Exception Handling

The **Exception Handling in Java** is one of the powerful *mechanism to handle the runtime errors* so that the normal flow of the application can be maintained.

The java.lang.Throwable class is the root class of Java Exception hierarchy inherited by two subclasses: Exception and Error. The hierarchy of Java Exception classes is given below:

Diagram

Description automatically generated

Types of Java Exceptions

There are mainly two types of exceptions: checked and unchecked. An error is considered as the unchecked exception. However, according to Oracle, there are three types of exceptions namely:

**1) Checked Exception**

The classes that directly inherit the Throwable class except RuntimeException and Error are known as checked exceptions. For example, IOException, SQLException, etc. Checked exceptions are checked at compile-time.

**2) Unchecked Exception**

The classes that inherit the RuntimeException are known as unchecked exceptions. For example, ArithmeticException, NullPointerException, ArrayIndexOutOfBoundsException, etc. Unchecked exceptions are not checked at compile-time, but they are checked at runtime.

**3) Error**

Error is irrecoverable. Some example of errors are OutOfMemoryError, VirtualMachineError, AssertionError etc.

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| **Keyword** | **Description** |
| try | The "try" keyword is used to specify a block where we should place an exception code. It means we can't use try block alone. The try block must be followed by either catch or finally. |
| catch | The "catch" block is used to handle the exception. It must be preceded by try block which means we can't use catch block alone. It can be followed by finally block later. |
| finally | The "finally" block is used to execute the necessary code of the program. It is executed whether an exception is handled or not. |
| throw | The "throw" keyword is used to throw an exception. |
| throws | The "throws" keyword is used to declare exceptions. It specifies that there may occur an exception in the method. It doesn't throw an exception. It is always used with method signature. |

**Java finally block**

**Java finally block** is a block used to execute important code such as closing the connection, etc.

Java finally block is always executed whether an exception is handled or not. Therefore, it contains all the necessary statements that need to be printed regardless of the exception occurs or not.

The finally block follows the try-catch block.

  Java throw Exception

In Java, exceptions allows us to write good quality codes where the errors are checked at the compile time instead of runtime and we can create custom exceptions making the code recovery and debugging easier.

**Java throw keyword**

The Java throw keyword is used to throw an exception explicitly.

We specify the **exception** object which is to be thrown. The Exception has some message with it that provides the error description. These exceptions may be related to user inputs, server, etc.

We can throw either checked or unchecked exceptions in Java by throw keyword. It is mainly used to throw a custom exception. We will discuss custom exceptions later in this section.

**Java throws keyword**

The **Java throws keyword** is used to declare an exception. It gives an information to the programmer that there may occur an exception. So, it is better for the programmer to provide the exception handling code so that the normal flow of the program can be maintained.

Exception Handling is mainly used to handle the checked exceptions. If there occurs any unchecked exception such as NullPointerException, it is programmers' fault that he is not checking the code before it being used.

The throw and throws is the concept of exception handling where the throw keyword throw the exception explicitly from a method or a block of code whereas the throws keyword is used in signature of the method.

There are many differences between [throw](https://www.javatpoint.com/throw-keyword) and [throws](https://www.javatpoint.com/throws-keyword-and-difference-between-throw-and-throws) keywords. A list of differences between throw and throws are given below:

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| **Sr. no.** | **Basis of Differences** | **throw** | **throws** |
| 1. | Definition | Java throw keyword is used throw an exception explicitly in the code, inside the function or the block of code. | Java throws keyword is used in the method signature to declare an exception which might be thrown by the function while the execution of the code. |
| 2. | Type of exception Using throw keyword, we can only propagate unchecked exception i.e., the checked exception cannot be propagated using throw only. | Using throws keyword, we can declare both checked and unchecked exceptions. However, the throws keyword can be used to propagate checked exceptions only. |  |
| 3. | Syntax | The throw keyword is followed by an instance of Exception to be thrown. | The throws keyword is followed by class names of Exceptions to be thrown. |
| 4. | Declaration | throw is used within the method. | throws is used with the method signature. |
| 5. | Internal implementation | We are allowed to throw only one exception at a time i.e. we cannot throw multiple exceptions. | We can declare multiple exceptions using throws keyword that can be thrown by the method. For example, main() throws IOException, SQLException. |

**Difference between final, finally and finalize**

The final, finally, and finalize are keywords in Java that are used in exception handling. Each of these keywords has a different functionality. The basic difference between final, finally and finalize is that the [**final**](https://www.javatpoint.com/final-keyword) is an access modifier, [**finally**](https://www.javatpoint.com/finally-block-in-exception-handling) is the block in Exception Handling and [**finalize**](https://www.javatpoint.com/java-object-finalize-method) is the method of object class.

Along with this, there are many differences between final, finally and finalize. A list of differences between final, finally and finalize are given below:

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| **Sr. no.** | **Key** | **final** | **finally** | **finalize** |
| 1. | Definition | final is the keyword and access modifier which is used to apply restrictions on a class, method or variable. | finally is the block in Java Exception Handling to execute the important code whether the exception occurs or not. | finalize is the method in Java which is used to perform clean up processing just before object is garbage collected. |
| 2. | Applicable to | Final keyword is used with the classes, methods and variables. | Finally block is always related to the try and catch block in exception handling. | finalize() method is used with the objects. |
| 3. | Functionality | (1) Once declared, final variable becomes constant and cannot be modified.  (2) final method cannot be overridden by sub class.  (3) final class cannot be inherited. | (1) finally block runs the important code even if exception occurs or not.  (2) finally block cleans up all the resources used in try block | finalize method performs the cleaning activities with respect to the object before its destruction. |
| 4. | Execution | Final method is executed only when we call it. | Finally block is executed as soon as the try-catch block is executed.  It's execution is not dependant on the exception. | finalize method is executed just before the object is destroyed. |

**Why use custom exceptions?**

Java exceptions cover almost all the general type of exceptions that may occur in the programming. However, we sometimes need to create custom exceptions.

Following are few of the reasons to use custom exceptions:

* To catch and provide specific treatment to a subset of existing Java exceptions.
* Business logic exceptions: These are the exceptions related to business logic and workflow. It is useful for the application users or the developers to understand the exact problem.

In order to create custom exception, we need to extend Exception class that belongs to java.lang package.

Consider the following example, where we create a custom exception named WrongFileNameException:

1. **public** **class** WrongFileNameException **extends** Exception {
2. **public** WrongFileNameException(String errorMessage) {
3. **super**(errorMessage);
4. }
5. }