

Contents

- Object Oriented Programming (OOPS)
- Modules
- Exception Handling

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Object Oriented Programming

OOPs

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Class

Object

Inheritance

- Single , Multilevel , Hierarchical , Multiple

Polymorphism

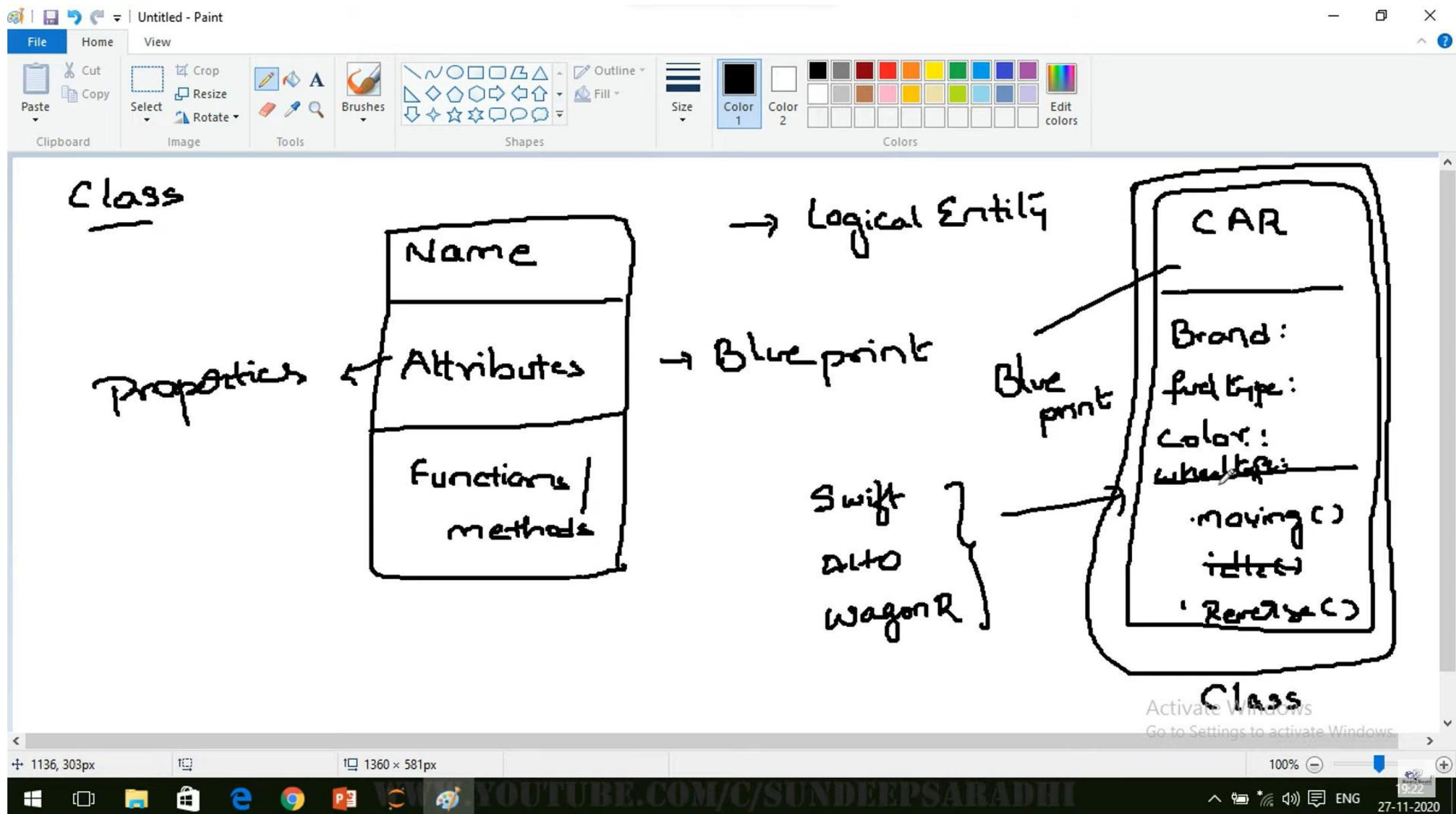
- Compile Time , Run Time

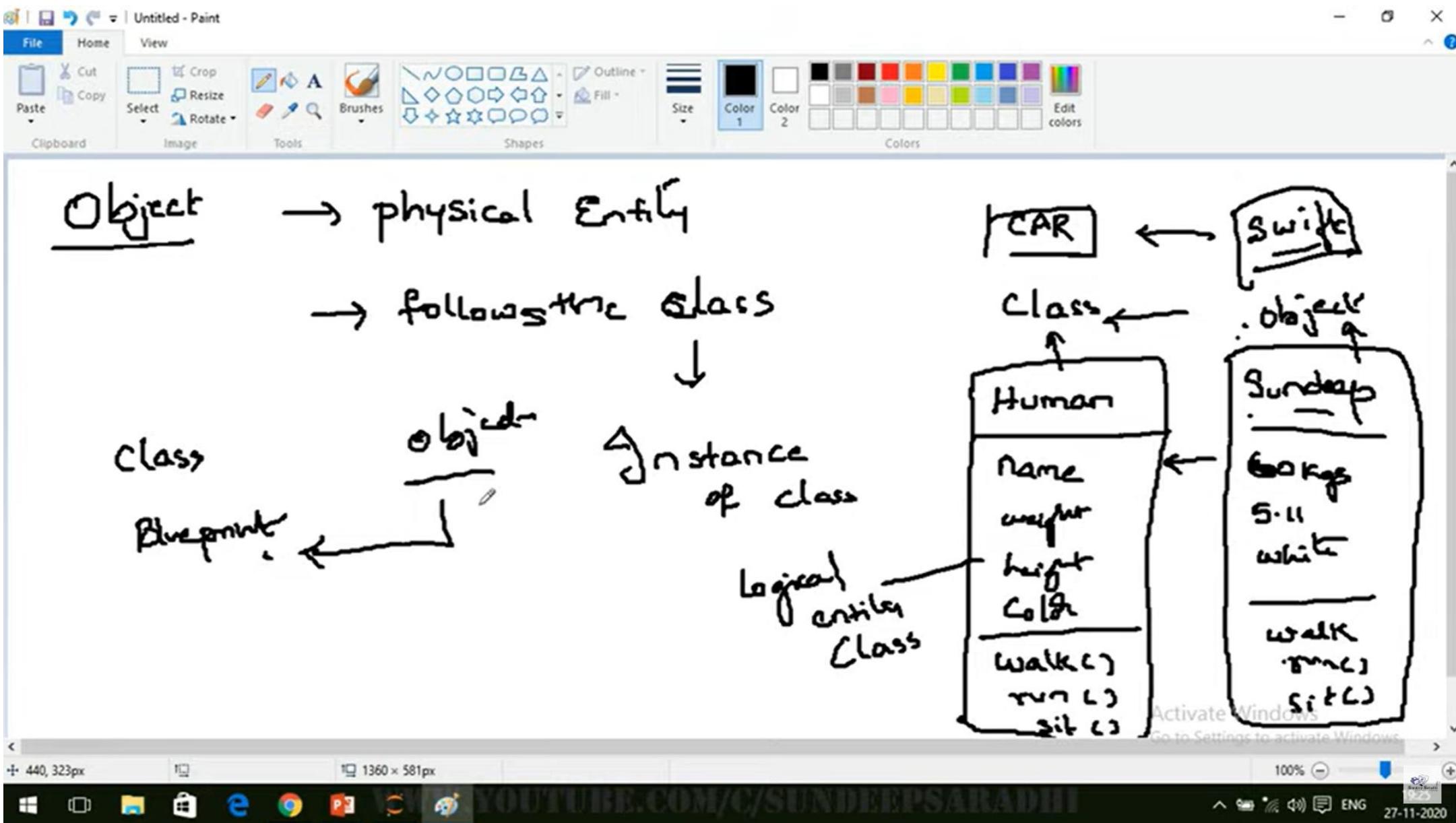
Abstraction

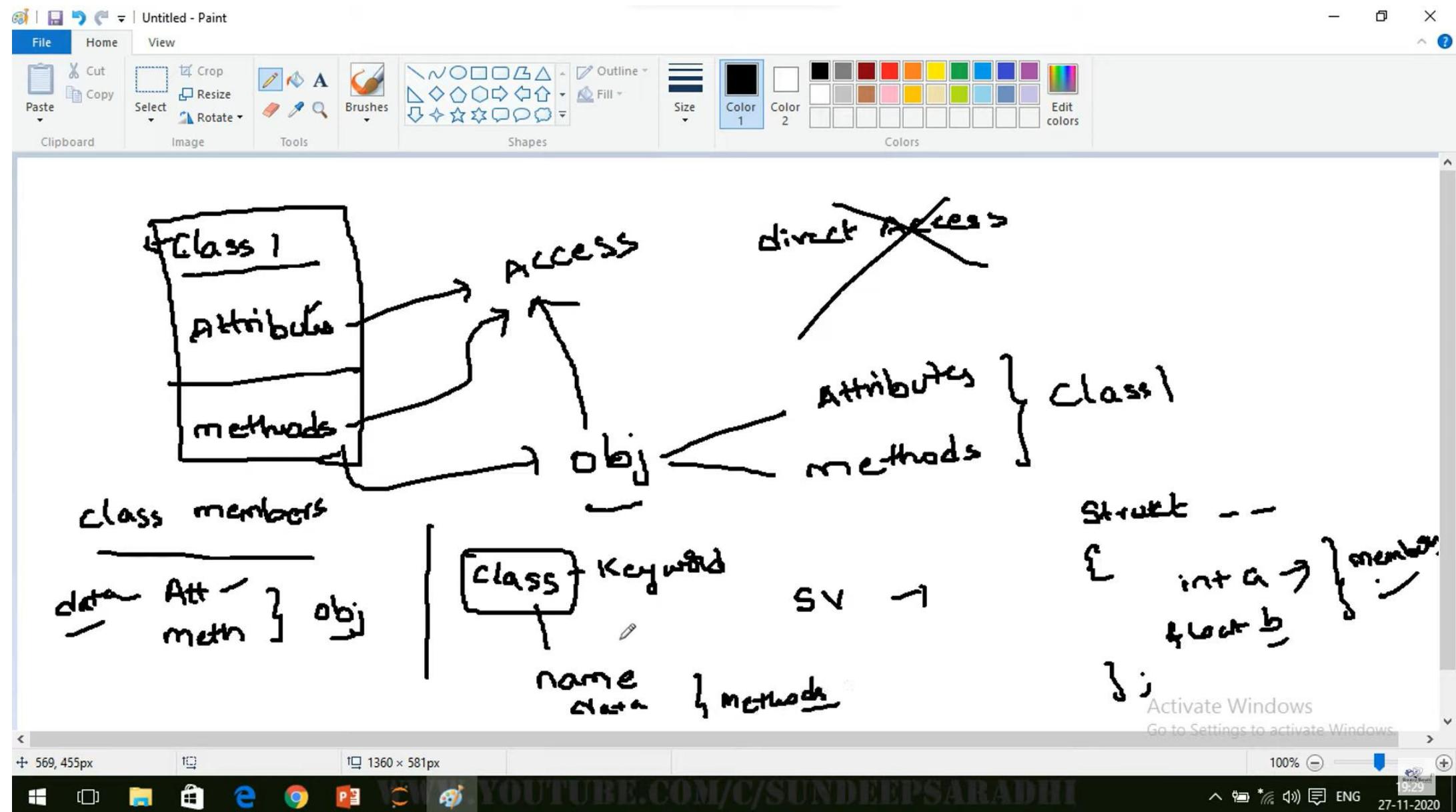
Encapsulation & Data Hiding

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In [1]:

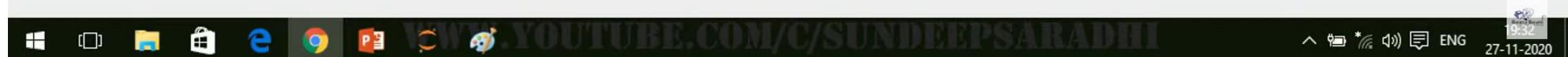
```
class Human:
    color="white"
    height=5.11
    def run(self):
        print("RUNNING.....")
    def walk(self):
        print("WALKING.....")
print(color)
```

```
NameError Traceback (most recent call last)
<ipython-input-1-0a24d38af451> in <module>
      6     def walk(self):
      7         print("WALKING.....")
----> 8 print(color)

NameError: name 'color' is not defined
```

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In [23]:

```
class Human:      #CLASS
    def __init__(self,c,h):  #CONSTRUCTOR
        self.color=c
        self.height=h
    def run(self,n):
        print(n+" "+"RUNNING.....")
    def walk(self):
        print("WALKING.....")

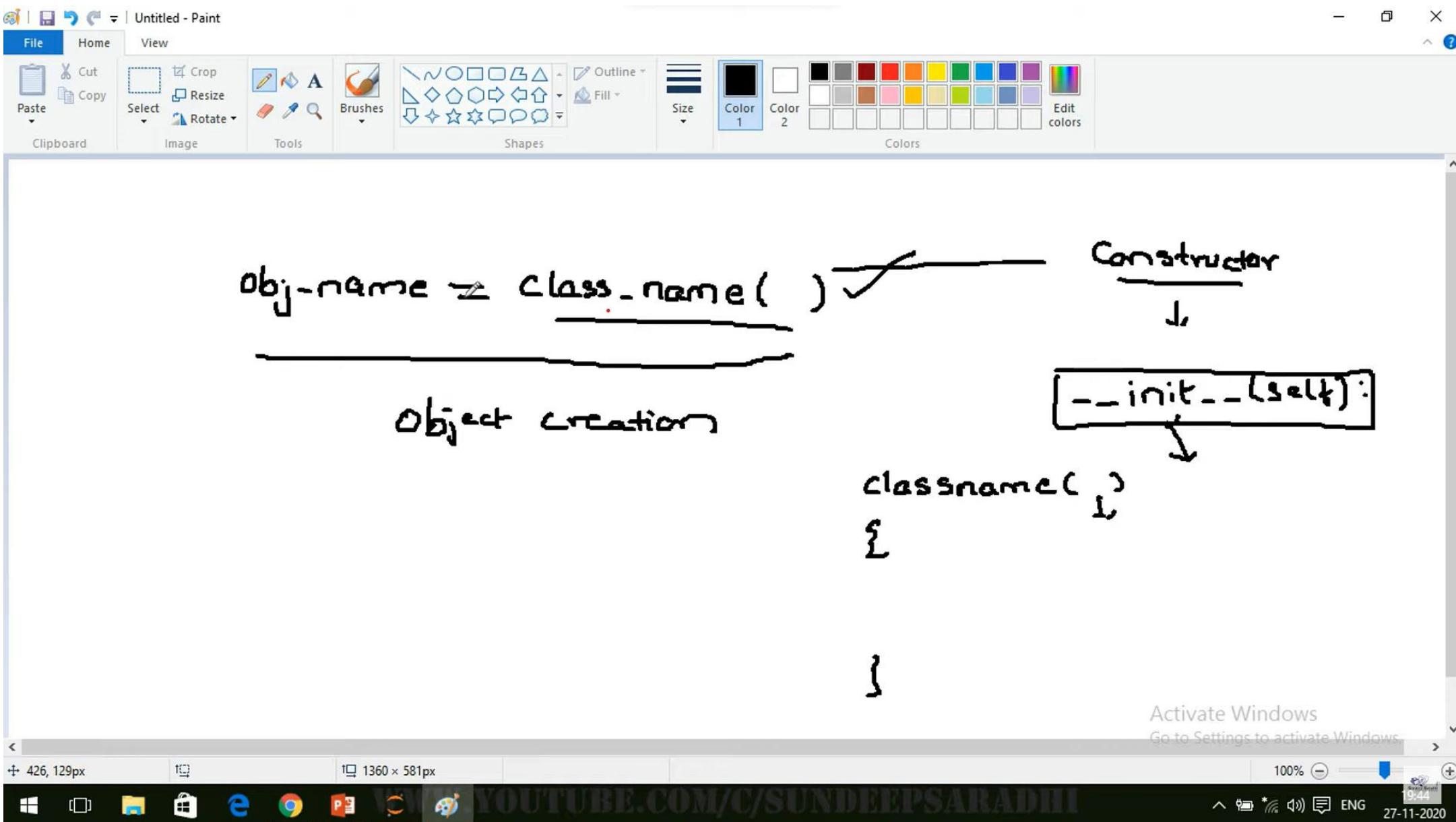
sundeep=Human("white",5.11)  #OBJECT
print(sundeep.color,sundeep.height)
saradhi=Human("black",5.6)
print(saradhi.color,saradhi.height)
suresh=Human("Fair",6.2)
print(suresh.color,suresh.height)
sundeep.run("sundeep")
saradhi.run("saradhi")
```

white 5.11
black 5.6
Fair 6.2
sundeep RUNNING.....
saradhi RUNNING.....

In []:

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In [27]:

```
class BaseClass:
    a=10
    b=100
    def display(self):
        print("BASE CLASS")
class DerivedClass:
    c=20
    d=200
    def show(self):
        print("DERIVED CLASS")

bobject=BaseClass()
print(bobject.a,bobject.b)
bobject.display()

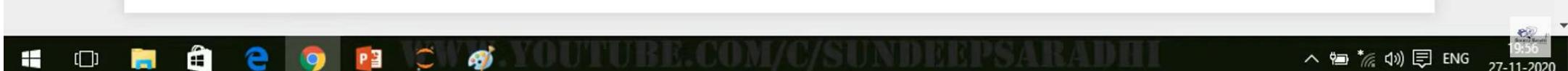
dobject=DerivedClass()
print(dobject.c,dobject.d)
dobject.show()
```

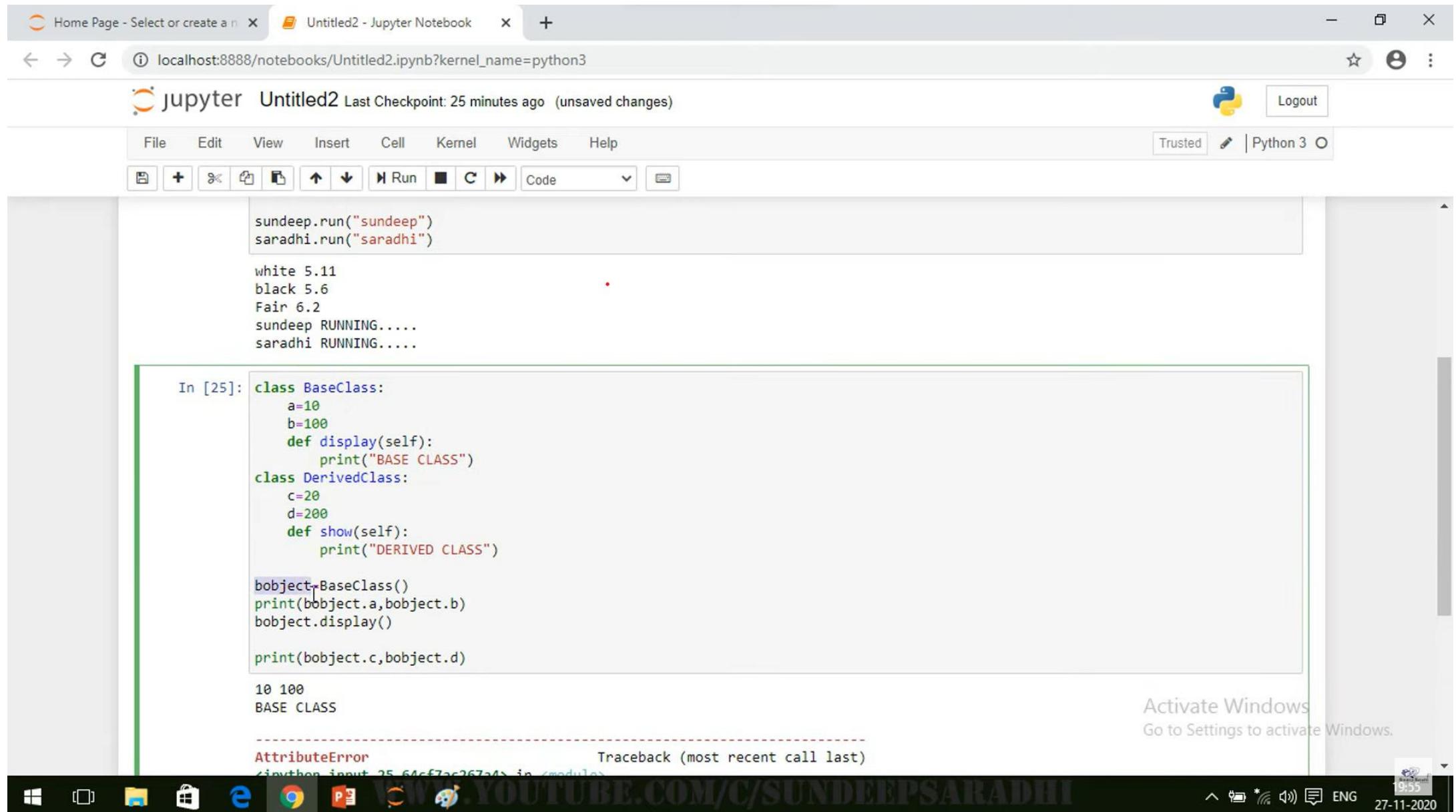
10 100
BASE CLASS
20 200
DERIVED CLASS

In []:

In []:

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File Edit View Insert Cell Kernel Widgets Help Trusted Python 3

sundeepranjan RUNNING.....
saradhi RUNNING.....

```
In [30]: class BaseClass:    #PARENT CLASS
    a=10
    b=100
    def display(self):
        print("BASE CLASS")
class DerivedClass(BaseClass):    #CHILD CLASS
    c=20
    d=200
    def show(self):
        print("DERIVED CLASS")

dobject=DerivedClass()
print(dobject.c,dobject.d)
dobject.show()
print(dobject.a,dobject.b)
dobject.display()

20 200
DERIVED CLASS
10 100
BASE CLASS
```

In []:

In []:

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sundeeprunNING.....
saradhi RUNNING.....

```
In [31]: class BaseClass:    #PARENT CLASS
    a=10
    b=100
    def display(self):
        print("BASE CLASS")
class DerivedClass(BaseClass):    #CHILD CLASS
    c=20
    d=200
    def show(self):
        print("DERIVED CLASS")

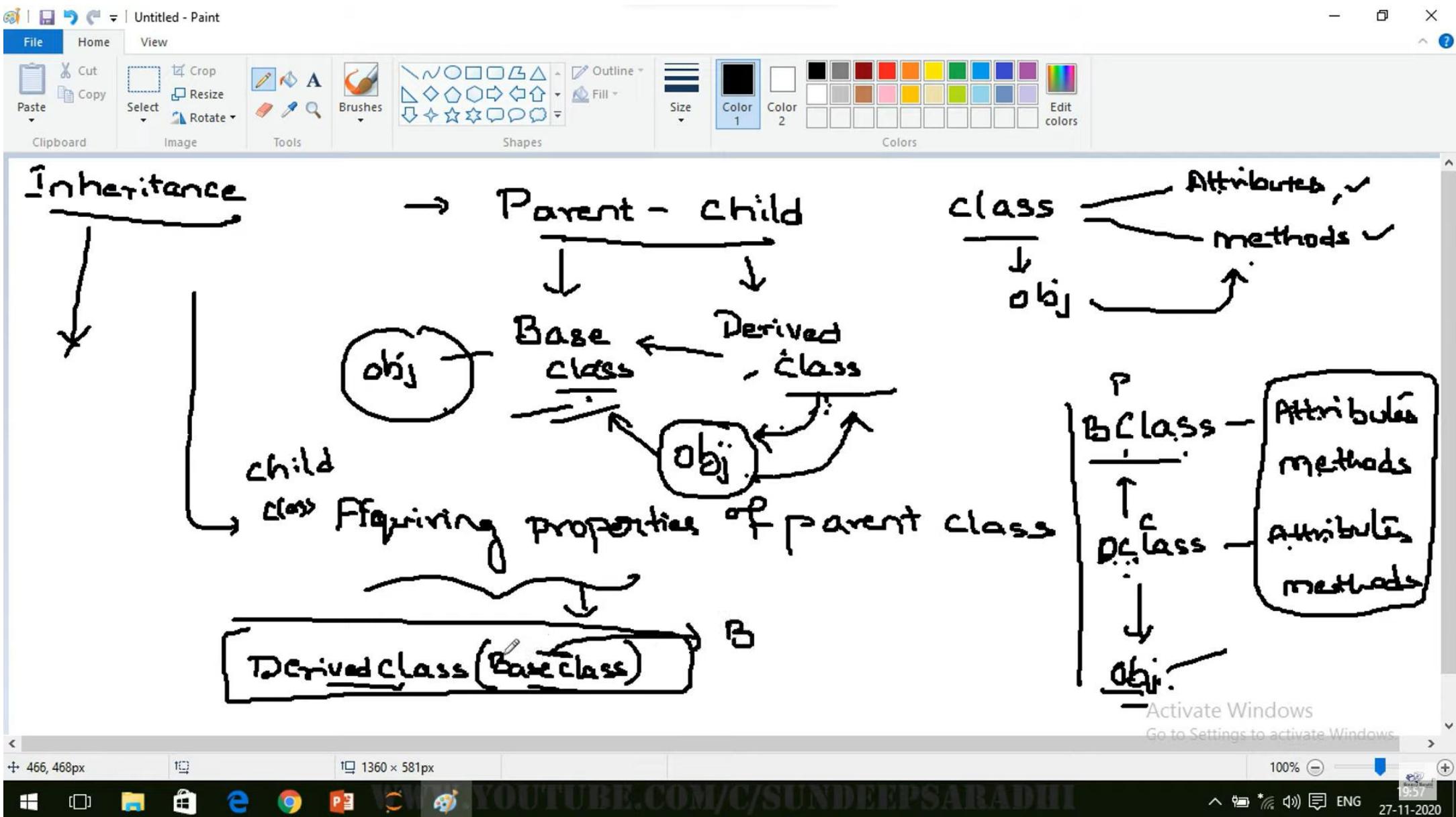
bobject=BaseClass()
print(bobject.c,bobject.d)
bobject.show()
print(bobject.a,bobject.b)
bobject.display()
```

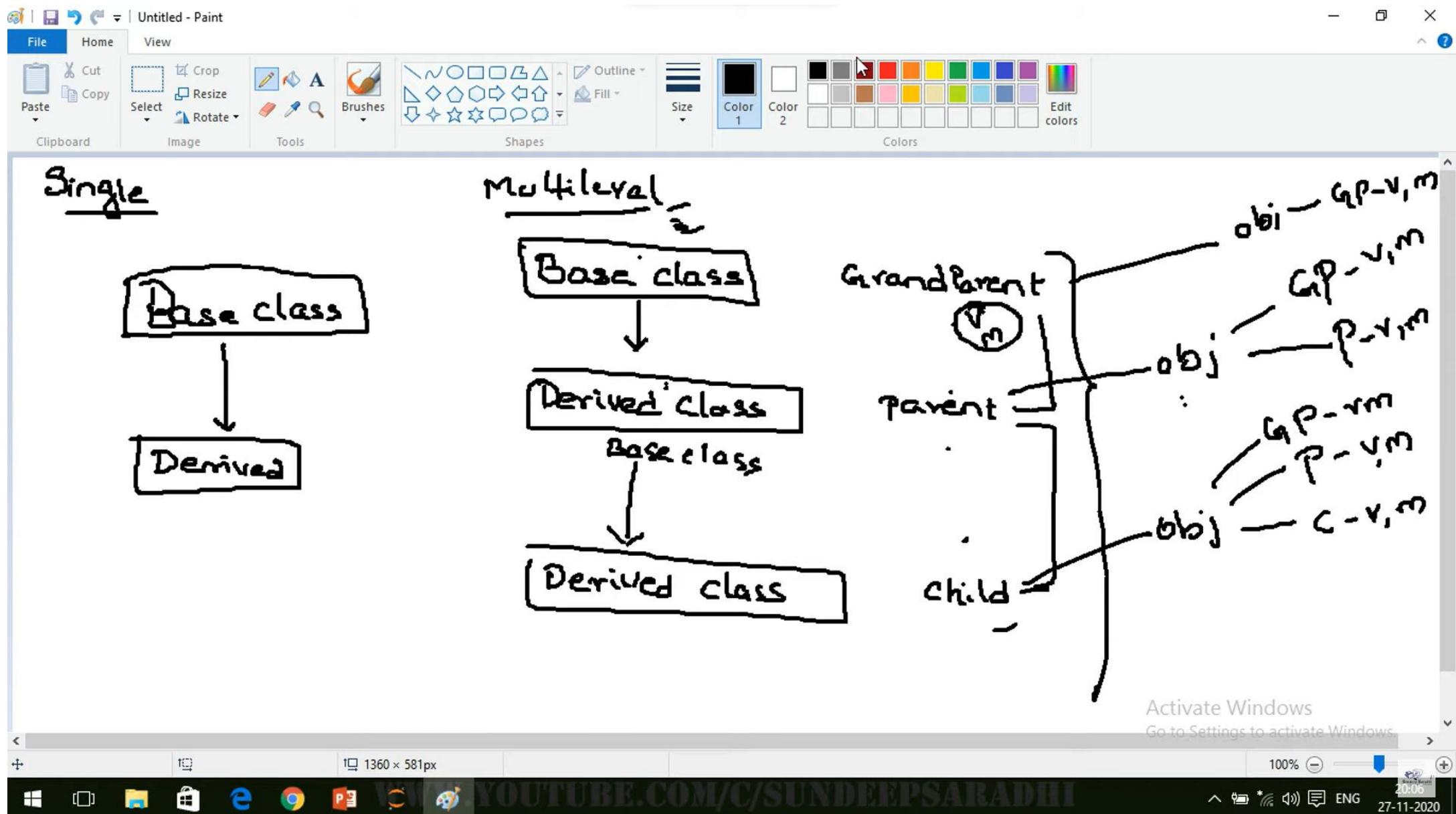
```
-----
AttributeError                               Traceback (most recent call last)
<ipython-input-31-21fba9ab19b6> in <module>
      11
      12     bobject=BaseClass()
----> 13     print(bobject.c,bobject.d)
      14     bobject.show()
      15     print(bobject.a,bobject.b)

AttributeError: 'BaseClass' object has no attribute 'c'
```

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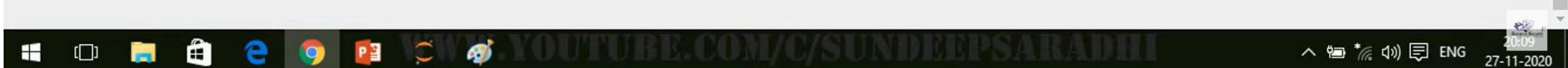
10 100
BASE CLASS

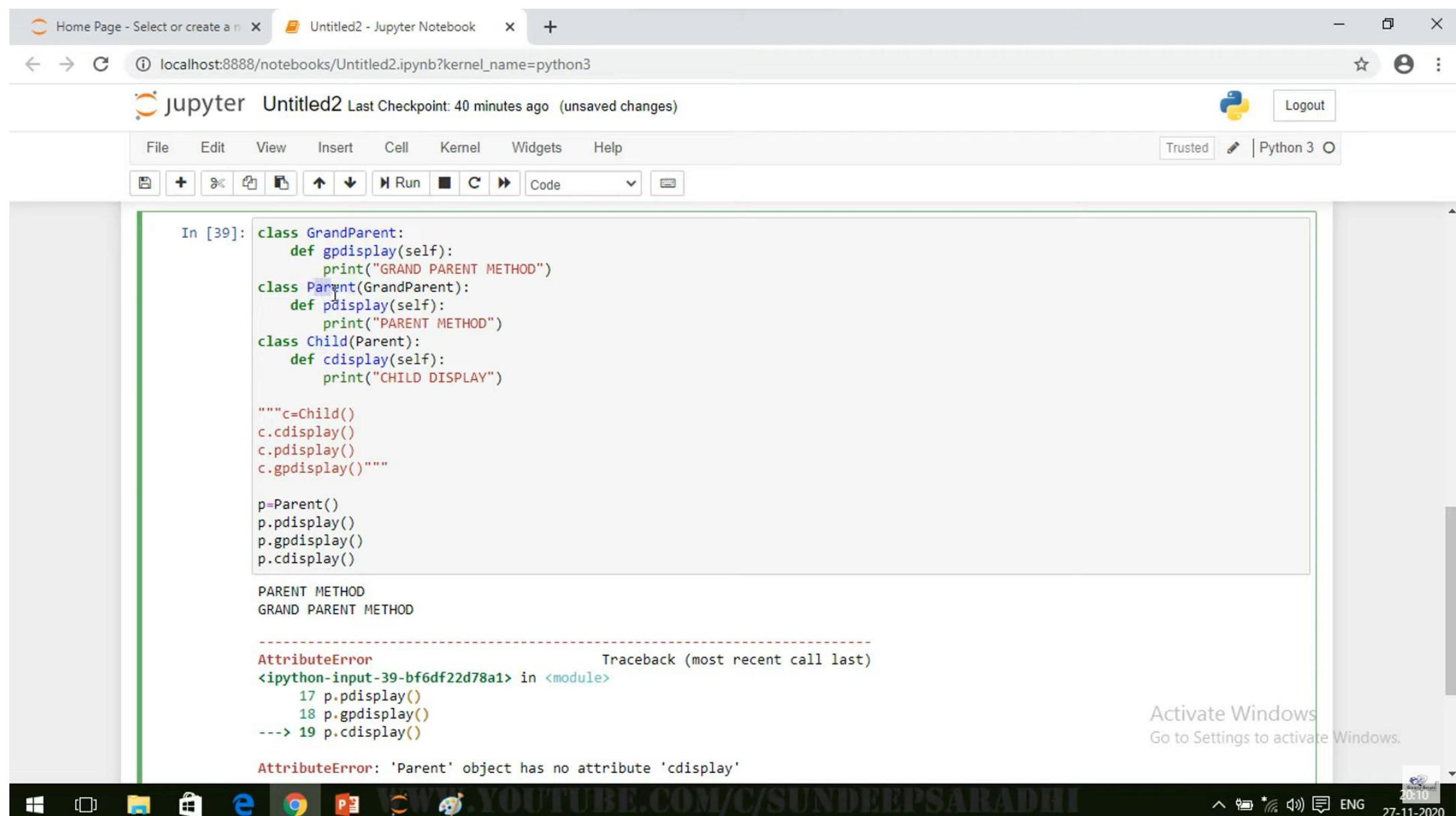
```
In [36]: class GrandParent:  
    def gdisplay(self):  
        print("GRAND PARENT METHOD")  
class Parent(GrandParent):  
    def pdisplay(self):  
        print("PARENT METHOD")  
class Child(Parent):  
    def cdisplay(self):  
        print("CHILD DISPLAY")  
  
c=Child()  
c.cdisplay()  
c.pdisplay()  
c.gdisplay()
```

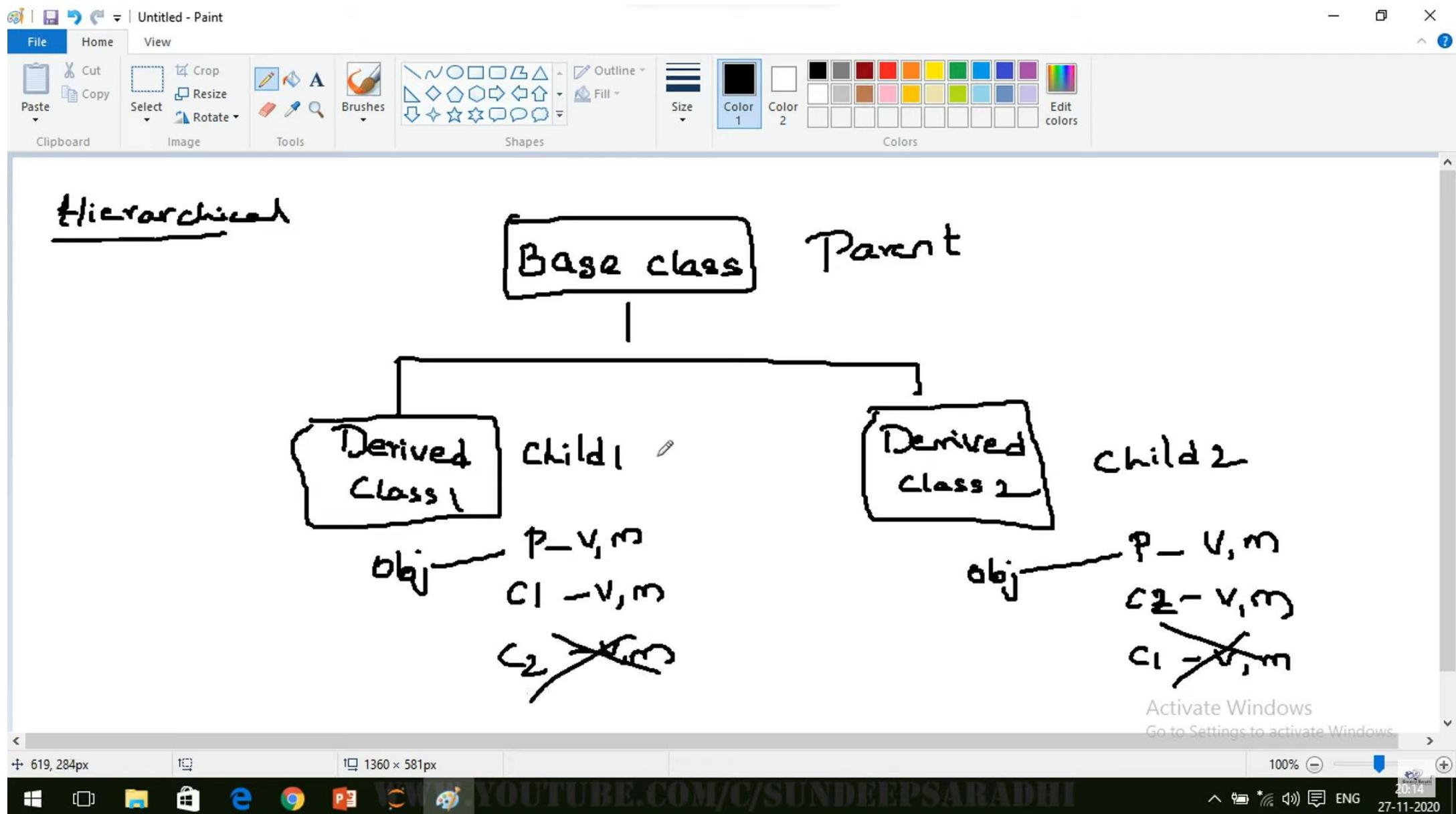
CHILD DISPLAY
PARENT METHOD
GRAND PARENT METHOD

In []:

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gp=GrandParent()
gp.gpdisplay()

GRAND PARENT METHOD

In [46]:

```
class Parent:  
    def pdisplay(self):  
        print("PARENT CLASS")  
class Son(Parent):  
    def sdisplay(self):  
        print("SON CLASS")  
class Daughter(Parent):  
    def ddisplay(self):  
        print("DAUGHTER CLASS")  
  
s=Son()  
s.sdisplay()  
s.pdisplay()  
s.ddisplay()
```

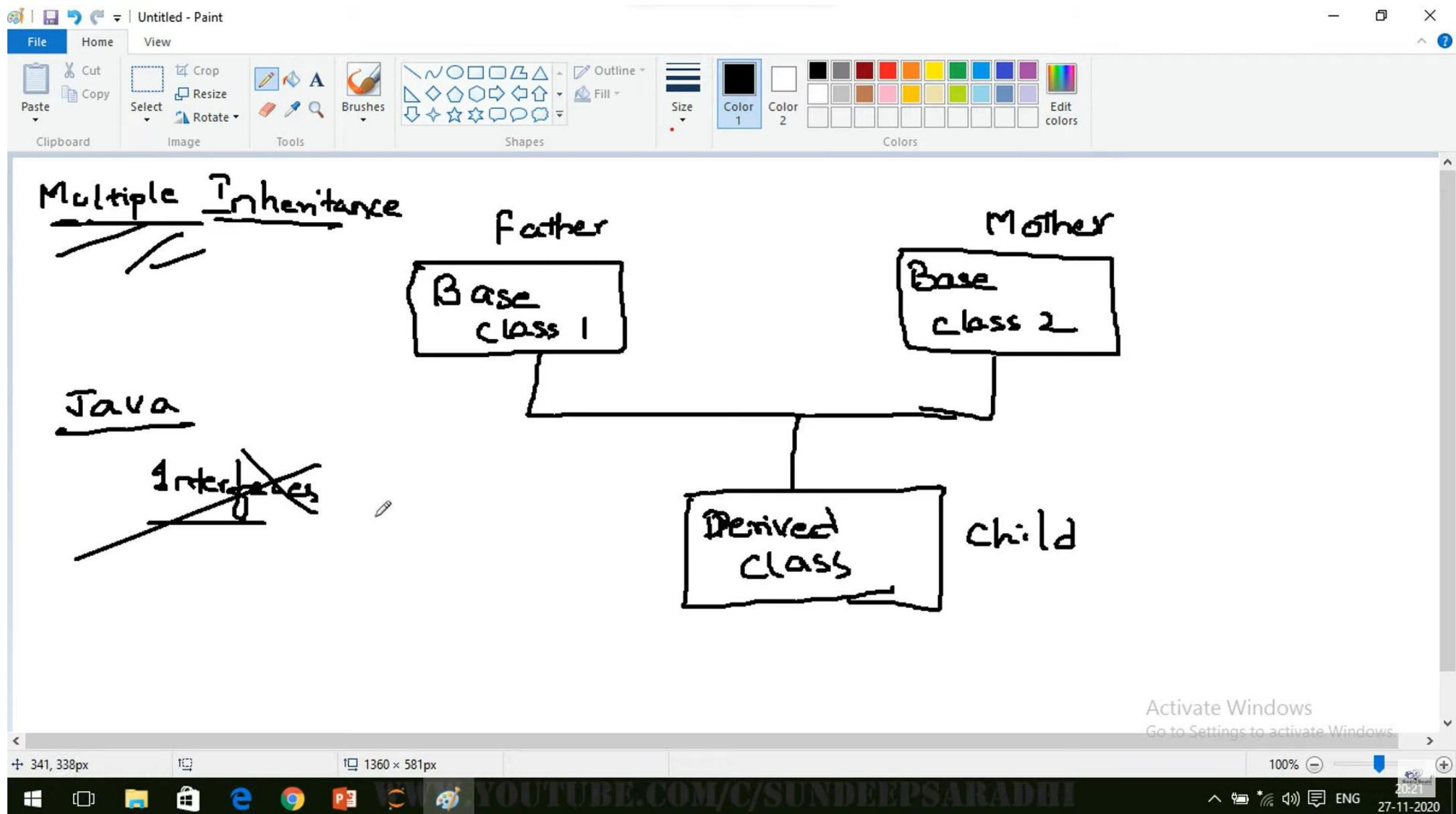
SON CLASS
PARENT CLASS

AttributeError Traceback (most recent call last)
<ipython-input-46-539a1974dff> in <module>
 12 s.sdisplay()
 13 s.pdisplay()
----> 14 s.ddisplay()

AttributeError: 'Son' object has no attribute 'ddisplay'

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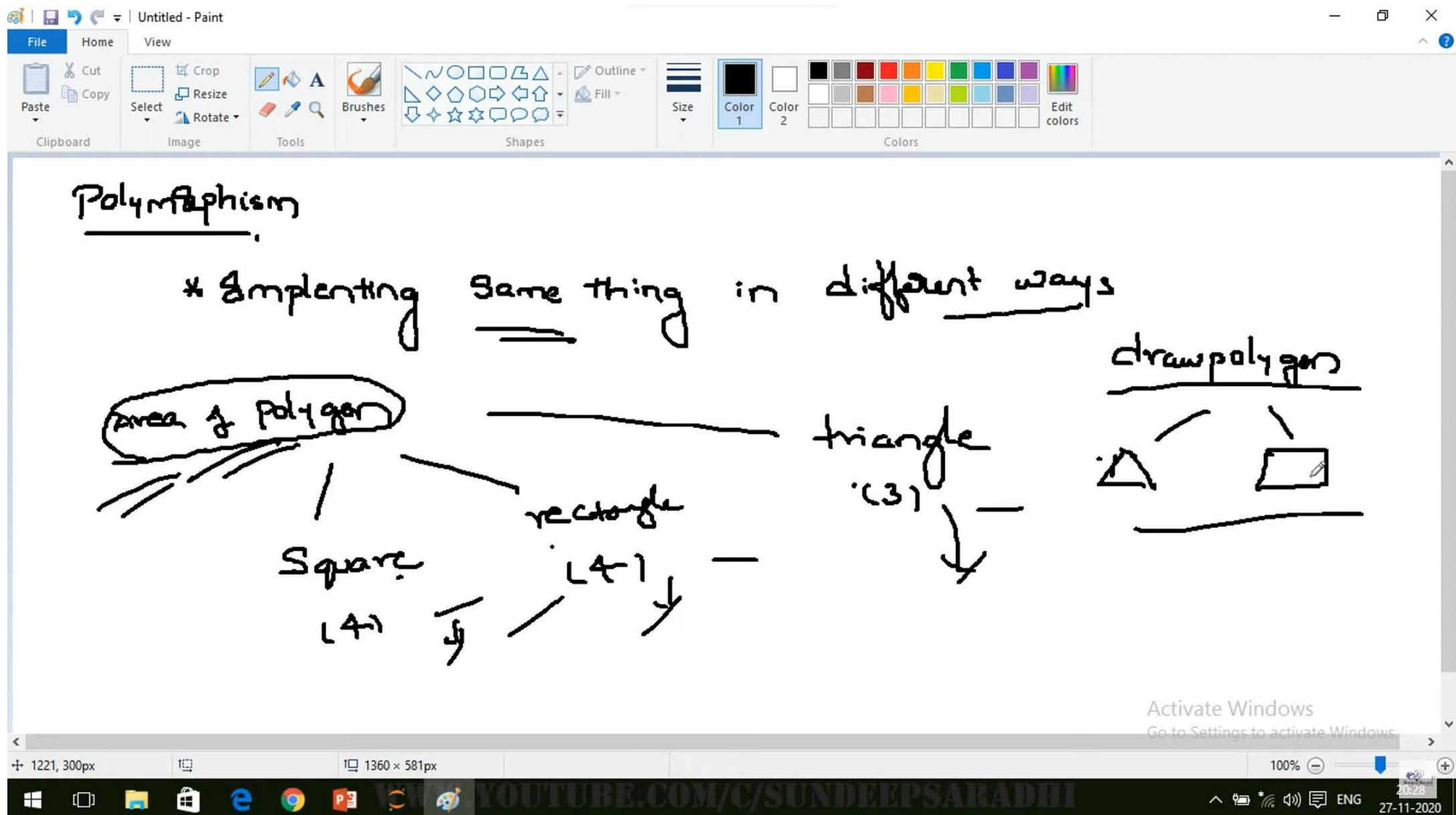
DAUGHTER CLASS
PARENT CLASS

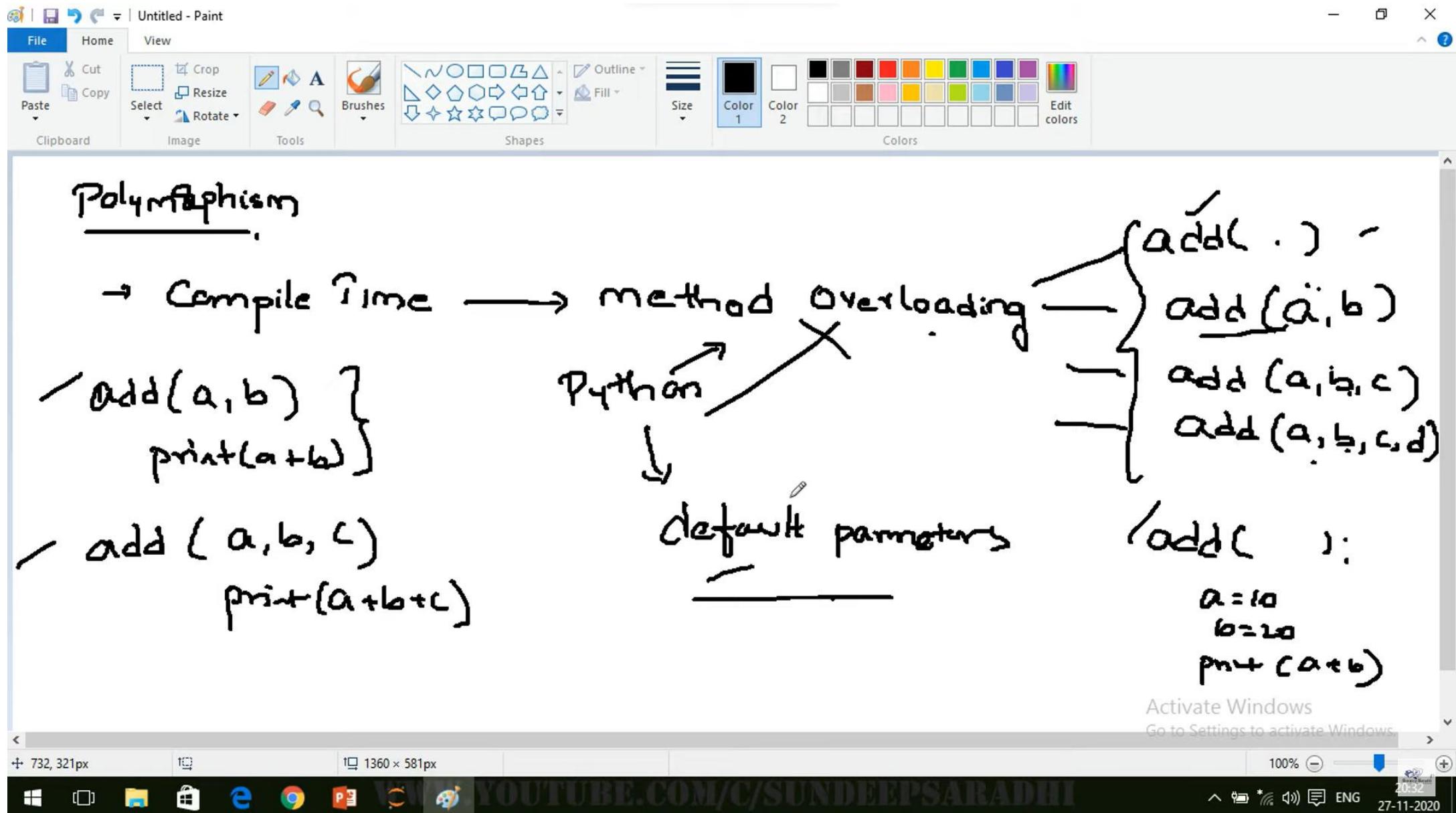
```
In [53]: class Father:  
    def fdisplay(self):  
        print("FATHER CLASS")  
class Mother:  
    def mdisplay(self):  
        print("MOTHER CLASS")  
class Child(Father,Mother):  
    def cdisplay(self):  
        print("CHILD CLASS")  
  
c=Child()  
c.cdisplay()  
c.mdisplay()  
c.fdisplay()
```

CHILD CLASS
MOTHER CLASS
FATHER CLASS

In []:

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c.cdisplay()
c.mdisplay()
c.fdisplay()

CHILD CLASS
MOTHER CLASS
FATHER CLASS

In [54]:

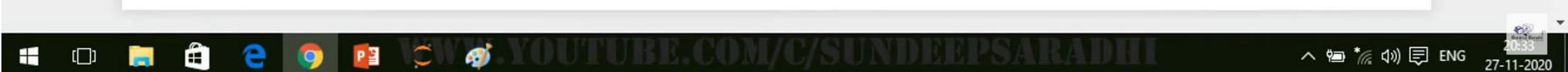
```
class Demo:  
    def add(self):  
        a=10  
        b=20  
        print(a,b)  
    def add(self,a,b):  
        print(a,b)  
obj=Demo()  
obj.add()
```

```
TypeError Traceback (most recent call last)  
<ipython-input-54-369c9eb81ed6> in <module>  
      7         print(a,b)  
      8 obj=Demo()  
----> 9 obj.add()
```

TypeError: add() missing 2 required positional arguments: 'a' and 'b'

In []:

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Cell toolbar: Run, Stop, Cell, Next, Previous, Code dropdown, etc.

```
c=Child()
c.cdisplay()
c.mdisplay()
c.fdisplay()

CHILD CLASS
MOTHER CLASS
FATHER CLASS
```

In [56]:

```
class Demo:
    def add(self):
        a=10
        b=20
        print(a,b)
    def add(self,a,b):
        print(a+b)
obj=Demo()
obj.add(100,200)  [
obj.add(
```

300

In []:

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```
In [58]: class Demo:  
    def add(self,a,b,c=100):  
        print(a+b+c)  
obj=Demo()  
obj.add(100,200)  
obj.add(100,200,300)
```

400
600

In []:

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Code

```
def cdisplay(self):
    print("CHILD CLASS")

c=Child()
c.cdisplay()
c.mdisplay()
c.fdisplay()

CHILD CLASS
MOTHER CLASS
FATHER CLASS
```

In [58]:

```
class Demo:
    def add(self,a,b,c=100):
        print(a+b+c)
obj=Demo()
obj.add(100,200)
obj.add(100,200,300)
```

400
600

In []:

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Untitled - Paint

File Home View

Cut Copy Paste Select Resize Rotate Tools Brushes Shapes Colors

Polymorphism

Run-time

Same method name parameters

Base — 2 param

method_name (Par)

Derived — 2 param

method_name (par)

Override

Parent

transport ()

cycle

child (Parent)

transport ()

bike ✓

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Code

```
print(a+b+c)
obj=Demo()
obj.add(100)
obj.add(100,200)
obj.add(100,200,300)
```

700
400
600

```
In [60]: class Parent:
    def transport(self):
        print("CYCLE")
class Child(Parent):
    def transport(self):
        print("BIKE")

c=Child()
c.transport()
```

BIKE

In []:

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MOTHER CLASS
FATHER CLASS

In [59]:

```
class Demo:      #METHOD OVERLOADING - COMPILE TIME POLYMORPHISM
    def add(self,a,b=500,c=100):
        print(a+b+c)
obj=Demo()
obj.add(100)
obj.add(100,200)
obj.add(100,200,300)
```

700
400
600

In [63]:

```
class Parent:      #METHOD OVERRIDING - RUNTIME POLYMORPHISM
    def transport(self):
        print("CYCLE")
class Child(Parent):
    def transport(self):
        print("BIKE")

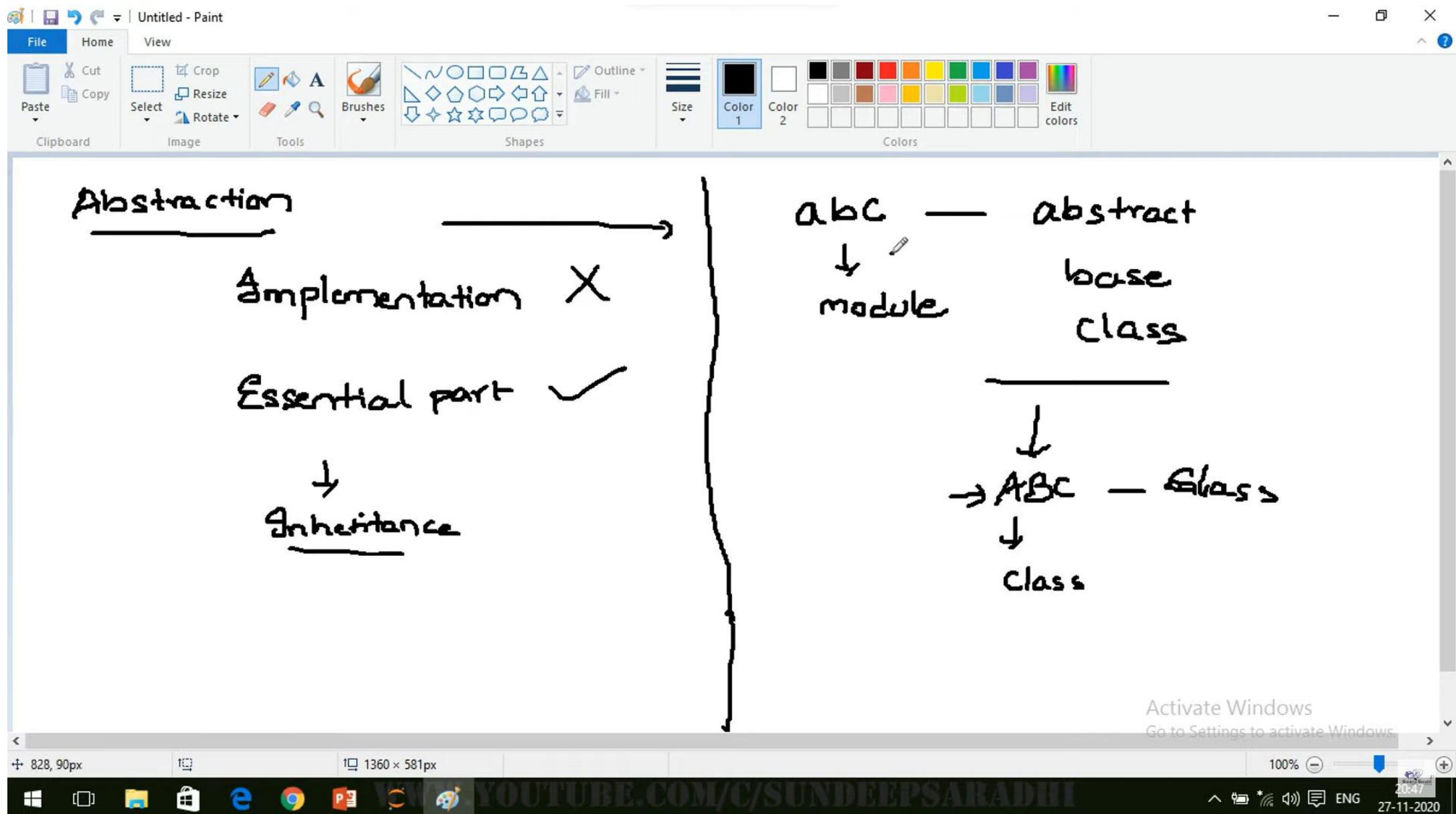
c=Child()
c.transport()
```

BIKE

In []:

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ABSTRACT CLASS → obj X

↓

at least one abstract method

Base

Concrete Class - obj ✓

→ No abstract methods

ABSTRACT METHOD

method
only ≡ function call
with empty def.

↓

decorator

↓

@ abstract method

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BIKE

```
In [65]: from abc import ABC,abstractmethod
class AbstractDemo(ABC):          #ABSTRACT CLASS
    @abstractmethod
    def HousingInterest(self):    #ABSTRACT METHOD
        None
    @abstractmethod
    def VehicleInterest(self):
        None
obj=AbstractDemo()

-----
TypeError                                 Traceback (most recent call last)
<ipython-input-65-8c13850f9ea9> in <module>
      7     def VehicleInterest(self):
      8         None
----> 9 obj=AbstractDemo()

TypeError: Can't instantiate abstract class AbstractDemo with abstract methods HousingInterest, VehicleInterest
```

In []:

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BIKE

```
In [69]: from abc import ABC,abstractmethod
class AbstractDemo(ABC):
    @abstractmethod
    def HousingInterest(self):          #ABSTRACT METHOD
        None
    @abstractmethod
    def VehicleInterest(self):
        None

class SBI(AbstractDemo):
    def HousingInterest(self):
        print("HOUSING INTEREST 8.5%")
    def VehicleInterest(self):
        print("VEHICLE INTEREST 5.5%")

sbiobj=SBI()
sbiobj.HousingInterest()
sbiobj.VehicleInterest()
```

HOUSING INTEREST 8.5%
VEHICLE INTEREST 5.5%

In []:

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Code

```
class AbstractDemo(ABC):          #ABSTRACT CLASS
    @abstractmethod
    def HousingInterest(self):      #ABSTRACT METHOD
        None
    @abstractmethod
    def VehicleInterest(self):
        None

class SBI(AbstractDemo):           #CONCRETE CLASS
    def HousingInterest(self):
        print("HOUSING INTEREST 8.5%")
    def VehicleInterest(self):
        print("VEHICLE INTEREST 5.5%")
class ICICI(AbstractDemo):
    def HousingInterest(self):
        print("HOUSING INTEREST 8.0%")
    def VehicleInterest(self):
        print("VEHICLE INTEREST 5.0%")

sbiobj=SBI()
sbiobj.HousingInterest()
sbiobj.VehicleInterest()

iciciobj=ICICI()
iciciobj.HousingInterest()
iciciobj.VehicleInterest()
```

HOUSING INTEREST 8.5%
VEHICLE INTEREST 5.5%
HOUSING INTEREST 8.0%
VEHICLE INTEREST 5.0%

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In [71]:

```
from abc import ABC,abstractmethod
class AbstractDemo(ABC):          #ABSTRACT CLASS
    @abstractmethod
    def HousingInterest(self):    #ABSTRACT METHOD
        None
    @abstractmethod
    def VehicleInterest(self):
        None

class SBI(AbstractDemo):          #CONCRETE CLASS
    def HousingInterest(self):
        print("HOUSING INTEREST 8.5%")

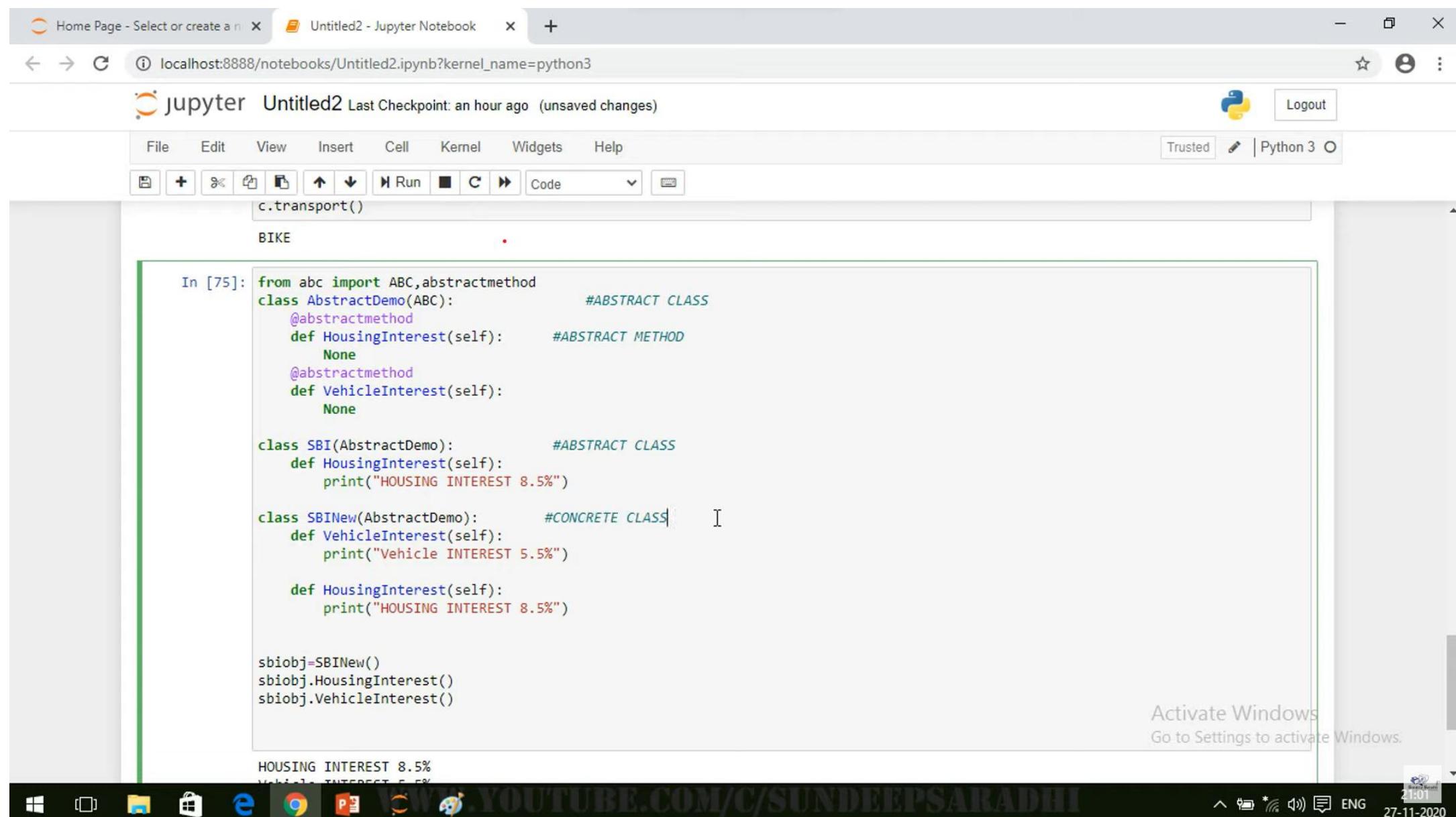
    sbiobj=SBI()
    sbiobj.HousingInterest()
    sbiobj.VehicleInterest()
```

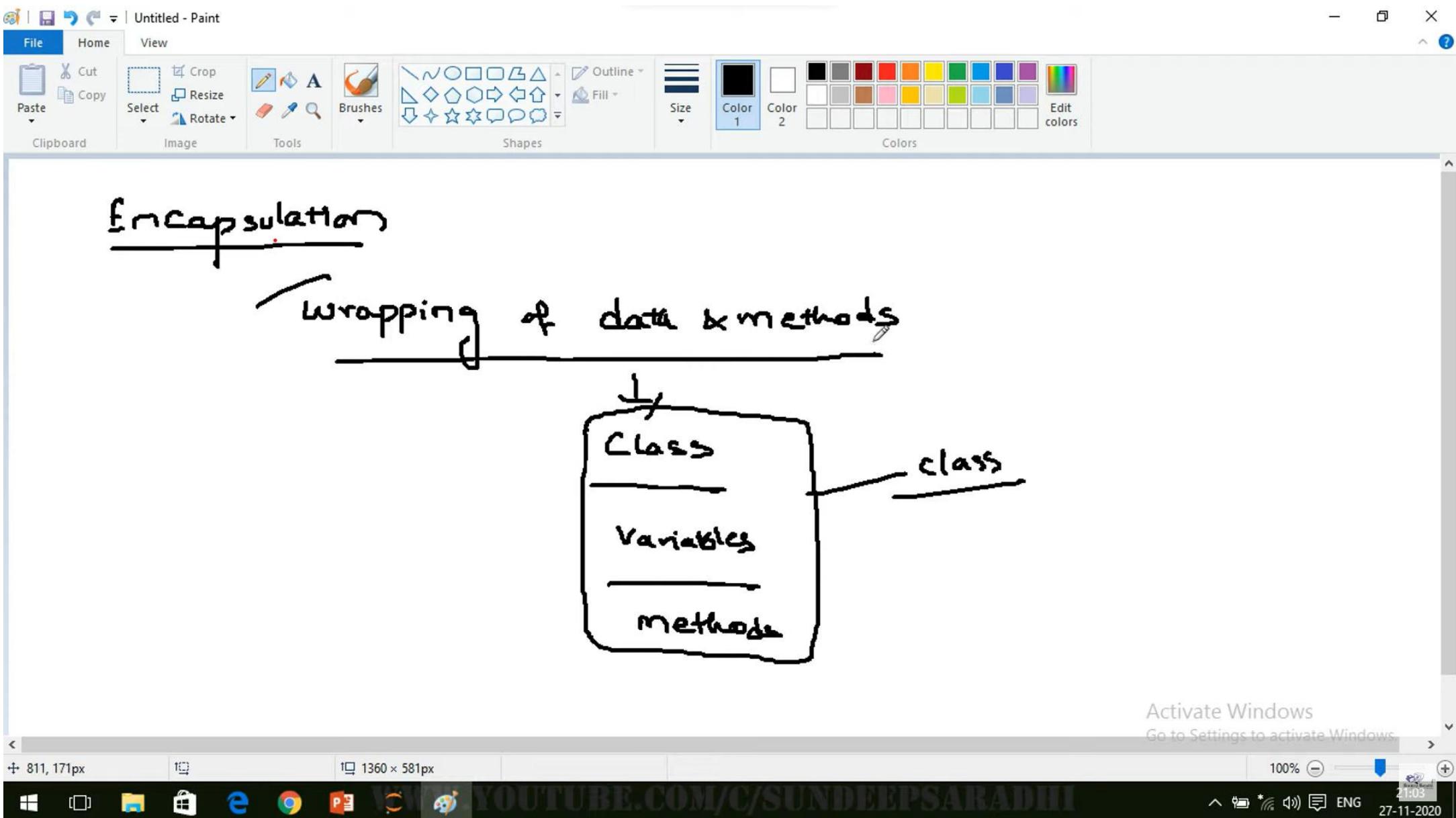
```
TypeError
Traceback (most recent call last)
<ipython-input-71-d0559bd0a5ff> in <module>
      14
      15
----> 16 sbiobj=SBI()
      17 sbiobj.HousingInterest()
      18 sbiobj.VehicleInterest()

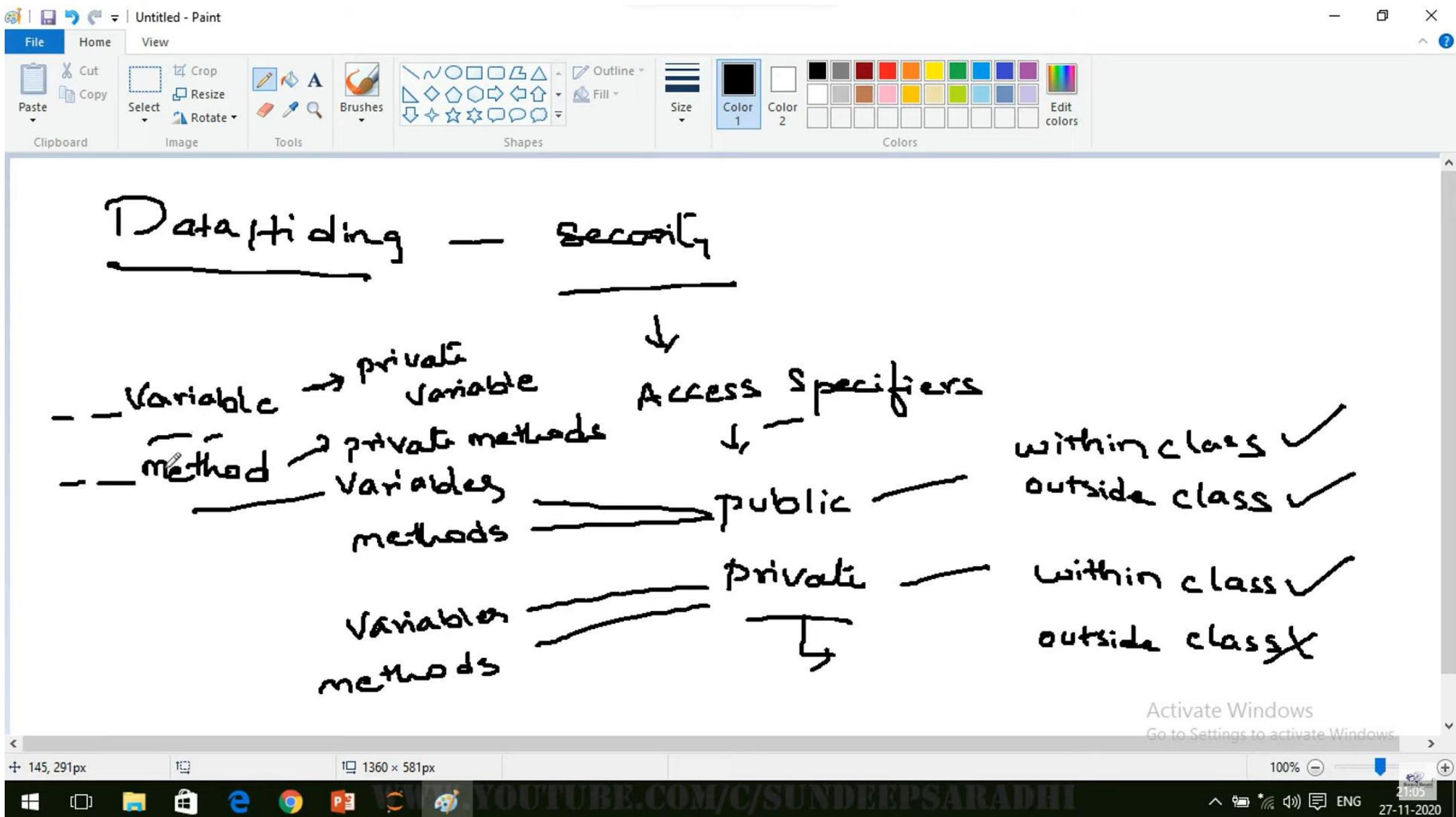
TypeError: Can't instantiate abstract class SBI with abstract methods VehicleInterest
```

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sbiobj=SBINew()
sbioj.HousingInterest()
sbioj.VehicleInterest()

HOUSING INTEREST 8.5%
Vehicle INTEREST 5.5%

In [76]:

```
class Demo:  
    a=10  
    b=100  
    def display(self):  
        print("DISPLAY METHOD IN DEMO CLASS")  
obj=Demo()  
print(obj.a,obj.b)  
obj.display()
```

10 100
DISPLAY METHOD IN DEMO CLASS

In []:

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Vehicle INTEREST 5.5%

```
In [77]: class Demo:  
    __a=10  
    b=100  
    def display(self):  
        print("DISPLAY METHOD IN DEMO CLASS")  
obj=Demo()  
print(obj.a,obj.b)  
obj.display()
```

```
-----  
AttributeError Traceback (most recent call last)  
<ipython-input-77-32d73083f39c> in <module>  
      5     print("DISPLAY METHOD IN DEMO CLASS")  
      6 obj=Demo()  
----> 7 print(obj.a,obj.b)  
      8 obj.display()  
  
AttributeError: 'Demo' object has no attribute 'a'
```

```
In [ ]:
```

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sbiobj.VehicleInterest()

.

HOUSING INTEREST 8.5%
Vehicle INTEREST 5.5%

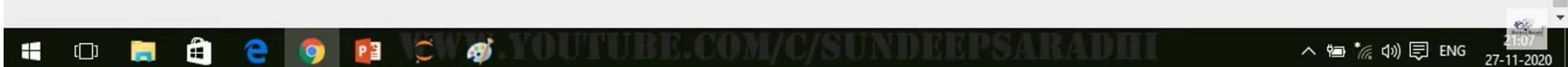
In [80]:

```
class Demo:  
    __a=10  
    b=100  
    def display(self):  
        print(self.__a)  
        print("DISPLAY METHOD IN DEMO CLASS")  
  
obj=Demo()  
print(obj.b)  
obj.display()
```

100
10
DISPLAY METHOD IN DEMO CLASS

In []:

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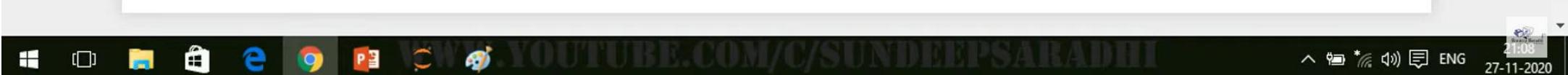
```
In [81]: class Demo:  
    a=10  
    b=100  
    def __display(self):  
        print(self.a)  
        print("DISPLAY METHOD IN DEMO CLASS")  
  
obj=Demo()  
print(obj.b)  
obj.display()
```

100

```
-----  
AttributeError Traceback (most recent call last)  
<ipython-input-81-f73f89fc5e12> in <module>  
      8 obj=Demo()  
      9 print(obj.b)  
--> 10 obj.display()  
  
AttributeError: 'Demo' object has no attribute 'display'
```

In []:

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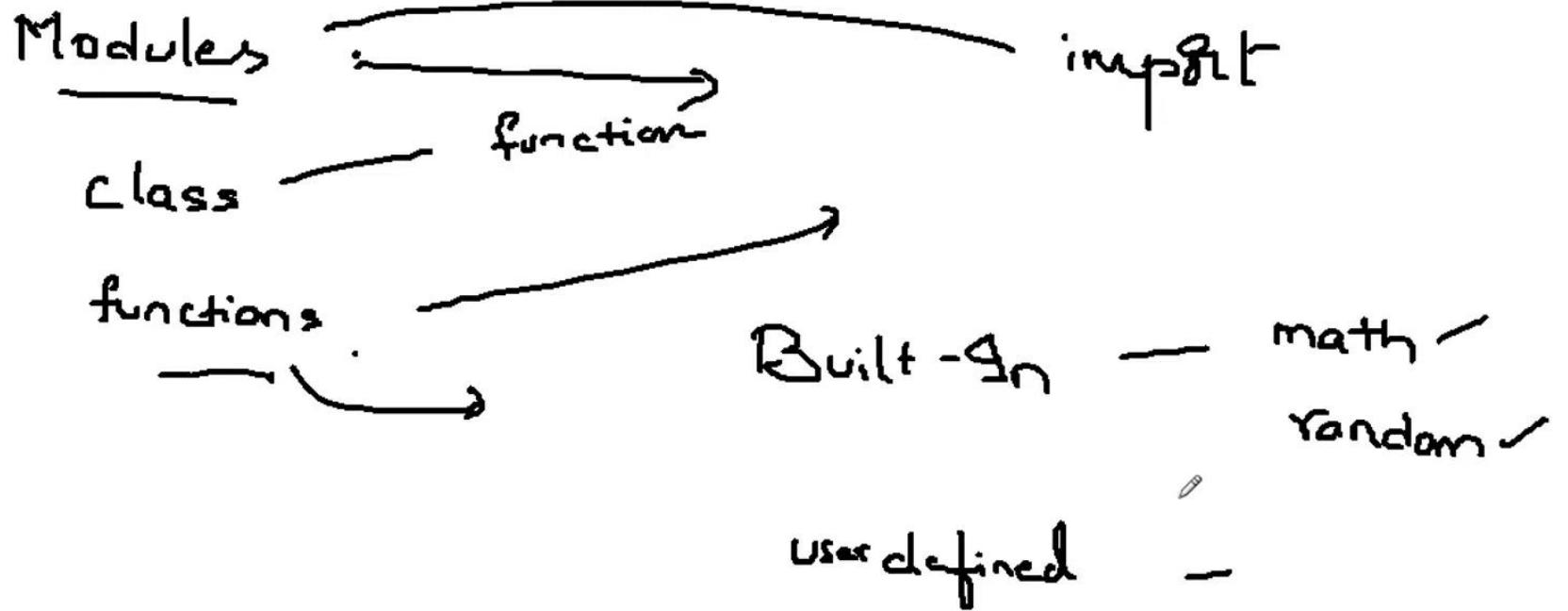
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HOUSING INTEREST 8.5%
Vehicle INTEREST 5.5%

```
In [83]: class Demo:  
    __a=10  
    b=100  
    def __display(self):  
        print(self.__a)  
        print("DISPLAY METHOD IN DEMO CLASS")  
    def show(self):  
        self.__display()  
  
obj=Demo()  
print(obj.b)  
obj.show()  
  
100  
10  
DISPLAY METHOD IN DEMO CLASS
```

In []:

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+ 1037, 378px

1360 × 581px

100%



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□ Built-In Modules

- OS Module
- SYS Module
- DATETIME Module

□ User Defined Modules

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OS MODULE

- **mkdir()** - A new directory corresponding to the path in the string argument of the function will be created.
- **getcwd()** - current working directory
- **rmdir()** - removes the specified directory either with an absolute or relative path. However, we can not remove the current working directory. Also, for a directory to be removed, it should be empty.
- **listdir()** - returns the list of all files and directories in the specified directory.

If we don't specify any directory, then list of files and directories in the current working directory will be returned.

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SYS MODULE

- **sys.argv** - returns a list of command line arguments passed to a Python script. The item at index 0 in this list is always the name of the script. The rest of the arguments are stored at the subsequent indices.
- **sys.maxsize** - Returns the largest integer a variable can take.
- **sys.path** - This is an environment variable that is a search path for all Python modules.
- **sys.version** - This attribute displays a string containing the version number of the current Python interpreter.

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Commonly used classes in the ***datetime module*** are:

- date Class
- time Class
- datetime Class
- timedelta Class

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DATETIME MODULE

Python has a module named ***datetime*** to work with dates and times.

- **Get Current Date and Time**

One of the classes defined in the ***datetime*** module is ***datetime*** class. We then used ***now()*** method to create a ***datetime object*** containing the current local date and time.

datetime_object = datetime.datetime.now()

- **Get Current Date**

today() method defined in the ***date*** class to get a ***date object*** containing the current local date.

date_object = datetime.date.today()

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Date object to represent a date

```
>>> import datetime  
  
>>> d = datetime.date(2019, 4, 13)  
          ↓  
>>> print(d)
```

(Or)

```
>>> from datetime import date  
  
>>> a = date(2019, 4, 13)  
  
>>> print(a)
```

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Time object to represent time

```
from datetime import time  
# time(hour = 0, minute = 0, second = 0)  
a = time()  
print("a =", a)  
# time(hour, minute and second)  
b = time(11, 34, 56)  
print("b =", b)  
# time(hour, minute and second)  
c = time(hour = 11, minute = 34, second = 56)  
print("c =", c)  
# time(hour, minute, second, microsecond)  
d = time(11, 34, 56, 234566)  
print("d =", d)
```

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Print today's year, month and day

```
from datetime import date  
  
# date object of today's date  
  
today = date.today()  
  
print("Current year:", today.year)  
print("Current month:", today.month)  
print("Current day:", today.day)
```

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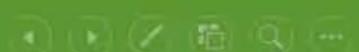


Print hour, minute, second and microsecond

```
from datetime import time  
a = time(11, 34, 56)  
print("hour =", a.hour)  
print("minute =", a.minute)  
print("second =", a.second)  
print("microsecond =", a.microsecond)
```



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Python datetime object

```
from datetime import datetime  
  
#datetime(year, month, day)  
  
a = datetime(2018, 11, 28)  
  
print(a)  
  
# datetime(year, month, day, hour, minute, second, microsecond)  
  
b = datetime(2017, 11, 28, 23, 55, 59, 342380)  
  
print(b)
```

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Print year, month, hour, minute and timestamp

```
from datetime import datetime
```

```
a = datetime(2017, 11, 28, 23, 55, 59, 342380)
```

```
print("year =", a.year)
```

```
print("month =", a.month)
```

```
print("hour =", a.hour)
```

```
print("minute =", a.minute)
```

```
print("timestamp =", a.timestamp())
```

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Difference between two timedelta objects

```
from datetime import timedelta
```

```
t1 = timedelta(weeks = 2, days = 5, hours = 1, seconds = 33)
```

```
t2 = timedelta(days = 4, hours = 11, minutes = 4, seconds = 54)
```

```
t3 = t1 - t2
```

```
print("t3 =", t3)
```

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Printing negative timedelta object

```
from datetime import timedelta
```

```
t1 = timedelta(seconds = 33)
```

```
          ^  
t2 = timedelta(seconds = 54)
```

```
t3 = t1 - t2
```

```
.
```

```
print("t3 =", t3)
```

```
print("t3 =", abs(t3))
```

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Py *Untitled*

File Edit Format Run Options Window Help

```
def add(a,b):
    print(a+b)

on
Typ
>>>def sub(a,b):
    print(a-b)

def div(a,b):
    print(a/b)

def mul(a,b):
    print(a*b)

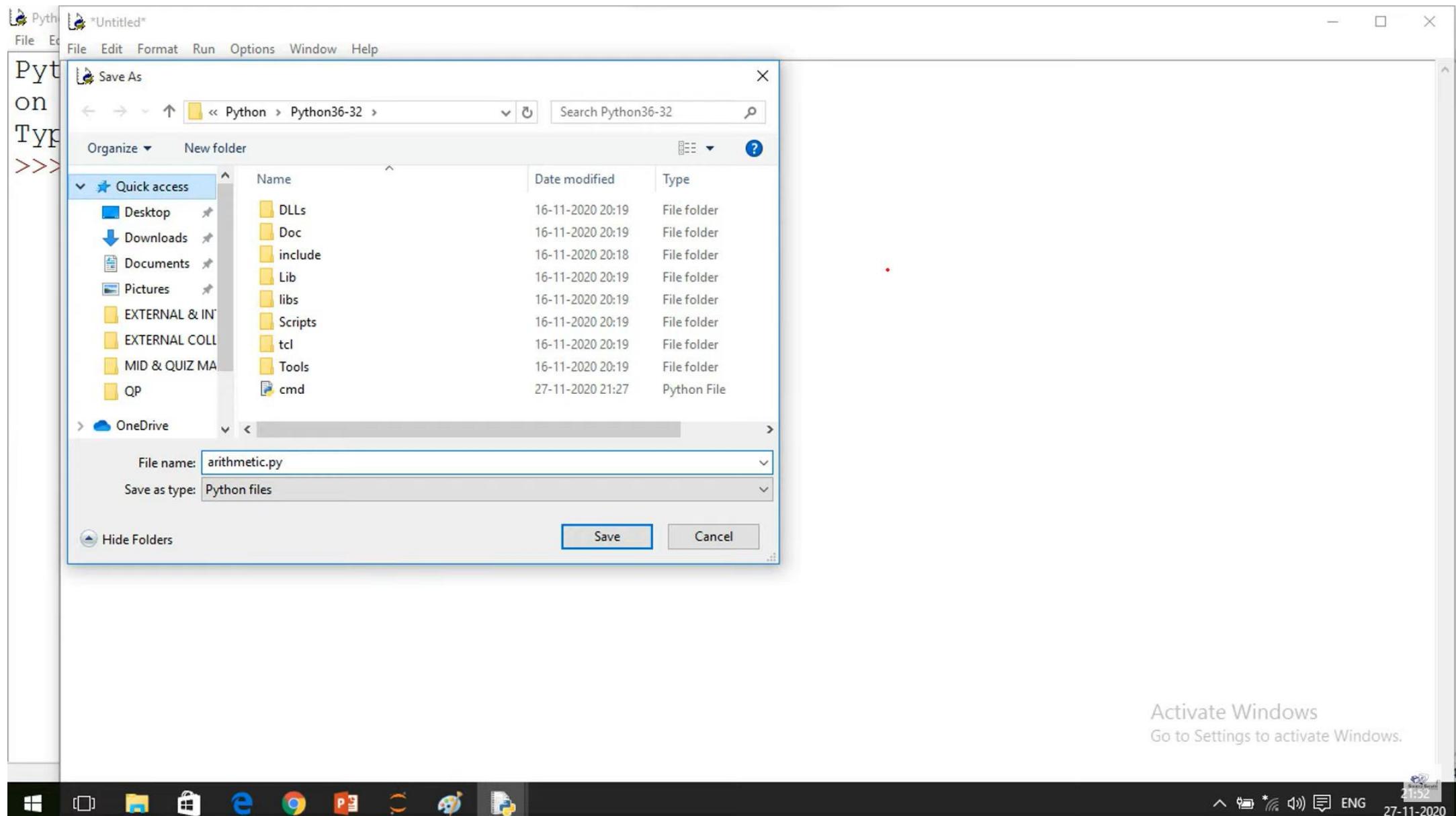
def pow(a,b):
    print(a**b)|
```

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21:52 27-11-2020



Py arithmetic.py - C:/Users/sunde/AppData/Local/Programs/Python/Python36-32/arithmetic.py (3.6.5)

File Edit Format Run Options Window Help

```
Python Type
>>> def add(a,b):
        print(a+b)

def sub(a,b):
    print(a-b)

def div(a,b):
    print(a/b)

def mul(a,b):
    print(a*b)

def pow(a,b):
    print(a**b)
```

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21:52

mod.py - C:/Users/sunde/AppData/Local/Programs/Python/Python36-32/mod.py (3.6.5)

File Edit Format Run Options Window Help

```
Py import arithmetic
on x=int(input("Enter value for x"))
Ty y=int(input("Enter value for y"))
>>
arithmetic.add(x,y)
|
```

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21:53

Python 3.6.5 Shell



File Edit Shell Debug Options Window Help

Python 3.6.5 (v3.6.5:f59c0932b4, Mar 28 2018, 16:07:46) [MSC v.1900 32 bit (Intel)]
on win32

Type "copyright", "credits" or "license()" for more information.

>>>

== RESTART: C:/Users/sunde/AppData/Local/Programs/Python/Python36-32/mod.py ==

Enter value for x10

Enter value for y20

30

>>> |

|

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21:53 ENG
27-11-2020

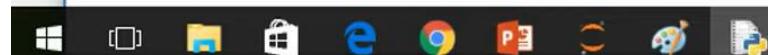
mod.py - C:/Users/sunde/AppData/Local/Programs/Python/Python36-32/mod.py (3.6.5)

File Edit Format Run Options Window Help

```
Py import arithmetic
on x=int(input("Enter value for x"))
Ty y=int(input("Enter value for y"))
>>
== arithmetic.add(x, y)
En
En
30
>>
```

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l: 4



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Exception Handling

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- Compile Time Error (Syntax Error)
- Logical Error
- Run Time Error

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- Try Block
- Except Block
- Else Block
- Finally Block

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```
In [147]: print("hello")
          ^

File "<ipython-input-147-07bfa5a64a67>", line 1
    pritn("hello"
           ^
SyntaxError: unexpected EOF while parsing
```

```
In [ ]:
```

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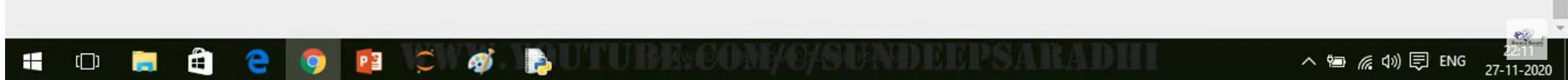
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```
In [150]: a=10  
b=20  
c=a-b  
print("sum=",c)
```

```
sum= -10
```

```
In [ ]:
```

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```
In [154]: a=int(input("Enter a:"))
b=int(input("Enter b:"))
print(a/b)

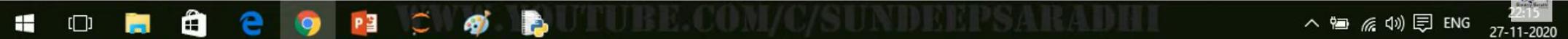
Enter a:10
Enter b:0

-----
ZeroDivisionError Traceback (most recent call last)
<ipython-input-154-33002f60818c> in <module>
      1 a=int(input("Enter a:"))
      2 b=int(input("Enter b:"))
----> 3 print(a/b)

ZeroDivisionError: division by zero
```

In []:

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ERROR	DESCRIPTION
AttributeError	Raised if object accessing a member which is not available
FileNotFoundException	Raised if file is not available
IndexError	Raised if index to sequence is out of bound
KeyError	Raised if non-existent key requested for set or dictionary
NameError	Raised if non-existent identifier used
TypeError	Raised when wrong type of parameter is sent to a function
ValueError	Raised when parameter has invalid value
ZeroDivisionError	Raised when division is done by zero.

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Run Cell Code

```
ValueError Traceback (most recent call last)
<ipython-input-168-800b707d65b6> in <module>
      1 n=int(a)
----> 2     ValueError: invalid literal for int() with base 10: 'hello'

In [169]: try:
      1=[10,20,30]
      2     print(a/0)
      3     print(l[3])
except Exception as e:
      4     print(e)
else:
      5     print("NO EXCEPTIONS")
finally:
      6     print("Program Executed")
```

unsupported operand type(s) for /: 'str' and 'int'
Program Executed

In []:

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Notebook saved Trusted Python 3

ValueError Traceback (most recent call last)
<ipython-input-168-800b707d65b6> in <module>
----> 1 n=int(a)

ValueError: invalid literal for int() with base 10: 'hello'

In [170]: try:
 l=[10,20,30]
 print(10/0)
 print(l[3])
except Exception as e:
 print(e)
else:
 print("NO EXCEPTIONS")
finally:
 print("Program Executed")

division by zero
Program Executed

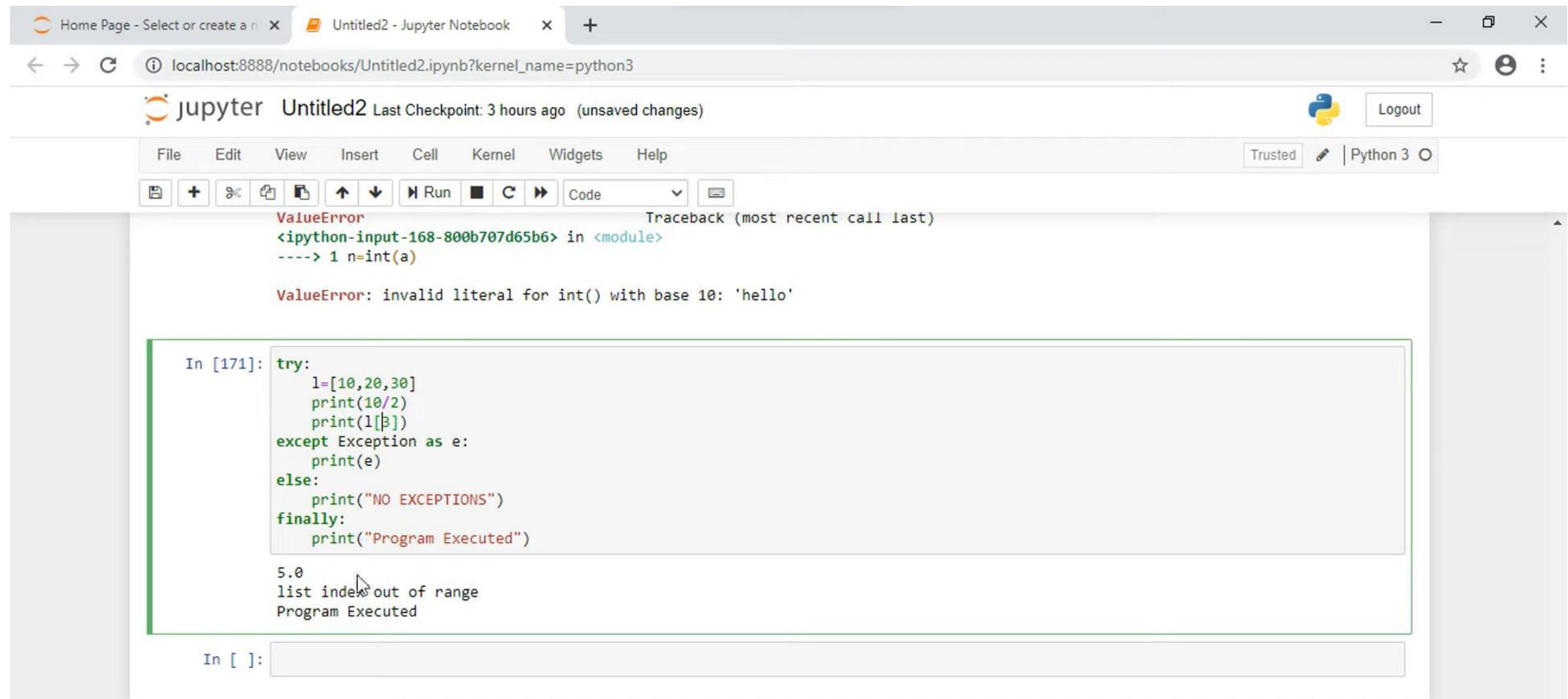
In []:

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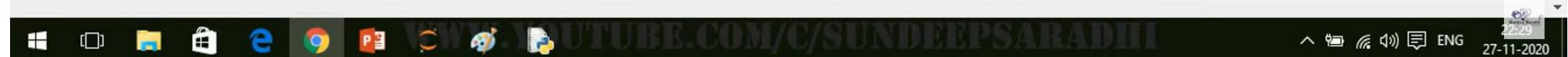


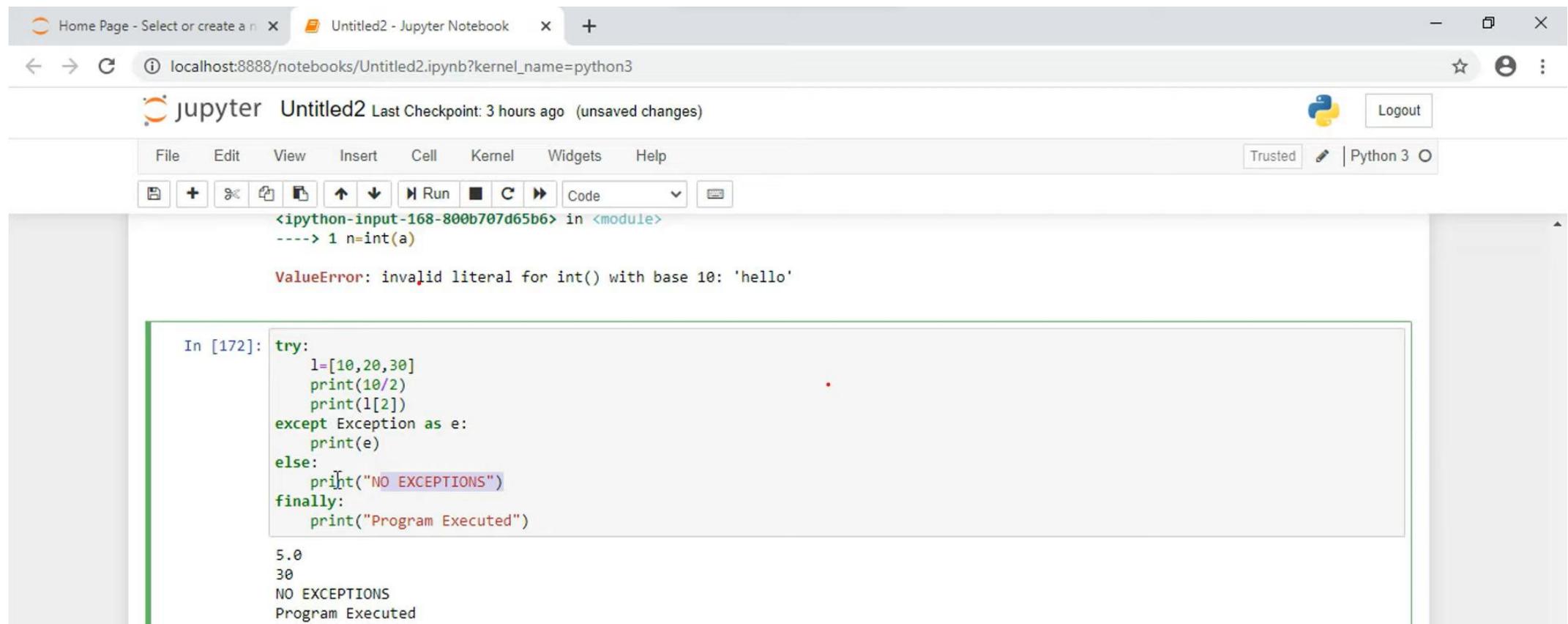
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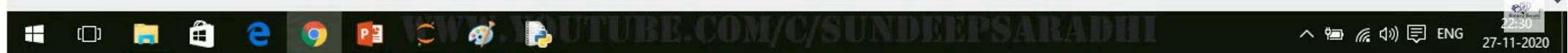


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```
In [174]: try:  
    l=[10,20,30]  
    print(10/0)  
    print(l[3])  
except (ZeroDivisionError,IndexError):  
    print("ERROR")  
else:  
    print("NO EXCEPTIONS")  
finally:  
    print("Program Executed")
```

```
ERROR  
Program Executed
```