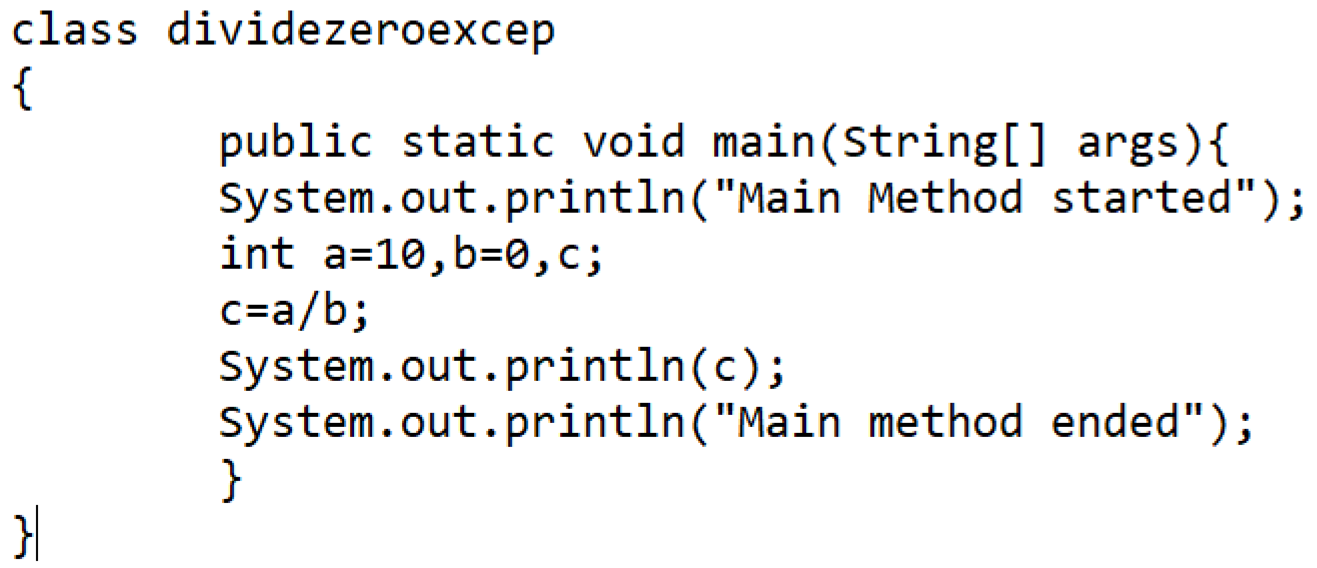
Exception Handling

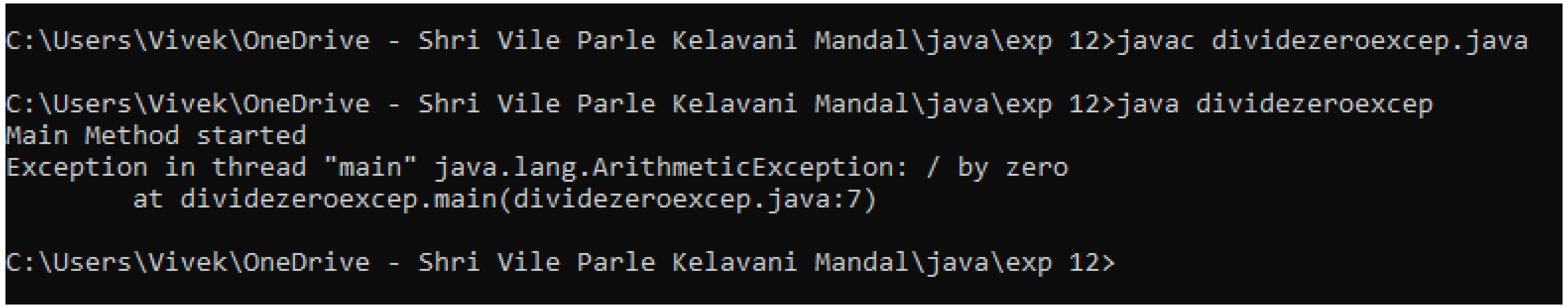
What is Exception?

- A situation which is Unexpected/Unwanted/abnormal that occurred during runtime.
- Reasons of Exceptions

1. Invalid user input
2. code errors
3. Device failure
4. The loss of a network connection,
5. Insufficient memory to run an application,
6. A memory conflict with another program,
7. A program attempting to divide by zero or a user attempting to open files that are unavailable.



```
class dividezeroexcep
{
        public static void main(String[] args){
        System.out.println("Main Method started");
        int a=10,b=0,c;
        c=a/b;
        System.out.println(c);
        System.out.println("Main method ended");
        }
}
```



```
C:\Users\Vivek\OneDrive - Shri Vile Parle Kelavani Mandal\java\exp 12>javac dividezeroexcep.java

C:\Users\Vivek\OneDrive - Shri Vile Parle Kelavani Mandal\java\exp 12>java dividezeroexcep
Main Method started
Exception in thread "main" java.lang.ArithmeticException: / by zero
        at dividezeroexcep.main(dividezeroexcep.java:7)

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```

Handling

- Exception handling is done by writing code when such exception occurs.
- The core advantage of exception handling is **to maintain the normal flow of the application**.

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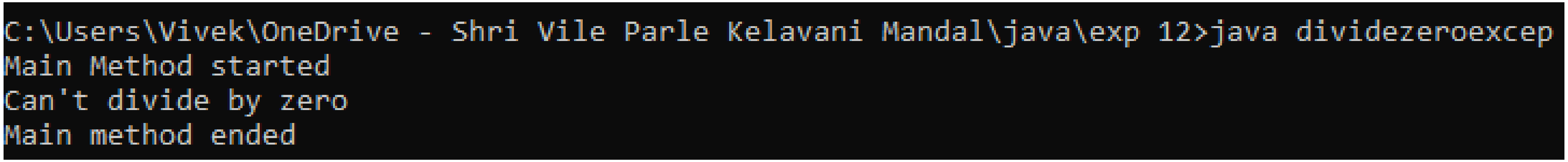
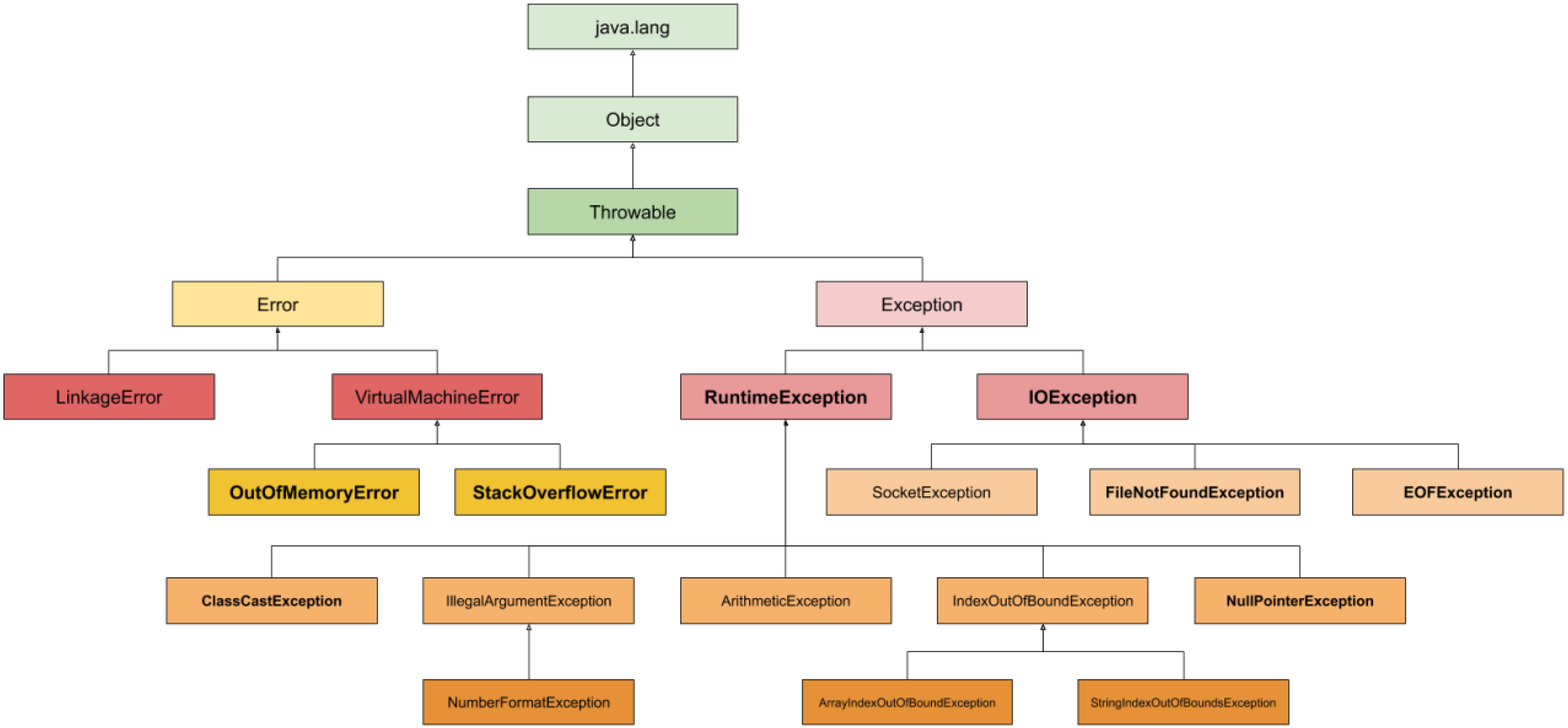
```
class dividezeroexcep
{
        public static void main(String[] args){
        System.out.println("Main Method started");
        int a=10,b=0,c;
        try{
        c=a/b;
        System.out.println(c);
        }
        catch(Exception e)
        {
                System.out.println("Can't divide by zero");
        }
                System.out.println("Main method ended");
        }
}
```



```
C:\Users\Vivek\OneDrive - Shri Vile Parle Kelavani Mandal\java\exp 12>java dividezeroexcep
Main Method started
Can't divide by zero
Main method ended
```

```
class dividezeroexcep
{
        public static void main(String[] args){
        System.out.println("Main Method started");
        int a=10,b=0,c;
        try{
        c=a/b;
        System.out.println(c);
        }
        catch(ArithmeticException e)
        {
                System.out.println("Can't divide by zero");
        }
                System.out.println("Main method ended");
        }
}
```


java.lang
Object
Throwable
Error
Exception
LinkageError
VirtualMachineError
RuntimeException
IOException
OutOfMemoryError
StackOverflowError
SocketException
FileNotFoundException
EOFException
ClassCastException
IllegalArgumentException
ArithmeticException
IndexOutOfBoundException
NullPointerException
NumberFormatException
ArrayIndexOutOfBoundException
StringIndexOutOfBoundsException

Difference between Error and Exception

1. Error

- It cannot and should not be handled by the developer.
- It usually tends to signal the end of your program
- It signals that the program cannot recover and causes you to exit the program altogether instead of trying to handle it.

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Difference between Error and Exception Cont..

2. Exceptions

- It can and should be handled by the developer.
- Otherwise, they will surely lead to abnormal termination of the program.
- They are objects of a type ‘System.Exception’ class and arise when non-fatal and recoverable errors occur during run-time

Types of Exceptions

1. **Checked Exceptions:**

- Arise during compilation time.
- The compiler checks for these exceptions and whether the programmer has handled them.
- If not handle checked exceptions, then, it causes a compilation error, and the program will not compile.
- Examples: classNotFound Exception, SQL Exception, IO Exception, etc.

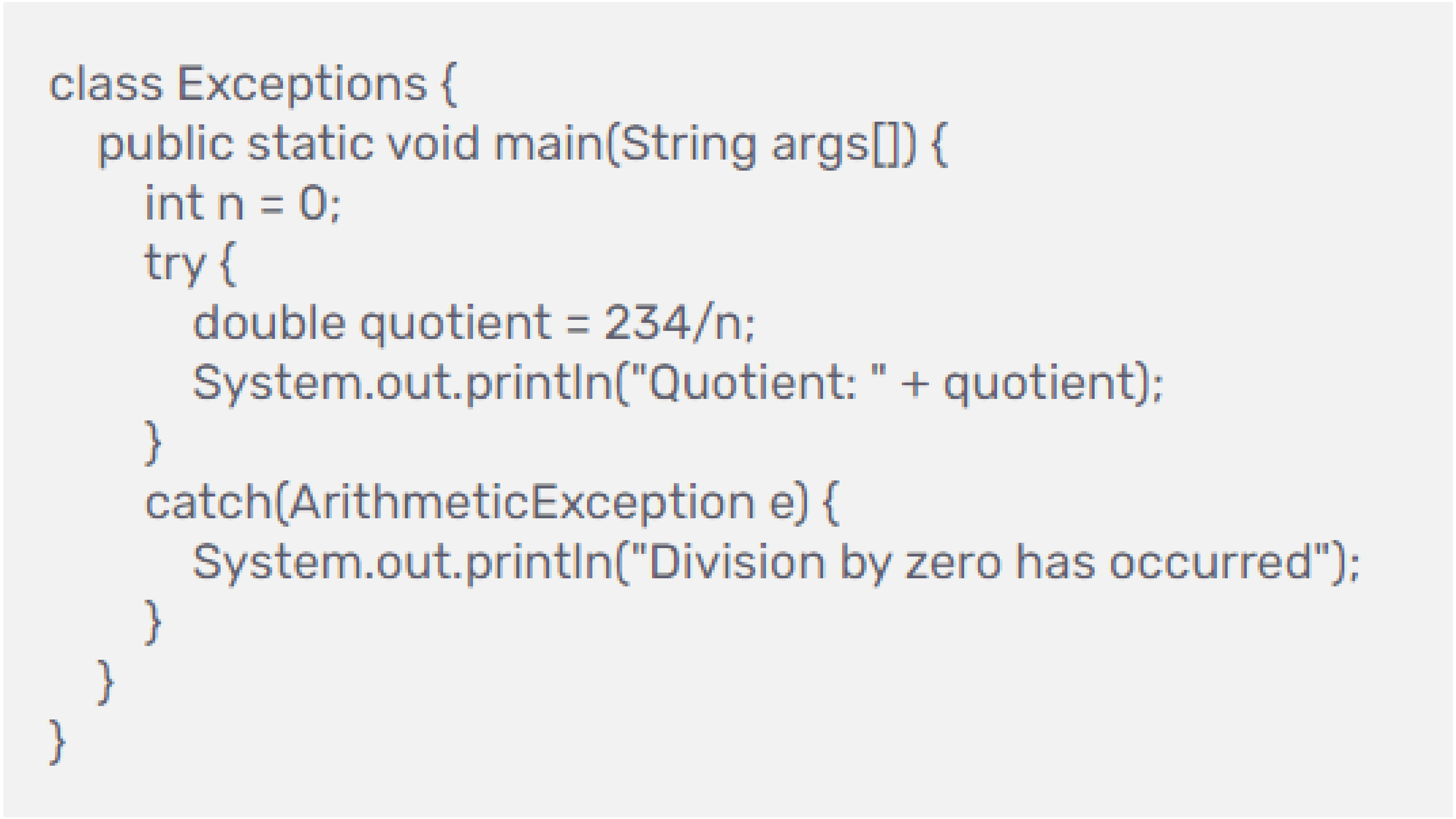
Keywords

- **The Try Block**
- The try block contains those lines which can cause an exception and can have one or more legal lines of code.
- If an exception occurs at a particular statement of the try block, the rest of the statements will not be executed.
- It is recommended to exclude those lines which won't throw an exception.

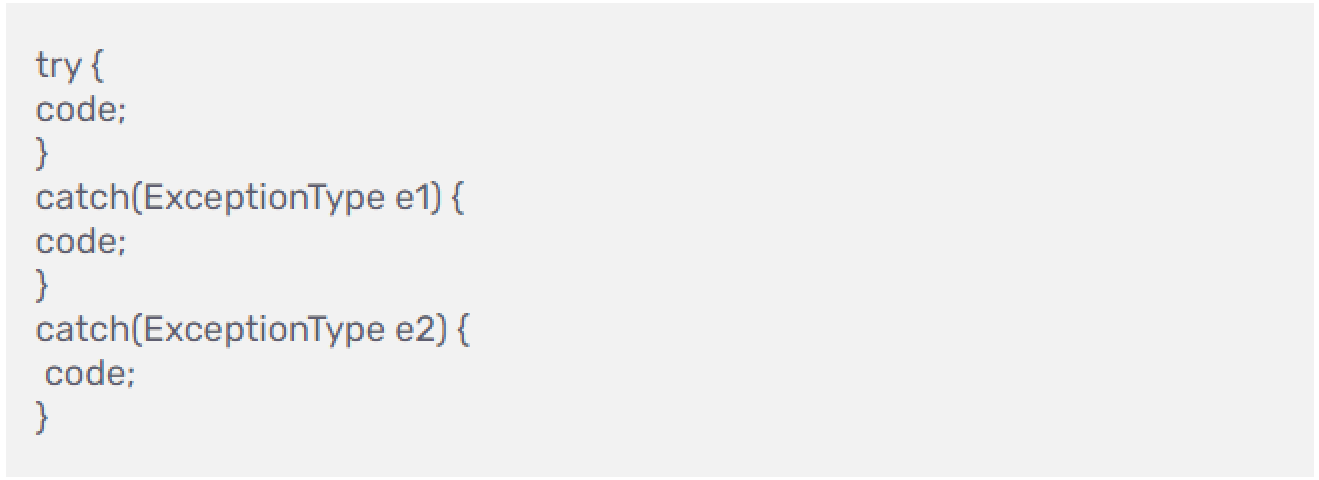
```
try {
 Block of code;
}
catch and finally blocks...
```

Keywords

- **The Catch Block**
- The catch block handles the exception.
- It contains lines of code that will be executed if an exception occurs.
- Each catch block is an exception handler that handles the type of exception specified by the argument.
- The argument type *ExceptionType* declares the type of exception that the handler can handle and must be the name of a class that inherits from the Throwable class.
- The Throwable class is the super-class of all the errors and exceptions in Java.



```
class Exceptions {
  public static void main(String args[]) {
    int n = 0;
    try {
      double quotient = 234/n;
      System.out.println("Quotient: " + quotient);
    }
    catch(ArithmeticException e) {
      System.out.println("Division by zero has occurred");
    }
  }
}
```



```
try {
code;
}
catch(ExceptionType e1) {
code;
}
catch(ExceptionType e2) {
 code;
}
```

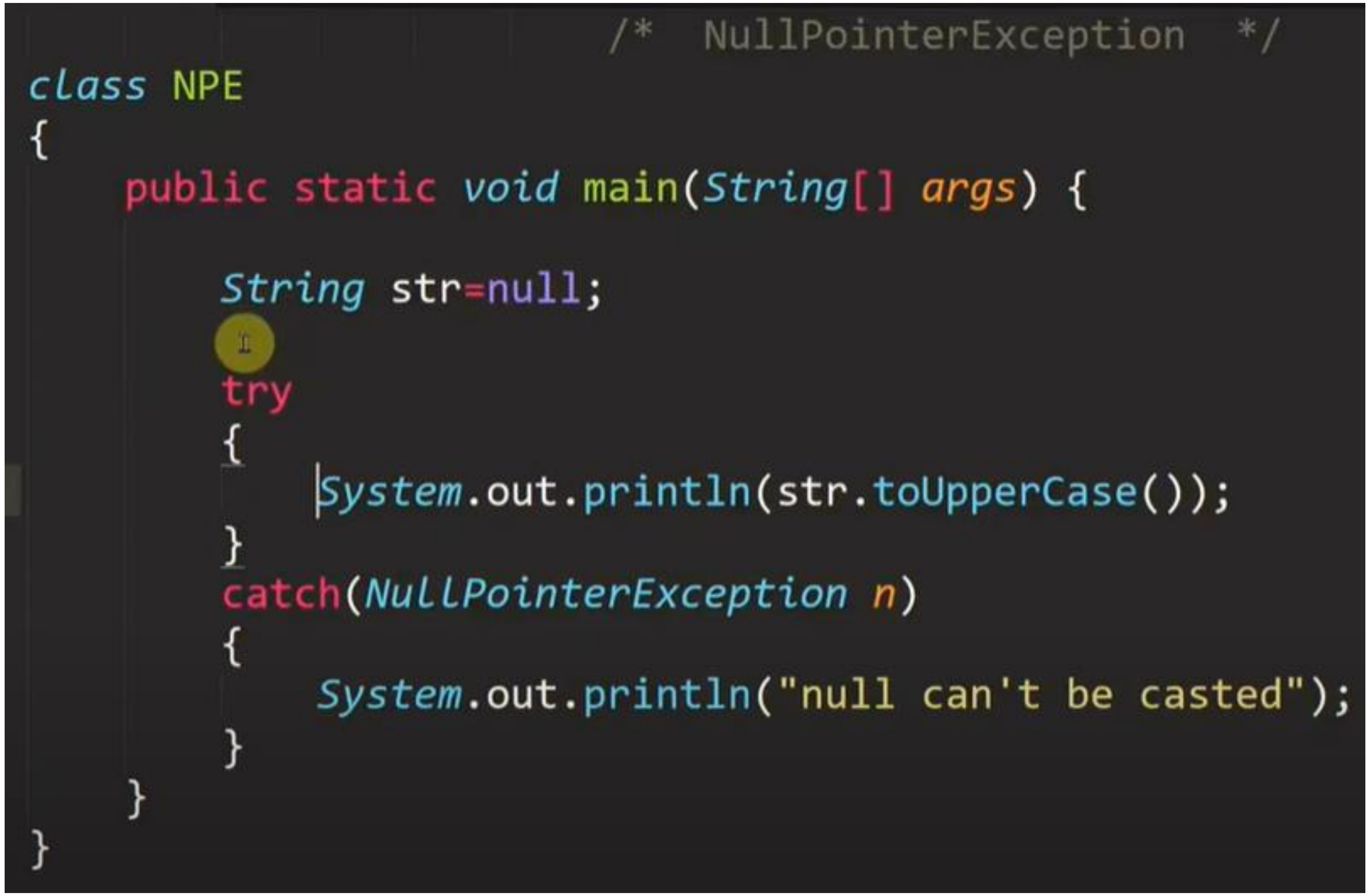
the class ArithmeticException is an instance of a Throwable class and is thrown by the JVM to handle the arithmetic exceptions.

Important Points

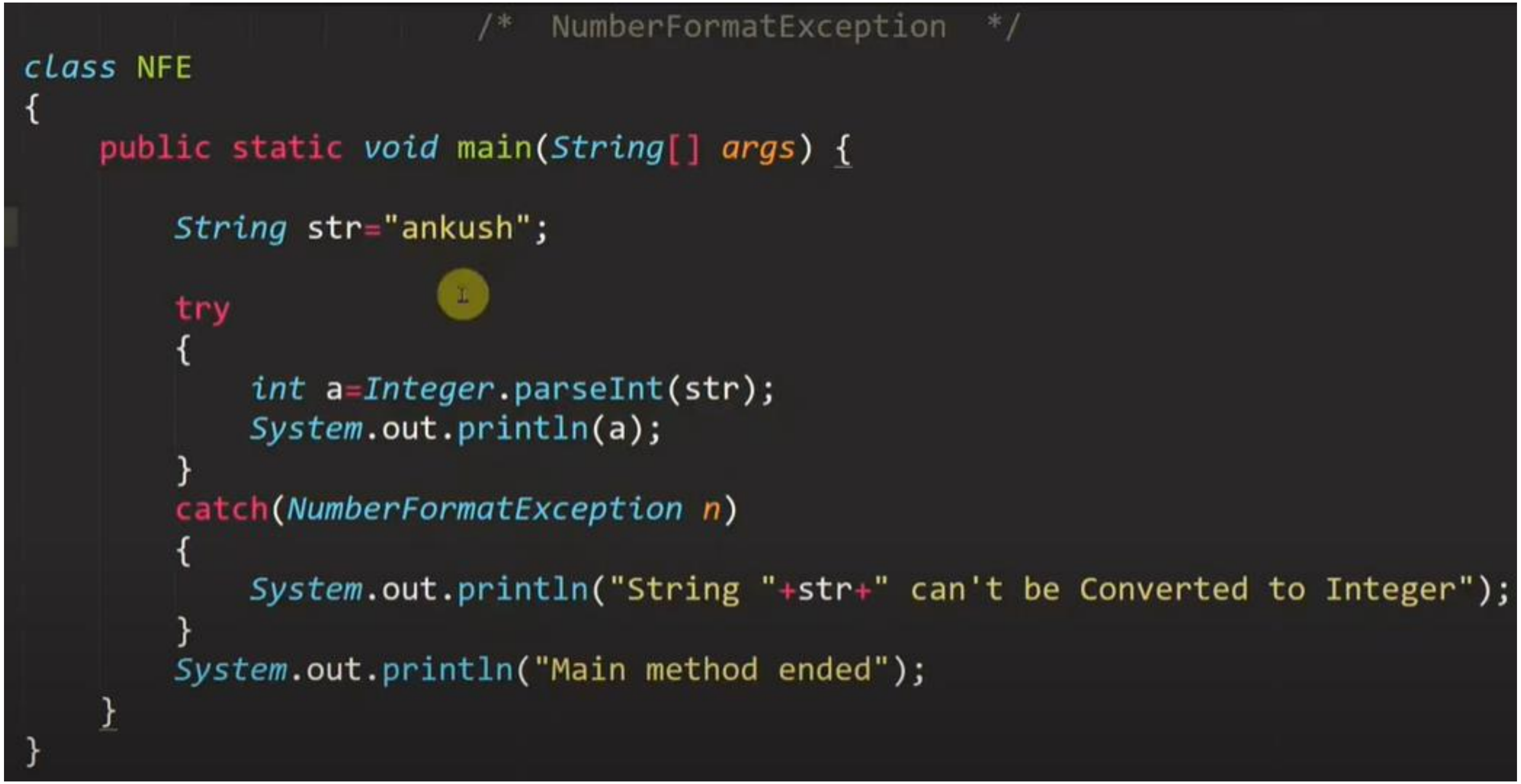
- The try block has to be followed by a catch block.
- No lines of code can come in between Try and Catch.
- There may be multiple catch blocks to one try block.
- Each catch block handles different types of exceptions.
- The catch block is executed as and when the exception matching the exception type in the handler is invoked.

example- catch(ArithmeticException e) will handle only arithmetic exceptions, catch(NullPointException e) will handle only NullPointExceptions.

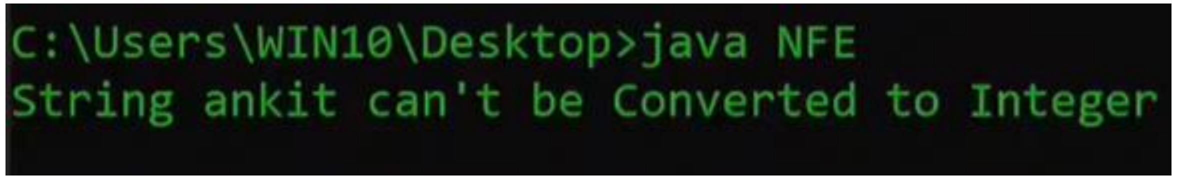
- If no exception occurs, then all the catch blocks will be completely ignored.



```
                                /*  NullPointerException  */
class NPE
{
    public static void main(String[] args) {

        String str=null;

        try
        {
            System.out.println(str.toUpperCase());
        }
        catch(NullPointerException n)
        {
            System.out.println("null can't be casted");
        }
    }
}
```



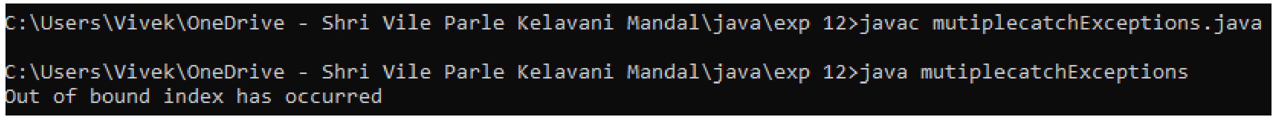
```
                  /*  NumberFormatException  */
class NFE
{
    public static void main(String[] args) {

        String str="ankush";

        try
        {
            int a=Integer.parseInt(str);
            System.out.println(a);
        }
        catch(NumberFormatException n)
        {
            System.out.println("String "+str+" can't be Converted to Integer");
        }
        System.out.println("Main method ended");
    }
}
```



```
C:\Users\WIN10\Desktop>java NFE
String ankit can't be Converted to Integer
```

Multiple catch blocks

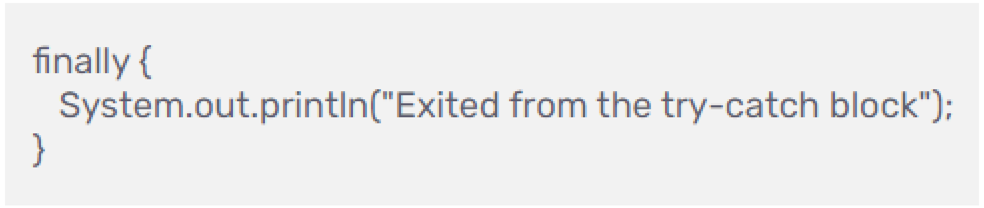
```
class mutiplecatchExceptions {
  public static void main(String args[]) {
    int n = 0;
    int A[] = {1,2,3,4,5};
    try {
      System.out.println("Element: " + A[7]);
      double quotient = 234/n;
      System.out.println("Quotient: " + quotient);
    }
    catch(ArithmeticException e) {
      System.out.println("Division by zero has occurred");
    }
    catch(ArrayIndexOutOfBoundsException e) {
      System.out.println("Out of bound index has
occurred");
    }
    catch(Exception e) {
      System.out.println("Some other exception has
occurred");
    }
  }
}
```



```
C:\Users\Vivek\OneDrive - Shri Vile Parle Kelavani Mandal\java\exp 12>javac mutiplecatchExceptions.java

C:\Users\Vivek\OneDrive - Shri Vile Parle Kelavani Mandal\java\exp 12>java mutiplecatchExceptions
Out of bound index has occurred
```

Finally Block

- ‘finally’ block will be executed whether an exception occurs.
- This block is written after the end of all the catch blocks.
- This block is not just useful in handling exceptions but also helps the programmer to avoid cleaning up the code that may have been bypassed by a continue, return or break statement.
- example, ‘finally’ close the database connection. So that even if there is an exception, we are sure that the database connection will get closed.



```
finally {
  System.out.println("Exited from the try-catch block");
}
```

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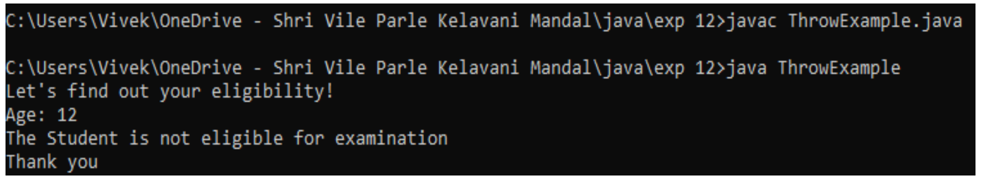
Throw Block

- Throw keyword to throw custom exceptions or User Defined Exceptions.
- Block can handle exception when thrown by someone or something.
- Either the programmer throws it or the JVM does it.
- We have seen that an instance of the Throwable class has been thrown whenever an exception arises.

- Example to find out whether a student is eligible to sit for an exam based on his/her age. If he/she is older than 15 years, he/she will be eligible for the exam otherwise not. Here, we can explicitly throw an exception with a suitable message with a condition based on age



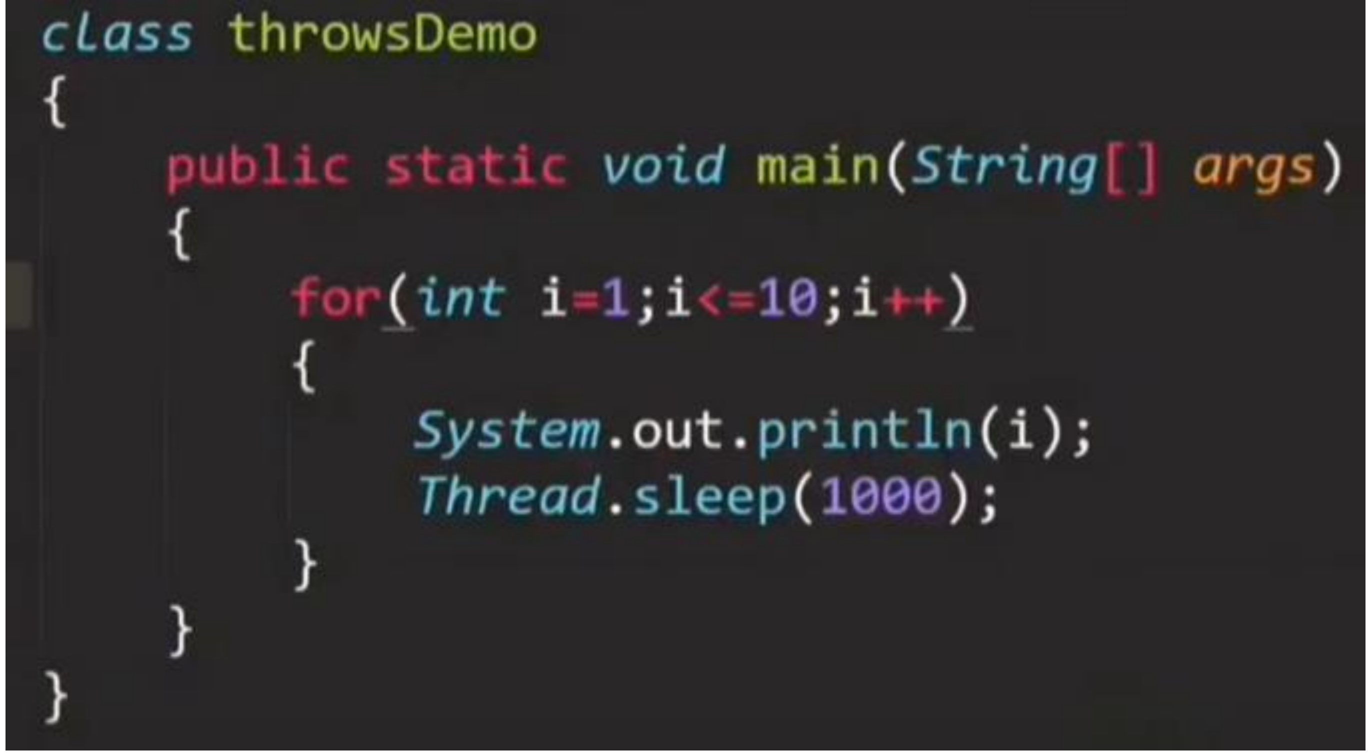
```
C:\Users\Vivek\OneDrive - Shri Vile Parle Kelavani Mandal\java\exp 12>javac ThrowExample.java

C:\Users\Vivek\OneDrive - Shri Vile Parle Kelavani Mandal\java\exp 12>java ThrowExample
Let's find out your eligibility!
Age: 12
The Student is not eligible for examination
Thank you
```

```
public class ThrowExample {
  static void checkEligibilty(int age){
   System.out.println("Age: " + age);
   try{
     if(age<15) {
       throw new ArithmeticException("The Student is not
eligible for examination");
     }
     else {
       System.out.println("The Student is Eligible!");
     }
   }
   catch(ArithmeticException e) {
     System.out.println(e.getMessage());
   }
  }
  public static void main(String args[]){
    System.out.println("Let's find out your eligibility!");
    checkEligibilty(12);
    System.out.println("Thank you");
 }
}
```

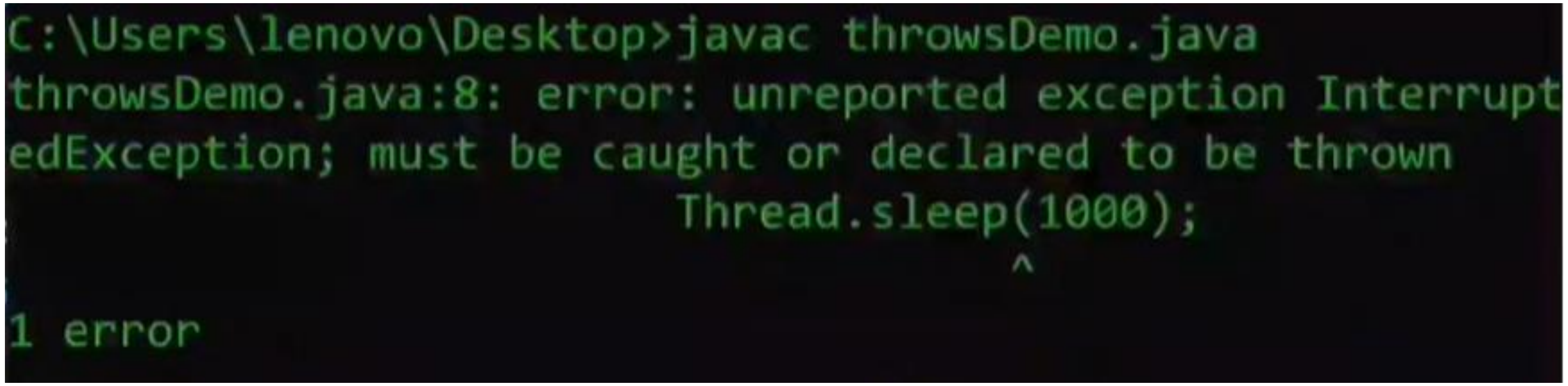
Throws Keyword

- The throws keyword is used to indicate that a particular method may throw an exception of a specific type.
- The caller handles using a try-catch block.
- The throws keyword declares an exception and if not handled, could cause compilation errors.
- This keyword is used to handle only ‘checked exceptions’, i.e., compile-time exceptions.

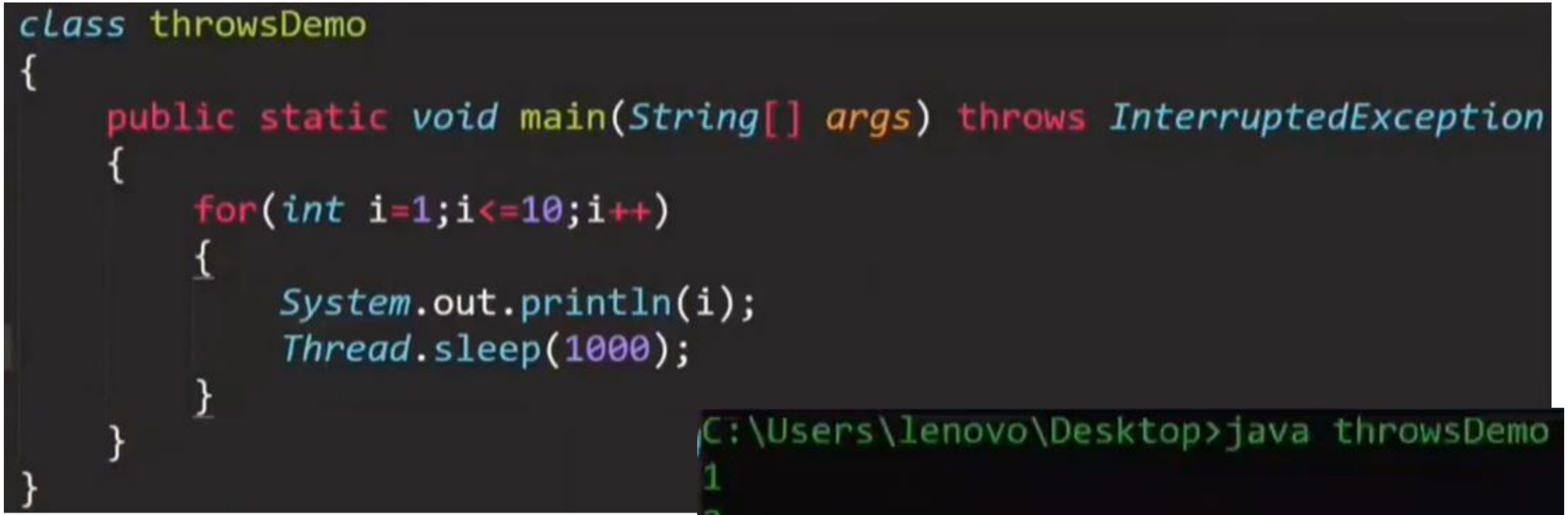
```
import java.io.*;
class ThrowsExample {
   public static void main(String args[]) throws IOException {
      throw new IOException("Exception has arised.");
   }
}
```



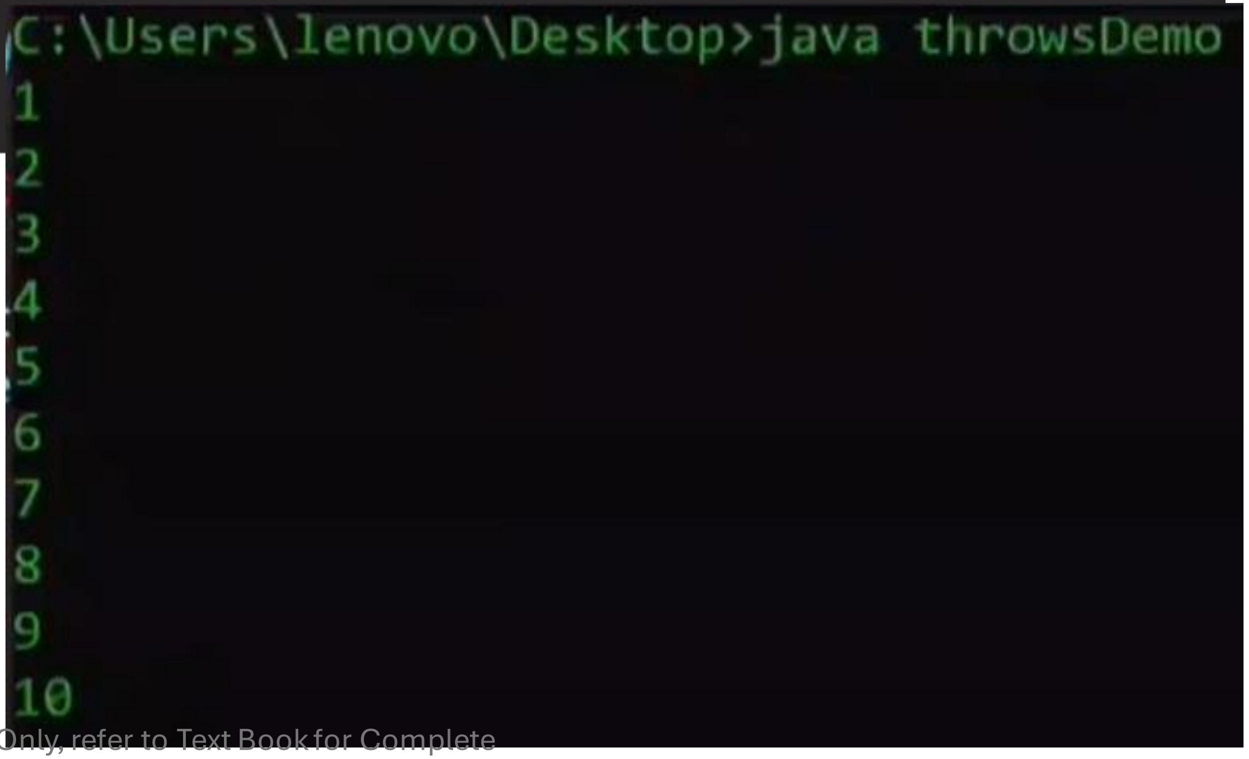
```java
class throwsDemo
{
    public static void main(String[] args)
    {
        for(int i=1;i<=10;i++)
        {
            System.out.println(i);
            Thread.sleep(1000);
        }
    }
}
```



```
C:\Users\lenovo\Desktop>javac throwsDemo.java
throwsDemo.java:8: error: unreported exception Interrupt
edException; must be caught or declared to be thrown
                        Thread.sleep(1000);
                                    ^
1 error
```



```java
class throwsDemo
{
    public static void main(String[] args) throws InterruptedException
    {
        for(int i=1;i<=10;i++)
        {
            System.out.println(i);
            Thread.sleep(1000);
        }
    }
}
```



```
C:\Users\lenovo\Desktop>java throwsDemo
1
2
3
4
5
6
7
8
9
10
```

JVM will handle the interruption

InputStreamReader

- InputStreamReader acts as a bridge between byte streams and character streams. It reads bytes from an input stream and decodes them into characters based on a specified character encoding. This is important because:
- Programs often deal with text data, which is represented as characters.
- Underlying input sources like files or network connections typically provide data as bytes.

BufferedReader

- BufferedReader is a buffered character-input stream that sits on top of an InputStreamReader. It adds a buffer to improve the performance of reading text data. Here's how it works:
- **Buffering:** BufferedReader internally maintains a character buffer. Instead of reading characters from the underlying InputStreamReader one by one, it reads a block of characters at once and stores them in the buffer.
- **Methods:** BufferedReader inherits methods from Reader and provides additional methods like readLine() to read entire lines of text efficiently.

Throws Example

```
import java.io.*;
class Example {
   public void artOfTesting(int n) throws
IOException, ClassNotFoundException{
      System.out.println("Inside artOfTesting");
      if(n<0)
         throw new IOException("IOException
occurred");
      else
         throw new
ClassNotFoundException("ClassNotFoundExcepti
on occurred");
   }
}
```

```
class ThrowsExample {
   public static void main(String args[]) {
      Example E = new Example();
      try {
         E.artOfTesting(-1);
      }
      catch(IOException e) {
         System.out.println(e.getMessage());
      }
      catch(ClassNotFoundException e) {
         System.out.println(e.getMessage());
      }
      finally {
         System.out.println("Inside main method");
      }
   }
}
```