Classes and Object

Q. What is class?

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class is a combination of state and behavior here state means variable declared within class and behavior means function define within class

or

class is combination of instance variable , static or class variable , methods , constructor, instance initializer, static initializer and nested classes

Instance variable means variable declared within class without static keyword called as instance variable
class variable means variable declared within class with static keyword called as class variable
If we define any function within class called as method.
Function same as class name or method same name as class name called as constructor
If we define block within class without static keyword called as instance initializer.
If we define block within class with static keyword called as static initializer.
If we define class within another class called as nested class

How to declare the class?

If we want to declare the class we have following syntax

```
access specifier class classname
{
     access specifier data type variablename;

   access specifier return type functionname(datatype arguments)
   {  write here your logics
   }
}
```

Example with source code

```
Example:
class ABC
{   int a=5;  //instance variable
    static int b=10; // class variable or static variable
     //nested class
     class MNO{

     }
     void show() //method
     {
     }
     ABC() //constructor
     {
     }
    //instance initializer
     {
     }
  //static initializer
    static
    {
     }
}
```

Q. Why use class or what is benefit of class?

There are three benefits of class

1. Ability to store different type of data

Note: some time people say class is complex data structure or it is a user defined data type.

```
class Employee
{
   private int id;
   private String name;
   private long sal;
   private Date dob;
}
```

Note: if we think about left hand side we have class name as Employee with field id with type int, name with type string, sal with long and dob with DOB it contain different types of data so we can say ability to store different types of data.

we provide class name as Employee means user can decide the name of class as well as user can decide what kind of data will store or use in class means class structure and data is 100% dependent on user choice so we can say class is a user defined data type or it is referential data type.

2. Reusability of code: if we think about class we can declare class only once and we can reuse it more than one time.

How we can reuse class more than one time?

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If we want to reuse class more than one time we can object or by using object we can reuse class more than one time.

Q. What is object?

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Object is block of memory where class data store

or

It is instance of class

or

It is runtime entity

or

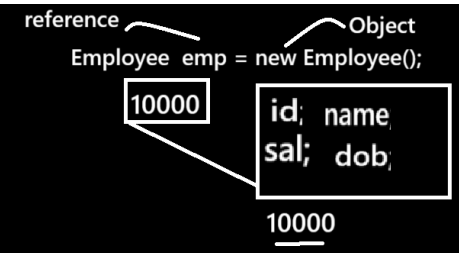
It is photocopy of class.

How to create object in java

_____

Syntax: classname ref = new classname();

```
class Employee
{
   private int id;
   private String name;
   private long sal;
   private Date dob;
}
```



Note: if we think about Employee emp = new Employee() here emp is reference variable and new Employee() is our actual object.

Q. What is difference between reference and object?

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reference is variable which hold address of object and object is block of memory where class data store.

Standard steps to use any class

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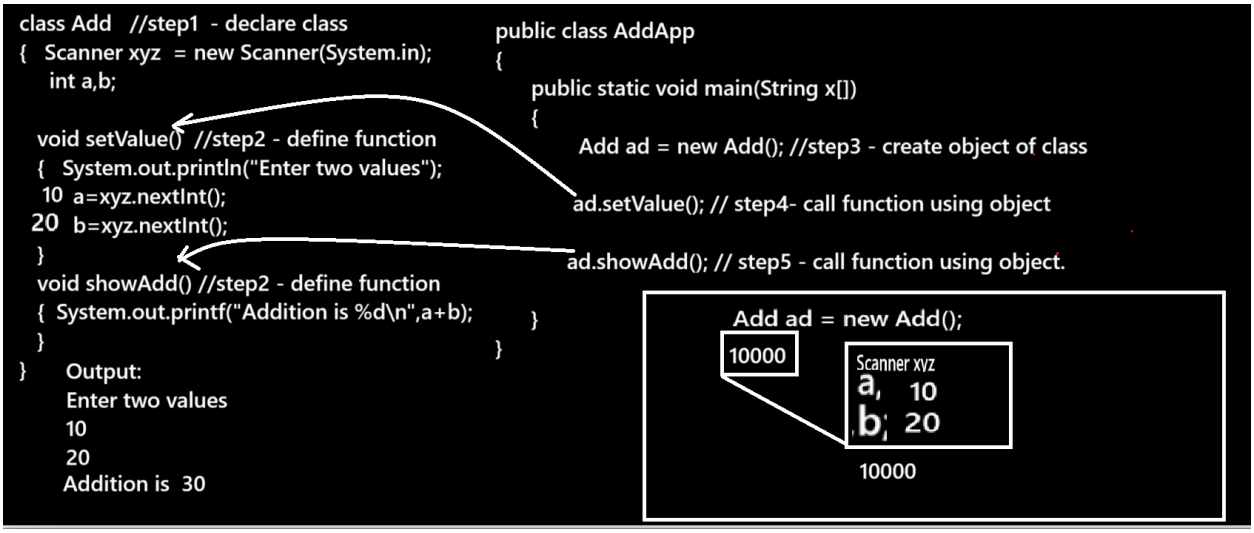
a) Declare class

b) Declare variable & Define function within class

c) Create object of class

d) Call class method using object of class.



Example with source code

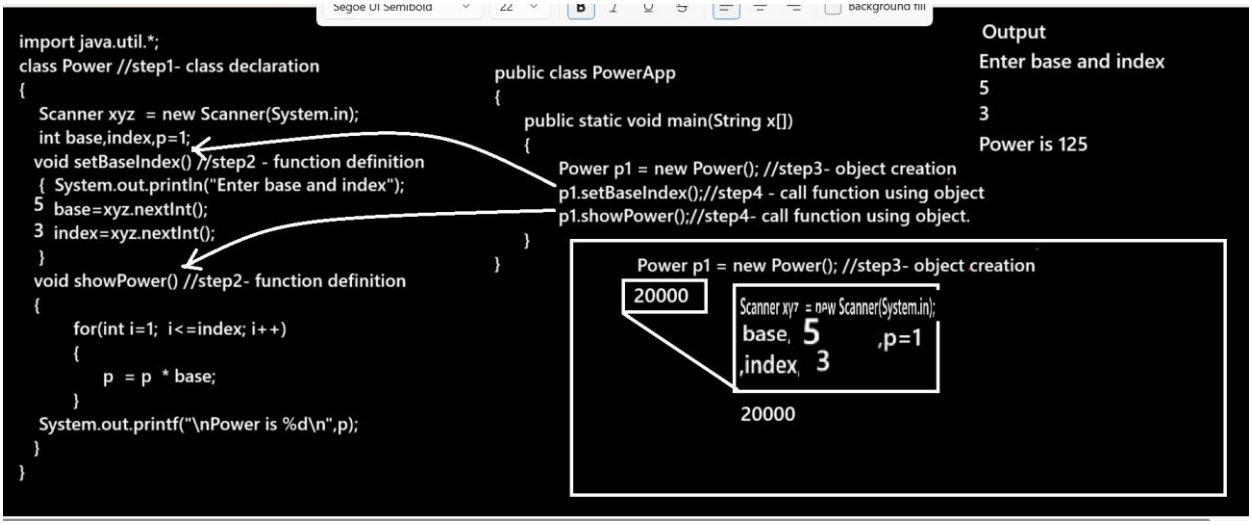
```
import java.util.*;
class Add  //step - class declaration
{ Scanner xyz  = new Scanner(System.in);
  int a,b;
  void setValue() //step2 - function definition
  { System.out.println("Enter two values");
    a=xyz.nextInt();
          b=xyz.nextInt();
  }
  void showAdd() //step2 - function definition
  { System.out.printf("Addition is %d\n",a+b);
  }
}
public class AddAppSep2024
{ public static void main(String x[])
        {       Add ad = new Add(); //step3 - object creation
                ad.setValue();  //step4 - member calling by using object
                ad.showAdd();   //step4 - member calling by using object
        }
}
```

Output

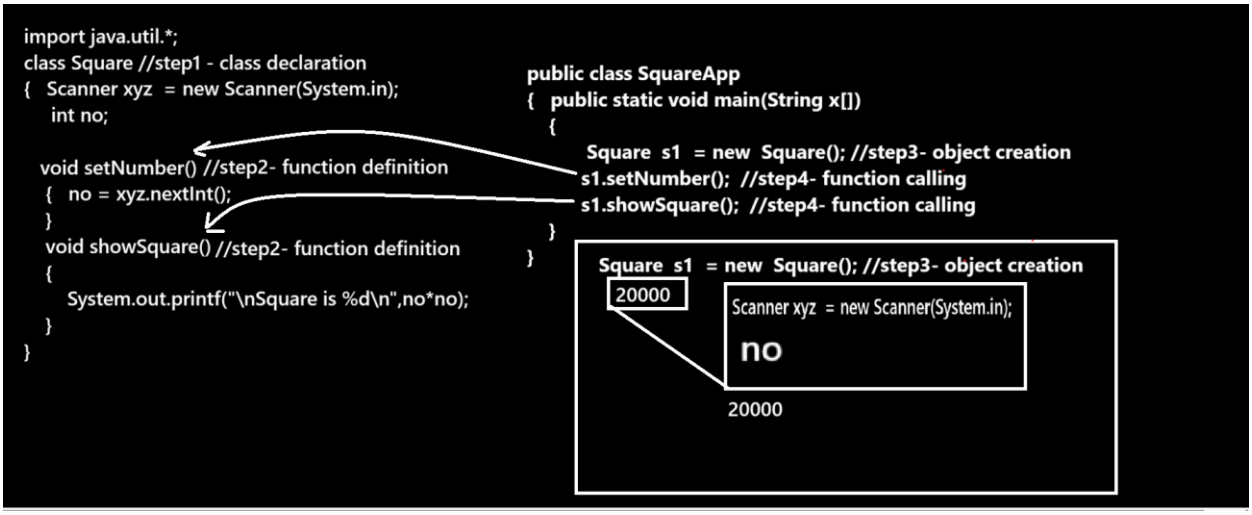
```
C:\Program Files\Java\jdk-23\bin>javac AddAppSep2024.java

C:\Program Files\Java\jdk-23\bin>java AddAppSep2024
Enter two values
10
20
Addition is 30
```

Example: WAP to create class name as Power with two functions
void setBaseIndex(): this function can accept base and index as input value
void showPower(): this function can calculate power of two number and display it.



Example: WAP to create class name as Square with two functions
void setNumber(): this function can accept number from keyboard
void showSquare(): this function can calculate the square of number and display it.



If we think about above statement Square s1 = new Square() here s1 is reference of Square class and new Square() is actual object

Q. What is difference between reference and object?

Reference is variable which hold address of object and object is block of memory where class data store.

Q. What happen if we not use reference with object?

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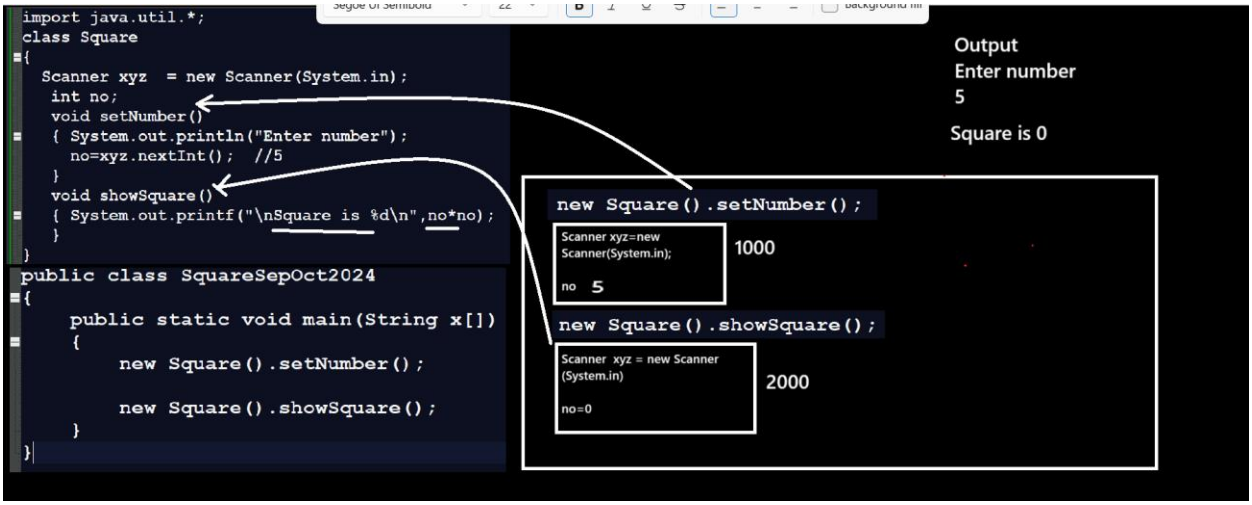
if we not use reference with object then JVM create new object every time in memory and when we have new object every time in memory means we have new block every time in memory and every object has different content means we cannot use same object content/data more than one time if we required.

Note: if we not use reference with object then technically object known as anonymous object.



if we think about above code we have statement new Square().setNumber() here we create object of Square class whose address is 1000 and setNumber() function call by object whose address is 1000 and setNumber() function we have logic

Enter number

5

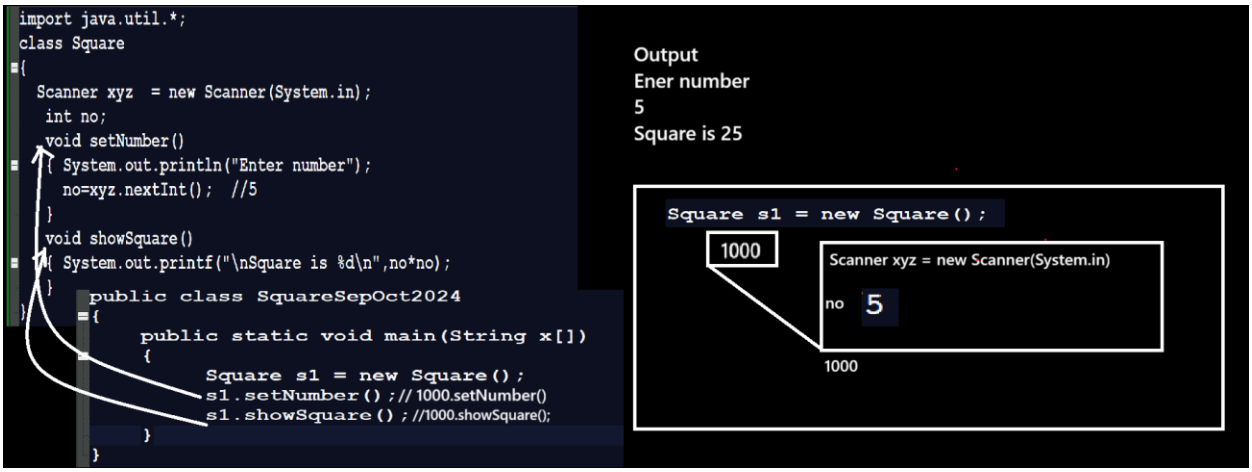
so this 5 value get stored in no=5 in object whose address is 1000 again we have one more statement in class new Square().showSquare() means we create second object in memory whose address is 2000 we consider diagram and newSquare().showSquare() indicate we call function using object whose address is 2000 or reference is 2000 so in showSquare() we have logic

Square is no*no means this no is refer from second object whose address is 2000 but we initialize value to object whose address is 2000 so the default of value no is 0 so we get answer square is 0

so the conclusion is when we use new keyword then every time new object in memory means we can say anonymous object can use only once in application cannot use more than one time but if we want to proper answer of above so we required to object whose address is 1000 two times or more than one time means first time with setNumber() function and second time with showSquare() function so for resolve this problem we need to store its address in class variable i.e reference

Q. Why use reference with object?

If we want to use same object more than one time then we can use reference with object shown in following diagram.



If we think about above diagram we have statement Square s1 = new Square() means we have object in memory whose address is 1000 and we store this address in reference variable s1 and we have statement s1.setNumber() means 1000.setNumber() means we call this function using object whose address is 1000 and when we call this function we have logic

Enter number

5

Again we have statement s1.showSquare () the meaning of this statement is we not create new object in memory just we use the object whose address is 1000 so means we use same object with two functions means two time using reference so showSquare() contain logic Square is no*no means this no variable refer from address 1000 i.e. previous object so we get answer is 25 means the conclusion is we can use same object more than one time with the help of reference

Q. Can we use more than one reference on single object and what happen if we use it?

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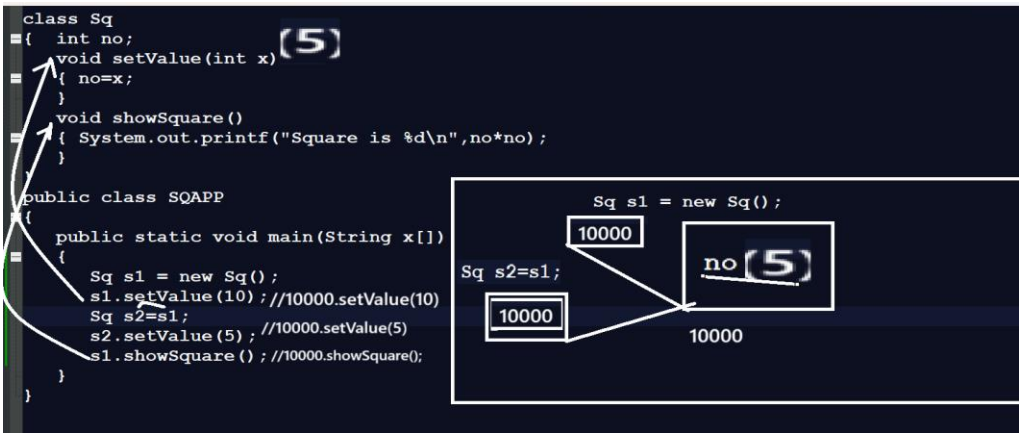
yes we can apply more than one reference on single object and if we apply more than one reference on single object and if we perform change on object content by using any one reference then object previous content may be lost or may be state/data get change



Note: if we think about above diagram we have statement Square s1=new Square() here we create object in memory whose address is 10000 and we store this address in reference variable s1 and we have statement s1.setValue(10) means 10000.setValue(10) means we store 10 value in no variable whose object address is 10000 again we have statement Square s2=s1 means we initialize or assign address of s1 in s2 reference means s2 points to 10000 location so we have only one object in memory but we have two reference variable which points same object and again we have statement s2.setValue(5) means 10000.setValue(5) so we pass 5 value in no variable whose object address is 10000 means this newly pass 5 value get override on 10 which is previous value of no variable and when we call s1.showSquare() means 10000.showSquare() so 10000 address contain updated value i.e no=5 so we have square is 25 so final conclusion is value change by s2 reference but s1 get impacted because reference s2 change the state of object or variable of object or data of object also
means when we have multiple reference on single object and if we change object using any reference then all references get affected.

How to pass parameter to class function

If we want to pass parameter to class function we need to copy the value of local variable in to instance variable because local variable cannot access outside of his function block
Example:

3. Provide encapsulation