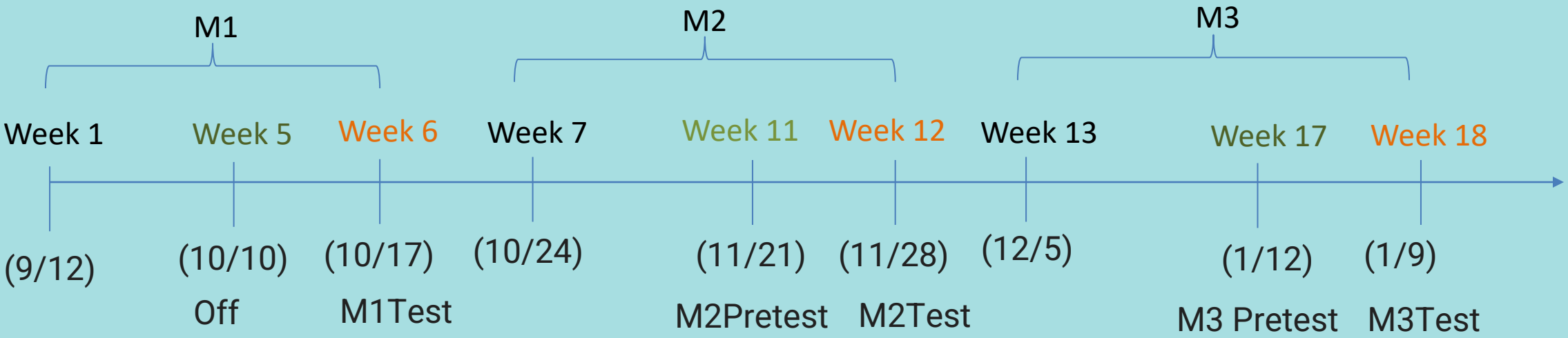
Fundamental Programming Course

Week 5

Huseh-Ting Chu@Asia University, 2021

Schedule


M1
M2
M3
Week 1
Week 5
Week 6
Week 7
Week 11
Week 12
Week 13
Week 17
Week 18
(9/12)
(10/10)
Off
(10/17)
M1Test
(10/24)
(11/21)
M2Pretest
(11/28)
M2Test
(12/5)
(1/12)
M3 Pretest
(1/9)
M3Test

Syllabus

- W1-Python Introduction and Programming Tools
- W2-Variables and Operations
- W3-Loop and formatted output
- W4-Condition and Containers
- W5-String and built-in functions
- W6-M1 test
- W07-Dictionary Container
- W08-File I/O
- W09-Function
- W10-Advanced flow control
- W11-Advanced operations and generators
- W12-M2 test

- W13-Advanced functions
- W14-Class fundamentals (classes, objects, properties, constructors, methods)
- W15-Advanced Classes (Static methods, class Methods and class decorators)
- W16-Modules and Packages
- W17-Advanced programming(Argparse and Venv)
- W18-M3 test

Python cheat sheet

Beginner's Python Cheat Sheet

Variables and Strings

Variables are used to store values. A string is a series of characters, surrounded by single or double quotes.

Hello world

```
print("Hello world!")
```

Hello world with a variable

```
msg = "Hello world!"
print(msg)
```

Concatenation (combining strings)

```
first_name = 'albert'
last_name = 'einstein'
full_name = first_name + ' ' + last_name
print(full_name)
```

Lists

A list stores a series of items in a particular order. You access items using an index, or within a loop.

Make a list

```
bikes = ['trek', 'redline', 'giant']
```

Get the first item in a list

```
first_bike = bikes[0]
```

Get the last item in a list

```
last_bike = bikes[-1]
```

Looping through a list

```
for bike in bikes:
    print(bike)
```

Adding items to a list

```
bikes = []
bikes.append('trek')
bikes.append('redline')
bikes.append('giant')
```

Making numerical lists

```
squares = []
for x in range(1, 11):
    squares.append(x**2)
```

Lists (cont.)

List comprehensions

```
squares = [x**2 for x in range(1, 11)]
```

Slicing a list

```
finishers = ['sam', 'bob', 'ada', 'bea']
first_two = finishers[:2]
```

Copying a list

```
copy_of_bikes = bikes[:]
```

Tuples

Tuples are similar to lists, but the items in a tuple can't be modified.

Making a tuple

```
dimensions = (1920, 1080)
```

If statements

If statements are used to test for particular conditions and respond appropriately.

Conditional tests

```
equals            x == 42
not equal         x != 42
greater than      x > 42
  or equal to     x >= 42
less than         x < 42
  or equal to     x <= 42
```

Conditional test with lists

```
'trek' in bikes
'surly' not in bikes
```

Assigning boolean values

```
game_active = True
can_edit = False
```

A simple if test

```
if age >= 18:
    print("You can vote!")
```

If-elif-else statements

```
if age < 4:
    ticket_price = 0
elif age < 18:
    ticket_price = 10
else:
    ticket_price = 15
```

Dictionaries

Dictionaries store connections between pieces of information. Each item in a dictionary is a key-value pair.

A simple dictionary

```
alien = {'color': 'green', 'points': 5}
```

Accessing a value

```
print("The alien's color is " + alien['color'])
```

Adding a new key-value pair

```
alien['x_position'] = 0
```

Looping through all key-value pairs

```
fav_numbers = {'eric': 17, 'ever': 4}
for name, number in fav_numbers.items():
    print(name + ' loves ' + str(number))
```

Looping through all keys

```
fav_numbers = {'eric': 17, 'ever': 4}
for name in fav_numbers.keys():
    print(name + ' loves a number')
```

Looping through all the values

```
fav_numbers = {'eric': 17, 'ever': 4}
for number in fav_numbers.values():
    print(str(number) + ' is a favorite')
```

User input

Your programs can prompt the user for input. All input is stored as a string.

Prompting for a value

```
name = input("What's your name? ")
print("Hello, " + name + "!")
```

Prompting for numerical input

```
age = input("How old are you? ")
age = int(age)

pi = input("What's the value of pi? ")
pi = float(pi)
```


This Week's Content – Loop and Formatting Output

- Essential - basic
  - IPO model: input–process–output (input-processing-output)
  - Input: Review of input
  - Process: string function, ascii function, unicode function
  - Process: String Indexing (Indexing) and Slicing (Slicing)
  - Review of Output:Output
- Advanced-Advanced
  - Built-in functions: pow(), divmod(), round()
  - Built-in functions: repr() and eval()

Kissipo Learning

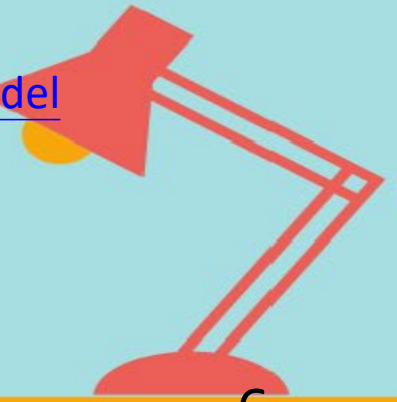
Kissipo = KISS principle + IPO model

KISS principle

"keep it simple, stupid" or "keep it stupid simple", is a design principle noted by the U.S. Navy in 1960.
https://en.wikipedia.org/wiki/KISS_principle

IPO model

The input–process–output (IPO) model is a widely used approach in systems analysis and software engineering for describing the structure of an information processing program or other process.
https://en.wikipedia.org/wiki/IPO_model



Kissipo Learning for Programming with Python(PWP)

Courseware: Notebook+ Github

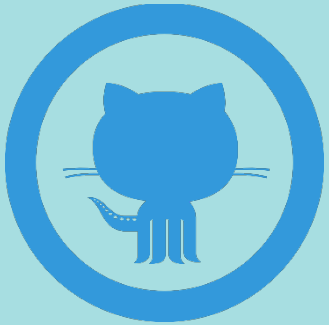
(1) Teaching with Notebook (Google Colab).
(2) Use Github to build lesson plans

Keep:

Variables and assignment
operator and expression
left-hand side and right-hand side
unpacking

S&S:

help(), type(), len(), size()



IPO-I: input

input()
int(), float(), str()
split(), map()

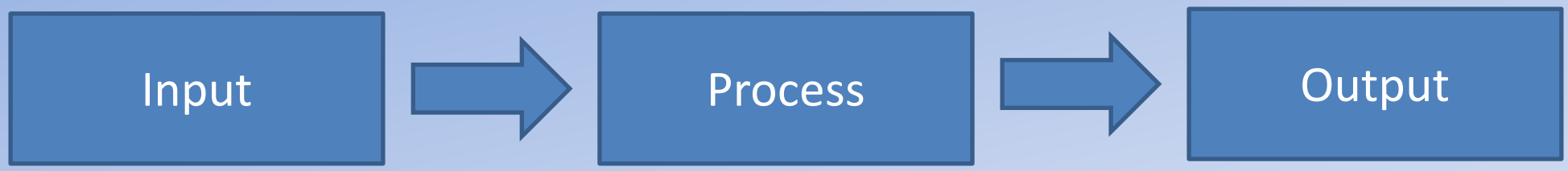
IPO-P: Process

for-loop/while-loop
if, elif, else
range()

IPO-O: output

print()
open(), write()

IPO Model(1)



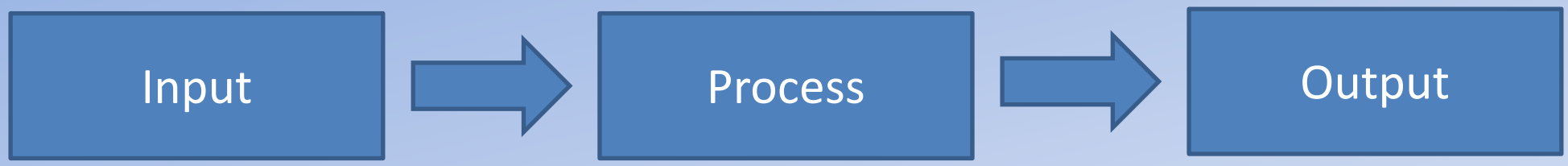
input()

help(), type()

print()

The basic idea of this chapter is that students should know:
Input with input(), output with print()
help() can view the description of the function or category
type() can check the type of the variable

IPO Model (2)



input() input a variable
Convert to integer variable using int()
Convert to float variable using float()

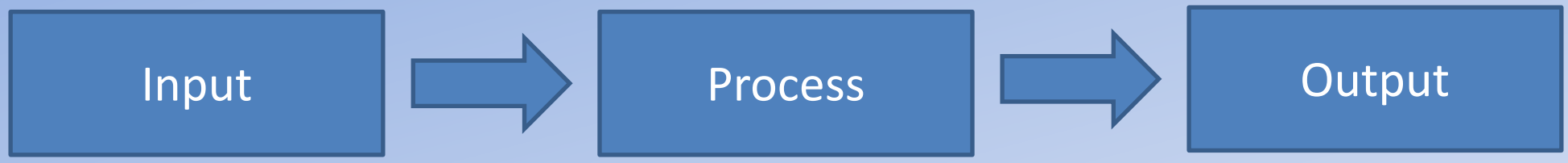
Arithmetic operator
Operator precedence
String representation in program
Comment

The print() function
Escape Sequence

The basic idea of this chapter is that students should know:

- How to use input() to input numbers of different types
- Output print() has two parameters sep and end to control the output
- Arithmetic operations in Python include: addition, subtraction, multiplication and division (+ - * /), power (**), quotient (//) and remainder (%).
- The result of addition, subtraction, multiplication and division (+ - * /), power (**) is a floating point number. The quotient (//) and remainder (%) calculations result in integers.

IPO Model (3)



input() input multiple variables
Convert to a list using split()

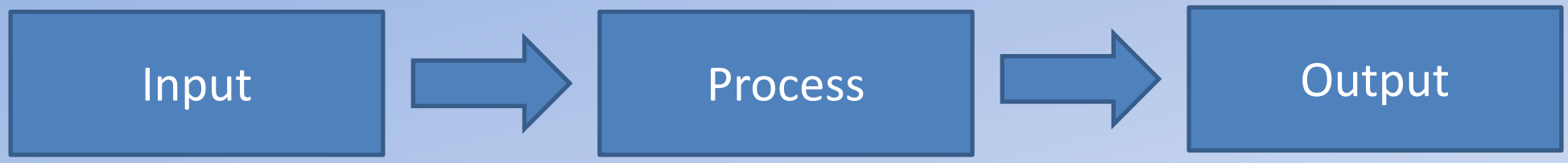
for-loop,
Multiple assignment
Indexing and Slicing
Use of the range() function
Initialization of a list (List)

Formatted output of print()
f - string format

The basic idea of this chapter is that students should know:

- How to enter multiple variables with input()
- formatted output with f-format string
- Use of loops.
- What is Indexing and Slicing

IPO Model (4)



Use map() to input multiple variables

if conditional
comparison operator
Boolean Values and Boolean Logic
while loop

The basic idea of this chapter is that students should know:

- Use of conditional expressions.
- Advanced String Formatting
- Container: List, Tuple, Dict, Set

IPO Model (5)

Review of Input

- Input a variable
- Multiple variables of same type
- Multiple variables of different types

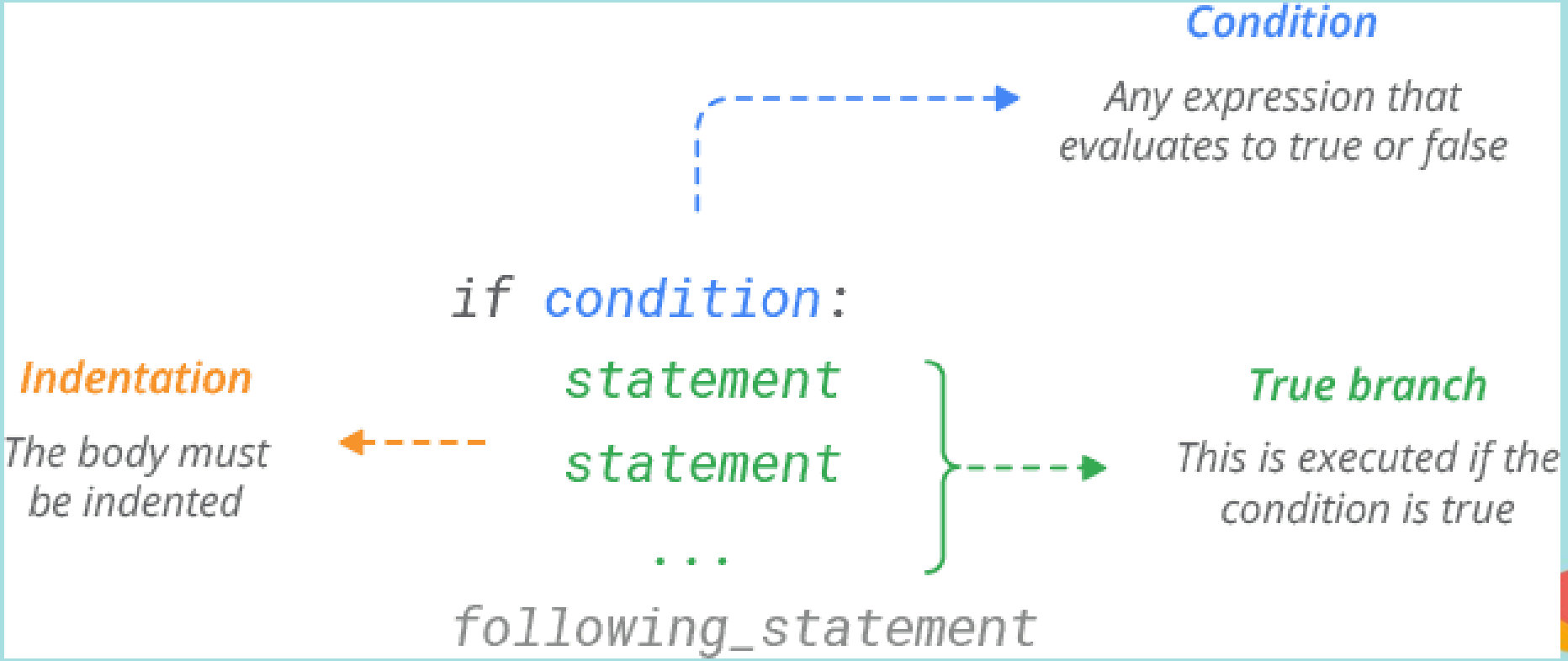
String functions,
ascii/unicode function,
String indexing and slicing

Review of Output

- formatted output with multiple variables
- Controls the width of formatted output
- Controls the interval for formatted output

Pre-exam practice

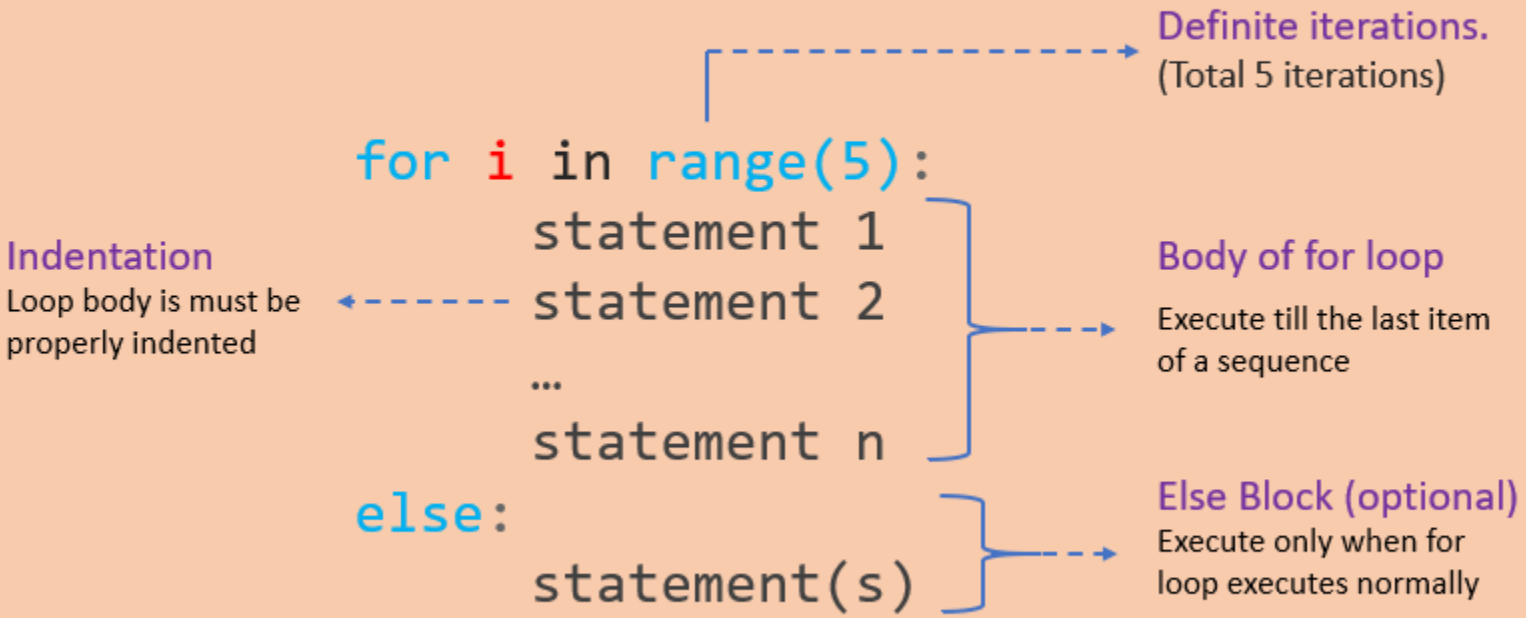
if condition



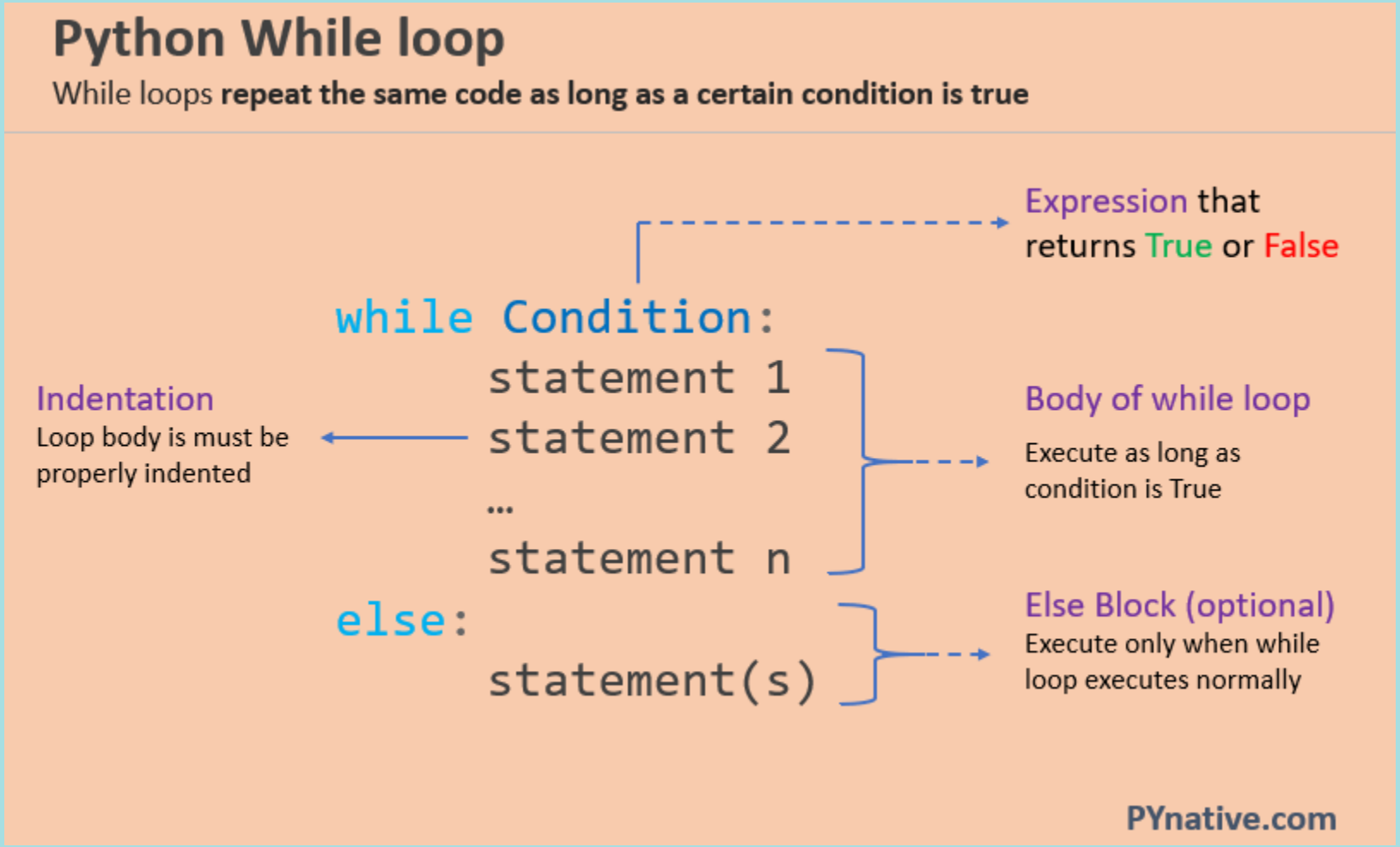
for loop

Python for loop

A for loop is **used for iterating over a sequence and iterables** (like range, list, a tuple, a dictionary, a set, or a string).

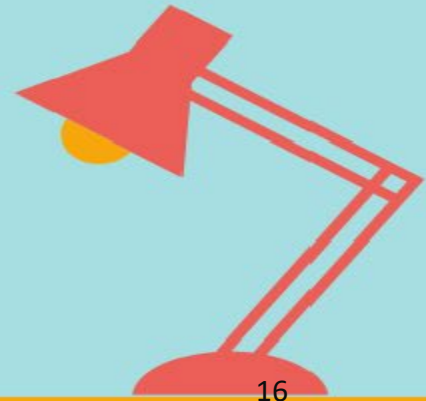


while loop


Python While loop
While loops repeat the same code as long as a certain condition is true
Expression that returns True or False
while Condition:
statement 1
statement 2
…
statement n
else:
statement(s)
Indentation
Loop body is must be properly indented
Body of while loop
Execute as long as condition is True
Else Block (optional)
Execute only when while loop executes normally
PYnative.com

Topic 1- Review of input variables

- Step 1: Enter a string parameter
- Step 2: Enter an integer parameter
- Step 3: Enter a float parameter
- Step 4: Enter two string parameters
- Step 5: Enter three integer parameters

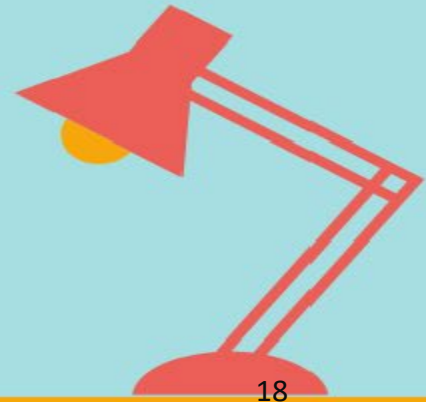


Topic 2- Review of formatted output

- Step 1: Format multiple variables for output
- Step 2: Control the width and arrangement of formatted output

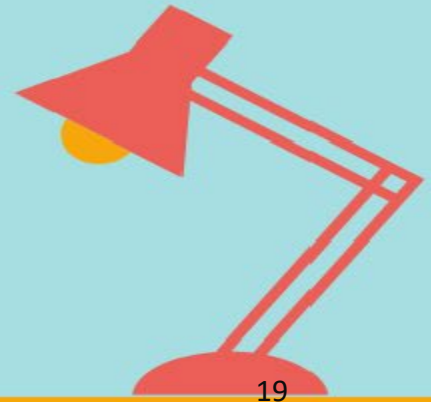
Topic 3-Indexing and slicing

- Step 1: String Indexing
- Step 2: Slicing of Strings



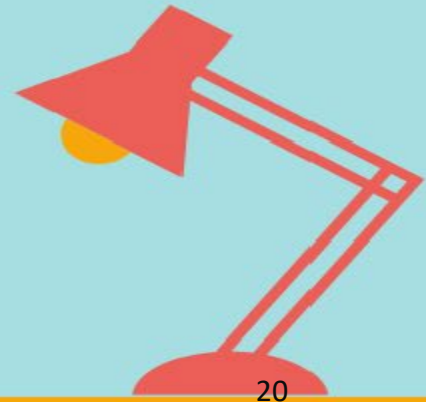
Topic 4- string functions

- Step 1: Split str.split()
- Step 2: Upper and lower case str.lower(), str.upper()
- Step 3: Remove the head and tail str.strip(), str.rstrip(), str.lstrip()



Topic 5-ascii/unicode convertion function

- Step 1: ord()
- Step 2: chr()



Thanks!

Q&A