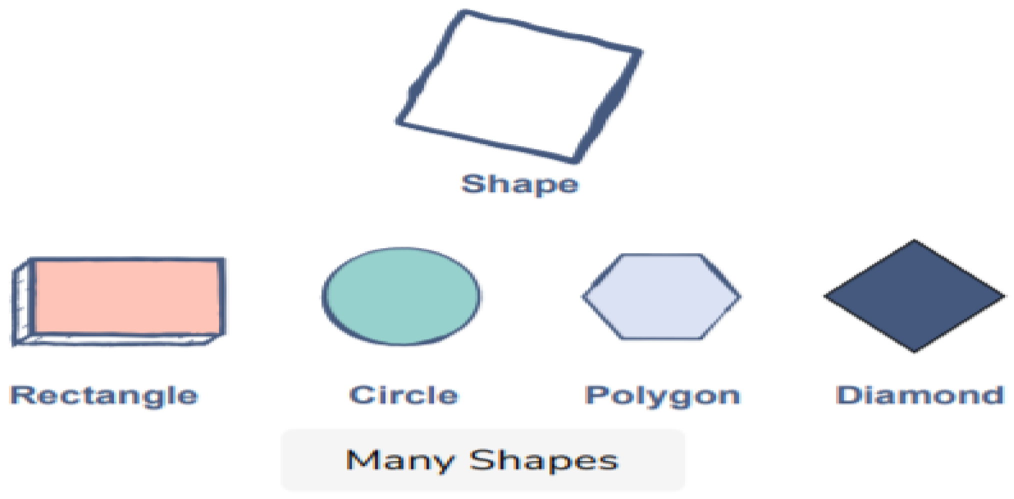
# Polymorphism

**We will cover the following:-**

- Definition
- Types of polymorphism
- Compile-time polymorphism
- Method overloading  with example
- Run-time polymorphism.
- Method overriding with example

## Definition:-

The word Polymorphism is a combination of two Greek words, Poly means many and Morph means forms.
In programming, polymorphism refers to the same object exhibiting different forms and behaviors. For example, take the Shape Class. The exact shape you choose can be anything. It can be a rectangle, a circle, a polygon, or a diamond. So, these are all shapes but their properties are different. This is called Polymorphism



## Types of polymorphism

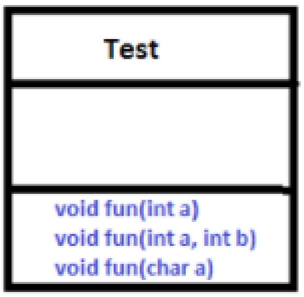
- Compile-time polymorphism
- Runtime polymorphism

## Compile-time polymorphism

It is also known as static polymorphism. This type of polymorphism is achieved by Method Overloading or operator overloading
Note:- operator overloading is not supported by java.

### Method overloading:-

when we have more than one function/method in the same class with the same name and number of arguments. then these functions are known as overloaded functions. Functions can be overloaded by a change in the number of arguments or/and a change in the type of arguments.
Note:-different return type is not considered as overloading.

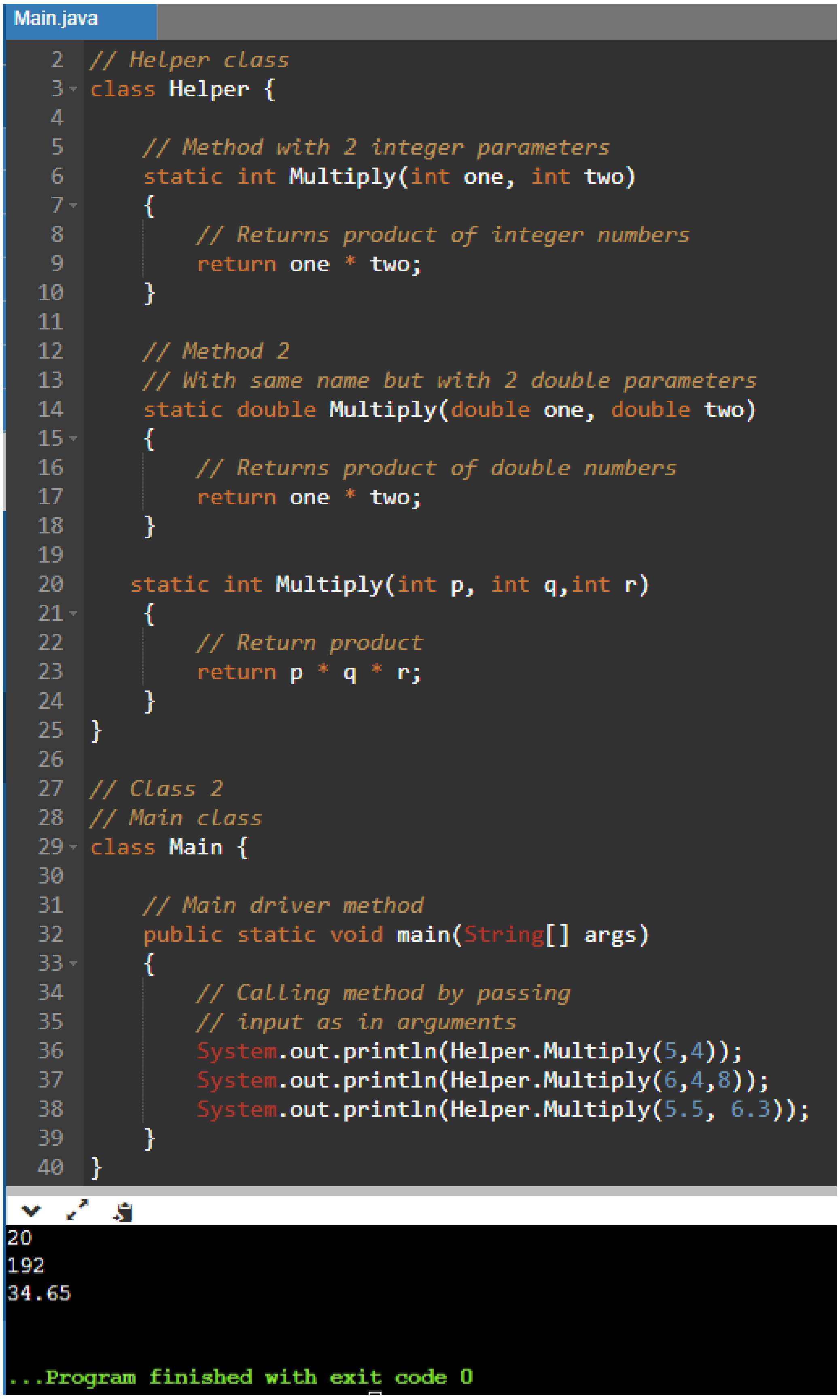


Overloading

Here, you can see there are three functions in the same class having the same name and the same number of arguments. So these functions are overloaded.

Here we will look at an example of the same with the help of a program written in java. We have overloaded multiply function using different arguments types, and a number of arguments are different in each function.

Main.java



```java
// Helper class
class Helper {

    // Method with 2 integer parameters
    static int Multiply(int one, int two)
    {
        // Returns product of integer numbers
        return one * two;
    }

    // Method 2
    // With same name but with 2 double parameters
    static double Multiply(double one, double two)
    {
        // Returns product of double numbers
        return one * two;
    }

   static int Multiply(int p, int q,int r)
    {
        // Return product
        return p * q * r;
    }
}

// Class 2
// Main class
class Main {

    // Main driver method
    public static void main(String[] args)
    {
        // Calling method by passing
        // input as in arguments
        System.out.println(Helper.Multiply(5,4));
        System.out.println(Helper.Multiply(6,4,8));
        System.out.println(Helper.Multiply(5.5, 6.3));
    }
}
```

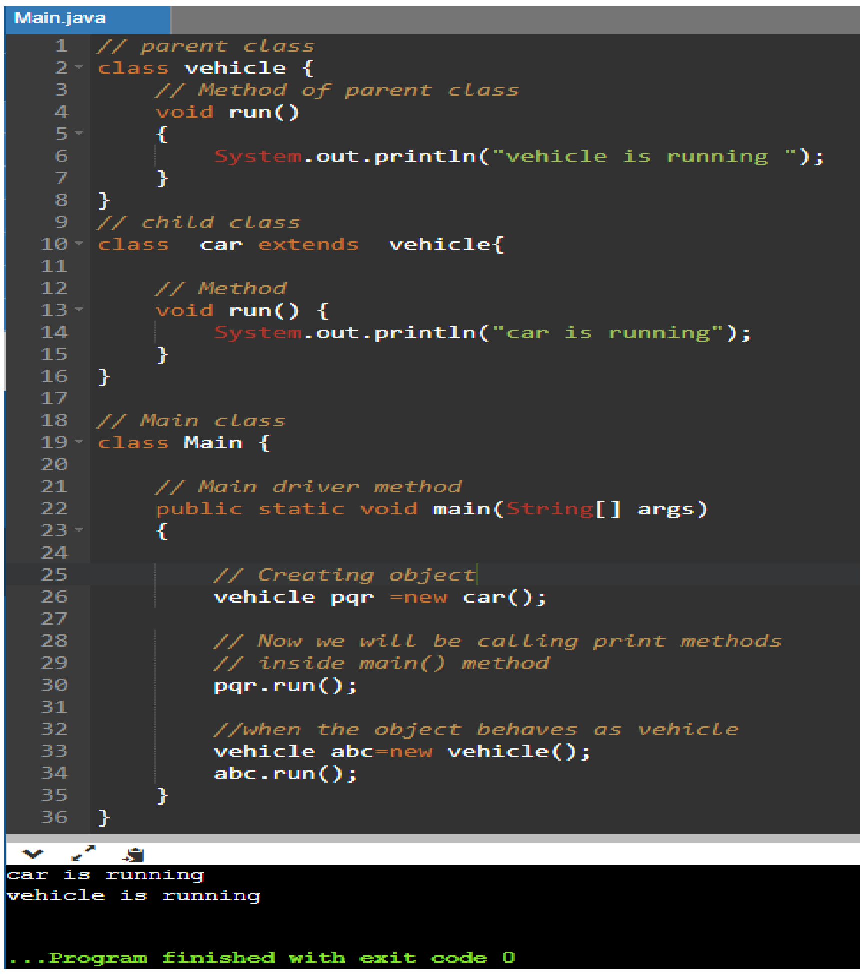
```
20
192
34.65


...Program finished with exit code 0
```

## Run-time polymorphism

It is also known as Dynamic Method Dispatch. It is a process in which a function call to the overridden method is resolved at Runtime. Method Overriding achieves this type of polymorphism. On the other hand, method overriding occurs when a derived class has a definition for one of the member functions of the base class. That base function is said to be overridden.

### Method overriding

In a simple language, when we have two classes, one is child class, and the other is parent class, and when we write the same function in both the child class and the parent class, the method is said to be overridden. This concept is known as runtime polymorphism because the compiler will decide at runtime to which function it will call during the program's execution.



Main.java

```java
// parent class
class vehicle {
     // Method of parent class
     void run()
     {
         System.out.println("vehicle is running ");
     }
}
// child class
class  car extends  vehicle{

     // Method
     void run() {
         System.out.println("car is running");
     }
}

// Main class
class Main {

     // Main driver method
     public static void main(String[] args)
     {
         // Creating object
         vehicle pqr =new car();

         // Now we will be calling print methods
         // inside main() method
         pqr.run();

         //when the object behaves as vehicle
         vehicle abc=new vehicle();
         abc.run();
     }
}
```

```
car is running
vehicle is running


...Program finished with exit code 0
```

Here, you can easily understand that the run method is called at the runtime, according to whether the vehicle is behaving like a car, or the vehicle is behaving like the vehicle itself.