Advanced Programming

Error Handling & Exception Management in Java

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Table of Contents

Before Exceptions — Traditional Error Management

```
int divide(int a, int b) {
    if (b == 0) return -1; // error signal
    return a / b;
}
```

Problems:

- Magic error values (`-1` , `null` , etc.)
- Hard to detect real failure vs result
- No call stack → debugging is painful

> Traditional error codes are weak and ambiguous.

Exception Handling in Java

```java
try {
    // code that may fail
} catch (Exception e) {
    // recovery / fallback
}
```

Benefits:

- Clear failure path
- Stack trace preserved
- Encourages predictable failure patterns

`try` / `catch` / `finally`

```java
try {
    FileReader f = new FileReader("data.txt");
} catch (FileNotFoundException e) {
    System.out.println("File not found");
} finally {
    System.out.println("Cleanup always runs");
}
```

- `finally` always executes (except `System.exit()` / JVM crash).
- Use for **cleanup**: closing files, sockets, DB connections.

Checked vs Unchecked Exceptions

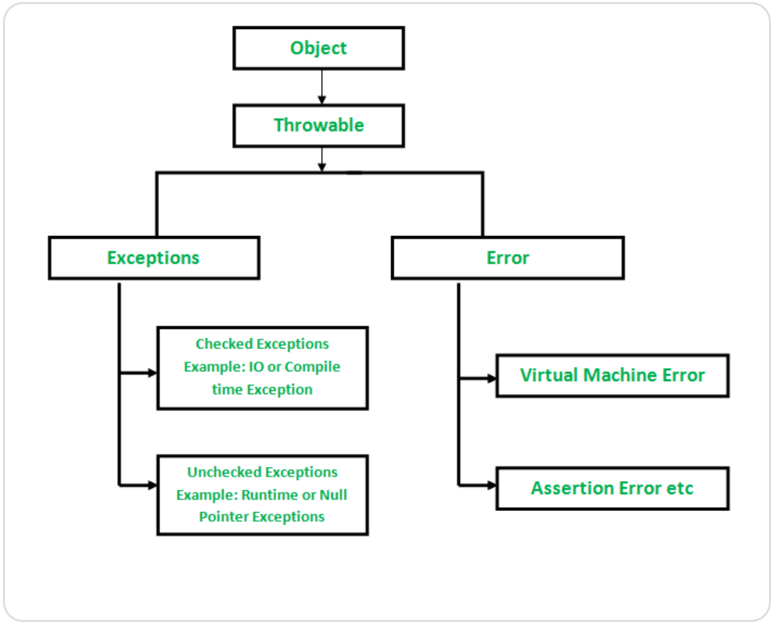
Type	Inherits From	Must Handle?	Root Cause	Examples
Checked	`Exception`	**Yes**	External failures	`IOException`, `SQLException`
Unchecked	`RuntimeException`	No	Logic bugs	`NullPointerException`, `ArithmeticException`

> Checked = environment uncertainty
> Unchecked = programming mistake

Visual Comparison — Checked

Checked Exceptions

- Caused by environment (I/O, network)
- Developer must acknowledge the risk
- Encourages recovery strategy


Object
Throwable
Exceptions
Error
Checked Exceptions Example: IO or Compile time Exception
Unchecked Exceptions Example: Runtime or Null Pointer Exceptions
Virtual Machine Error
Assertion Error etc

Visual Comparison — Unchecked

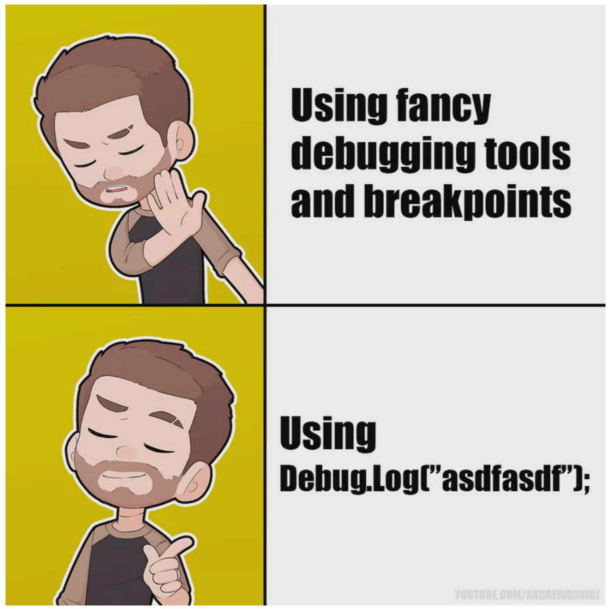
Unchecked Exceptions

- Caused by incorrect logic in code
- No forced handling
- Should be solved by fixing logic

Developer Humor Break

> “It works on my machine.”

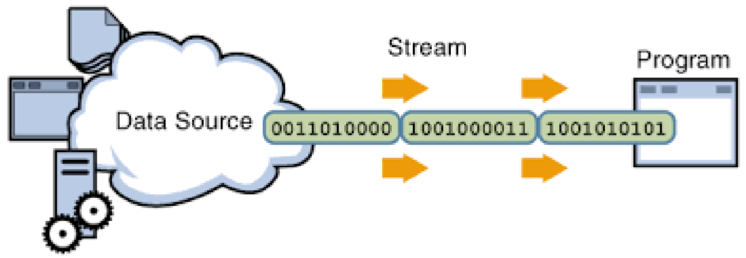
```
Translation:
I have absolutely no idea why it doesn't work anywhere else.
```


Using fancy debugging tools and breakpoints
Using Debug.Log("asdfasdf");
YOUTUBE.COM/ANDREWDAVIDJ

Real-World Example — Checked

```java
void loadConfig() throws IOException {
    FileReader reader = new FileReader("config.json");
    // process...
}
```

- The file may not exist
- Storage may be corrupted
- Permissions may differ



Real-World Example — Unchecked

```
void greet(User user) {
    System.out.println(user.name); // may throw NullPointerException
}
```

Correct approach:

```
void greet(User user) {
    if (user == null) throw new IllegalArgumentException("User cannot be null");
    System.out.println(user.name);
}
```

Developer Humor Break #2

Developer:

```
No need for error handling, my code cannot fail.
```

Production:

```
Exception: Are you sure about that?
```

Big Picture Flow Diagram

```
Outside World (Unpredictable)
            ↓
+-----------------------+
|  CHECKED EXCEPTION    |
+-----------------------+
  Must handle or declare
```

```
Developer Logic (Bug)
            ↓
+-----------------------+
| UNCHECKED EXCEPTION   |
+-----------------------+
  Fix the code logic
```

Summary

Concept	Key Idea
Checked Exceptions	Handle real-world uncertainty
Unchecked Exceptions	Fix broken program logic
`finally`	Always used for cleanup
Good Practice	Fail clearly, fail meaningfully

> Robust software is not only coded — it is **defensively designed**.

Thank You!

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