



# Java Generic

Rawlabs Academy

# What is **Java Generics**?

Java **generic methods** and **generic classes** enable programmer to specify, with a **single method declaration**, a set of **related methods**, or with a **single class declaration**, a set of **related types**, respectively.

*“ Get your data structures correct first and the rest of the program will write itself. **David Jones** ”*

# Java Generic **Methods**

A **single generic method** declaration that can be called with arguments of **different types**. Based on the **types of the arguments** passed to the generic method, the compiler handles each method call appropriately.

# Java Generic Methods - Rules

- All generic method declarations **have a type parameter** section delimited by angle brackets (**<>**) that precedes the method's return type.
- Each type parameter section contains **one or more** type parameters separated by **commas**. A type parameter, also known as a type variable, is an identifier that specifies a generic type name.
- The type parameters can be used to **declare the return type** and act as placeholders for the types of the arguments passed to the generic method, which are known as actual type arguments.
- A generic method's body is declared like that of any other method. **Note** that type parameters can represent **only reference types**, not primitive types (like int, double and char).
- The convention is to use a **1-letter name** such as: **T** for Type, **E** for Element, **N** for Number, **K** for Key, or **V** for Value

# Java Generic Methods - Example

Print the different type, the parameter **T** mean type and should define with `<T>` before method type.

```
public class GenericMethod {  
    public static <T> void print(T value) {  
        System.out.println("Hello : " + value)  
    }  
    public static void main(String[] args) {  
        print(1);  
        print("dua");  
        print(3.0);  
        print('a');  
    }  
}
```

# Cont..

```
public class GenericMethod {  
    public static <T> T max(T a, T b, T c) {  
        T max = a;  
        if (Double.parseDouble(String.valueOf(b)) >  
            Double.parseDouble(String.valueOf(max))) {  
            max = b;  
        }  
        if (Double.parseDouble(String.valueOf(c)) >  
            Double.parseDouble(String.valueOf(max))) {  
            max = c;  
        }  
        return max;  
    }  
    public static void main(String[] args) {  
        System.out.println(max(1, 2, 3));  
        System.out.println(max(2.5, 9.4, 8));  
    }  
}
```

# Generic Method - Bounded Type Parameters

There may be times when you'll want to **restrict the kinds of types** that are allowed to be passed to a type parameter. For example, a method that operates on numbers might only want to accept instances of `Number` or its subclasses. This is what bounded type parameters are for

```
public class GenericMethod {
    public static <T extends Comparable<T>> T maximum(T x, T y, T z) {
        T max = x;
        if(y.compareTo(max) > 0) {
            max = y;
        }
        if(z.compareTo(max) > 0) {
            max = z;
        }
        return max;
    }
    public static void main(String[] args) {
        System.out.println(max(1, 2, 3));
        System.out.println(max(2.5, 9.4, 8.0));
    }
}
```

# Java Generic Classes

A generic class declaration looks like a non-generic class declaration, except that the class name is followed by a type parameter section.

As with generic methods, the type parameter section of a generic class can have one or more type parameters separated by commas. These classes are known as parameterized classes or parameterized types because they accept one or more parameters.



# Generic Classes - Example

```
public class Box<T> {  
    private T data;  
  
    // Setter and getter method  
}
```

```
public static void main(String[] args) {  
    Box<String> stringBox = new Box<>();  
    stringBox.setData("Any box");  
  
    Box<Integer> integerBox = new Box<>();  
    integerBox.setData(1);  
  
    Box<Double> doubleBox = new Box<>();  
    doubleBox.setData(3.0);  
  
    System.out.println(stringBox.getData());  
    System.out.println(integerBox.getData());  
    System.out.println(doubleBox.getData());  
}
```

# Exercise

1. Create method to print an array of different type using single generic method.
2. Create method to merge 2 arrays of different type using single generic method.
3. Create generic class to store 2 data with different type

# Task - Array Unique

Create a method to identify the unique value between 2 array of different type using single **generic method**.

## Test Case :

- Input : `[1, 2, 3, 4]` and `[1, 3, 5, 10, 16]`  
Output : `[2, 4, 5, 10, 16]`
- Input : `["one", "two"]` and `["two", "six"]`  
Output : `["one", "six"]`

# Task - Generic Class

Create class using **generic class**. The class must have attributes `responseCode`, `responseDesc`, `timestamp` and `data`. The `data` is generic type that can be used for `String`, `Integer`, `Object`, `List`, etc.

```
responseCode: SUCCESS  
responseDesc: Success  
timestamp: 2023-02-13T21:48:27.870496  
data: Hello World
```

```
responseCode: SUCCESS  
responseDesc: Success  
timestamp: 2023-02-13T21:50:05.087440  
data: [Calvin, Joe, Cassandra]
```