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# Python Class Variables

Updated on: February 7, 2022 | + 5 Comments

In [Object-oriented programming](#), when we design a class, we use instance variables



In Class,  
attributes  
can be  
defined into  
two parts:

- [Instance variables](#)

[les](#): If  
the  
value  
of a  
variable  
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varies  
from  
object  
to  
object,  
then  
such  
variables  
are  
called  
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**After  
reading  
this article,  
you'll  
learn:**



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- Modify

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- [Class Variable vs Instance](#)



- [Class Variables In Inheritance](#)
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## What is an Class Variable in Python?

If the **value** of a [variable](#) is **not varied** from

of variables  
are called  
class  
variables or  
static  
variables.

Class  
variables  
are **shared  
by all  
instances  
of a class.**

Unlike  
instance  
variable, the  
value of a  
class  
variable is  
not varied  
from object  
to object,

In Python,  
Class  
variables  
are  
declared  
when a  
[class](#) is



not defined  
inside any  
methods of  
a class  
because of  
this only  
one copy of  
the static  
variable will  
be created  
and shared  
between all  
objects of  
the class.

For  
example, in  
Student  
class, we  
can have  
different  
instance  
variables  
such as  
name and  
roll number  
because  
each  
student's  
name and





But, if we want to include the school name in the student class, we must use the class variable instead of an instance variable as the school name is the same for all students. So instead of maintaining the separate copy in each object, we can create a class variable that will hold the



(objects)  
can share it.

We can add  
any number  
of class  
variables in  
a class.



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# Create Class Variables

A class variable is declared inside of class, but outside of any instance method or `__init__` method.

By convention, typically it is placed right below the



constructor  
method  
and other  
methods.

### Example:

```
class Student:
    # Class Variable
    school = 'PYNative'

    def __init__(self, name, age, address):
        self.name = name
        self.age = age
        self.address = address

# create object
s1 = Student('Emma', 10, 'A Street')
print(s1.name)
# access class variable
print(Student.school)

# create object
s2 = Student('Jessa', 20, 'B Street')
print(s2.name)
```



Run

### Output

```
Emma 10 A Street
Jessa 20 B Street
```



we created  
the class  
variable  
`school_name`  
and  
accessed it  
using the  
object and  
class name.

**Note:** Like  
regular  
[variables](#),  
class  
variables  
can store  
data of any  
type. We  
can use  
[Python list](#),  
[Python  
tuple](#), and  
[Python  
dictionary](#)  
as a class  
variable.



# Class Variables

We can access static variables either by class name or by object reference, but it is recommended to use the class name.

In Python, we can access the class variable in the following places

- Access inside



by  
using  
either  
**self**  
param  
eter or  
class  
name.

- Access  
class  
variabl  
e  
inside  
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metho  
d by  
using  
either  
self of  
class  
name
- Access  
from  
outsid  
e of  
class  
by  
using



nce or  
class  
name.

### Example 1:

Access  
Class  
Variable in  
the  
constructor

```
class School:  
    # Class Variable  
    school = 'ABC School'  
  
    # Constructor  
    def __init__(self, name):
```

```
# create  
s1 = School('XYZ School')
```



Run

### Output

```
ABC School  
ABC School
```





Access  
Class  
Variable in  
Instance  
method  
and outside  
class

```
class Student:
    # Class Variable
    school = 'PYNative'

    # Constructor
    def __init__(self, name, rollno):
        self.name = name
        self.rollno = rollno

    # Instance Method
    def show(self):
        print('Student Name: ', self.name)
        print('Student Rollno: ', self.rollno)

# create object
s1 = Student('PYNative', 1)
s1.show()

# access class variable
print(s1.school)

# access class variable outside class
print(Student.school)
```



## Output

```
Inside in  
Emma 10 A  
ABC Schoo
```

```
Outside c  
ABC Schoo  
ABC Schoo
```

In this example, we accessed the class variable `school_name` using class name and a `self` keyword inside a method.

## Modify Class



Generally,  
we assign  
value to a  
class  
variable  
inside the  
class  
declaration.  
However,  
we can  
change the  
value of the  
class  
variable  
either in the  
class or  
outside of  
class.

**Note:** We  
should  
change the  
class  
variable's  
value using  
the class  
name only.

## Example



# Create

def

# Init

def

# create

s1 = Stu

print('I

s1.show

# Modifi

Student

print('I

s1.show



Run

**Output:**

Before

Emma 10 A

After

Emma 10 X

**N****o**



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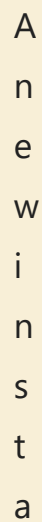
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for  
these  
objects

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les. So always use the class name to



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# Class Variable vs Instance





The following table shows the difference between the instance variable and the class variable.

In Python, properties can be defined into two parts:

- **Instance variables:** Instance variable's value varies from object



ce  
variabl  
es are  
not  
shared  
by  
object  
s.

Every  
object  
has its  
own  
copy  
of the  
instanc  
e  
attribu  
te

- **Class Variables:** A class variable is a variable that is declared

but  
outsid  
e of  
any  
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or `__i  
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`()` me  
thod.  
Class  
variabl  
es are  
shared  
by all  
instanc  
es of a  
class.

**Read More:**

[Instance  
variables in  
Python with  
Examples](#)

**Instance  
Variable**



Instance variables are not shared by objects. Every object has its own copy of the instance attribute

Instance variables are declared inside the constructor i.e., the `__init__()` method.



It is gets  
created  
when an  
instance of  
the class is  
created.

Changes  
made to  
these  
variables  
through  
one object  
will not  
reflect in  
another  
object.

Class

Variables vs.

Instance

Variables



**Example:**



create a  
class  
variable and  
instance  
variable.

```
class Car:  
    # Class  
    manf
```

```
    def
```

```
    # create  
    car = Car  
    print(c
```



Run

**Output:**

```
x1 2500 B
```

## Class Variab les In



As you know, only one copy of the class variable will be created and shared between all objects of that class.

When we use [inheritance](#), all variables and methods of the base class are available to the child class. In such cases, We can also change the value of the parent class's class



We can use the parent class or child class name to change the value of a parent class's class variable in the child class.

### Example

```
class Country:
    # Country class variable
    country = "Country"

class State:
    def __init__(self):
        def __init__(self):
```



 Run

## Output

```
Before  
Student n  
  
Now  
Student n
```

What if both **child class** and **parent class** has the same **class variable name**. In this case, the child class will not inherit the class variable of a base class. So it is recommend



variable for  
child class  
instead of  
inheriting  
the base  
class  
variable.

### Example:

```
class Country:
    # class variable
    country = "India"

class Student:
    # class variable
    country = "USA"

    def __init__(self, name):
        self.name = name

    def show(self):
        print(self.name, self.country)

# create student object
stud = Student("John")
stud.show()
```

 Run**Output:**

```
Before  
Student n  
Now  
Student n  
  
Parent C1
```

## Wrong Use of Class Variables

In Python, we should properly use the class variable because all



Thus, if one of the objects modifies the value of a class variable, then all objects start referring to the fresh copy.

For example,

### Example

```
class P1:
    # class variable
    clul = 100
    spo = 200

    def __init__(self):
        self.spo = 100

    def __del__(self):
        self.spo = 200

p1 = P1()
# wrong
```



```
p2.sport  
p2.show
```

```
# actual  
print(''
```



Run

## Output

```
Player :  
Player :  
Club: Che
```

In the above example, the instance variable `name` is unique for each player. The class variable `team` and `sport` can be accessed and



Because both objects modified the class variable, a new instance variable is created for that particular object with the same name as the class variable, which shadows the class variables.

In our case, for object `p1` new instance variable `club` gets created, and for



variable

`sport` gets  
created.

So when  
you try to  
access the  
class

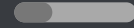
variable  
using the  
`p1` or `p2`  
object, it  
will not  
return the  
actual class  
variable  
value.

To avoid  
this, always  
modify the  
class  
variable  
value using  
the class  
name so  
that all  
objects gets  
the  
updated



Player..

Player..



AD

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