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Exception Handling

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Java Exception Handling

- Program can operate Warn and continue, or terminate gracefully
- even if exceptions occur
- Allows for grouping of types of exceptions
- Separates exception-handling logic from normal functionality

https://docs.oracle.com/javase/tutorial/essential/exceptions/advantages.html

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Types of Exceptions

Type	Description	Catch/Throw?
Error	Problem occurred **external** to application (in JVM)	*Not Usually*
Runtime Exception	Programs **cannot** anticipate or recover from, usually a bug.	*Optional*
Checked Exception	Programs **should** anticipate and recover from.	**Required**

https://docs.oracle.com/javase/tutorial/essential/exceptions/catchOrDeclare.html

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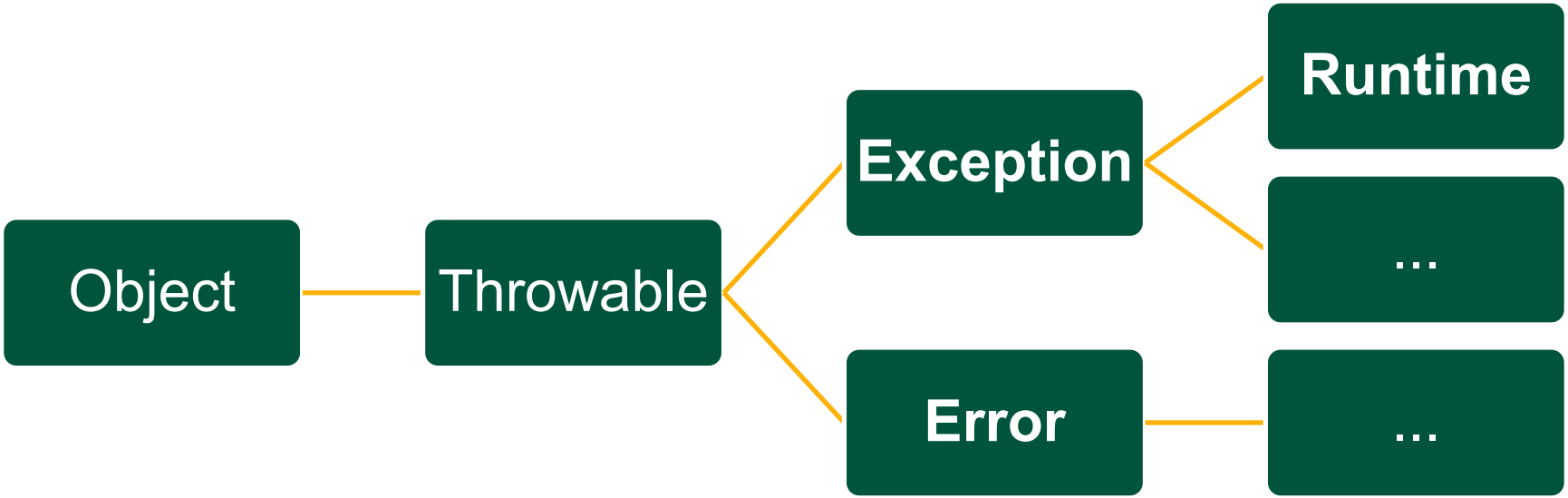
Exception Hierarchy



https://docs.oracle.com/javase/tutorial/essential/exceptions/throwing.html

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Errors

- Indicate a serious problem external to program (in JVM) occurred
- Usually not addressed by simple programs
- For example, an IOError from hard drive failure while reading an open file

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Runtime Exceptions

- Includes all Exception subclasses under RuntimeException
- Can be caught or thrown, but not required
- Often indicates code defects
- For example, accessing an array out of bounds

https://docs.oracle.com/javase/tutorial/essential/exceptions/catchOrDeclare.html

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Common Runtime Exceptions

- ArithmeticException
- IndexOutOfBoundException
  - ArrayIndexOutOfBoundsException
  - StringIndexOutOfBoundsException
- NegativeArraySizeException
- NullPointerException

https://docs.oracle.com/en/java/javase/12/docs/api/java.base/java/lang/RuntimeException.html

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Checked Exceptions

- Includes all Exception subclasses except those under RuntimeException
- Should be anticipated by programmer
- Must be handled by application
- For example, trying to open an non-existent file

https://docs.oracle.com/javase/tutorial/essential/exceptions/catchOrDeclare.html

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Common IO Exceptions

- EOFException
- FileNotFoundException
- FileSystemException
  - NoSuchFileException
- CharacterCodingException
  - MalformedInputException

https://docs.oracle.com/en/java/javase/12/docs/api/java.base/java/io/IOException.html

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Handling Checked Exceptions

- Use try, catch, finally blocks to handle
- Use try-with-resources blocks
  - Added in Java 7 to auto-close resources
- Use throws keyword and catch elsewhere
  - Catch where makes sense to handle exception

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Catching Exceptions

- Any exception type (even unchecked) can be caught
- Can specify multiple catch blocks for each try
- Will execute first matching catch block
  - Related to inheritance, discussed more later
- Can catch more than one exception per handler
- Can throw exceptions within handlers

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API Example

nextInt

`public int nextInt()`

Scans the next token of the input as an `int`.

An invocation of this method of the form `nextInt()` behaves in exactly the same way as the invocation `nextInt(radix)`, where `radix` is the default radix of this scanner.

Returns:

the `int` scanned from the input

Throws:

`InputMismatchException` - if the next token does not match the *Integer* regular expression, or is out of range

`NoSuchElementException` - if input is exhausted

`IllegalStateException` - if this scanner is closed

https://docs.oracle.com/en/java/javase/12/docs/api/java.base/java/util/Scanner.html#nextInt()

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