Fachhochschule Dortmund
University of Applied Sciences and Arts

MODULE 1-05

Compact Course Programming. Java

- Organisation and Introduction -

Brief Introduction…

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Course Targets and Overview

Course Target: Learn basic skills and concepts of computer programming in an object-oriented approach using Java. At the end of the course you will be able to write Java programs.

Course Prerequisites: Basic Java knowledge from pre-cpirse is required for this course. Also, some basic knowledge and experience with computer systems is required.

Course Topics:

- Exception handling
- Basic input-output
- Concurrency
- Regular expressions
- Unit testing

Course Concept

- This course is based on highly interactive lectures
  - with a lot of content
  - with small quizes, tasks and exercises for each student during the lecture
  - with student homework solution presentations

- This course requires relevant self-study time (homework assignments, further reading etc.)

- How to be successful in that course
  - Attend all lectures, concentrate on lecture content
  - Actively apply lecture content in lecture quizes, tasks, exercises etc.
  - Review lecture content & exercises after the lecture & identify questions
  - Solve and submit the homework assignments
  - In the next lecture: clarify questions & present your homework assignment

Compact Course Exam - Presentation of the capstone project

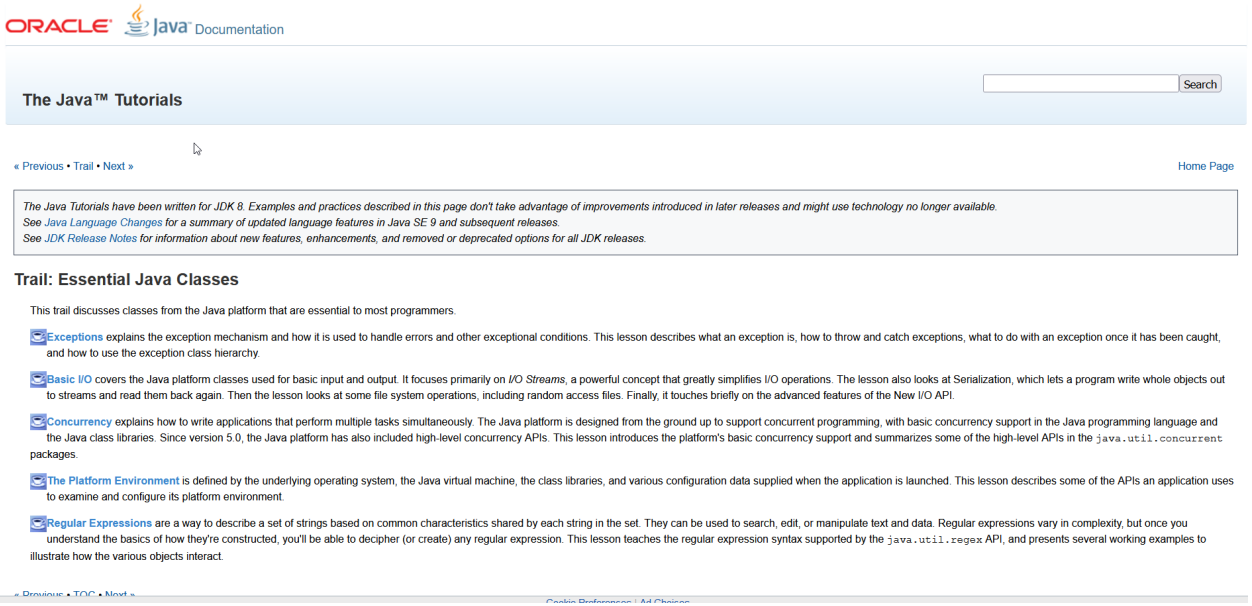
Additional Grade Points

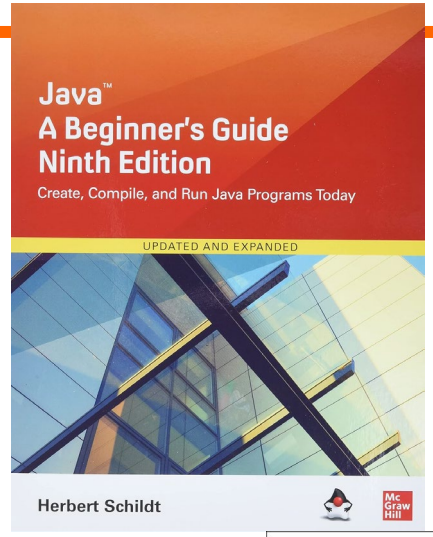
- Self-study work on homework assignment and the active participation in class are very important

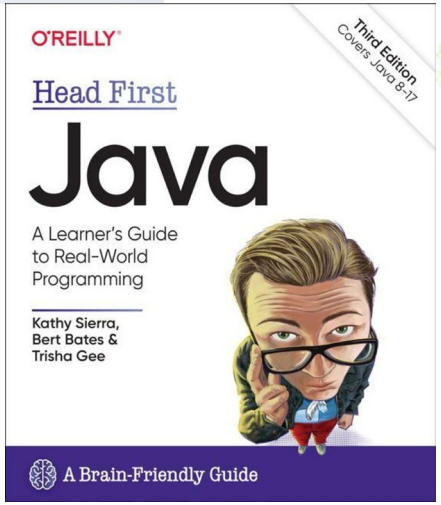
Date	Type of the study	Type of Assignment
Friday, October 6, 2023	selfstudy	
Friday, October 13, 2023	selfstudy	
Friday, October 20, 2023	on-site	Introduction to the course.
Friday, October 27, 2023	selfstudy	
Friday, November 3, 2023	ILIAS upload deadline	Hometask1.
Friday, November 10, 2023	on-site	QA session
Friday, November 17, 2023	ILIAS upload deadline	Hometask 2.
Friday, November 24, 2023	selfstudy	
Friday, December 1, 2023	ILIAS upload deadline	Hometask 3.
Friday, December 1, 2023	onsite	QA session
Friday, December 8, 2023	selfstudy	Knowledge test 2. OOP
Friday, December 15, 2023	ILIAS upload deadline	Hometask 4.
Friday, December 22, 2023	onsite	QA session
Friday, December 29, 2023	ILIAS upload deadline	Hometask 5.
Friday, January 5, 2024	onsite	QA session
Friday, January 12, 2024	selfstudy	
Friday, January 19, 2024	selfstudy	
Friday, January 26, 2024	onsite	QA session
Friday, February 2, 2024	ILIAS upload deadline	Capstone project and All Hometask assignment
Friday, February 9, 2024	onsite	Final presentation

Learning Material

OER such as The Java™ Tutorials :







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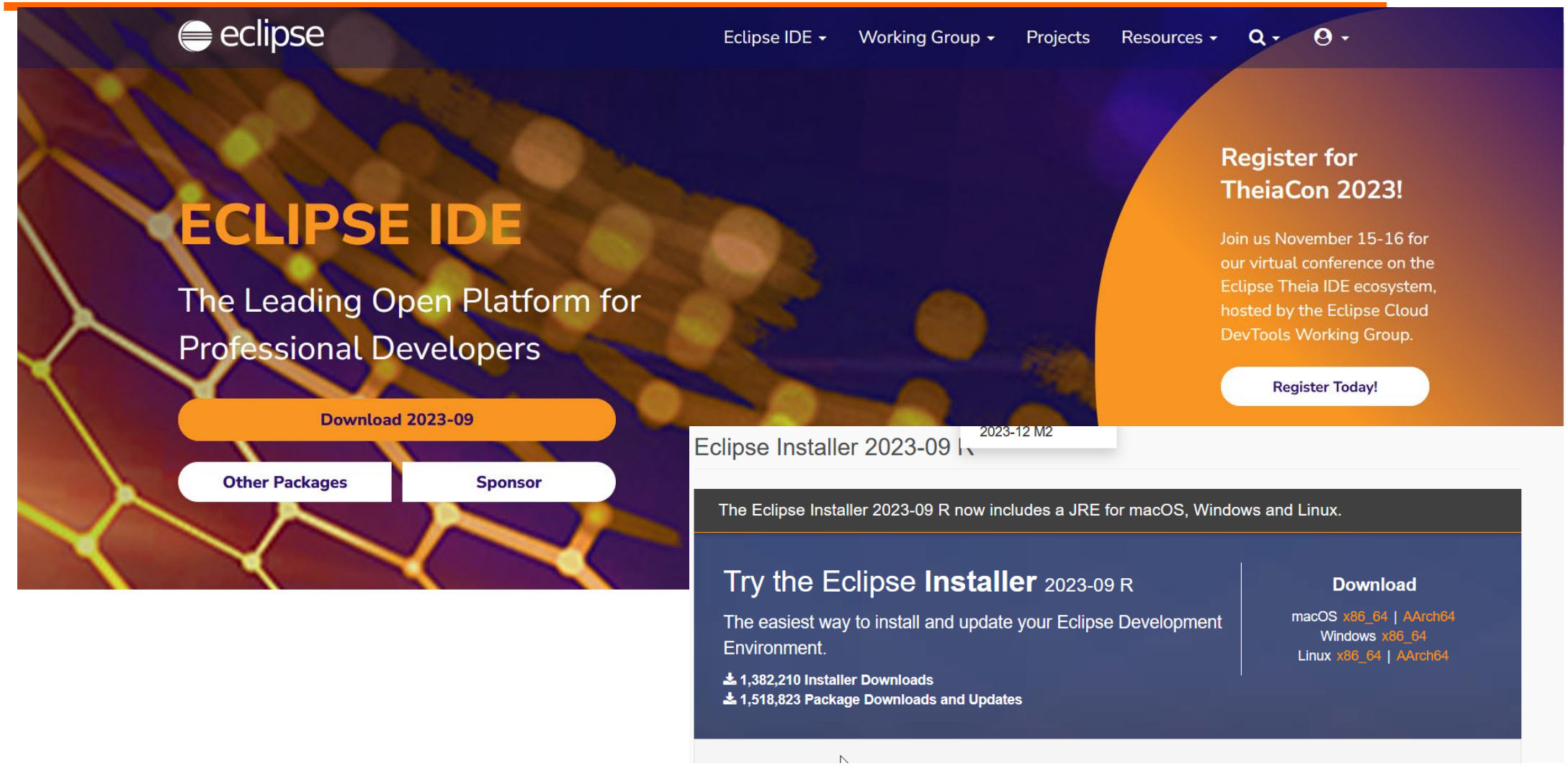
Project requirements

Development Environment



Hometasks submission

1. Create solution
2. Commit it to the GitHub repository
3. Record screencast
4. Answer questions
5. Upload to the Ilias zip file named as teamHA#.zip which contains links to the screencast and solution

On-site presentation on 9 February

Evaluated:

- originality of the solution – 30%,
- individual impact of each team member 30%,
- knowledge in the object-oriented programming 30%,
- quality of the presentation 10%

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Part 1. Exception Handling

Java specific keywords for exception handling purposes

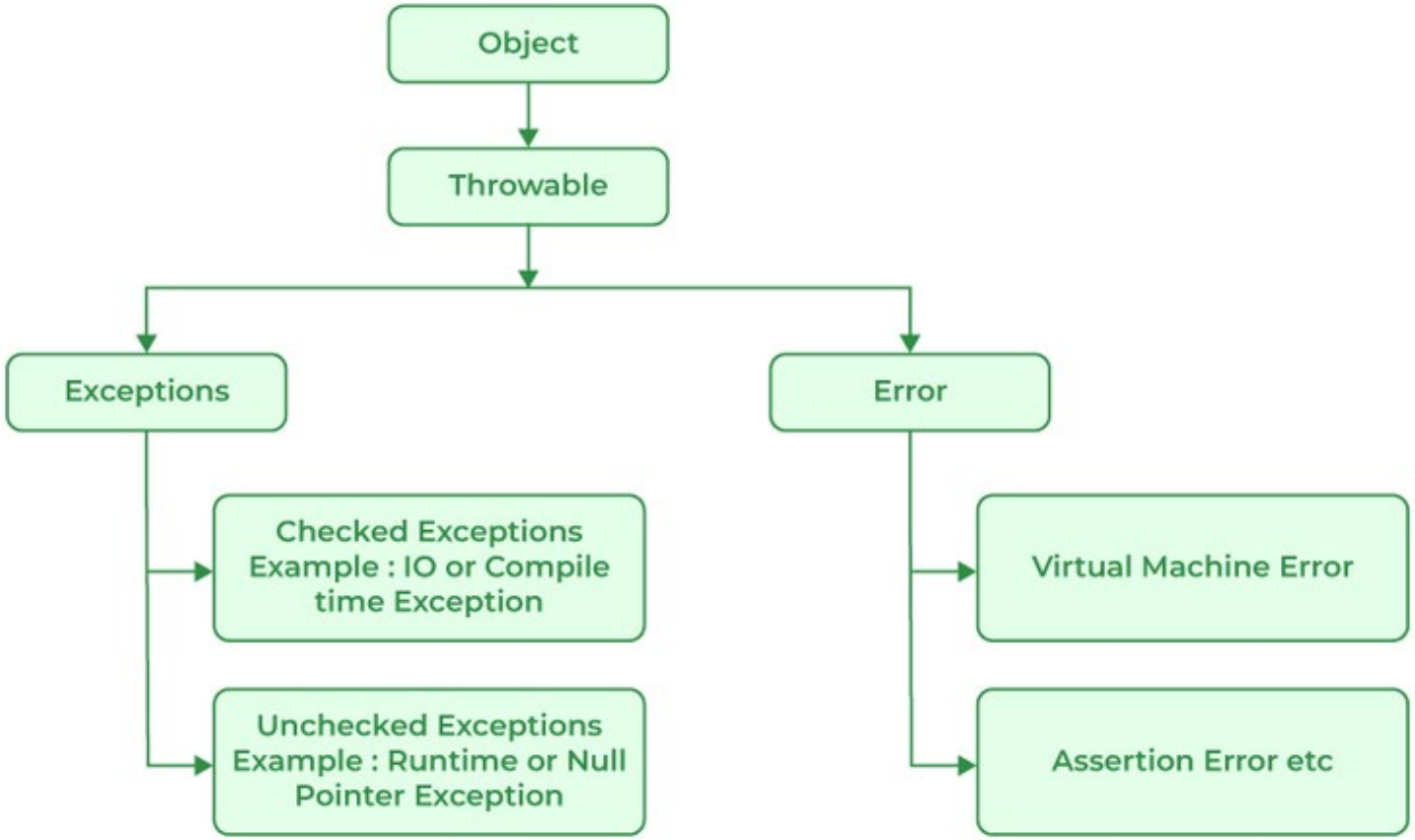
- throw – We know that if an error occurs, an exception object is getting created and then Java runtime starts processing to handle them. Sometimes we might want to generate exceptions explicitly in our code. For example, in a user authentication program, we should throw exceptions to clients if the password is null. The throw keyword is used to throw exceptions to the runtime to handle it.
- throws – When we are throwing an exception in a method and not handling it, then we have to use the throws keyword in the method signature to let the caller program know the exceptions that might be thrown by the method. The caller method might handle these exceptions or propagate them to its caller method using the throws keyword. We can provide multiple exceptions in the throws clause, and it can be used with the main() method also.
- try-catch – We use the try-catch block for exception handling in our code. try is the start of the block and catch is at the end of the try block to handle the exceptions. We can have multiple catch blocks with a try block. The try-catch block can be nested too. The catch block requires a parameter that should be of type Exception.
- finally – the finally block is optional and can be used only with a try-catch block. Since exception halts the process of execution, we might have some resources open that will not get closed, so we can use the finally block. The finally block always gets executed, whether an exception occurred or not.

Reasons for Exceptions

- Invalid user input
- Device failure
- Loss of network connection
- Physical limitations (out-of-disk memory)
- Code errors
- Opening an unavailable file

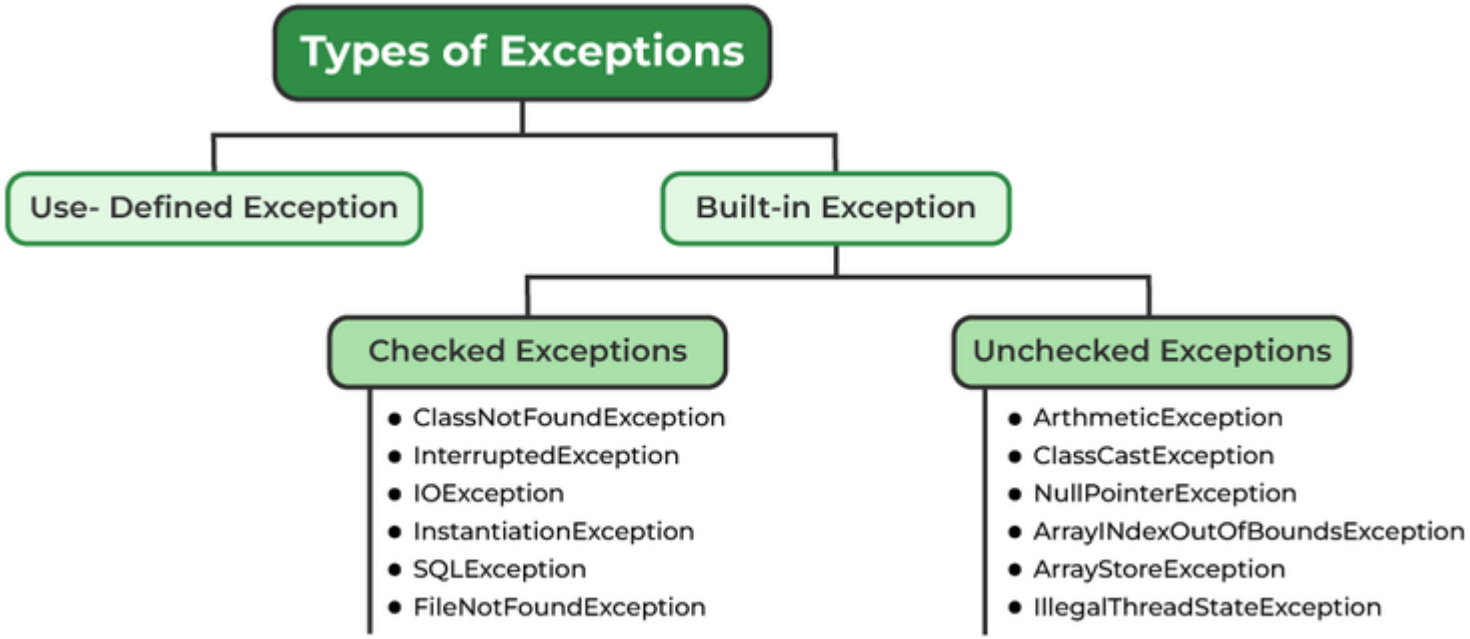
- **Error:** An Error indicates a serious problem that a reasonable application should not try to catch.
- **Exception:** Exception indicates conditions that a reasonable application might try to catch.

Exception Hierarchy

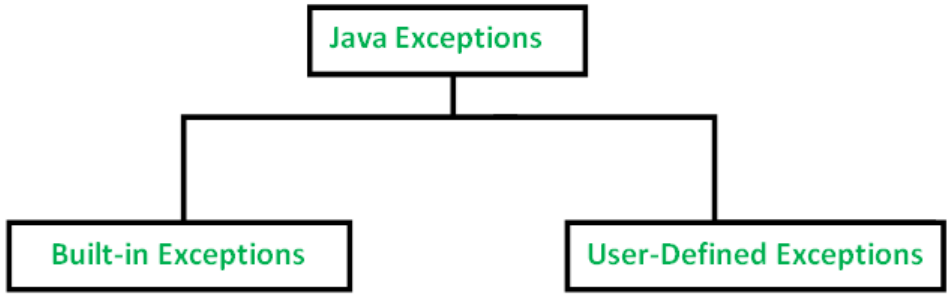


https://www.geeksforgeeks.org/exceptions-in-java/

Types of exceptions



https://media.geeksforgeeks.org/wp-content/uploads/20230714113547/Exceptions-in-Java-1-768.png




```
class ArithmeticException_Demo
{
public static void main(String args[])
{
try {
int a = 30, b = 0;
int c = a/b; // cannot divide by zero
System.out.println ("Result = " + c);
}
catch(ArithmeticException e) {
System.out.println ("Can't divide a number by 0");
}
}
}
```

https://www.geeksforgeeks.org/types-of-exception-in-java-with-examples/

- Built-in exceptions are the exceptions that are available in Java libraries. These exceptions are suitable to explain certain error situations. Below is the list of important built-in exceptions in Java.
    1. **ArithmeticException:** It is thrown when an exceptional condition has occurred in an arithmetic operation.
    2. **ArrayIndexOutOfBoundsException:** It is thrown to indicate that an array has been accessed with an illegal index. The index is either negative or greater than or equal to the size of the array.
    3. **ClassNotFoundException:** This Exception is raised when we try to access a class whose definition is not found
    4. **FileNotFoundException:** This Exception is raised when a file is not accessible or does not open.
    5. **IOException:** It is thrown when an input-output operation failed or interrupted
    6. **InterruptedException:** It is thrown when a thread is waiting, sleeping, or doing some processing, and it is interrupted.
    7. **NoSuchFieldException:** It is thrown when a class does not contain the field (or variable) specified
    8. **NoSuchMethodException:** It is thrown when accessing a method that is not found.
    9. **NullPointerException:** This exception is raised when referring to the members of a null object. Null represents nothing
    10. **NumberFormatException:** This exception is raised when a method could not convert a string into a numeric format.
    11. **RuntimeException:** This represents an exception that occurs during runtime.
    12. **StringIndexOutOfBoundsException:** It is thrown by String class methods to indicate that an index is either negative or greater than the size of the string
    13. **IllegalArgumentException :** This exception will throw the error or error statement when the method receives an argument which is not accurately fit to the given relation or condition. It comes under the unchecked exception.
    14. **IllegalStateException :** This exception will throw an error or error message when the method is not accessed for the particular operation in the application. It comes under the unchecked exception.

User-Defined Exceptions


```
public class MyException extends Exception {


private static final long serialVersionUID =
4664456874499611218L;


private String errorCode = "Unknown_Exception";


public MyException(String message, String
errorCode) {
super(message);
this.errorCode=errorCode;
}


public String getErrorCode() {
return this.errorCode;
}
}
```

Home task1.

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1. Read the tutorial https://docs.oracle.com/javase/tutorial/essential/exceptions/index.html
2. Give answers on the following the tasks:
    1. Give the example of the **try-with-resources Statement**
    2. What is the purpose of throw statement
    3. Which classes inherit from Throwable class
    4. Give 5 different examples of catching and handling exceptions

1. Create the class for exception handling in your project. Distribute the task in your team so that each teamber responsibility to cover the topic:
    a. **Handling Multiple Exceptions**
    b. **Re-throwing Exceptions**:
    c. **Resource Management**:
    d. **Chaining Exceptions**
2. Upload your project to the GitHub.
3. Record 8 min screencast of your work. Upload to the personal YouTube channel
4. Submit a link to the GitHub project and a link to the YouTube video.