



Java Lambda Expression

Rawlabs Academy

Java Lambda Expression

- Java lambda expression are Java's first step into functional programming
- It is an anonymous function that doesn't have a name and doesn't belong to any class
- It provides a clear and concise way to represent a method interface via an expression
- It provides the implementation of a functional interface & simplifies the software development

The **Syntax**

The **syntax** is `parameter -> expression body`, **arrow operator** is introduced in Java through lambda expression that divides it into two parts i.e `Parameters` and `Body`.

Characteristic :

- Optional type declaration
- Optional parenthesis around parameters
- Optional curly braces
- Optional return keyword

Functional Interface

```
public class Main {  
    interface Display {  
        void print();  
    }  
  
    public static class DisplayImpl implements Display {  
        @Override  
        public void print() {  
            System.out.println("Hello world!!!");  
        }  
    }  
  
    public static void main(String[] args) {  
        Display display = new DisplayImpl();  
        display.print();  
    }  
}
```

Functional Interface replace with **Lambda**

```
public class Main {  
    interface Display {  
        void print();  
    }  
  
    public static void main(String[] args) {  
        Display display = () -> System.out.println("Hey I'm using lambda!");  
        display.print();  
    }  
}
```

Lambda Parameters

- Zero parameters

```
() -> System.out.println("Hello World!");
```

- One parameters

```
(param) -> System.out.println("Hi, my name is " + param);
```

- Multiple parameters

```
(p1, p2) -> System.out.println("Multiple parameter: " + p1 + "  
:: " + p2);
```

Lambda as an Object

A java lambda expression is essentially an object that can assign into a variable and passed around

```
public class Main {  
    interface Operator {  
        double execute(int a, int b);  
    }  
  
    public static void main(String[] args) {  
        Operator sum = (a, b) -> a + b;  
        System.out.println(sum.execute(6, 12));  
  
        Operator multiply = (a, b) -> a * b;  
        System.out.println(multiply.execute(2, 8));  
    }  
}
```

Lambda **Variable Capture**

Java lambda expression can access variable that are declared outside the lambda function body under certain circumstances.



Local Variable

```
public class Main {  
    interface Display {  
        String print(char[] chars);  
    }  
  
    public static void main(String[] args) {  
        String str = "Welcome to Rawlabs";  
        Display display = (val) -> {  
            return str + " :: " + new String(val);  
        };  
  
        char[] chars = {'j', 'a', 'v', 'a'};  
        System.out.println(display.print(chars));  
    }  
}
```

Instance Variable

```
public class MyLambda {  
    private String str = "Rahlabs.id";  
  
    public void print(List<String> data) {  
        data.forEach(v -> {  
            System.out.println(this.str + " :: " + v);  
        });  
    }  
}
```

```
public static void main(String[] args) {  
    MyLambda consumer = new MyLambda();  
    consumer.print(List.of("Calvin", "Joe"));  
}
```

Static Variable

```
public class MyLambda {  
    private static String MY_STR = "Rahlabs.id";  
  
    public void print(List<String> data) {  
        data.forEach(v -> {  
            System.out.println(MY_STR + " :: " + v);  
        });  
    }  
}
```

```
public static void main(String[] args) {  
    MyLambda consumer = new MyLambda();  
    consumer.print(List.of("Calvin", "Joe"));  
}
```

Lambda **Method Reference**

Method reference is used to refer method of functional interface. It is compact and easy form of lambda expression.



Static Method Reference

```
public class MyLambda {  
    public static String doPrint(String val) {  
        return val;  
    }  
}
```

```
public class Main {  
    interface Display {  
        String print(String val);  
    }  
  
    public static void main(String[] args) {  
        Display display = MyLambda::doPrint;  
        System.out.println(display.print("Rawlabs.id"));  
    }  
}
```

Parameter Method Reference

```
public class Main {  
    interface Display {  
        String doJoin(String param1, String... param2);  
    }  
  
    public static void main(String[] args) {  
        Display display = String::join;  
        String str = display.doJoin(" ", "Java Bootcamp");  
        System.out.println(str);  
    }  
}
```

Instance Method Reference

```
public class StringConverter {  
    public Integer convertToInt(String value) {  
        return Integer.parseInt(value);  
    }  
}
```

```
public class Main {  
    interface NumberDeserializer {  
        Integer deserialize(String value);  
    }  
  
    public static void main(String[] args) {  
        StringConverter converter = new StringConverter();  
        NumberDeserializer deserializer = converter::convertToInt;  
  
        Integer number = deserializer.deserialize("15");  
        System.out.println("Type: " + number.getClass().getName() + " - Value: " + number);  
    }  
}
```

Constructor Method Reference

```
public class Main {  
    interface StringFactory {  
        String create(char[] value);  
    }  
  
    public static void main(String[] args) {  
        StringFactory factory = String::new;  
        char[] chars = {'j', 'a', 'v', 'a'};  
        System.out.println(factory.create(chars));  
    }  
}
```


Lambda Examples

Frequently Usage

The Data

```
public class Book {  
    private String title;  
    private String category;  
    private Integer price;  
  
    public Book(String title, String category, Integer price) {  
        this.title = title;  
        this.category = category;  
        this.price = price;  
    }  
  
    // Getter and Setter Method  
}
```

Get a **List of Value** from a **List of Object**

```
public class Main {  
    public static void main(String[] args) {  
        List<Book> books = List.of(  
            new Book("Become a Java Developer", "programming", 150000),  
            new Book("Java for Beginner", "programming", 200000),  
            new Book("Love Bird Story", "drama", 130000),  
            new Book("The Thinker", "marketing", 300000)  
        );  
  
        List<String> bookNames = books  
            .stream()  
            .map(Book::getTitle)  
            .collect(Collectors.toList());  
        System.out.println(bookNames);  
    }  
}
```

Get a List of Book Category

```
public class Main {  
    public static void main(String[] args) {  
        List<Book> books = List.of(  
            new Book("Become a Java Developer", "programming", 150000),  
            new Book("Java for Beginner", "programming", 200000),  
            new Book("Love Bird Story", "drama", 130000),  
            new Book("The Thinker", "marketing", 300000)  
        );  
  
        Set<String> categories = books  
            .stream()  
            .map(Book::getCategory)  
            .collect(Collectors.toSet());  
        System.out.println(categories);  
    }  
}
```

Get Book List **where category == programming**

```
public class Main {  
    public static void main(String[] args) {  
        List<Book> books = List.of(  
            new Book("Become a Java Developer", "programming", 150000),  
            new Book("Java for Beginner", "programming", 200000),  
            new Book("Love Bird Story", "drama", 130000),  
            new Book("The Thinker", "marketing", 300000)  
        );  
  
        List<Book> filteredBooks = books  
            .stream()  
            .filter(v -> "programming".equalsIgnoreCase(v.getCategory()))  
            .collect(Collectors.toList());  
        for (Book book : filteredBooks) {  
            System.out.println(book.getTitle() + " => " + book.getCategory());  
        }  
    }  
}
```

Grouping Book List by Category

```
public class Main {  
    public static void main(String[] args) {  
        List<Book> books = List.of(  
            new Book("Become a Java Developer", "programming", 150000),  
            new Book("Java for Beginner", "programming", 200000),  
            new Book("Love Bird Story", "drama", 130000),  
            new Book("The Thinker", "marketing", 300000)  
        );  
  
        Map<String, List<Book>> map = books  
            .stream()  
            .collect(Collectors.groupingBy(Book::getCategory));  
        System.out.println(map);  
    }  
}
```

Task - Play with Data

It is known with the following data :

Name	Interest	GPA	Status
Calvin	Mobile	3.5	PASSED
Joe	Backend	4.0	PASSED
Albert	Web	3.8	PASSED
Maverick	Backend	2.9	NOT_PASSED
Andra	Backend	2.5	NOT_PASSED
Cassandra	Mobile	3.0	PASSED

Cont...

1. Get list of cumlaude students, GPA should be greater than equal to **3.5** GPA
2. Group student by status
3. Count interest, how many took the **Mobile**, **Backend** or **Web** interest.
4. Order students by name **ascending** order
5. Order students by GPA **descending** order