



# Exception Handling

## Chapter 9

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## Exceptions in Java

- An exception is an object
  - Signals the occurrence of unusual event during program execution
- Throwing an exception
  - Creating the exception object
- Handling the exception
  - Code that detects and deals with the exception

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## Exceptions in Java

- Note **try block**
  - Contains code where something could possibly go wrong
  - If it does go wrong, we *throw an exception*
- Note **catch block**
  - When exception thrown, **catch** block begins execution
  - Similar to method with parameter
  - Parameter is the thrown object

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## Predefined Exception Classes

- Java has predefined exception classes within Java Class Library
  - Can place method invocation in **try** block
  - Follow with **catch** block for this type of exception
- Example classes
  - **BadStringOperationException**
  - **ClassNotFoundException**
  - **IOException**
  - **NoSuchMethodException**

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## Predefined Exception Classes

- Example code

```

SampleClass object = new SampleClass();
try
{
    <Possibly some code>
    object.doStuff(); //may throw IOException
    <Possibly some more code>
}
catch(IOException e)
{
    <Code to deal with the exception, probably including the following:>
    System.out.println(e.getMessage());
}

```

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## Defining Your Own Exception Classes

- Must be derived class of some predefined exception class
  - Text uses classes derived from class **Exception**
- View [sample class](#), listing 9.5  
**class DivideByZeroException  
extends Exception**
- View [demo program](#), listing 9.6  
**class DivideByZeroDemo**

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## Defining Your Own Exception Classes

- Note method `getMessage` defined in exception classes
  - Returns string passed as argument to constructor
  - If no actual parameter used, default message returned
- The type of an object is the name of the exception class

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## Defining Your Own Exception Classes

### Guidelines

- Use the `Exception` as the base class
- Define at least two constructors
  - Default, no parameter
  - With `String` parameter
- Start constructor definition with call to constructor of base class, using `super`
- Do not override inherited `getMessage`

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## Declaring Exceptions

- Consider method where code throws exception
  - May want to handle immediately
  - May want to delay until something else is done
- Method that does not catch an exception
  - Notify programmers with **throws** clause
  - Programmer then given responsibility to handle exception

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## Declaring Exceptions

- Note syntax for throws clause

```
public Type Method_Name(Parameter_List) throws List_Of_Exceptions  
Body_Of_Method
```

- Note distinction
  - Keyword **throw** used to throw exception
  - Keyword **throws** used in method heading to declare an exception

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## Declaring Exceptions

- If a method throws exception and exception not caught inside the method
  - Method ends immediately after exception thrown
- A throws clause in overriding method
  - Can declare fewer exceptions than declared
  - But not more
- View [program example](#), listing 9.7  
`class DoDivision`

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## Kinds of Exceptions

- In most cases, exception is caught ...
  - In a `catch` block ... or
  - Be declared in `throws` clause
- But Java has exceptions you do not need to account for
- Categories of exceptions
  - Checked exceptions
  - Unchecked exceptions

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## Kinds of Exceptions

- *Checked* exception
  - Must be caught in **catch** block
  - Or declared in **throws** clause
- *Unchecked* exception
  - Also called *run-time*
  - Need not be caught in **catch** block or declared in **throws**
  - Exceptions that coding problems exist, should be fixed

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## Kinds of Exceptions

- Examples why unchecked exceptions to are thrown
  - Attempt to use array index out of bounds
  - Null pointer exception
- Uncaught runtime exception terminates program execution

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## Multiple Throws and Catches

- A try block can throw any number of exceptions of different types
- Each catch block can catch exceptions of only one type
  - Order of catch blocks matter
- View [example program](#), listing 9.8  
`class TwoCatchesDemo`

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## Multiple Throws and Catches

- Exceptions can deal with invalid user input
- To handle an exception thrown by a method
  - It does not matter where in the method the `throw` occurs
- Use of `throw` statement be should be reserved for cases where it is unavoidable
- Nested try-catch blocks rarely useful

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## The **finally** Block

- Possible to add a **finally** block after sequence of **catch** blocks
- Code in **finally** block executed
  - Whether or not execution thrown
  - Whether or not required **catch** exists

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## Rethrowing an Exception

- Legal to throw an exception within a **catch** block
- Possible to use contents of **String** parameter to **throw** same or different type exception

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## Summary

- An exception is an object derived from class **Exception**
  - Descendants of class **Error** behave like exceptions
- Exception handling allows design of normal cases separate from exceptional situations
- Two kinds of exceptions
  - Checked and unchecked

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## Summary

- Exceptions can be thrown by
  - Java statements
  - Methods from class libraries
  - Programmer use of **throw** statement
- Method that might **throw** but not **catch** an exception should use **throws** clause
- Exception is caught in **catch** block

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## Summary

- A **try** block followed by one or more **catch** blocks
  - More specific exception **catch** types should come first
- Every exception type has **getMessage** method usable to recover description of caught description
- Do not overuse exceptions