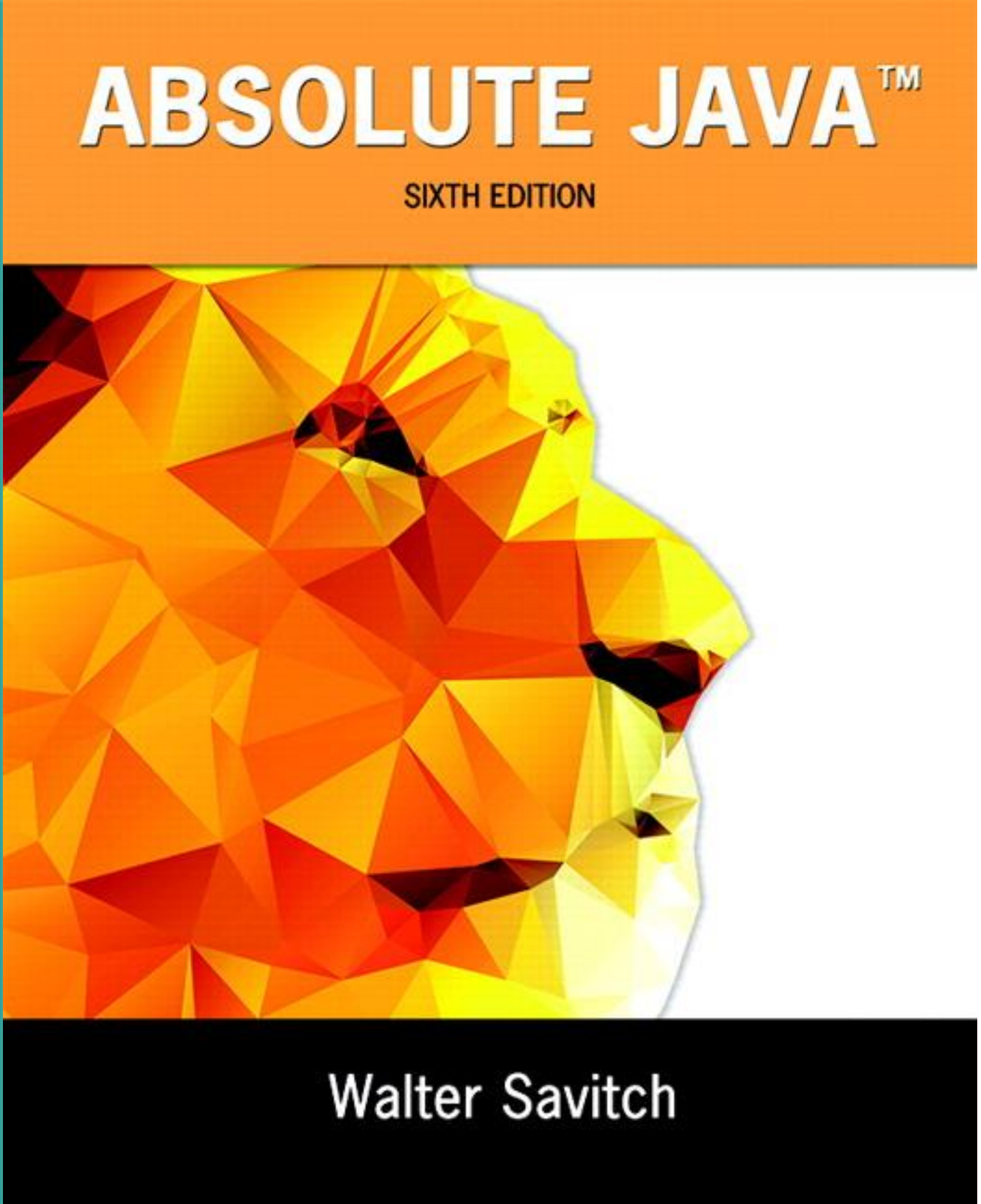


Chapter 9

Exception Handling

Slides prepared by Rose Williams, *Binghamton University*

Kenrick Mock, *University of Alaska Anchorage*

Last modified

- 2015-10-02 by C Hoang

Introduction to Exception Handling

- Sometimes the best outcome can be when nothing unusual happens
- However, the case where exceptional things happen must also be prepared for
  - Java exception handling facilities are used when the invocation of a method may cause something exceptional to occur
  - Often the exception is some type of error condition

Introduction to Exception Handling

- Java library software (or programmer-defined code) provides a mechanism that signals when something unusual happens
  - This is called *throwing an exception*
- In another place in the program, the programmer must provide code that deals with the exceptional case
  - This is called *handling the exception*

`try-throw-catch` Mechanism

- The basic way of handling exceptions in Java consists of the ***`try-throw-catch`*** trio
- The **`try`** block contains the code for the basic algorithm
  - It tells what to do when everything goes smoothly
- It is called a **`try`** block because it "tries" to execute the case where all goes as planned
  - It can also contain code that throws an exception if something unusual happens

```
try
{
   CodeThatMayThrowAnException
}
```

`try-throw-catch` Mechanism

```
throw new
   ExceptionClassName(PossiblySomeArguments);
```

- When an exception is thrown, the execution of the surrounding `try` block is stopped
  - Normally, the flow of control is transferred to another portion of code known as the `catch` block
- The value thrown is the argument to the `throw` operator, and is always an object of some exception class
  - The execution of a `throw` statement is called *throwing an exception*

`try-throw-catch` Mechanism

- A **`throw`** statement is similar to a method call:

  ```
  throw new ExceptionClassName(SomeString);
  ```

  - In the above example, the object of class ***`ExceptionClassName`*** is created using a string as its argument
  - This object, which is an argument to the **`throw`** operator, is the exception object thrown
- Instead of calling a method, a **`throw`** statement calls a **`catch`** block

`try-throw-catch` Mechanism

- When an exception is thrown, the `catch` block begins execution
  - The `catch` block has one parameter
  - The exception object thrown is plugged in for the `catch` block parameter
- The execution of the `catch` block is called *catching the exception*, or *handling the exception*
  - Whenever an exception is thrown, it should ultimately be handled (or caught) by some `catch` block

`try-throw-catch` Mechanism

```
catch(Exception e)
{
  ExceptionHandlingCode
}
```

- A `catch` block looks like a method definition that has a parameter of type `Exception` class
  - It is not really a method definition, however
- A `catch` block is a separate piece of code that is executed when a program encounters and executes a `throw` statement in the preceding `try` block
  - A `catch` block is often referred to as an *exception handler*
  - It can have at most one parameter

`try-throw-catch` Mechanism

```
catch(Exception e) { . . . }
```

- The identifier `e` in the above `catch` block heading is called the `catch` block parameter
- The `catch` block parameter does two things:
  1. It specifies the type of thrown exception object that the `catch` block can catch (e.g., an `Exception` class object above)
  2. It provides a name (for the thrown object that is caught) on which it can operate in the `catch` block
     – Note: The identifier `e` is often used by convention, but any non-keyword identifier can be used

`try-throw-catch` Mechanism

- When a `try` block is executed, two things can happen:
  1. No exception is thrown in the `try` block
     - The code in the `try` block is executed to the end of the block
     - The `catch` block is skipped
     - The execution continues with the code placed after the `catch` block

`try-throw-catch` Mechanism

2. An exception is thrown in the `try` block and caught in the `catch` block
   - The rest of the code in the `try` block is skipped
   - Control is transferred to a following `catch` block (in simple cases)
   - The thrown object is plugged in for the `catch` block parameter
   - The code in the `catch` block is executed
   - The code that follows that `catch` block is executed (if any)

Demo

- Get the java files from the text's website
- getIntDemo.java
  - handle getting correct input from user
  - InputMismatchException
  - what to do when expect integers but user enters, say, characters

- BadNumberExceptionDemo.java

Exception Example

- In many cases your own code doesn’t throw the exception, but instead it is thrown by an existing Java library
- Example: Input an integer using **`nextInt()`**
  - What if the user doesn’t enter an integer?
  - The **`nextInt`** method throws an **`InputMismatchException`**

Exception Handling with the `Scanner` Class

- If a user enters something other than a well-formed `int` value, an `InputMismatchException` will be thrown
  - Unless this exception is caught, the program will end with an error message
  - If the exception is caught, the `catch` block can give code for some alternative action, such as asking the user to reenter the input

The `InputMismatchException`

- The `InputMismatchException` is in the standard Java package `java.util`
  - A program that refers to it must use an `import` statement, such as the following:

    ```
    import java.util.InputMismatchException;
    ```
- It is a descendent class of `RuntimeException`
  - Therefore, it is an unchecked exception and does not have to be caught in a `catch` block or declared in a `throws` clause
  - However, catching it in a `catch` block is allowed, and can sometimes be useful

Tip: Exception Controlled Loops

- Sometimes it is better to simply loop through an action again when an exception is thrown, as follows:

```
boolean done = false;
while (! done)
{
   try
   {
      CodeThatMayThrowAnException
      done = true;
   }
   catch (SomeExceptionClass e)
   {
      SomeMoreCode
   }
}
```

Exception Controlled Loop

Display 9.1 An Exception Controlled Loop

```java
import java.util.Scanner;
import java.util.InputMismatchException;

public class InputMismatchExceptionDemo
{
    public static void main(String[] args)
    {
        Scanner keyboard = new Scanner(System.in);
        int number = 0; //to keep compiler happy
        boolean done = false;

        while (! done)
        {
            try
            {
              System.out.println("Enter a whole number:");
              number = keyboard.nextInt();
              done = true;
            }
            catch(InputMismatchException e)
            {
              keyboard.nextLine();
              System.out.println("Not a correctly written whole
              number.");
              System.out.println("Try again.");
            }
        }

        System.out.println("You entered " + number);
    }
}
```

If `nextInt` throws an exception, the `try` block ends and the `Boolean` variable `done` is not set to `true`.

Sample Dialogue

```
Enter a whole number:
forty two
Not a correctly written whole number.
Try again.
Enter a whole number:
Fortytwo
Not a correctly written whole number.
Try again.
Enter a whole number:
42
You entered 42
```

Exception Classes

- There are more exception classes than just the single class **`Exception`**
  - There are more exception classes in the standard Java libraries
  - New exception classes can be defined like any other class
- All predefined exception classes have the following properties:
  - There is a constructor that takes a single argument of type **`String`**
  - The class has an accessor method **`getMessage`** that can recover the string given as an argument to the constructor when the exception object was created
- All programmer-defined classes should have the same properties

Exception Classes from Standard Packages

- Numerous predefined exception classes are included in the standard packages that come with Java
  - For example:

    ```
    IOException
    NoSuchMethodException
    FileNotFoundException
    ```

  - Many exception classes must be imported in order to use them

    ```
    import java.io.IOException;
    ```

Exception Classes from Standard Packages

- The predefined exception class **`Exception`** is the root class for all exceptions
  - Every exception class is a descendent class of the class **`Exception`**
  - Although the **`Exception`** class can be used directly in a class or program, it is most often used to define a derived class
  - The class **`Exception`** is in the **`java.lang`** package, and so requires no **`import`** statement

Using the **getMessage** Method

```
. . . // method code
try
{
   . . .
   throw new Exception(StringArgument);
   . . .
}
catch(Exception e)
{
   String message = e.getMessage();
   System.out.println(message);
   System.exit(0);
}  . . .
```

Using the `getMessage` Method

- Every exception has a `String` instance variable that contains some message
  - This string typically identifies the reason for the exception
- In the previous example, `StringArgument` is an argument to the `Exception` constructor
- This is the string used for the value of the string instance variable of exception `e`
  - Therefore, the method call `e.getMessage()` returns this string

Defining Exception Classes

- A `throw` statement can throw an exception object of any exception class
- Instead of using a predefined class, exception classes can be programmer-defined
  - These can be tailored to carry the precise kinds of information needed in the `catch` block
  - A different type of exception can be defined to identify each different exceptional situation

Defining Exception Classes

- Every exception class to be defined must be a derived class of some already defined exception class
  - It can be a derived class of any exception class in the standard Java libraries, or of any programmer defined exception class
- Constructors are the most important members to define in an exception class
  - They must behave appropriately with respect to the variables and methods inherited from the base class
  - Often, there are no other members, except those inherited from the base class
- The following exception class performs these basic tasks only

A Programmer-Defined Exception Class

Display 9.4 A Programmer-Defined Exception Class

```
public class DivisionByZeroException extends Exception
{
    public DivisionByZeroException()
    {
        super("Division by Zero!");
    }

    public DivisionByZeroException(String message)
    {
        super(message);
    }
}
```

You can do more in an exception constructor, but this form is common.

`super` is an invocation of the constructor for the base class `Exception`.

Using our own Exception Class (1 of 3)

Display 9.5 Using a Programmer-Defined Exception Class

```java
import java.util.Scanner;

public class DivisionDemoFirstVersion
{

    public static void main(String[] args)
    {
        try
        {
            Scanner keyboard = new Scanner(System.in);

            System.out.println("Enter numerator:");
            int numerator = keyboard.nextInt();
            System.out.println("Enter denominator:");
            int denominator = keyboard.nextInt();
```

Using our own Exception Class (2 of 3)

```
            if (denominator == 0)
                throw new DivisionByZeroException();

            double quotient = numerator/(double)denominator;
            System.out.println(numerator + "/"
                                 + denominator
                                 + " = " + quotient);
        }
        catch (DivisionByZeroException e)
        {
            System.out.println(e.getMessage());
            secondChance();
        }

        System.out.println("End of program.");
    }
```

Using our own Exception Class (3 of 3)

```
    public static void secondChance()
    {
        Scanner keyboard = new Scanner(System.in);
        System.out.println("Try again:");
        System.out.println("Enter numerator:");
        int numerator = keyboard.nextInt();
        System.out.println("Enter denominator:");
        System.out.println("Be sure the denominator is not zero.");
        int denominator = keyboard.nextInt();

        if (denominator == 0)
        {
            System.out.println("I cannot do division by zero.");
            System.out.println("Aborting program.");
            System.exit(0);
        }

        double quotient = ((double)numerator)/denominator;
        System.out.println(numerator + "/"
                                     + denominator
                                     + " = " + quotient);
    }
}
```

Sometimes it is better to handle an exceptional case without throwing an exception.

Tip: An Exception Class Can Carry a Message of Any Type: int Message

- An exception class constructor can be defined that takes an argument of another type
  - It would stores its value in an instance variable
  - It would need to define accessor methods for this instance variable

An Exception Class with an **`int`** Message

An Exception Class with an `int` Message

```java
public class BadNumberException extends Exception
{
    private int badNumber;

    public BadNumberException(int number)
    {
        super("BadNumberException");
        badNumber = number;
    }

    public BadNumberException()
    {
        super("BadNumberException");
    }

    public BadNumberException(String message)
    {
        super(message);
    }

    public int getBadNumber()
    {
        return badNumber;
    }
}
```

Exception Object Characteristics

- The two most important things about an exception object are its type (i.e., exception class) and the message it carries
  - The message is sent along with the exception object as an instance variable
  - This message can be recovered with the accessor method `getMessage`, so that the catch block can use the message

Programmer-Defined Exception Class Guidelines

- Exception classes may be programmer-defined, but every such class must be a derived class of an already existing exception class
- The class `Exception` can be used as the base class, unless another exception class would be more suitable
- At least two constructors should be defined, sometimes more
- The exception class should allow for the fact that the method `getMessage` is inherited

Preserve `getMessage`

- For all predefined exception classes, `getMessage` returns the string that is passed to its constructor as an argument
  - Or it will return a default string if no argument is used with the constructor
- This behavior must be preserved in all programmer-defined exception class
  - A constructor must be included having a string parameter whose body begins with a call to `super`
  - The call to `super` must use the parameter as its argument
  - A no-argument constructor must also be included whose body begins with a call to `super`
  - This call to `super` must use a default string as its argument

Multiple `catch` Blocks

- A `try` block can potentially throw any number of exception values, and they can be of differing types
  - In any one execution of a `try` block, at most one exception can be thrown (since a throw statement ends the execution of the `try` block)
  - However, different types of exception values can be thrown on different executions of the `try` block

Multiple **`catch`** Blocks

- Each **`catch`** block can only catch values of the exception class type given in the **`catch`** block heading
- Different types of exceptions can be caught by placing more than one **`catch`** block after a **`try`** block
  - Any number of **`catch`** blocks can be included, but they must be placed in the correct order

Pitfall: Catch the More Specific Exception First

- When catching multiple exceptions, the order of the `catch` blocks is important
  - When an exception is thrown in a `try` block, the `catch` blocks are examined in order
  - The first one that matches the type of the exception thrown is the one that is executed

Pitfall: Catch the More Specific Exception First

```
catch (Exception e)
{ . . . }
catch (NegativeNumberException e)
{ . . . }
```

- Because a `NegativeNumberException` is a type of `Exception`, all `NegativeNumberExceptions` will be caught by the first `catch` block before ever reaching the second block
  - The catch block for `NegativeNumberException` will never be used!
- For the correct ordering, simply reverse the two blocks

Throwing an Exception in a Method

- Sometimes it makes sense to throw an exception in a method, but not catch it in the same method
  - Some programs that use a method should just end if an exception is thrown, and other programs should do something else
  - In such cases, the program using the method should enclose the method invocation in a **`try`** block, and catch the exception in a **`catch`** block that follows
- In this case, the method itself would not include **`try`** and **`catch`** blocks
  - However, it would have to include a ***`throws`*** *clause*

Declaring Exceptions in a `throws` Clause

- If a method can throw an exception but does not catch it, it must provide a warning
  - This warning is called a ***`throws`*** *clause*
  - The process of including an exception class in a throws clause is called *declaring the exception*

    ```
    throws AnException  //throws clause
    ```

  - The following states that an invocation of **`aMethod`** could throw **`AnException`**

    ```
    public void aMethod() throws AnException
    ```

Declaring Exceptions in a **`throws`** Clause

- If a method can throw more than one type of exception, then separate the exception types by commas

```
public void aMethod() throws
   AnException, AnotherException
```

- If a method throws an exception and does not catch it, then the method invocation ends immediately

The Catch or Declare Rule

- Most ordinary exceptions that might be thrown within a method must be accounted for in one of two ways:

1. The code that can throw an exception is placed within a **`try`** block, and the possible exception is caught in a **`catch`** block within the same method
2. The possible exception can be declared at the start of the method definition by placing the exception class name in a **`throws`** clause

The Catch or Declare Rule

- The first technique handles an exception in a **`catch`** block
- The second technique is a way to shift the exception handling responsibility to the method that invoked the exception throwing method
- The invoking method must handle the exception, unless it too uses the same technique to "pass the buck"
- Ultimately, every exception that is thrown should eventually be caught by a **`catch`** block in some method that does not just declare the exception class in a **`throws`** clause

The Catch or Declare Rule

- In any one method, both techniques can be mixed
  - Some exceptions may be caught, and others may be declared in a `throws` clause
- However, these techniques must be used consistently with a given exception
  - If an exception is not declared, then it must be handled within the method
  - If an exception is declared, then the responsibility for handling it is shifted to some other calling method
  - Note that if a method definition encloses an invocation of a second method, and the second method can throw an exception and does not catch it, then the first method must catch or declare it

Summary of exception propagation

- Suppose A calls B,
- B calls C,
- C throws an exception
- If B handles (catch) the exception
  - all is good ☺
- If B does not handle the exception
  - A should handle the exception
  - If not, program crashes

Checked and Unchecked Exceptions

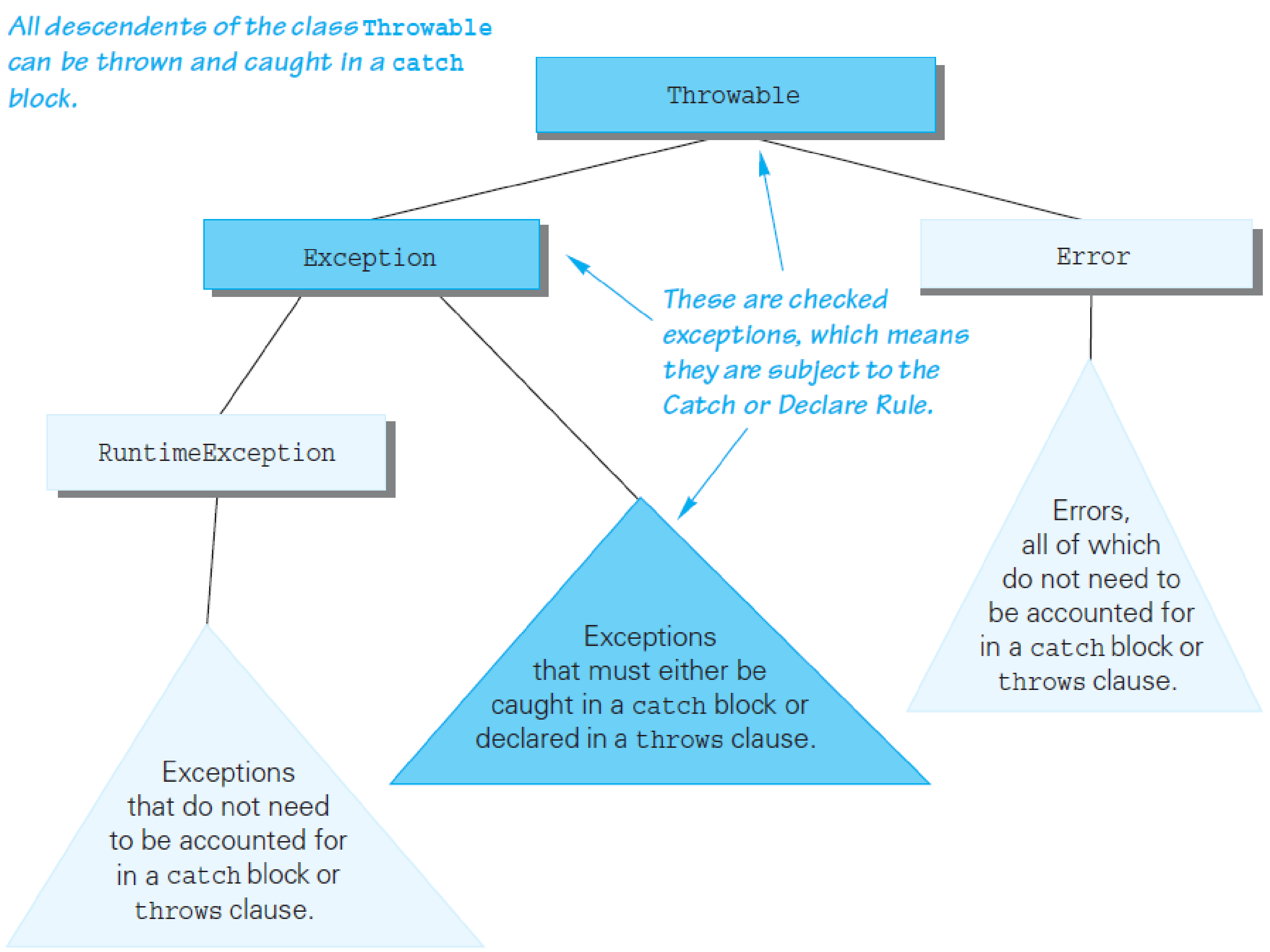
- Exceptions that are subject to the catch or declare rule are called *checked* exceptions
  - The compiler checks to see if they are accounted for with either a catch block or a throws clause
  - The classes **`Throwable`**, **`Exception`**, and all descendants of the class **`Exception`** are checked exceptions
- All other exceptions are *unchecked* exceptions
- The class **`Error`** and all its descendant classes are called *error classes*
  - Error classes are *not* subject to the Catch or Declare Rule

Exceptions to the Catch or Declare Rule

- Checked exceptions must follow the Catch or Declare Rule
  - Programs in which these exceptions can be thrown will not compile until they are handled properly
- Unchecked exceptions are exempt from the Catch or Declare Rule
  - Programs in which these exceptions are thrown simply need to be corrected, as they result from some sort of error

Hierarchy of Throwable Objects

Display 9.11 Hierarchy of `Throwable` Objects


All descendents of the class Throwable can be thrown and caught in a catch block.
Throwable
Exception
Error
These are checked exceptions, which means they are subject to the Catch or Declare Rule.
RuntimeException
Exceptions that must either be caught in a catch block or declared in a throws clause.
Errors, all of which do not need to be accounted for in a catch block or throws clause.
Exceptions that do not need to be accounted for in a catch block or throws clause.

The `throws` Clause in Derived Classes

- When a method in a derived class is overridden, it should have the same exception classes listed in its `throws` clause that it had in the base class
  - Or it should have a subset of them
- A derived class may not add any exceptions to the `throws` clause
  - But it can delete some

What Happens If an Exception is Never Caught?

- If every method up to and including the main method simply includes a `throws` clause for an exception, that exception may be thrown but never caught
  - In a GUI program (i.e., a program with a windowing interface), nothing happens - but the user may be left in an unexplained situation, and the program may be no longer be reliable
  - In non-GUI programs, this causes the program to terminate with an error message giving the name of the exception class
- Every well-written program should eventually catch every exception by a `catch` block in some method

Example – Retrieving a High Score Without Exceptions (1 of 2)

- No exceptions, return -1 if there is no score

```
public class HighScoreNoException
{
		private int score = 0;
		private boolean scoreSet = false;

		public HighScoreNoException()
		{
			score = 0;
			scoreSet = false;
		}

		public void setScore(int newScore)
		{
			score = newScore;
			scoreSet = true;
		}
```

Example – Retrieving a High Score Without Exceptions (2 of 2)

```
public int getScore()
        {
                if (!scoreSet)
                        return -1;
                else
                        return score;
        }

        // Short test program
        public static void main(String[] args)
        {
                HighScoreNoException highscore = new HighScoreNoException();
                System.out.println(highscore.getScore());
                highscore.setScore(100);
                System.out.println(highscore.getScore());
        }
}
```

Problems if negative scores are allowed!

Example – Retrieving a High Score with Exceptions (1 of 4)

- Problem solved with exceptions

```
public class ScoreNotSetException extends Exception
{
        public ScoreNotSetException()
        {
                super("Score not set");
        }
        public ScoreNotSetException(String message)
        {
                super(message);
        }
}
```

Example – Retrieving a High Score with Exceptions (2 of 4)

```
public class HighScoreException
{
        private int score = 0;
        private boolean scoreSet = false;

        public HighScoreException()
        {
                score = 0;
                scoreSet = false;
        }

        public void setScore(int newScore)
        {
                score = newScore;
                scoreSet = true;
        }
```

Example – Retrieving a High Score with Exceptions (3 of 4)

```
public int getScore() throws ScoreNotSetException
{
        if (!scoreSet)
                throw new ScoreNotSetException();
        else
                return score;
}

// Short test program
public static void main(String[] args)
{
        HighScoreException highscore = new HighScoreException();
        try
        {
                System.out.println
                        (highscore.getScore());
        }
```

Example – Retrieving a High Score with Exceptions (4 of 4)

```
catch (ScoreNotSetException e)
                    {
                              System.out.println
                                        (e.getMessage());
                    }
                    highscore.setScore(100);
                    try
                    {
                              System.out.println
                                        (highscore.getScore());
                    }
                    catch (ScoreNotSetException e)
                    {
                              System.out.println
                                        (e.getMessage());
                    }
          }
}
```

When to Use Exceptions

- Exceptions should be reserved for situations where a method encounters *an unusual or unexpected case that cannot be handled easily in some other way*
- When exception handling must be used, here are some basic guidelines:
  - Include **`throw`** statements and list the exception classes in a **`throws`** clause within a method definition
  - Place the **`try`** and **`catch`** blocks in a different method

When to Use Exceptions

- Here is an example of a method from which the exception originates:

```
public void someMethod()
                    throws SomeException
{
   . . .
   throw new
            SomeException(SomeArgument);
   . . .
}
```

When to Use Exceptions

- When `someMethod` is used by an `otherMethod`, the `otherMethod` must then deal with the exception:

```
public void otherMethod()
{
   try
   {
      someMethod();
      . . .
   }
   catch (SomeException e)
   {
      CodeToHandleException
   }
   . . .
}
```

Event Driven Programming

- Exception handling is an example of a programming methodology known as *event-driven programming*
- When using event-driven programming, objects are defined so that they send events to other objects that handle the events
  - An event is an object also
  - Sending an event is called *firing an event*

Event Driven Programming

- In exception handling, the event objects are the exception objects
  - They are fired (thrown) by an object when the object invokes a method that throws the exception
  - An exception event is sent to a `catch` block, where it is handled

Pitfall: Nested `try-catch` Blocks

- It is possible to place a `try` block and its following catch blocks inside a larger `try` block, or inside a larger `catch` block
  - If a set of `try-catch` blocks are placed inside a larger `catch` block, different names must be used for the `catch` block parameters in the inner and outer blocks, just like any other set of nested blocks
  - If a set of `try-catch` blocks are placed inside a larger `try` block, and an exception is thrown in the inner `try` block that is not caught, then the exception is thrown to the outer `try` block for processing, and may be caught in one of its `catch` blocks

The `finally` Block

- The `finally` block contains code to be executed whether or not an exception is thrown in a `try` block
  - If it is used, a `finally` block is placed after a `try` block and its following `catch` blocks

```
try
{   . . .   }
catch(ExceptionClass1 e)
{   . . .   }
  . . .
catch(ExceptionClassN e)
{   . . .   }
finally
{
  CodeToBeExecutedInAllCases
}
```

The `finally` Block

- If the `try-catch-finally` blocks are inside a method definition, there are three possibilities when the code is run:
  1. The `try` block runs to the end, no exception is thrown, and the finally block is executed
  2. An exception is thrown in the `try` block, caught in one of the `catch` blocks, and the `finally` block is executed
  3. An exception is thrown in the `try` block, there is no matching `catch` block in the method, the `finally` block is executed, and then the method invocation ends and the exception object is thrown to the enclosing method

Rethrowing an Exception

- A `catch` block can contain code that throws an exception
  - Sometimes it is useful to catch an exception and then, depending on the string produced by `getMessage` (or perhaps something else), throw the same or a different exception for handling further up the chain of exception handling blocks

`ArrayIndexOutOfBoundsException`

- An `ArrayIndexOutOfBoundsException` is thrown whenever a program attempts to use an array index that is out of bounds
  - This normally causes the program to end
- Like all other descendents of the class `RuntimeException`, it is an unchecked exception
  - There is no requirement to handle it
- When this exception is thrown, it is an indication that the program contains an error
  - Instead of attempting to handle the exception, the program should simply be fixed

The **`AssertionError`** Class

- When a program contains an assertion check, and the assertion check fails, an object of the class **`AssertionError`** is thrown
  - This causes the program to end with an error message
- The class **`AssertionError`** is derived from the class **`Error`**, and therefore is an unchecked exception
  - In order to prevent the program from ending, it could be handled, but this is not required

Assertions

- An *assertion* is a statement in the Java^{TM} programming language that enables you to test your assumptions about your program.
- For example, if you write a method that calculates the speed of a particle, you might assert that the calculated speed is less than the speed of light.

- Each assertion contains a boolean expression that you believe will be true when the assertion executes.
- If it is not true, the system will throw an error.
- By verifying that the boolean expression is indeed true, the assertion confirms your assumptions about the behavior of your program, increasing your confidence that the program is free of errors.
- For more detail, see the Oracle's documentation

assertion I

- assert *Expression*$_1$;
- where *Expression*$_1$ is a boolean expression.
  - When the system runs the assertion, it evaluates *Expression*$_1$ and if it is false throws an AssertionError with no detail message.

- assert *Expression$_1$* : *Expression$_2$* ; where:
- *Expression$_1$* is a boolean expression.
- *Expression$_2$* is an expression that has a value. (It cannot be an invocation of a method that is declared void.)
- Use this version of the assert statement to provide a detail message for the AssertionError. The system passes the value of *Expression$_2$* to the appropriate AssertionError constructor, which uses the string representation of the value as the error's detail message.

When to use an assertion

- if (i % 3 == 0) {
-    ... }
- else if (i % 3 == 1) {
- ... } else {
- **// We know (i % 3 == 2)**
- ... }

- if (i % 3 == 0) {
-    ... }
- else if (i % 3 == 1) {
- ... } else {
-    **assert i % 3 == 2 : i;**
- ... }

You should **use an assertion whenever you would have written a comment that asserts an invariant**

- switch(suit) {
-   case Suit.CLUBS:
-     ...
-   break;

-   case Suit.DIAMONDS:
-     ...
-   break;

-   case Suit.HEARTS:
-     ...
-     break;

-   case Suit.SPADES:
-       ...
    break;
- default:
-     assert false : suit;
- }

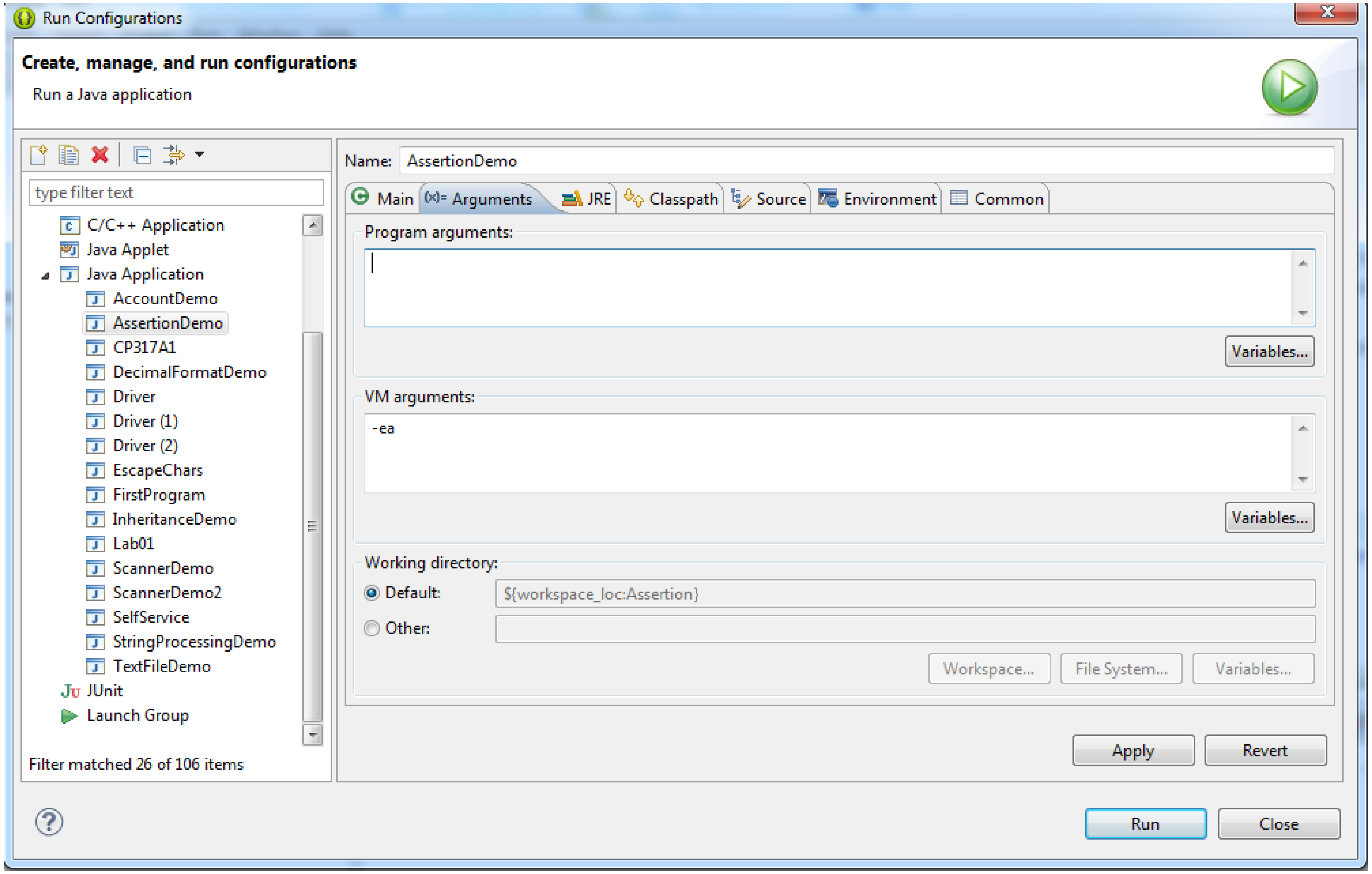
Compiling Files That Use Assertions

- You must compile using -source
- javac **-source 1.7** MyClass.java
- Then you must enable assertion when you run the program
- java –ea MyClass

Compiling with assertions in Eclipse

- Run -> Run Configurations -> Arguments
- then in the VM argument window, enter "-ea“
- to enable assertions

Compiling with assertions in Eclipse



Run Configurations

Create, manage, and run configurations

Run a Java application

type filter text

- C/C++ Application
- Java Applet
- Java Application
  - AccountDemo
  - AssertionDemo
  - CP317A1
  - DecimalFormatDemo
  - Driver
  - Driver (1)
  - Driver (2)
  - EscapeChars
  - FirstProgram
  - InheritanceDemo
  - Lab01
  - ScannerDemo
  - ScannerDemo2
  - SelfService
  - StringProcessingDemo
  - TextFileDemo
- JUnit
- Launch Group

Filter matched 26 of 106 items

Name: AssertionDemo

Program arguments:

VM arguments:

```
-ea
```

Working directory:

Default: ${workspace_loc:Assertion}

Other: