Review

- String type
  - text values and operations
  - Print and Input
- Bool type
  - True/False and Logical operations
- Relational operators and “in” operator
  - Bool type output
- Control where to execute depending on conditions

Modules - Importing

Lecture 4-1

Hyung-Sin Kim

 SNU Graduate School of Data Science

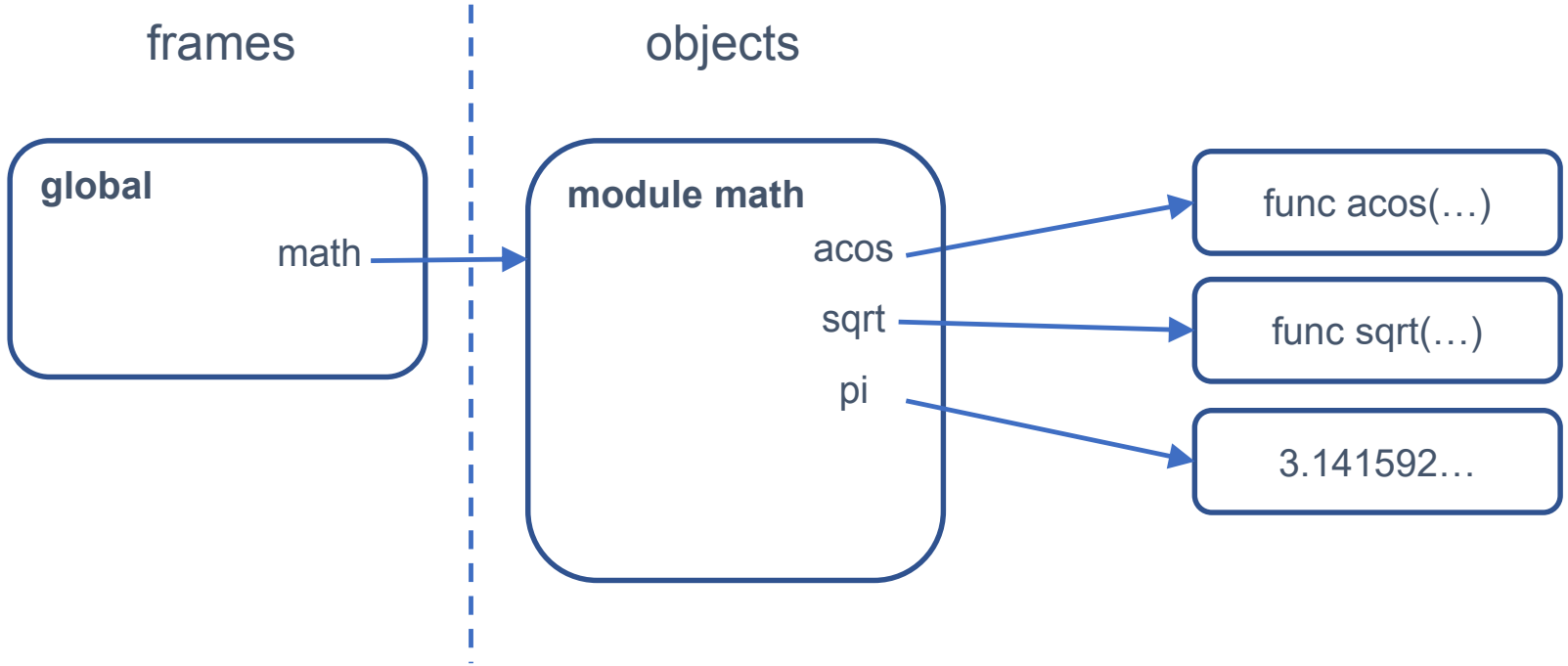
Module

- A package of (reusable) variables and functions, grouped together in a single file

- Once you **import** a module, you can use all the functions and variables in the module
  - >>> import math

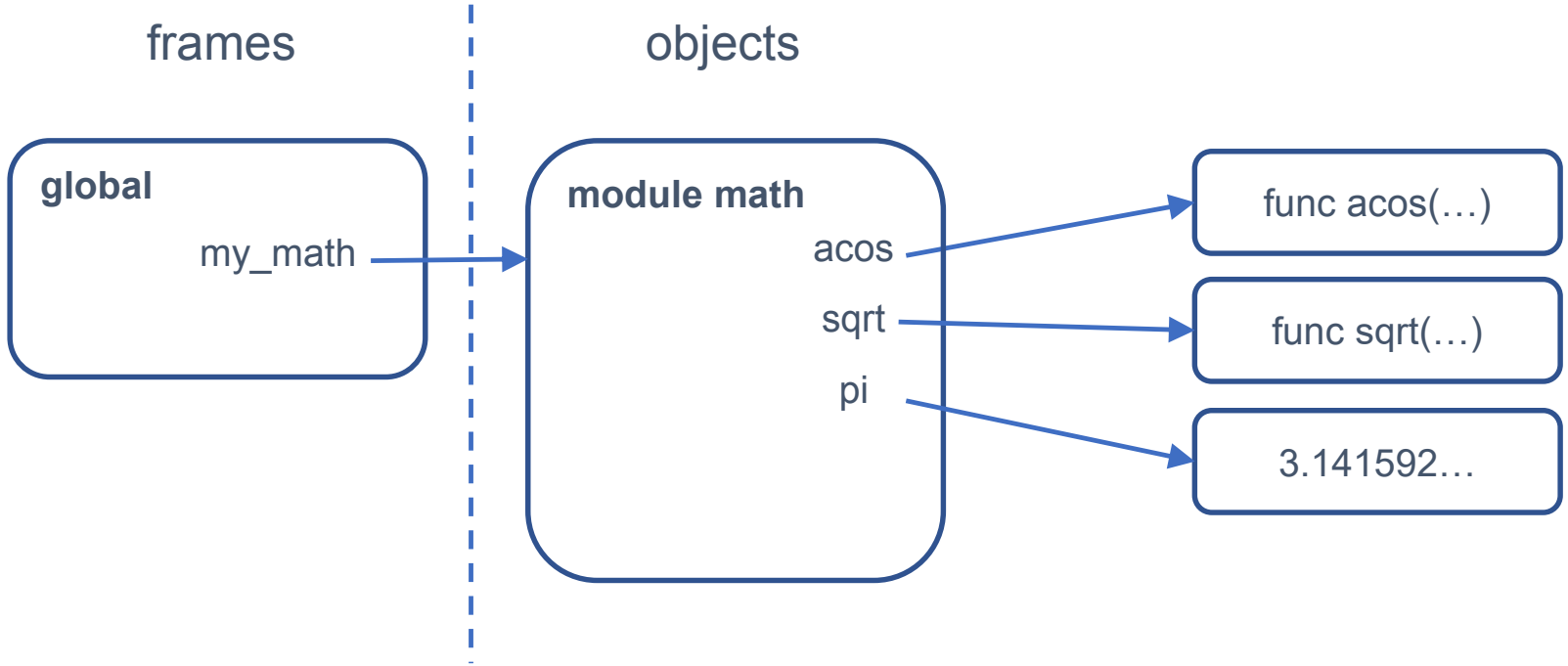
Module – What Happens when Importing?

- >>> import math
  - Creates a variable called **math** that refers to the math module **object**



Module – What Happens when Importing?

- >>> import math **as my_math**
  - Creates a variable called **my_math** that refers to the math module object



Module – Using Functions and Variables

- After importing, we can use functions and variables in math module as follows:
  - >>> math.xxxxx
  - >>> math.pi ➡ 3.141592653589793
  - >>> math.sqrt(9) ➡ 3.0

- **Dot** is an operator like + and *
  - >>> A.B
    - Step 1: Look up the object that the variable A refers to
    - Step 2: In that object, find the name B

Module – Warning

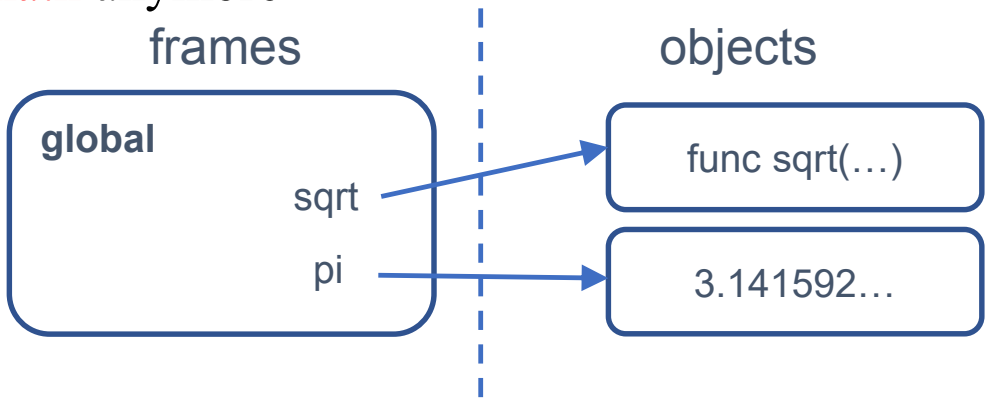
- You can even change the value of a module's variable, but DON't DO THIS!
  - >>> math.pi = -17482
  - Likewise, DON't MANIPULATE a built-in function's name! (e.g., max = min)

- Python does not allow programmers to "freeze" values, which is a significant **flaw**
  - Other programming languages like C provides **constants** as well as variables and do not allow the constants to be changed

Module – Importing Specific Things

- It is **inconvenient** to always type **math** to use something in the module math

- We can import specific functions and variables into the current namespace
  - >>> from math import sqrt, pi
    - Now we don't have math but **sqrt** and **pi** directly in the current namespace
    - Don't have to and cannot use math anymore
  - >>> sqrt(9) ⟹ 3.0



Module – Importing Specific Things

- Importing a single function **does not save** memory compared to importing an entire module
  - All things in math module are loaded on memory anyway
  - But the difference is how the module is mapped to names in the global namespace
  - https://www.youtube.com/watch?v=vhzdwoJangI

- Therefore, importing specific things really for the ease of typing …

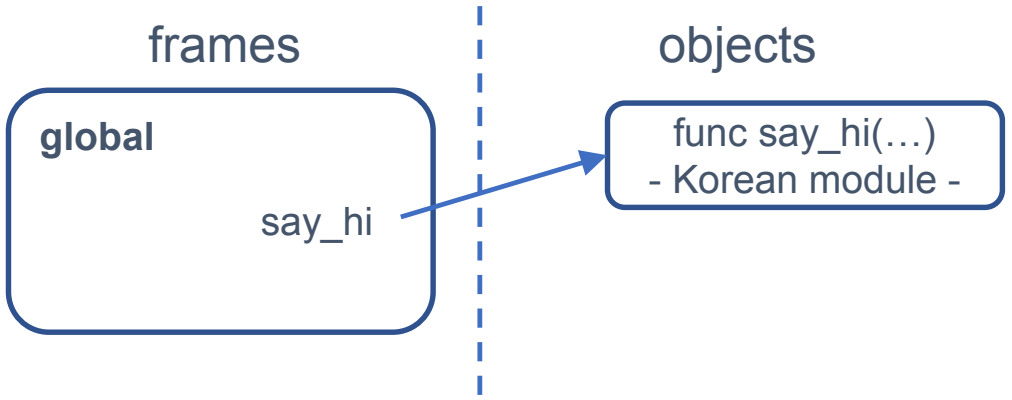
Module – Importing Specific Things

- What if you do “from math import *”?
  - You can import all the functions and variables from math module and use them directly. You can save some typing. Great!

- But this is **NOT** a good idea!
  - Python library contains **several hundreds** modules
  - Multiple modules might have functions or variables having **same name**

Module – Importing Specific Things

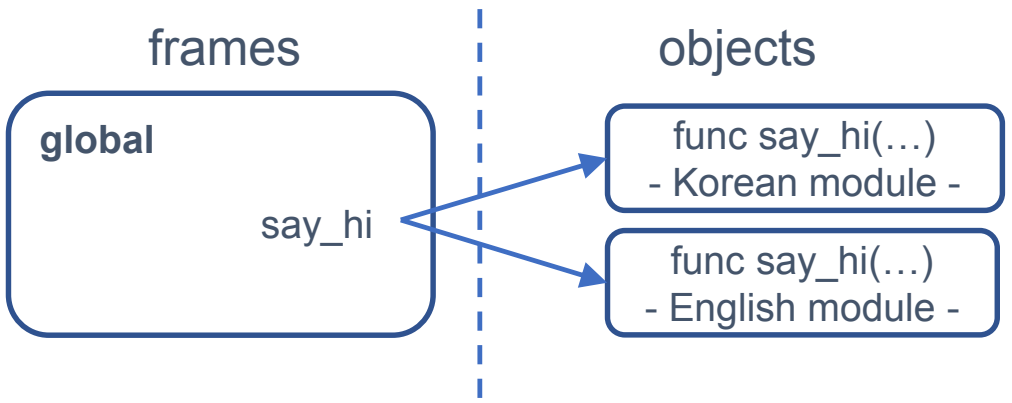
- What's wrong with that?
  - >>> from Korean import say_hi (안녕하세요)



Module – Importing Specific Things

- What's wrong with that?
  - >>> from Korean import say_hi (안녕하세요)
  - >>> from English import say_hi (Hello)
    - Say_hi function in Korean module is just gone, replaced by that in English module
  - >>> say_hi() ⟹ Hello
  - **NOT** wise to take this risk by doing…
    - >>> from Korean import *
    - >>> from English import *

You have no idea what (bad things) may happen later…



Summary

- Module: One step forward to reusable programming
- A.B
- Memory and module import
  - Entire module vs. specific function/variable
- Namespace and module import
  - Entire module vs. specific function/variable

Computing Bootcamp

Modules – Writing

Lecture 4-2

Hyung-Sin Kim


SNU Graduate School of Data Science

Module – Make Your Own Module

- Open a new text file and make the file name “temperature.py”
  - Now Jupyter knows that it is Python file

- Write some variables and functions in the file

```
1  a = 5.0
2  b = 9.0
3  c = 32.0
4
5  def convert_to_celsius(fahrenheit: float) -> float:
6      return (fahrenheit - c) * a / b
7
8  def convert_to_fahrenheit(celsius: float) -> float:
9      return celsius * b / a + c
```

- Save the file

Module – Make Your Own Module

- Now you have a temperature module
  - import temperature
  - Play with variables and functions in your own module!

- Good and convenient to group related variables and functions in a module!

Classes

Lecture 4-3

Hyung-Sin Kim

 SNU Graduate School of Data Science

Class

- Class is another type of **object** that has variables and functions similar to module
  - Functions in a class are called **methods**
  - A method takes its class object as the first and default argument
  - You can call a class's methods like calling a module's functions
    - <<class object>>.<<method>>
- There are more differences between class and module but…

Class

- All the types we've seen so far are actually classes
  - int class, float class, str class, bool class
  - You can see their definitions by typing, for example **help(int)**
- Class vs. Class object
  - A class is a **blueprint**, definition of its attributes and methods (but not real yet)
  - A class object is a class' **instance** (realization of a blueprint)
  - Example: TESLA model Y
    - TESLA designed **model Y's blueprint** and produces numerous **model Y objects** according to the blueprint.
    - I can buy a **model Y object** but not **the model Y blueprint**
    - **The model Y blueprint** has an attribute 'color.'
    - My **model Y object**'s color attribute is blue
    - Your **model Y object**'s color attribute is red
    - I can drive a **model Y object** without knowing its **blueprint**

Class

- Python has built-in classes, such as int, float, str, and bool
- We can create objects of these classes and easily use their methods and attributes, without worrying about how they are implemented
  - Yes, this is an example of **abstraction**!

- Example: **str** class
  - >>> name = “Hyung-Sin Kim” (name points at an **object** of str class, "Hyung-Sin Kim”)
  - When calling str methods, you don’t input name as the argument!
    - >>> name.lower() ⟹ “hyung-sin kim”
    - >>> name.upper() ⟹ “HYUNG-SIN KIM”
    - >>> name.find(“S”) ⟹ 6 (location where “S” appears first in “Hyung-Sin Kim”)
    - >>> name.count(“n”) ⟹ 2 (# of “n” in “Hyung-Sin Kim”)

Class

- You will write your own classes (**blueprint**) later
  - **Object**-oriented programming

- But now please be familiar with methods in **str class**
  - Manipulating strings fluently is super important!
  - https://www.w3schools.com/python/python_ref_string.asp
    - Count, find, lower, upper, lstrip, rstrip …

- You can understand how str methods work except split(), which will be described later (output type is List)

It is OK to not understand 100% for now.

You will be more familiar with this concept
as you use various classes and
learn object-oriented programming

Summary

- Class vs. Class object

- How to use methods in a class

Thanks!