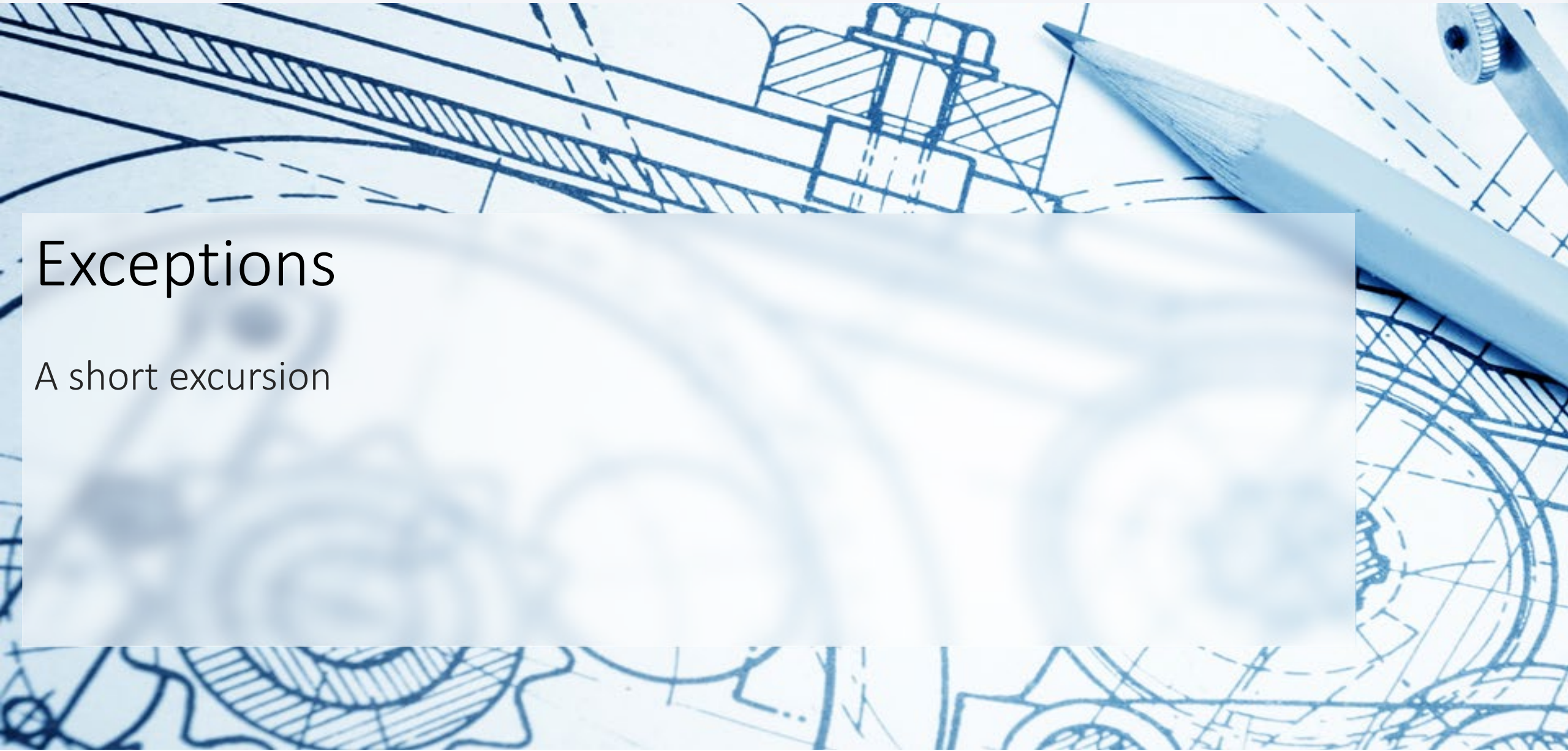

Exceptions

A short excursion

Exceptions in Java

Throwing of Exceptions

- How is an Exception thrown?
- When should you throw an Exception?

Catching of Exceptions

- How does the caller handle an Exception?
- What to do when an Exception can not be handled reasonably?

Recap

Finally an explanation to NullPointerException, ArrayIndexOutOfBoundsException!

Throwing an Exception

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Method declares it can throw an Exception under certain circumstances

```
public void doSomething() throws Exception{
    if(somethingWentWrong){
        throw new Exception("Uh-oh");
    }
    //normal execution when everything is fine
}
```

Throwing of the Exception Method is immediately left

Executed if no Exception needed to be thrown

Irregular State: Throw Exception

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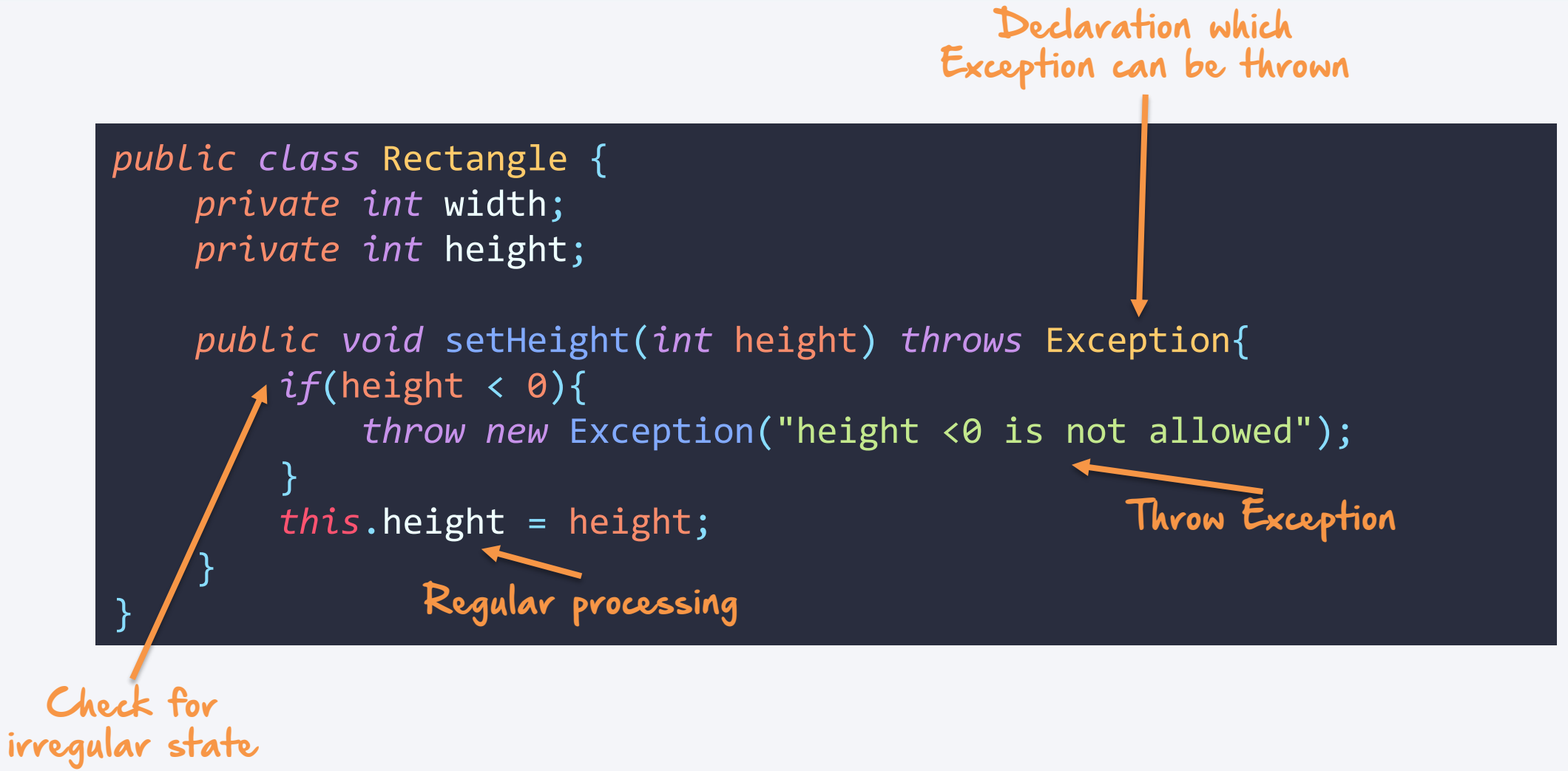

Catching Exceptions

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```
try {
  //call method that could throw an Exception
} catch (Exception ex) {
  //try to safe or recover
}
```

Same Exception-Class as declared in the method

Instructions for regular processing

Example


```
public Rectangle createRectangle(){
    int width;
    int height;

    Scanner s = new Scanner(System.in);
    height = s.nextInt();
    width = s.nextInt();
    Rectangle rectangle = new Rectangle();
    try{
        rectangle.setHeight(height);
    }catch(Exception ex){
        //What reasonable thing could we do here
    }
    return rectangle;
}
```

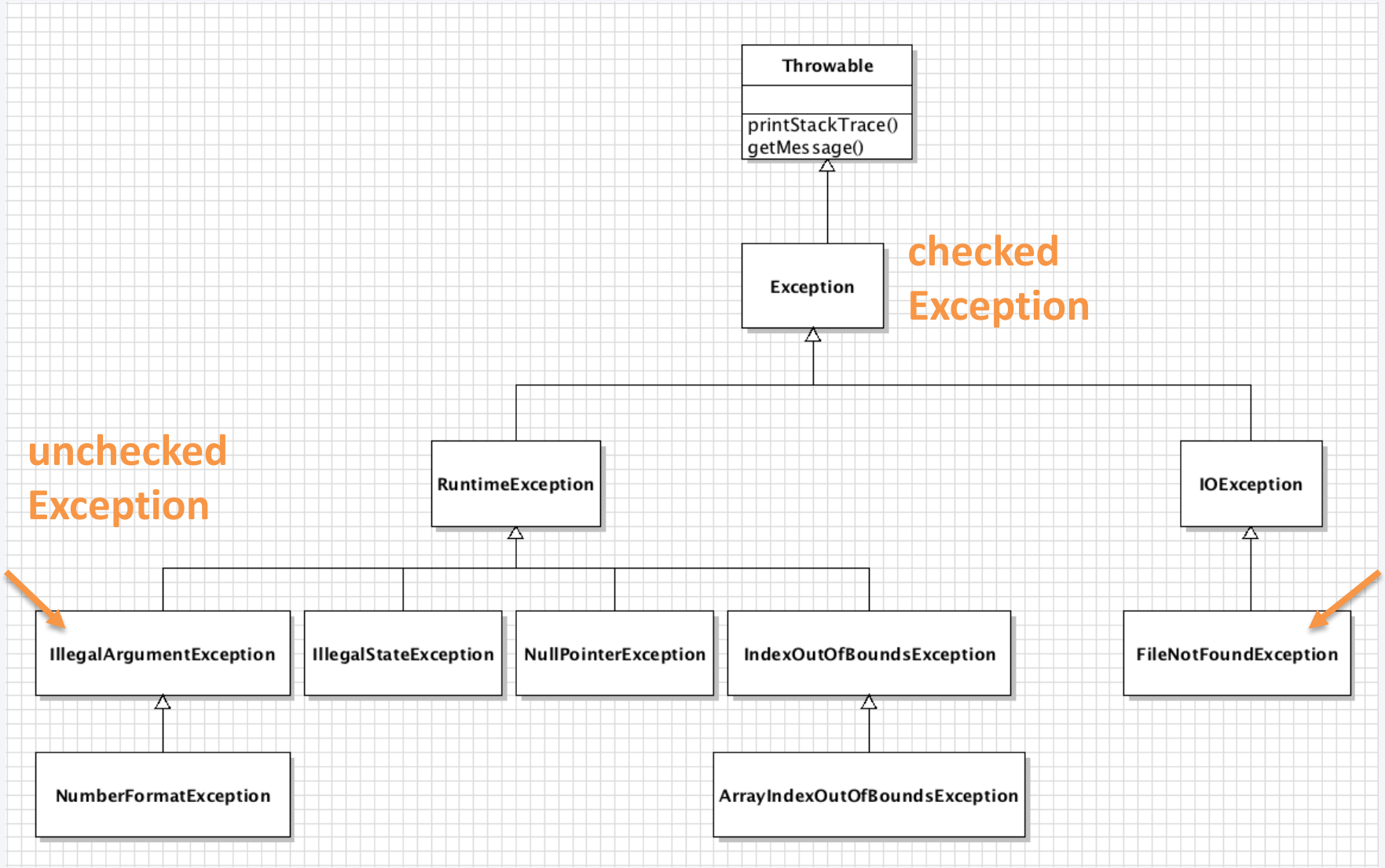
But wait…?

Why did we use so few try-catch-blocks?

We get tons of Exceptions like `NullPointerException` or `ArrayIndexOutOfBoundsException`

Do not all Exceptions have to be caught in a try-catch-block?

Excerpt of the Exception-Classhierarchy



Checked Exception – Checking through the Compiler

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```
public class FileExceptionExample {
    ...
    public void readFile() throws FileNotFoundException{
        ...
        throw new FileNotFoundException("no file found");
        ...
    }

    public void someMethod(){
        try{
            readFile();
        }catch(FileNotFoundException ex){
          //do what is possible
        }
    }

    public void someOtherMethod() throws FileNotFoundException{
        readFile();
    }
}
```

All thrown exceptions need to be declared

Catching of declared Exceptions

Forward a declared Exception that can not be handled appropriately

Unchecked Exception – Handling of runtime errors

RuntimeExceptions do not need to be declared

```
public void setSize(int size){
    if((size <= 8) || (size >= 120)){
        throw new IllegalArgumentException("Wrong size!");
    }else{
        this.size = size;
    }
}
```

Checked vs. Unchecked Exceptions

Checked Exceptions (checked by the Compiler)

- For foreseeable exceptional situations
  - Server is not running
  - File is not available
  - General: An external resource is not available

Unchecked Exception (Runtime Error)

- As a reaction to a coding error
- Error with the caller
  - Illegal parameters

```
throw new IllegalArgumentException();
throw new ArrayIndexOutOfBoundsException();
throw new NullPointerException();
```

- Error within a method

```
throw new IllegalStateException();
```

Control flow in try-catch-blocks

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Try-block is executed first

```
   try{
1)     int result = calculateSomething();
2)     int x = result * result;
   }catch(Exception ex){
       System.out.println("Error!");
   }
3)System.out.println("Done");
```

CalculateSomething can throw an Exception

The catch-block is not executed

Then code below the catch block

If "try" is successful (throws no Exception)

Control flow in try-catch-blocks

calculateSomething fails. The rest of the try-block is not executed

Is executed after the catch-block

```
  try{
1)    int result = calculateSomething();
      int x = result * result;
  }catch(Exception ex){
2)      System.out.println("Error!");
  }
3)System.out.println("Done");
```

CalculateSomething can throw an Exception

The catch-block is executed

If "try" fails (throws an Exception)

The **finally** keyword


```
public void cook(){
    try{
        turnOnStove();
        bakeACake();
    }catch(Exception ex){
        System.out.println("Something went wrong!");
    }finally {
        turnOffStove();
    }
}
```

The code in the finally-block is always executed

Control Flow with Exceptions

Experiment with **ExceptionTest** (on AD)

test = “nein”

test = “ja”

Stepwise Debugging of the class

Exceptions Recap

A method can throw an Exception, if something goes wrong at runtime

A method throws an Exception using the **throw** keyword, followed by a new Exception-Object

Exceptions of the type RuntimeException are **not** checked by the compiled
- Neither do they need to be declared or handled by a try/catch-block
- Are used when programming errors occur

Checked Exceptions are checked by the compiler
- The **Exception** needs to be declared in the method
- The calling code needs to be wrapped in a try/catch-block…
- … or continue to throw the Exception up the chain
- Checked Exceptions are used when calls to external resources fail

JDK contains loads of different Exceptions
- It is usually not necessary to implement your own RuntimeException-class
- Checked Exceptions are usually application specific subclasses of **Exception**