Objects - Part 1

Python for Everybody

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Warning

- This lecture is very much about definitions and mechanics for objects
- This lecture is a lot more about "how it works" and less about "how you use it"
- You won't get the entire picture until this is all looked at in the context of a real problem
- So please suspend disbelief and learn technique for the next 40 or so slides..

And I'm going to give you some sample code, but not so you can write that code,

5. Data Structures

This chapter describes some things you've learned about already in more detail, and adds some new things as well.

5.1. More on Lists

The list data type has some more methods. Here are all of the methods of list objects:

`list.`**`append`**(*x*)
Add an item to the end of the list. Equivalent to `a[len(a):] = [x]`.

`list.`**`extend`**(*L*)
Extend the list by appending all the items in the given list. Equivalent to `a[len(a):] = L`.

`list.`**`insert`**(*i*, *x*)
Insert an item at a given position. The first argument is the index of the element before which to insert, so `a.insert(0, x)` inserts at the front of the list, and `a.insert(len(a), x)` is equivalent to `a.append(x)`.

`list.`**`remove`**(*x*)
Remove the first item from the list whose value is *x*. It is an error if there is no such item.

`list.`**`pop`**([*i*])
Remove the item at the given position in the list, and return it. If no index is specified, `a.pop()` removes and returns the last item in the list. (The square brackets around the *i* in the method signature denote that the parameter is optional, not that you should type square brackets at that position. You will see this notation frequently in the Python Library Reference.)

https://docs.python.org/3/tutorial/datastructures.html

Well, it says here the list data type has some more methods.

12.6. `sqlite3` — DB-API 2.0 interface for SQLite databases

Source code: Lib/sqlite3/

SQLite is a C library that provides a lightweight disk-based database that doesn't require a separate server process and allows accessing the database using a nonstandard variant of the SQL query language. Some applications can use SQLite for internal data storage. It's also possible to prototype an application using SQLite and then port the code to a larger database such as PostgreSQL or Oracle.

The sqlite3 module was written by Gerhard Häring. It provides a SQL interface compliant with the DB-API 2.0 specification described by PEP 249.

To use the module, you must first create a `Connection` object that represents the database. Here the data will be stored in the `example.db` file:

```
import sqlite3
conn = sqlite3.connect('example.db')
```

You can also supply the special name `:memory:` to create a database in RAM.

Once you have a `Connection`, you can create a `Cursor` object and call its `execute()` method to perform SQL commands:

```
c = conn.cursor()

# Create table
c.execute('''CREATE TABLE stocks
             (date text, trans text, symbol text, qty real, price real)''')
```

https://docs.python.org/3/library/sqlite3.html

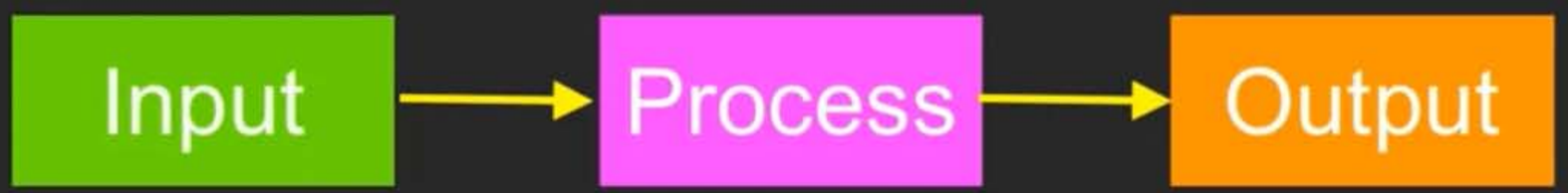
And database is a connection object and a cursor object and

INSIDE

```
inp = input('Europe floor?')
usf = int(inp) + 1
print('US floor', usf)
```

OUTSIDE

Europe floor? 0
US floor 1



Like programmers have to worry about this detail, the programmer that wrote it, but

Object Oriented

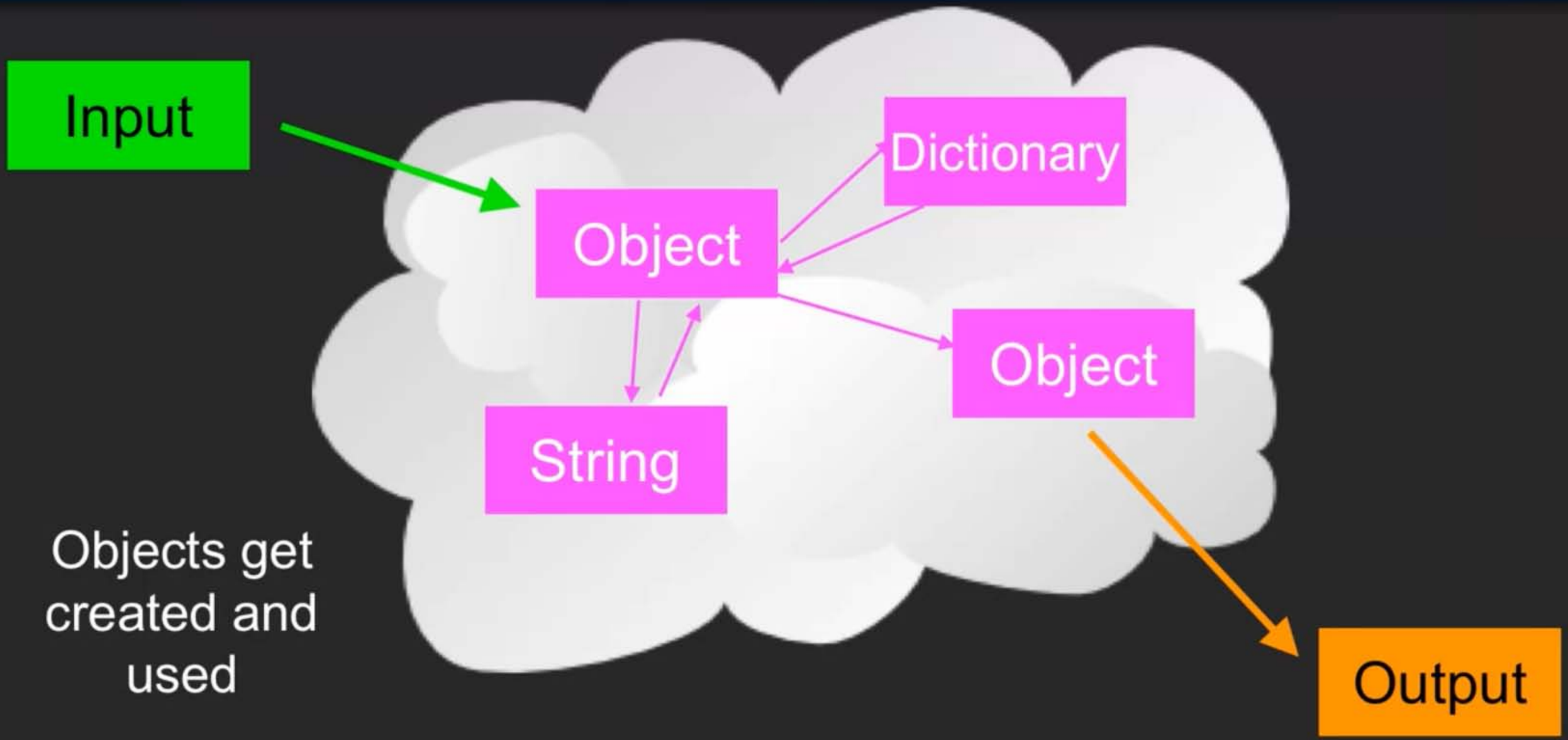
- A program is made up of many cooperating objects
- Instead of being the “whole program” - each object is a little “island” within the program and cooperatively working with other objects.
- A program is made up of one or more objects working together - objects make use of each other’s capabilities

And these objects sort of work together.

Object

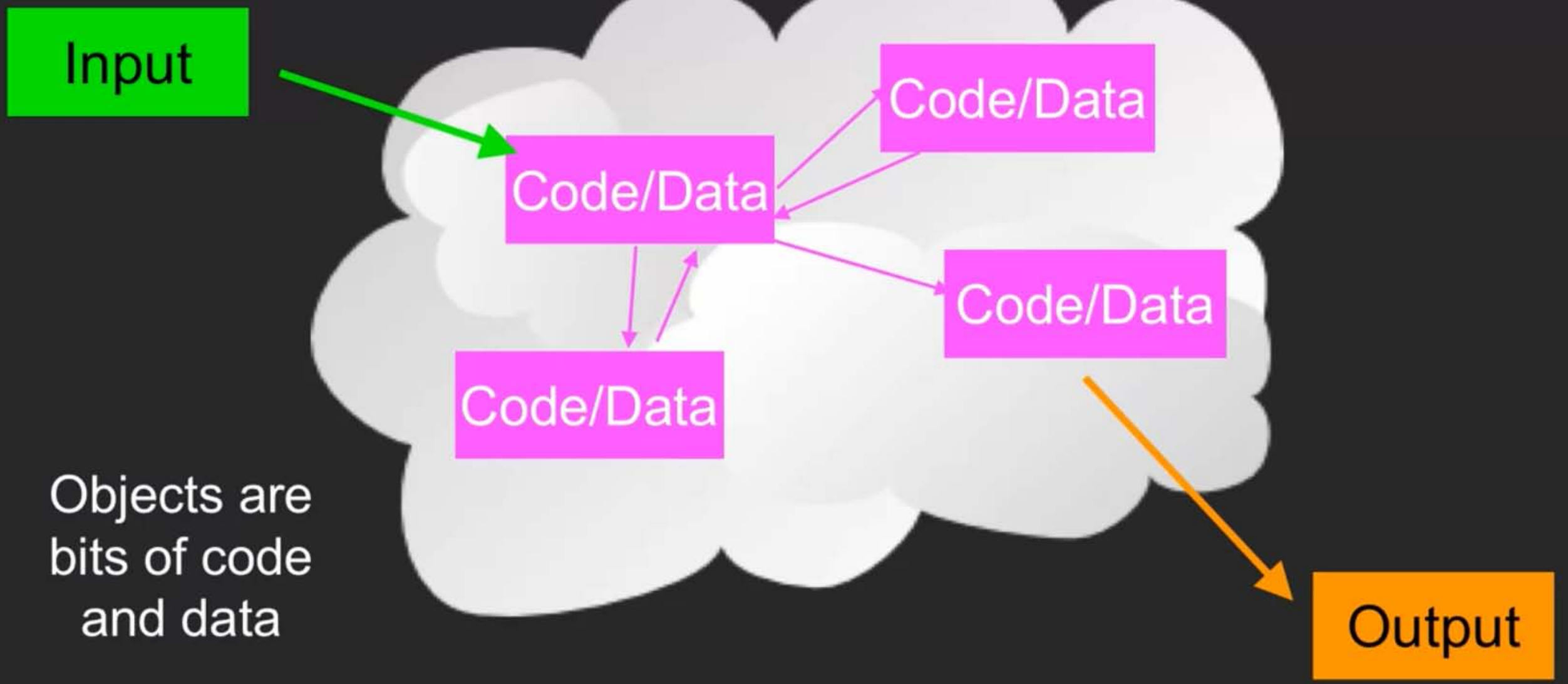
- An Object is a bit of self-contained Code and Data
- A key aspect of the Object approach is to break the problem into smaller understandable parts (divide and conquer)
- Objects have boundaries that allow us to ignore un-needed detail
- We have been using objects all along: String Objects, Integer Objects, Dictionary Objects, List Objects...

And the idea is you take this big problem
and break it into a series of problems,



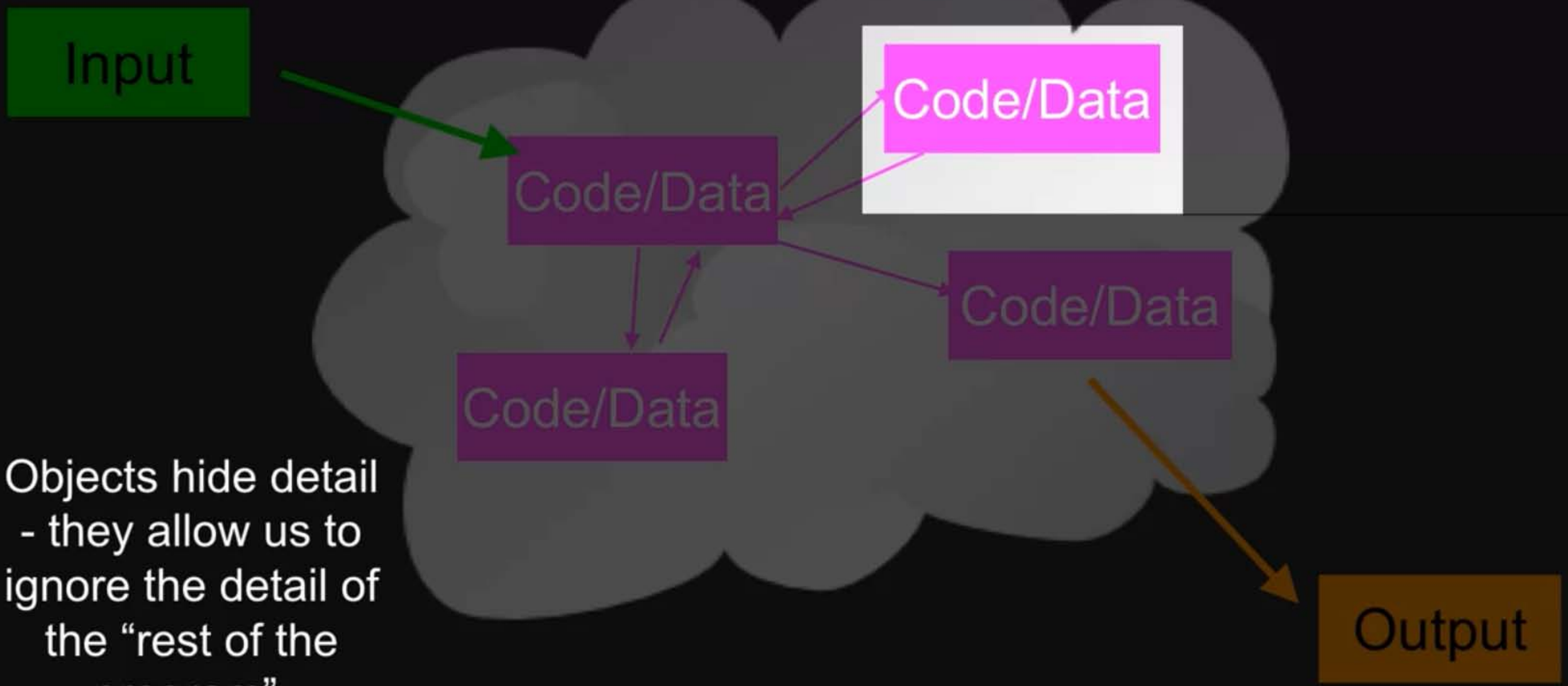
Objects get created and used

together to take the input of the program and produce the output of the program.



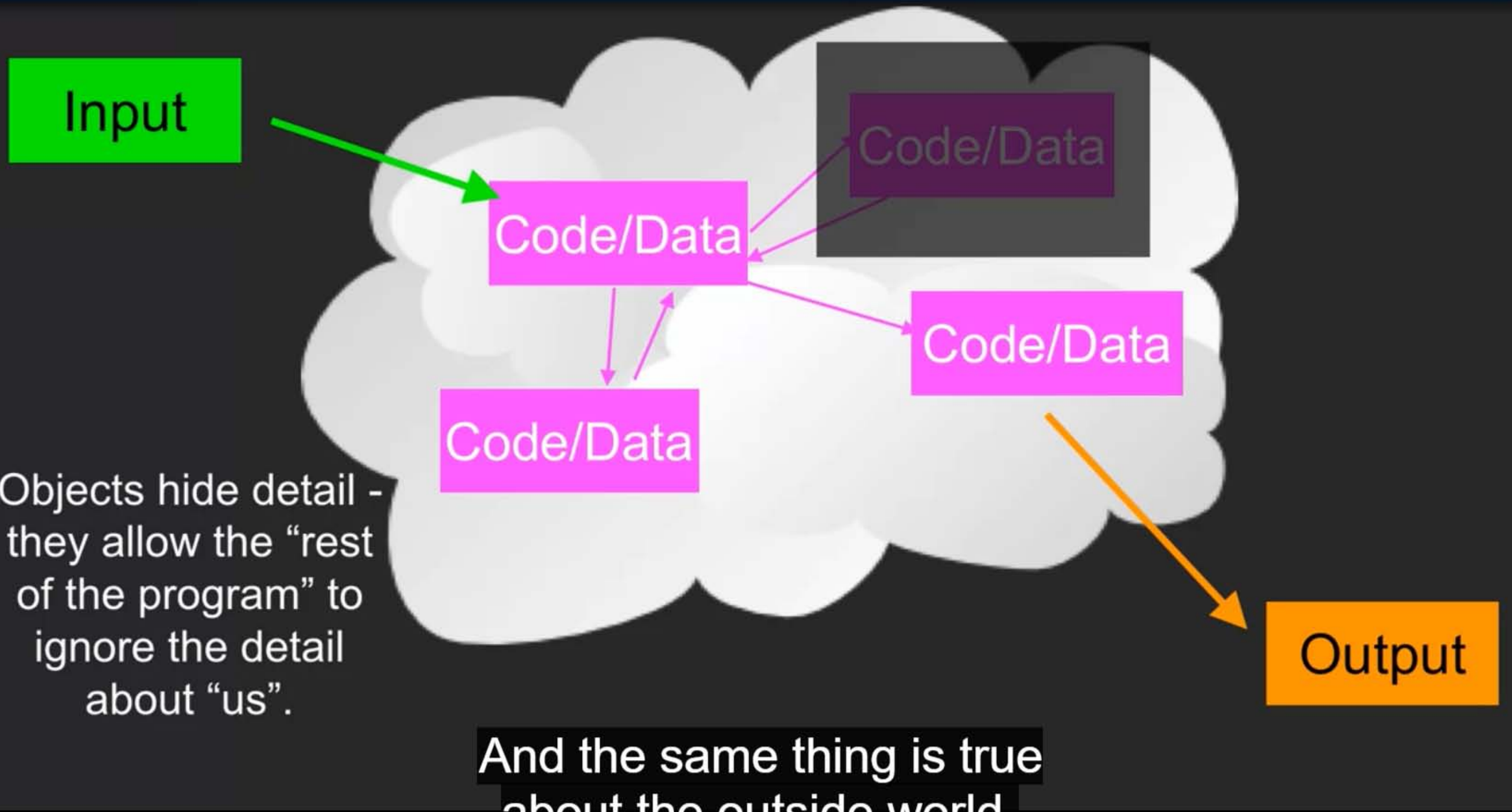
Objects are bits of code and data

But one other thing about objects is that each one contains some code and some data.



Objects hide detail - they allow us to ignore the detail of the “rest of the program”.

But one of the things is like okay, if you're in the object,



Objects hide detail - they allow the "rest of the program" to ignore the detail about "us".

And the same thing is true about the outside world.

Definitions

Class - a template

Method or Message - A defined capability of a class

Field or attribute- A bit of data in a class

Object or Instance - A particular instance of a class

And so a class is a shape of an object.

Terminology: Class

Defines the abstract characteristics of a thing (object), including the thing's characteristics (its attributes, fields or properties) and the thing's behaviors (the things it can do, or methods, operations or features). One might say that a class is a blueprint or factory that describes the nature of something. For example, the class Dog would consist of traits shared by all dogs, such as breed and fur color (characteristics), and the ability to bark and sit (behaviors).

http://en.wikipedia.org/wiki/Object-oriented_programming

So class is defining the general characteristics of a thing like what

Terminology: Instance

One can have an instance of a class or a particular object. The instance is the actual object created at runtime. In programmer jargon, the Lassie object is an instance of the Dog class. The set of values of the attributes of a particular object is called its state. The object consists of state and the behavior that's defined in the object's class.

Object and Instance are often used interchangeably.

An instance is another word for object.

http://en.wikipedia.org/wiki/Object-oriented_programming

Terminology: Method

An object's abilities. In language, methods are verbs. Lassie, being a Dog, has the ability to bark. So bark() is one of Lassie's methods. She may have other methods as well, for example sit() or eat() or walk() or save_timmy(). Within the program, using a method usually affects only one particular object; all Dogs can bark, but you need only one particular dog to do the barking

Method and Message are often used interchangeably.

http://en.wikipedia.org/wiki/Object-oriented_programming

Some Python Objects

```
>>> x = 'abc'
>>> type(x)
<class 'str'>
>>> type(2.5)
<class 'float'>
>>> type(2)
<class 'int'>
>>> y = list()
>>> type(y)
<class 'list'>
>>> z = dict()
>>> type(z)
<class 'dict'>
```

```
>>> dir(x)
[ … 'capitalize', 'casefold', 'center', 'count',
'encode', 'endswith', 'expandtabs', 'find',
'format', … 'lower', 'lstrip', 'maketrans',
'partition', 'replace', 'rfind', 'rindex', 'rjust',
'rpartition', 'rsplit', 'rstrip', 'split',
'splitlines', 'startswith', 'strip', 'swapcase',
'title', 'translate', 'upper', 'zfill']
>>> dir(y)
[… 'append', 'clear', 'copy', 'count', 'extend',
'index', 'insert', 'pop', 'remove', 'reverse',
'sort']
>>> dir(z)
[…, 'clear', 'copy', 'fromkeys', 'get', 'items',
'keys', 'pop', 'popitem', 'setdefault', 'update',
'values']
```

Type z is a dictionary, and that's a class.