

# Exception Handling

"Understanding, Using, and Handling runtime errors "  
**Advanced in Programming**

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# Agenda

- 1 Understanding Exception
- 2 Exceptions in Java
  - Introduction
  - Different Scenarios
  - Catching Exceptions; Syntax, and Example
- 3 Exceptions in PHP
  - Exception without try catch
  - Exception with try and catch
- 4 Exceptions in Python
  - Exception without try catch
  - Exception with try catch
- 5 Questions and Discussion



# What are exceptions?

- **Exception:** errors that rise during programs execution, indication of problem that occurs during a program's execution, or an event that disrupts the normal flow of the program (e.g. divide by zero)
- **Exception Handling:** mechanism to handle such problems and errors e.g. `IndexOutOfBoundsException`, `IO`, `SQL`, `Remote` etc.
- Core advantage is to *maintain the normal flow of the application*
- There are mainly two types of exceptions:
  - **Checked exceptions:** exceptions that occurs at compile time, can not be ignored (e.g. `IOException`, `SQLException` etc.)
  - **Unchecked exceptions:** occurs at program execution time also called runtime exceptions, and are ignored at compile time. These include programming bugs, such as logic errors or improper use of an API (e.g. `ArithmeticExceptions`, `NullPointerException` etc. )
  - **Errors:** These are not exceptions at all, but problems that arise beyond the control of the user or the programmer (e.g. `OutOfMemoryError`, `VirtualMachineError` etc.)



# Exception Handling Terminology

- Common terms used by most of the programming languages in exception handling *throw, rise, try, except, catch, finally*
  - **throw**; used to trigger an exception, must have at least one catch
  - **rise**; same as throw statement
  - **try**; a block where an exception may occur and for which a particular exception will be activated
  - **catch**; specify the type of exception to be handled
  - **except**; same as catch statement
  - **finally**; block that run in either condition, whether an exception occur or not



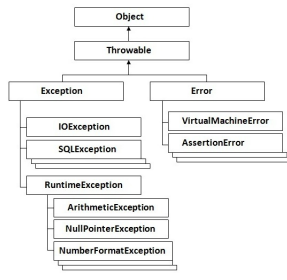
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# Java and Exception handling

- Java Exception Handling Keywords: *try, catch, finally, throw, and throws*
- All exception classes are subtypes of `java.lang.Exception` class
- Exception class is a subclass of the `Throwable` class
- There is another subclass called `Error` which is derived from the `Throwable` class



[1]

Figure: Hierarchy of Java Exception classes



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# Common Java exceptions scenario

- Common scenario in which exceptions may occur:

## 1 ArithmeticException

```
int a=50/0;//ArithmeticException
```

[1]

## 2 NullPointerException

```
String s=null;  
System.out.println(s.length());//NullPointerException
```

[1]

## 3 NumberFormatException

```
String s="abc";  
int i=Integer.parseInt(s);//NumberFormatException
```

[1]

## 4 ArrayIndexOutOfBoundsException

```
int a[]=new int[5];  
a[10]=50; //ArrayIndexOutOfBoundsException
```

[1]





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# Catching Exception

- A method catches exception using a combination of *try* and *catch* blocks.
- *try/catch* block is placed around the code which might rise an exception
- Code within *try/catch* block is referred to as protected code

## Syntax [2]

```
try{  
    // protected code  
} catch (ExceptionName excep){  
    // code that execute in case an exception occur  
}
```



# Catching Exception Example

## Handling IndexOutOfBoundsException Example [2]

```
// File Name : ExcepTest.java
import java.io.*;
public class ExcepTest {
    public static void main(String args[]) {
        try {
            int var[] = new int[2];
            System.out.println("Access element three :" + var[3]);
        } catch (ArrayIndexOutOfBoundsException e) {
            System.out.println("Exception thrown :" + e);
        }
        System.out.println("Out of the block");
    }
}
```



# throw and throws keywords

- *throws*: used to postpone the handling of a checked exception
- *throw*: used to invoke an exception explicitly

## Example: throws RemoteException, InsufficientFundsException [2]

```
import java.io.*;
public class Account {
    public void deposit(double amount) throws RemoteException {
        // Method implementation
        throw new RemoteException();
    }
    public void withdraw(double amount) throws RemoteException, InsufficientFundsException {
        // Method implementation
        throw new RemoteException();
        if (this.amount < amount){
            throw new InsufficientFundsException();
        }
    }
    // Remaining of class definition
}
```



# User defined exception

## User defined InsufficientFundsException Example [2]

```
// File Name InsufficientFundsException.java
import java.io.*;
public class InsufficientFundsException extends Exception {
    private double amount;
    public InsufficientFundsException(double amount) {
        this.amount = amount;
    }
    public double getAmount() {
        return amount;
    }
}
```



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# PHP: Exception without try catch

## User defined InsufficientFundsException Example [3]

```
<?php
//create function with an exception
function checkNum($number) {
    if($number > 1) {
        throw new Exception("Value must be 1 or below");
    }
    return true;
}
//trigger exception
checkNum(2);
?>
```

### Output:

```
Fatal error: Uncaught exception 'Exception'
with message 'Value must be 1 or below' in C:\webfolder\test.php:6
Stack trace: #0 C:\webfolder\test.php(12):
checkNum(28) #1 {main} thrown in C:\webfolder\test.php on line 6
```

[3]



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# PHP: Exception with try and catch

## User defined InsufficientFundsException Example [3]

```
<?php
//create function with an exception
function checkNum($number) {
    if($number > 1) {
        throw new Exception("Value must be 1 or below");
    }
    return true;
}
//trigger exception in a "try" block
try {
    checkNum(2);
    //If the exception is thrown, this text will not be shown
    echo 'If you see this, the number is 1 or below';
}
//catch exception
catch(Exception $e) {
    echo 'Message: ' . $e->getMessage();
}
?>
```

### Output:

Message: Value must be 1 or below

[3]



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# Python: Exception without try catch

Python uses: *try, except, and finally for exception handling*

## Example test.py

```
# /usr/bin/python  
fh = open("testfile", "r")
```

---

Traceback (most recent call last):

File "[/Users/jank/Desktop/PythonTut/test.py](#)", line 1, in <module>

fh = open('testfile', 'r')

FileNotFoundError: [Errno 2] No such file or directory: 'testfile'



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# Python: Exception with try catch

```
#!/usr/bin/python
```



```
try:
    fh = open("testfile", "w")
    try:
        fh.write("This is my test file for exception handling!!")
    finally:
        print "Going to close the file"
        fh.close()
except IOError:
    print "Error: can't find file or read data"
```

[1]



# Your Turn: Time to hear from you!



1



<sup>1</sup><https://fensafitters.files.wordpress.com/2013/07/3d095.jpg>

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