a double quote inside a string that is surrounded by double quotes:

```
myString1 = "We are the so-called "Vikings" from the north."
myString2 = "I am 5'4""
```

- We will get an error if using double quotes inside a string that is surrounded by double quotes.

- To insert characters that are **illegal** in a string, **use an escape character**.

Escape characters and sequence

- The backslash character (\) is used to **“escape”** a special character in Python.

- The backslash character goes **in front of the character we want to “escape”**

```
print("I am 5'4\"")
#I am 5′4″
print ("We are the so-called \"Vikings\" from the north.")
#We are the so-called "Vikings" from the north.
```

- We call the combination of the backslash character and the character we want to “escape” is an **escape sequence**.

- Escape sequence are used to represent characters that are difficult or impossible to type directly in the code or that have a special meaning in Python

Common Escape Sequences (1/2)

Escape Sequence	Purpose
\'	Print a single quote
\"	Print a double quote
\	Print a backslash
\t	Print a tab
\n	Print a newline (“enter”)

Source: http://learnpythonthehardway.org/book/ex10.html

Common Escape Sequences (2/2)

```
str1 = "\tI'm tabbed in."
print(str1)
	I'm tabbed in.
```

\t adds a tab

```
str2 = "We are splitting\na line."
print(str2)
We are splitting
a line.
```

\n adds a newline

```
str3 = "I'm \\ a \\ good boy."
print(str3)
I'm \ a \ good boy.
```

\\ adds a single backslash

Source: http://learnpythonthehardway.org/book/ex10.html

Three ways to solve the problem of printing out inch using quotes

```
print("I am 5'4\"")
```

escape double quotes (using " for the entire string)

```
print('I am 5\'4"')
```

escape single quotes (using ' for the entire string)

```
print("I am 5\'4\"")
```

escape both single and double quotes (works for both ' and ")

Alternative solution: Triple Quotes

Triple quotes can **enclose** strings containing single and double quotes.

```
print('''She said, "Thank you! It's mine."''')
#She said, "Thank you! It's mine."


print('''I am 5'4"''')
#I am 5'4"
```

Triple Quotes can also build a multi-line string

- Another use case of the triple quotes is to represent a multi-line string, e.g.,

```
print('''Hello
World
!''')
```

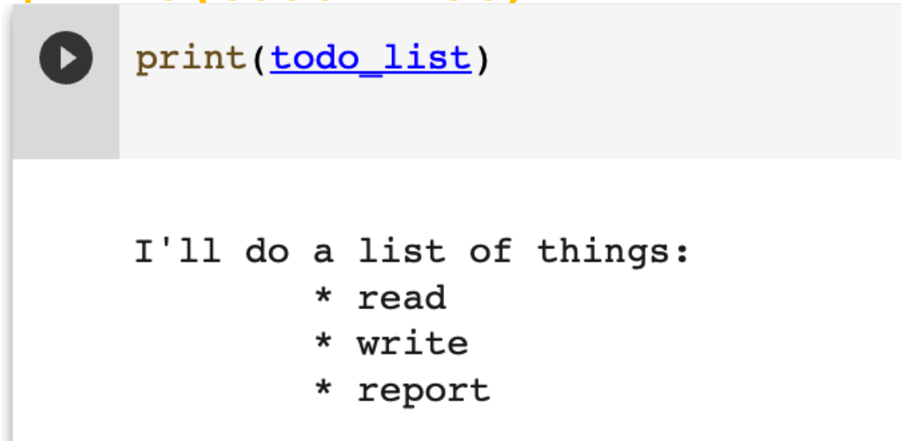
- We can also use escape sequences.

```
print('Hello\nWorld\n!')
```

Triple Quotes Example

```
todo_list= """
I'll do a list of things:
\t* read
\t* write
\t* report
"""
print(todo_list)
```

\t puts in a tab



```
print(todo_list)
```

```
I'll do a list of things:
        * read
        * write
        * report
```

When using triple quotes, the times you hit “**enter**” inside the string will print as newlines

Triple quotes are not an escape sequence but is helpful dealing with quotes in a string

Outline

- Arithmetic Operators
- Relational Operators
- Logical Operators
- String and Escape Characters
- **String Operations**

Types of string operations

- Concatenation/Addition:

```
str1 = "Simon Lee"
str2 = " is the best"
statement1 = str1 + str2
print(statement1)                #Simon Lee is the best
```

- Repetition/Multiplication:

```
“abc“ * 3   #arithmetic operator * on string

my_name = "Simon Lee "
new_name = 3 * my_name
print(new_name)
```

```
Simon Lee Simon Lee Simon Lee
```

Mixing numeric and string operands for string operations

```
x = 2
y = "hello"
print(x + y)  # What happens?

x = 2
y = "hello"
print(x * y) # What happens?
```

String Indexing

- You can access the characters in a string one at a time with the bracket operator, e.g., `letter = 'fruit'[1] #'r'`
  - extracts the character at index position **1** from the **fruit** variable and assigns it to the variable called **letter**.
  - The expression in brackets is called an ***index***, indicating which character in the sequence you want.

- Index starts from the position 0
  - In Python, the index starts from the beginning of the string, and the starting index is 0.

An example of string indexing (1/2)

```
Name = "Simon Lee"
```

String	S	i	m	o	n		L	e	e
Index	0	1	2	3	4	5	6	7	8

`Name[6]` What is the printout?

An example of string indexing (2/2)

```
Name = "Simon Lee"
```

String	S	i	m	o	n		L	e	e
Index	-9	-8	-7	-6	-5	-4	-3	-2	-1

`Name[-3]` What is the printout?

String indexing for escape sequences

- Escape sequences look like two characters to us
- But Python treats them as a **single** character

```
example1 = "see\n"
```

0	1	2	3
s	e	e	\n

```
example2 = "\tsee"
```

0	1	2	3
\t	s	e	e

String slicing

- A segment of a string is called a ***slice***. Selecting a slice is similar to selecting a character, but we are selecting multiple characters

```
s = 'Monty Python'
print(s[0:5])
print(s[6:12])
```

- The operator returns the part of the string from the "n-th" character to the "m-th" character, ***including*** the first but ***excluding*** the last.

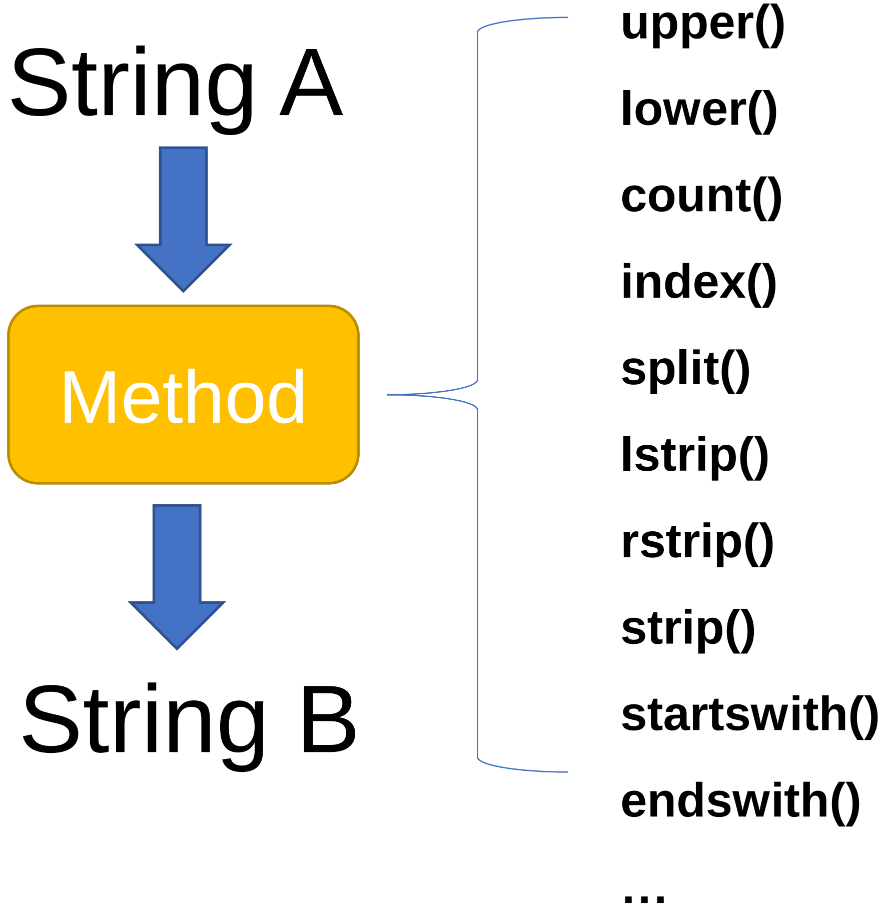
An example of string slicing

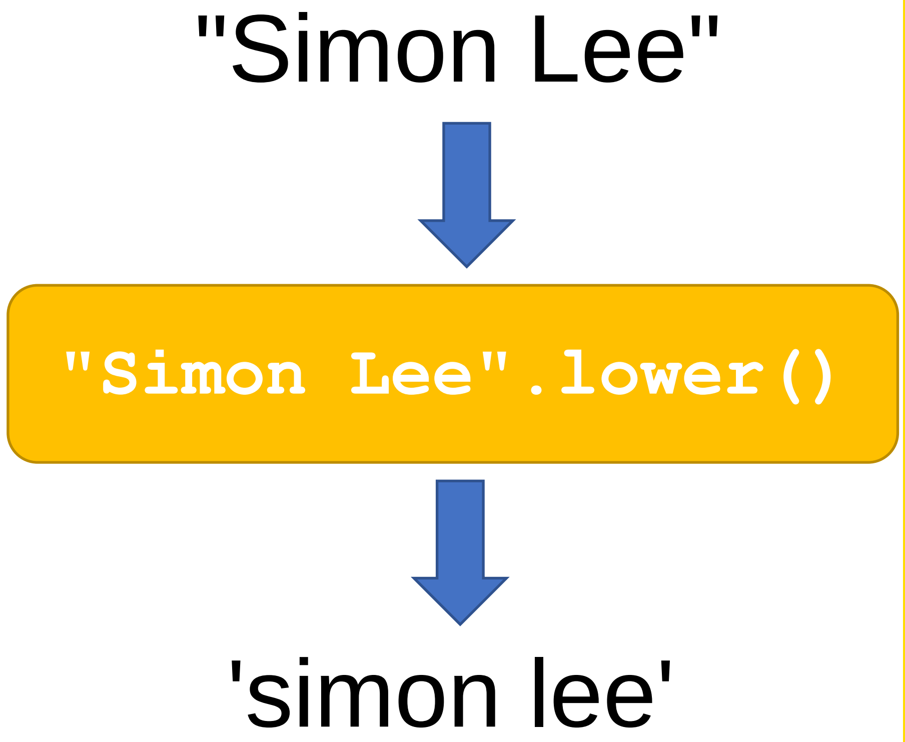
```
Name = "Simon Lee"
```

String	S	i	m	o	n		L	e	e
Index	0	1	2	3	4	5	6	7	8

```
firstName = Name[0:5]   # how to do this in Excel?
lastName = Name[6:9]    # how to do this in Excel?
```

String Methods (functions that belong to the string type)





Details on string methods (1/2)

- string.upper(): Converts the string into upper case
- string.lower(): Converts the string into lower case
- string.lstrip(): Returns a left trimmed version of the string
  - Space is the default leading character to remove
- string.rstrip(): Returns a right trimmed version of the string
  - Space is the default trailing character to remove
- string.strip(): Returns a trimmed version of the string
  - By default, remove any leading and/or trailing space character(s)

Details on string methods (2/2)

- string.count(): Returns occurrence of a specified value in the string
- string.index(): Searches the string for a specified value and returns the position of where it was found
- string.startswith(): Returns true if the string starts with the specified value
- string.endswith(): Returns true if the string ends with the specified value
- string.split(): Splits the string at the specified separator, and returns a list

String length

`len()` is a built-in function that returns the number of characters in a string

```
len("Simon Lee")

s = "Hello\nWorld" #\n is a newline character
len(s) # Returns 11. \n is two symbols, but it represents one
character
```

Is it a string method, i.e., does **`len()`** belong to string type?

String Operations

```
greet1 = "Hello World"
greet2 = "How are you?"

print(greet1.upper())
print(greet1.lower())
print(len(greet1))
print(greet1.index ("o"))
print(greet1.count('l'))
print(greet1[2:7])
print(greet1.startswith ("Hello"))
print(greet2.endswith ("you?"))

greetwords = greet1.split(" ")
print('greetwords[0] = ', greetwords[0])
print('greetwords[1] = ', greetwords[1])
```

What is the printout?

Recap Exercise

```
greet1 = "  Hello World   "
new_greet = greet1.replace("World", "John")
print(new_greet)
print(new_greet.lstrip())
print(new_greet.rstrip())
print(new_greet.strip())
```

What is the printout?

Recap Exercise

We already executed the following assignment statements:

```
width  = 20
height = 12.0
```

For each of the following expressions, write the value of the expression and the type (of the value of the expression)

```
width//2
width/2.0
height/3
1 + 2 ** 5
```

Use the Python interpreter to check your answers.

Recap Exercise

- Addition (+) for String means concatenation

```
print('a' + 'b’) # what is the printout?
```

- Multiplication (*) for String means Multiple concatenation

```
print('a' * 4) # what is the printout?
```