Creation of Class
General Format

- Class is a model or plan to create the objects
- Class contains,
  - Attributes: Represented by variables
  - Actions : Performed on methods
- Syntax of defining the class,

Syntax	Example

class Classname(object):
"""docstrings"""
 	
Attributes
 	
def __init__(self):
def method1():
def method2():
	class Student:
	"""The below block defines attributes"""
	def __init__(self):
	self.name = "Ram"
	self.age = 21
	self.marks = 89.75
	
	"""The below block defines a method"""
	def putdata(self):
	print("Name: ", self.name)
	print("Age: ", self.age)
	print("Marks: ", self.marks)

Creation of Class
Program

```
#To define the Student calss and create an Object to it.

#Class Definition
class Student:
    #Special method called constructor
    def __init__(self):
        self.name = "Ram"
        self.age = 21
        self.marks = 75.90

    #This is an instance method
    def putdata(self):
        print("Name: ", self.name)
        print("Age: ", self.age)
        print("Marks: ", self.marks)

#Create an instance to the student class
s = Student()

#Call the method using an Object
s.putdata()
```

The **Self** Variable

- 'Self' is the default variable that contains the memory address of the instance of the current class

s1 = Student()	• s1 contains the memory address of the instance • This memory address is internally and by default passed to 'self' variable
Usage-1: def __init__(self):	• The 'self' variable is used as first parameter in the constructor
Usage-2: def putdata(self):	• The 'self' variable is used as first parameter in the instance methods

Constructor

Constructor with **NO** parameter

- Constructors are used to create and initialize the 'Instance Variables'

Example

```
def __init__(self):
        self.name = "Ram"
        self.marks = 99
```

- Constructor will be called only once i.e at the time of creating the objects
- s = Student()

Constructor

Constructor with parameter

Example	def __init__(self, n = "", m = 0): self.name = n self.marks = m
Instance-1	s = Student() Will initialize the instance variables with default parameters
Instance-2	s = Student("Ram", 99) Will initialize the instance variables with parameters passed

Constructor
Program

```
#To create Student class with a constructor having more than one parameter

class Student:
    #Constructor definition
    def __init__(self, n = "", m = 0):
        self.name = n
        self.marks = m

    #Instance method
    def putdata(self):
        print("Name: ", self.name)
        print("Marks: ", self.marks)

#Constructor called without any parameters
s = Student()
s.putdata()

#Constructor called with parameters
s = Student("Ram", 99)
s.putdata()
```

Types Of Variables

- Instance variables
- Class / Static variables

Types Of Variables
Instance Variables

- Variables whose separate copy is created for every instance/object
- These are defined and init using the constructor with 'self' parameter
- Accessing the instance variables from outside the class,
  - instancename.variable

```
class Sample:
    def __init__(self):
        self.x = 10

    def modify(self):
        self.x += 1
```

```
#Create an objects
s1 = Sample()
s2 = Sample()

print("s1.x: ", s1.x)
print("s2.x: ", s2.x)

s1.modify()
print("s1.x: ", s1.x)
print("s2.x: ", s2.x)
```

Types Of Variables
Class Variables

- Single copy is created for all instances
- Accessing class vars are possible only by 'class methods'
- Accessing class vars from outside the class,
  - classname.variable

```
class Sample:
    #Define class var here
    x = 10

    @classmethod
    def modify(cls):
        cls.x += 1
```

```
#Create an objects
s1 = Sample()
s2 = Sample()

print("s1.x: ", s1.x)
print("s2.x: ", s2.x)

s1.modify()
print("s1.x: ", s1.x)
print("s2.x: ", s2.x)
```

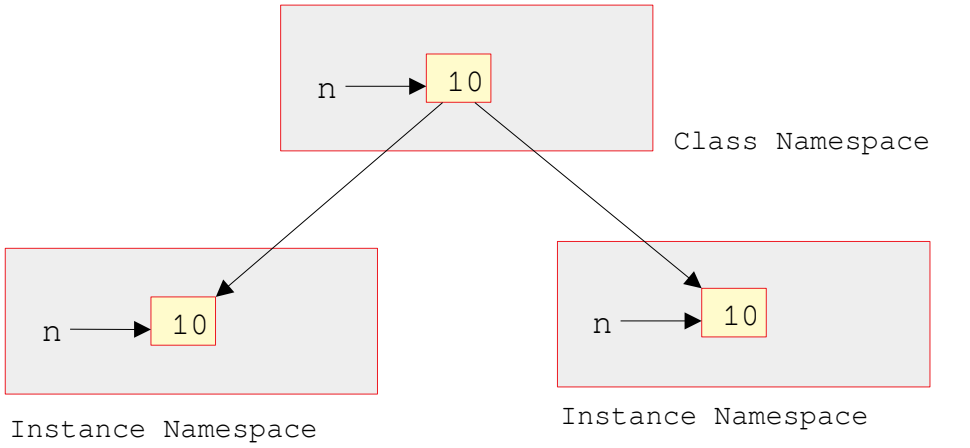
Namespaces
Introduction

- Namespace represents the memory block where names are mapped/linked to objects
- Types:
  - Class namespace
    - – The names are mapped to class variables
  - Instance namespace
    - – The names are mapped to instance variables

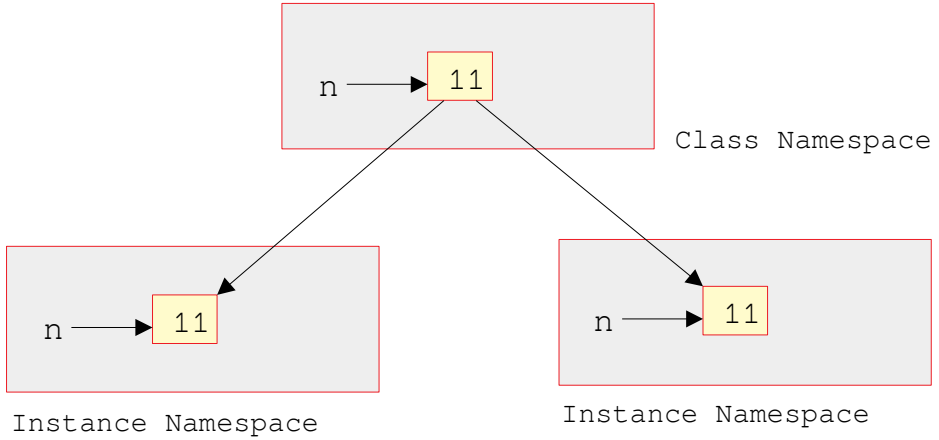
Namespaces
Class Namespace

```
#To understand class namespace

#Create the class
class Student:
    #Create class var
    n = 10

#Access class var in class namespace
print(Student.n)

#Modify in class namespace
Student.n += 1

#Access class var in class namespace
print(Student.n)

#Access class var in all instances
s1 = Student()
s2 = Student()

#Access class var in instance namespace
print("s1.n: ", s1.n)
print("s2.n: ", s2.n)
```

Before modifyng class variable ‘n’



After modifyng class variable ‘n’

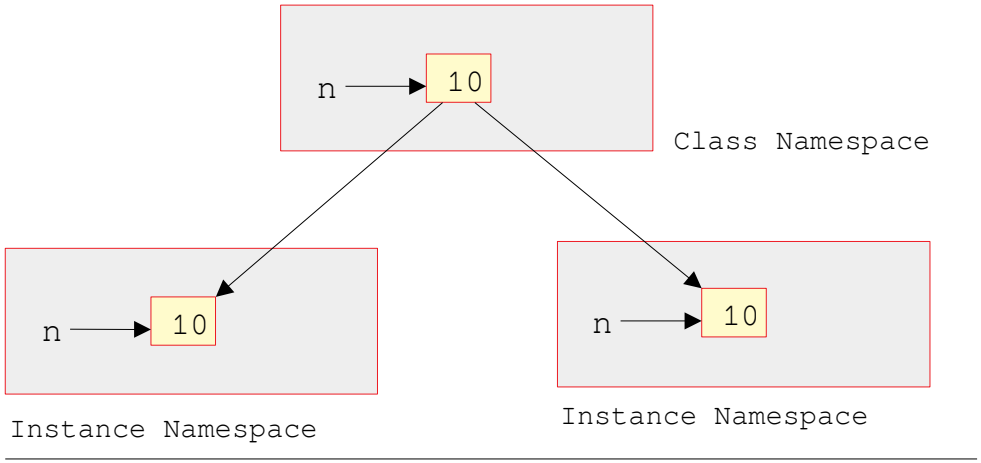


If class vars are modified in class namespace, then it reflects to all instances

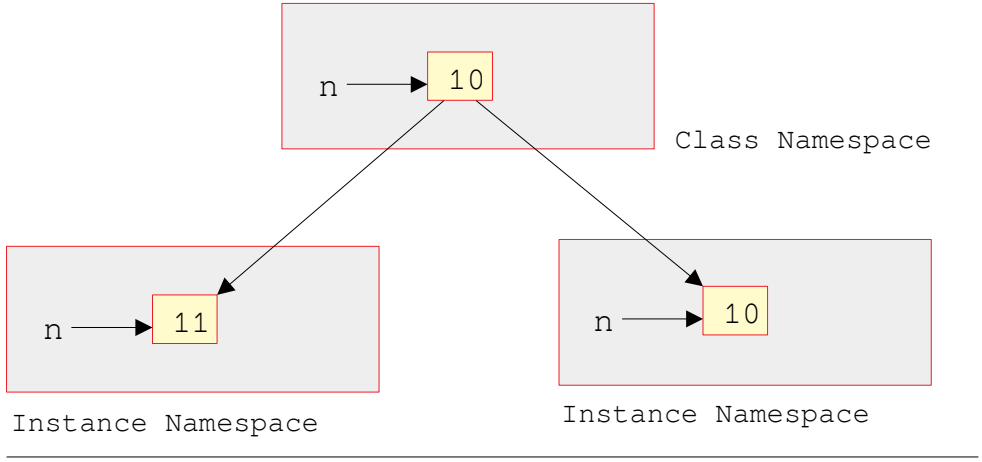
Namespaces
Instance Namespace

```
#To understand class namespace

#Create the class
class Student:
    #Create class var
    n = 10

s1 = Student()
s2 = Student()

#Modify the class var in instance namespace
s1.n += 1

#Access class var in instance namespace
print("s1.n: ", s1.n)
print("s2.n: ", s2.n)
```

Before modifyng class variable ‘n’



After modifyng class variable ‘n’



If class vars are modified in instance namespace, then it reflects only to that instance

Types of Methods

- Types:
  - Instance Methods
    - – Accessor
    - – Mutator
  - Class Methods
  - Static Methods

Types of Methods
Instance Methods

- Acts upon the instance variables of that class
- Invoked by instance_name.method_name()

```
#To understanf the instance methods

class Student:
    #Constructor definition
    def __init__(self, n = "", m = 0):
        self.name = n
        self.marks = m

    #Instance method
    def putdata(self):
        print("Name: ", self.name)
        print("Marks: ", self.marks)
```

```
#Constructor called without any parameters
s = Student()
s.putdata()

#Constructor called with parameters
s = Student("Ram", 99)
s.putdata()
```

Types of Methods

Instance Methods: Accessor + Mutator

Accessor	Mutator
• Methods just reads the instance variables, will not modify it • Generally written in the form: getXXXX() • Also called getter methods	• Not only reads the data but also modifies it • Generally wriiten in the form: setXXXX() • Also called setter methods

```
#To understand accessor and mutator

#Create the class
class Student:

    #Define mutator
    def setName(self, name):
        self.name = name

    #Define accessor
    def getName(self):
        return self.name
```

```
#Create an objects
s = Student()

#Set the name
s.setName("Ram")

#Print the name
print("Name: ", s.getName())
```

Types of Methods
Class Methods

- This methods acts on class level
- Acts on class variables only
- Written using @classmethod decorator
- First param is 'cls', followed by any params
- Accessed by classname.method()

```
#To understand the class methods

class Bird:
    #Define the class var here
    wings = 2

    #Define the class method
    @classmethod
    def fly(cls, name):
        print("{} flies with {} wings" . format(name, cls.wings))

#Call
Bird.fly("Sparrow")
Bird.fly("Pigeon")
```

Types of Methods
Static Methods

- Needed, when the processing is at the class level but we need not involve the class or instances
- Examples:
  - Setting the environmental variables
  - Counting the number of instances of the class
- Static methods are written using the decorator `@staticmethod`
- Static methods are called in the form `classname.method()`

```
#To Understand static method

class Sample:
    #Define class vars
    n = 0

    #Define the constructor
    def __init__(self):
        Sample.n = Sample.n + 1

    #Define the static method
    @staticmethod
    def putdata():
        print("No. of instances created: ", Sample.n)
```

```
#Create 3 objects
s1 = Sample()
s2 = Sample()
s3 = Sample()

#Class static method
Sample.putdata()
```

Passing Members

- It is possible to pass the members(attributes / methods) of one class to another
- Example:

```
e = Emp()
```

- After creating the instance, pass this to another class 'Myclass'
- Myclass.mymethod(e)
  - mymethod is static

Passing Members
Example

```
#To understand how members of one class can be passed to another
```

```
#Define the class
class Emp:
    def __init__(self, name, salary):
        self.name = name
        self.salary = salary

    def putdata(self):
        print("Name: ", self.name)
        print("Salary: ", self.salary)
```

```
#Define another class
class Myclass:
    @staticmethod
    def mymethod(e):
        e.salary += 1000
        e.putdata()
```

```
#Create Object
e = Emp("Ram", 20000)

#Call static method of Myclass and pass e
Myclass.mymethod(e)
```

Passing Members
Exercise

1. To calculate the power value of a number with the help of a static method

Inner Class
Introduction

- Creating class B inside Class A is called nested class or Inner class
- Example:

    Person's Data like,

        - Name: Single value
        - Age: Single Value
        - DoB: Multiple values, hence separate class is needed

Inner Class
Program: Version-1

```
#To understand inner class

class Person:
    def __init__(self):
        self.name = "Ram"
        self.db = self.Dob()

    def display(self):
        print("Name: ", self.name)

    #Define an inner class
    class Dob:
        def __init__(self):
            self.dd = 10
            self.mm = 2
            self.yy = 2002

        def display(self):
            print("DoB: {}/{}/{}" . format(self.dd,
self.mm, self.yy))
```

```
#Creating Object
p = Person()
p.display()

#Create inner class object
i = p.db
i.display()
```

Inner Class
Program: Version-2

```
#To understand inner class

class Person:
    def __init__(self):
        self.name = "Ram"
        self.db = self.Dob()

    def display(self):
        print("Name: ", self.name)

    #Define an inner class
    class Dob:
        def __init__(self):
            self.dd = 10
            self.mm = 2
            self.yy = 2002

        def display(self):
            print("DoB: {}/{}/{}" . format(self.dd,
self.mm, self.yy))
```

```
#Creating Object
p = Person()
p.display()

#Create inner class object
i = Person().Dob()
i.display()
```

THANK YOU