Java Exception and its types:

◇ What is an Exception?

- **Exception** = an **unexpected event** at runtime that disrupts normal program flow.
- All exceptions in Java are **objects** that inherit from Throwable.

◇ Types of Exceptions in Java

Java divides exceptions into **two main categories**:

1. **Checked Exceptions**

- Checked **at compile-time**.
- You must handle them with try-catch or declare with throws.
- Example: file not found, invalid input/output, SQL errors.

Examples:

- IOException
- SQLException
- ClassNotFoundException
- FileNotFoundException
- InterruptedException

```
import java.io.*;

class Test {
  public static void main(String[] args) {
    try {
      FileReader fr = new FileReader("abc.txt"); // File may not exist
    } catch (IOException e) {
      System.out.println("File not found: " + e);
    }
  }
}
```

2. **Unchecked Exceptions**

- Also called **Runtime Exceptions**.
- Not checked at compile-time, only occur while running.
- Usually due to programmer mistakes (dividing by zero, null access, etc.).

Examples:

- ArithmeticException
- NullPointerException
- ArrayIndexOutOfBoundsException
- NumberFormatException
- IllegalArgumentException

```
class Test {
  public static void main(String[] args) {
    int a = 10 / 0; // ArithmeticException
  }
}
```

3. **Errors** (not exceptions, but part of Throwable)

- Serious problems the program **cannot recover from**.
- Usually due to system-level issues (memory full, JVM crash, etc.).

Examples:

- OutOfMemoryError
- StackOverflowError
- VirtualMachineError

```
class Test {
   public static void main(String[] args) {
      main(null); // recursive call → StackOverflowError
   }
}
```

◇ Exception Hierarchy (simple view)

```
Object
└── Throwable
     ├── Exception
     │    ├── Checked Exceptions
     │    └── Unchecked Exceptions (RuntimeException)
     └── Error
```

◇ Summary Table

Type	Checked at Compile?	Examples	Recovery Possible?
Checked	✅ Yes	IOException, SQLException	Yes (handle with try-catch)
Unchecked	❌ No	NullPointerException, ArithmeticException	Usually yes
Error	❌ No	OutOfMemoryError, StackOverflowError	No (fatal issues)