Chapter 12 Exception Handling and Text IO

Exception-Handling Overview

Show runtime error

Quotient Run

Fix it using an if statement

QuotientWithIf Run

With a method

QuotientWithMethod Run

Runtime Error?

```java
import java.util.Scanner;

public class Quotient {
  public static void main(String[] args) {
    Scanner input = new Scanner(System.in);

    // Prompt the user to enter two integers
    System.out.print("Enter two integers: ");
    int number1 = input.nextInt();
    int number2 = input.nextInt();

    System.out.println(number1 + " / " + number2 + " is " +
      (number1 / number2));
  }
}
```

```
Enter two integers: 3 0 ↵Enter
Exception in thread "main" java.lang.ArithmeticException: / by zero
at Quotient.main(Quotient.java:11)
```

Fix it Using an if Statement

```
import java.util.Scanner;

public class QuotientWithIf {
  public static void main(String[] args) {
    Scanner input = new Scanner(System.in);

    // Prompt the user to enter two integers
    System.out.print("Enter two integers: ");
    int number1 = input.nextInt();
    int number2 = input.nextInt();

    if (number2 != 0)
      System.out.println(number1 + " / " + number2 + " is " +
        (number1 / number2));
    else
      System.out.println("Divisor cannot be zero ");
  }
}
```

Suppose there is another method that can throw the exception

```java
public class QuotientWithMethod {
  public static int quotient(int number1, int number2) {
    if (number2 == 0) {
      System.out.println("Divisor cannot be zero");
      System.exit(1);
    }

    return number1 / number2;
  }

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

    // Prompt the user to enter two integers
    System.out.print("Enter two integers: ");
    int number1 = input.nextInt();
    int number2 = input.nextInt();

    int result = quotient(number1, number2);
    System.out.println(number1 + " / " + number2 + " is "
      + result);
  }
}
```

Exception Advantages

QuotientWithException

Run

Now you see the *advantages* of using exception handling. It enables a method to throw an exception to its caller. Without this capability, a method must handle the exception or terminate the program.

```java
public class QuotientWithException {
  public static int quotient(int number1, int number2) {
    if (number2 == 0)
      throw new ArithmeticException("Divisor cannot be zero");

    return number1 / number2;
  }

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

    // Prompt the user to enter two integers
    System.out.print("Enter two integers: ");
    int number1 = input.nextInt();
    int number2 = input.nextInt();

    try {
      int result = quotient(number1, number2);
      System.out.println(number1 + " / " + number2 + " is "
        + result);
    }
    catch (ArithmeticException ex) {
      System.out.println("Exception: an integer " +
        "cannot be divided by zero ");
    }

    System.out.println("Execution continues ...");
  }
}
```

If an ArithmeticException occurs

Handling InputMismatchException

InputMismatchExceptionDemo Run

By handling InputMismatchException, your program will continuously read an input until it is correct.

Handling an exception and continuing program execution

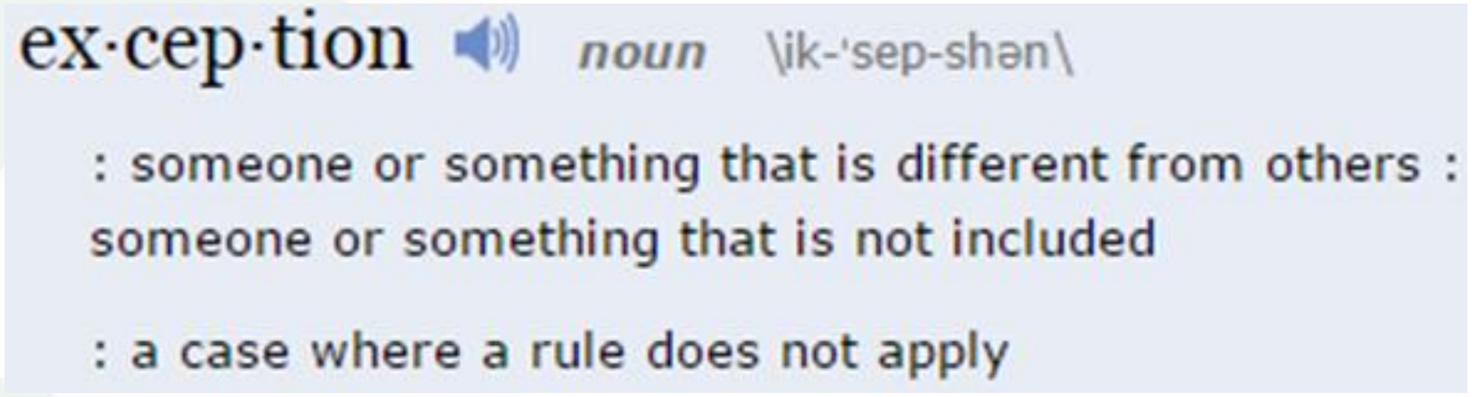
```java
public class InputMismatchExceptionDemo {
  public static void main(String[] args) {
    Scanner input = new Scanner(System.in);
    boolean continueInput = true;

    do {
      try {
        System.out.print("Enter an integer: ");
        int number = input.nextInt();

        // Display the result
        System.out.println(
          "The number entered is " + number);

        continueInput = false;
      }
      catch (InputMismatchException ex) {
        System.out.println("Try again. (" +
          "Incorrect input: an integer is required)");
        input.nextLine(); // Discard input
      }
    } while (continueInput);
  }
}
```

If an InputMismatch Exception occurs

Exception Handling

❖ Exception handling technique enables a method to **throw** an exception to its caller.

❖ Without this capability, a method must handle the exception or terminate the program.

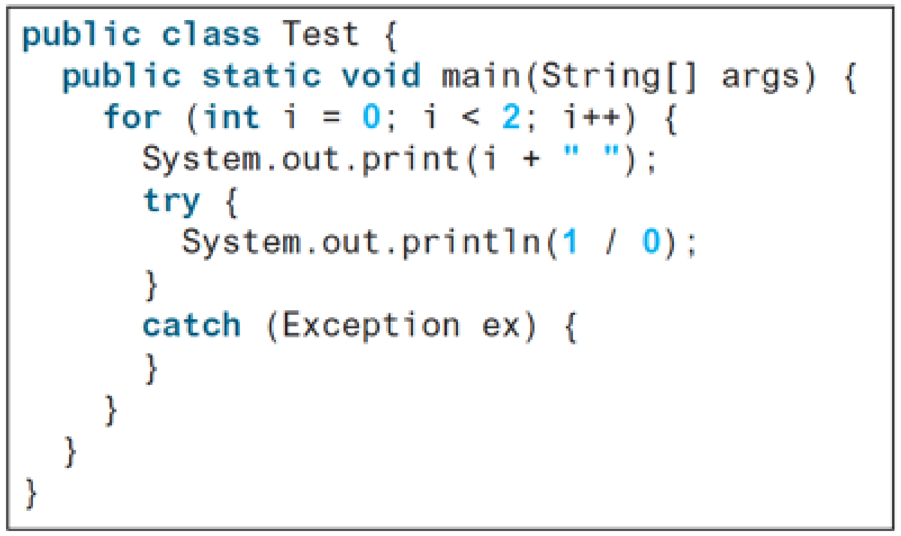


ex·cep·tion *noun* \ik-ˈsep-shən\

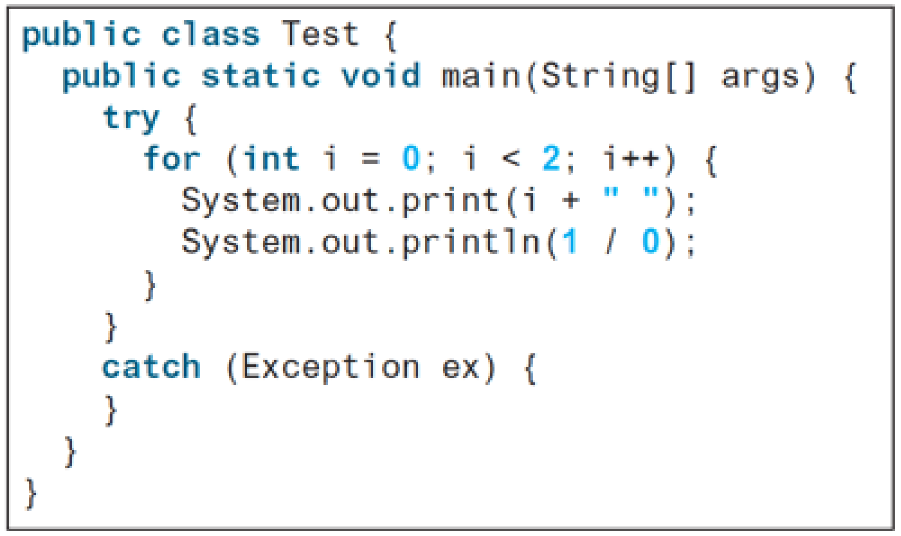
: someone or something that is different from others : someone or something that is not included

: a case where a rule does not apply

What's the Output?

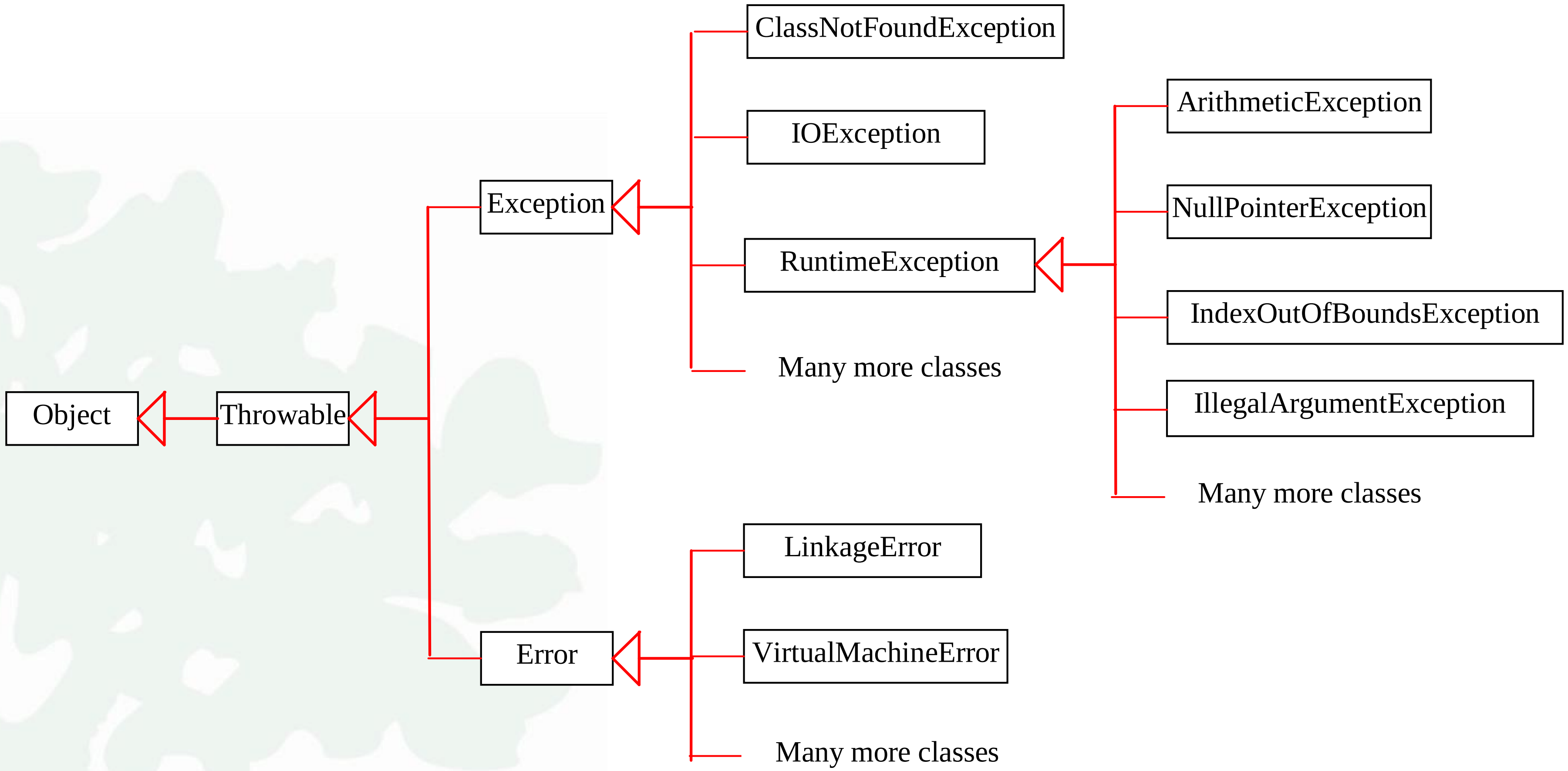


```
public class Test {
  public static void main(String[] args) {
    for (int i = 0; i < 2; i++) {
      System.out.print(i + " ");
      try {
        System.out.println(1 / 0);
      }
      catch (Exception ex) {
      }
    }
  }
}
```

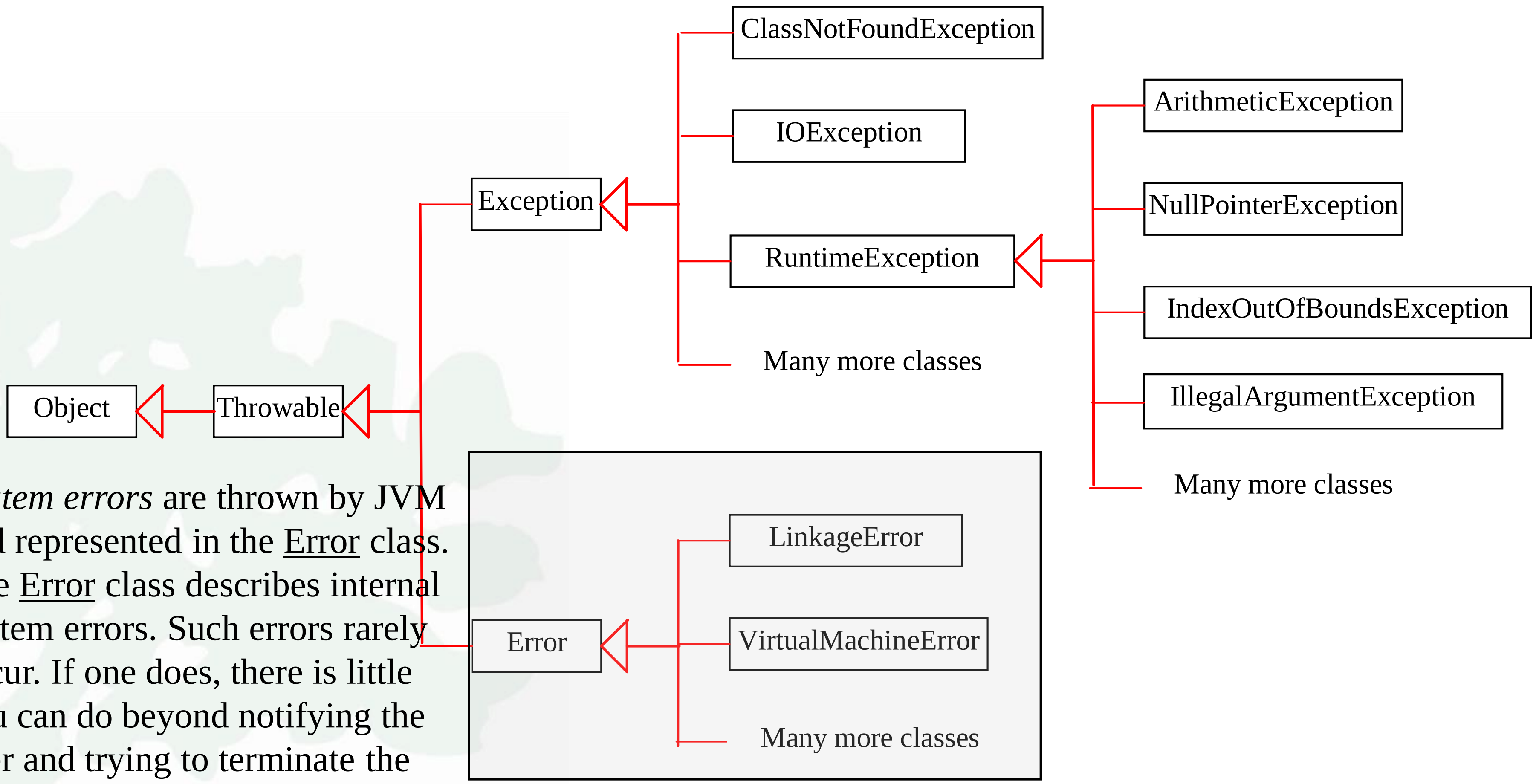


```
public class Test {
  public static void main(String[] args) {
    try {
      for (int i = 0; i < 2; i++) {
        System.out.print(i + " ");
        System.out.println(1 / 0);
      }
    }
    catch (Exception ex) {
    }
  }
}
```

Exception Types



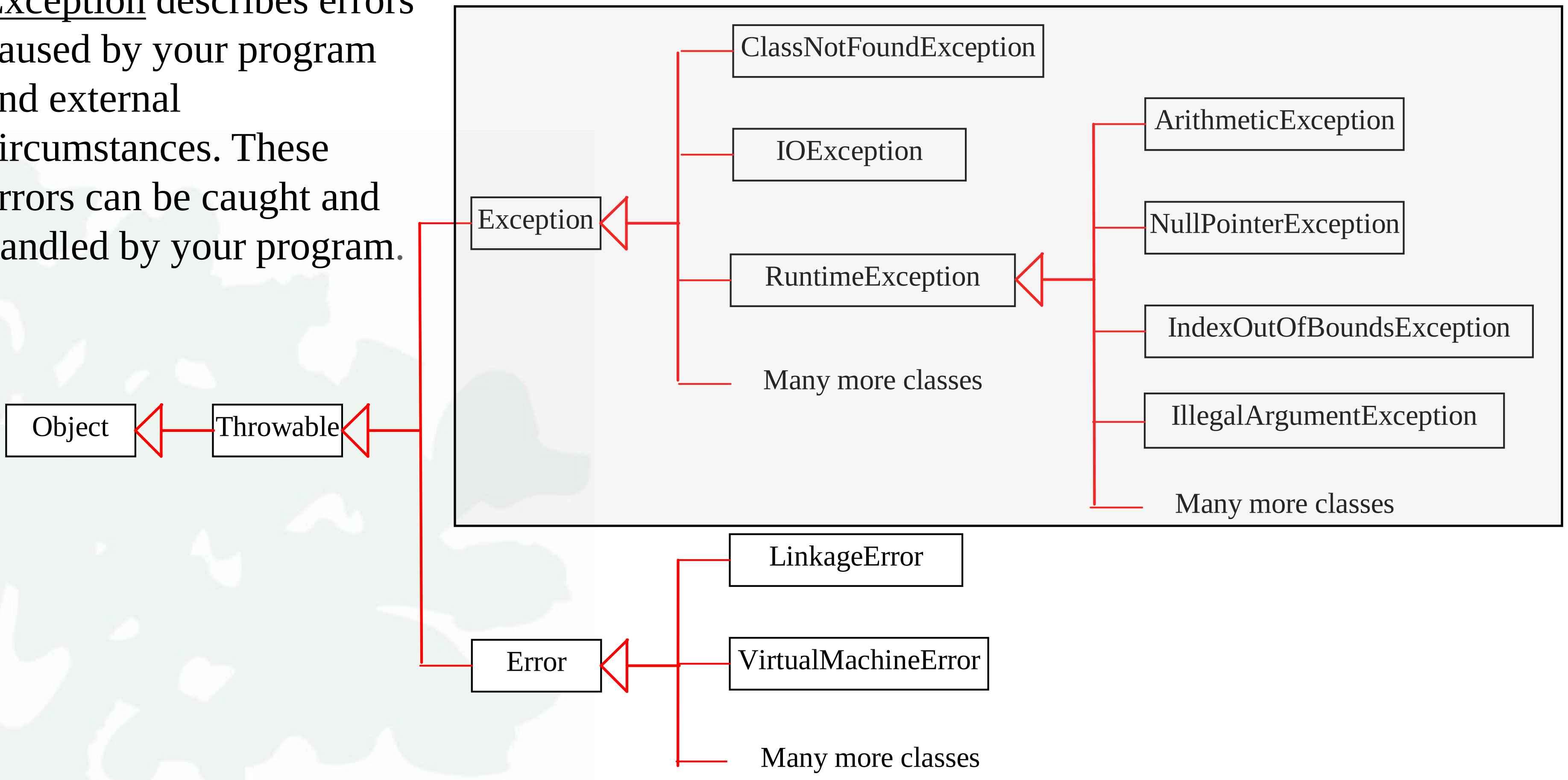
System Errors



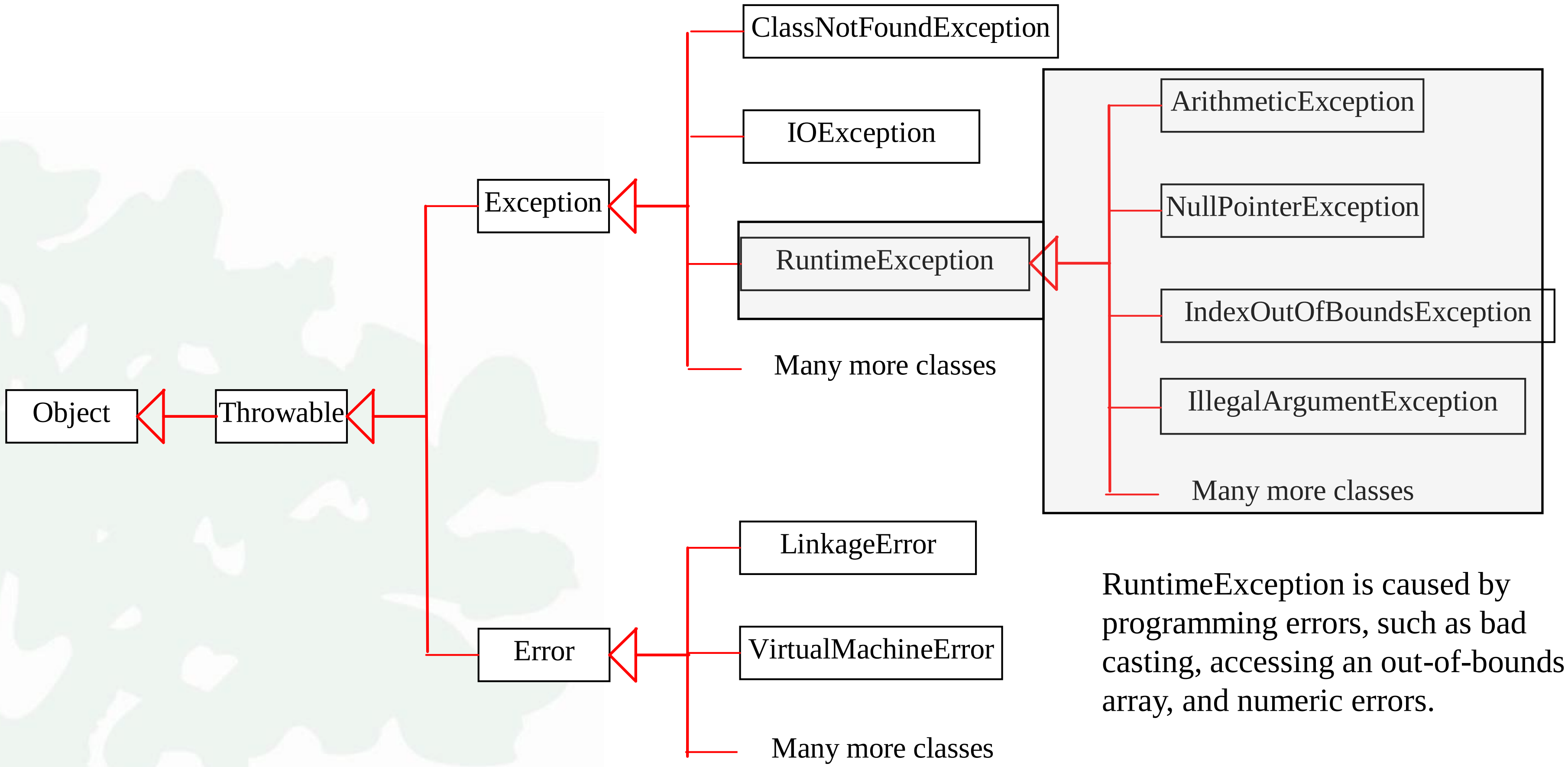
System errors are thrown by JVM and represented in the Error class. The Error class describes internal system errors. Such errors rarely occur. If one does, there is little you can do beyond notifying the user and trying to terminate the program gracefully.

Exceptions

Exception describes errors caused by your program and external circumstances. These errors can be caught and handled by your program.



Runtime Exceptions



RuntimeException is caused by programming errors, such as bad casting, accessing an out-of-bounds array, and numeric errors.

What is the Exception?!

```java
public class Test {
  public static void main(String[] args) {
    System.out.println(1 / 0);
  }
}
```

(a)

```java
public class Test {
  public static void main(String[] args) {
    int[] list = new int[5];
    System.out.println(list[5]);
  }
}
```

(b)

```java
public class Test {
  public static void main(String[] args) {
    String s = "abc";
    System.out.println(s.charAt(3));
  }
}
```

(c)

```java
public class Test {
  public static void main(String[] args) {
    Object o = new Object();
    String d = (String)o;
  }
}
```

(d)

```java
public class Test {
  public static void main(String[] args) {
    Object o = null;
    System.out.println(o.toString());
  }
}
```

(e)

```java
public class Test {
  public static void main(String[] args) {
    System.out.println(1.0 / 0);
  }
}
```

(f)

Checked Exceptions vs. Unchecked Exceptions

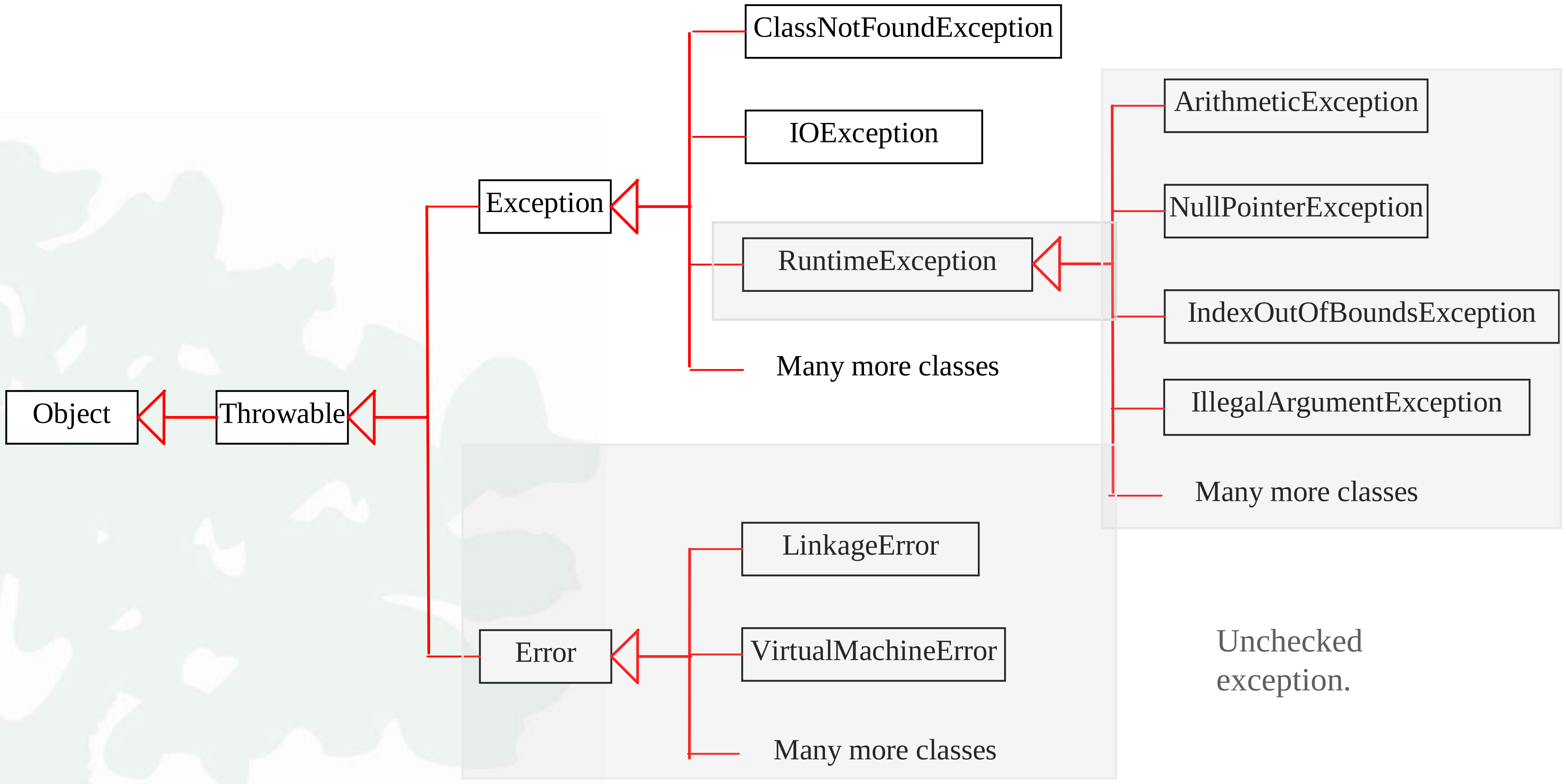
- ❖ **RuntimeException**, **Error** and their subclasses are known as **unchecked exceptions**.

- ❖ All other exceptions are known as **checked exceptions**, meaning that the compiler forces the programmer to check and deal with the exceptions.

Unchecked Exceptions

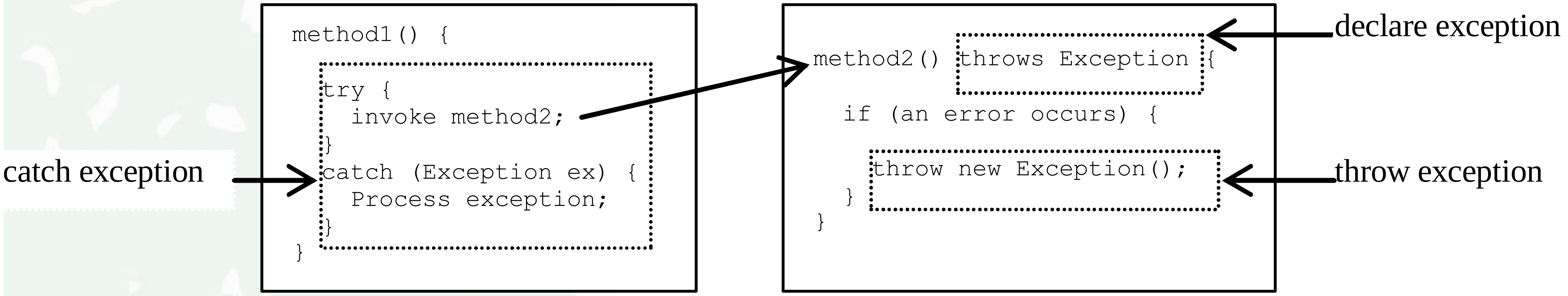
- In most cases, unchecked exceptions reflect programming **logic errors** that are not recoverable.
- For example:
  - a **NullPointerException** is thrown if you access an object through a reference variable before an object is assigned to it.
  - an **IndexOutOfBoundsException** is thrown if you access an element in an array outside the bounds of the array.
- These are the logic errors that should be corrected in the program.

Unchecked Exceptions



Unchecked exception.

Declaring, Throwing, and Catching Exceptions



```
method1() {

  try {
    invoke method2;
  }
  catch (Exception ex) {
    Process exception;
  }
}
```

```
method2() throws Exception {

  if (an error occurs) {

    throw new Exception();
  }
}
```

Declaring Exceptions

Every method must state the types of checked exceptions it might throw. This is known as *declaring exceptions*.

```
public void myMethod()
   throws IOException

public void myMethod()
   throws IOException, OtherException
```

Throwing Exceptions

- When the program detects an error, the program can create an **instance** of an appropriate exception type and throw it.
- This is known as **throwing an exception**.

```
throw new TheException();

TheException   ex = new
TheException();
throw ex;
```

Throwing Exceptions Example

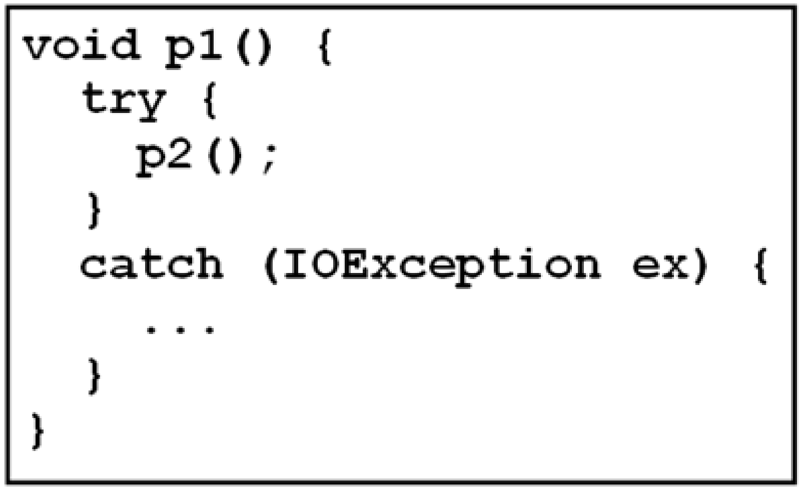
```
/** Set a new radius */
public void setRadius(double newRadius)
    throws IllegalArgumentException {
  if (newRadius >= 0)
    radius =  newRadius;
  else
    throw new IllegalArgumentException(
      "Radius cannot be negative");
}
```

Catching Exceptions

```
try {
    statements;  // Statements that may throw exceptions
}
catch (Exception1 exVar1) {
    handler for exception1;
}
catch (Exception2 exVar2) {
    handler for exception2;
}
...
catch (ExceptionN exVar3) {
    handler for exceptionN;
}
```

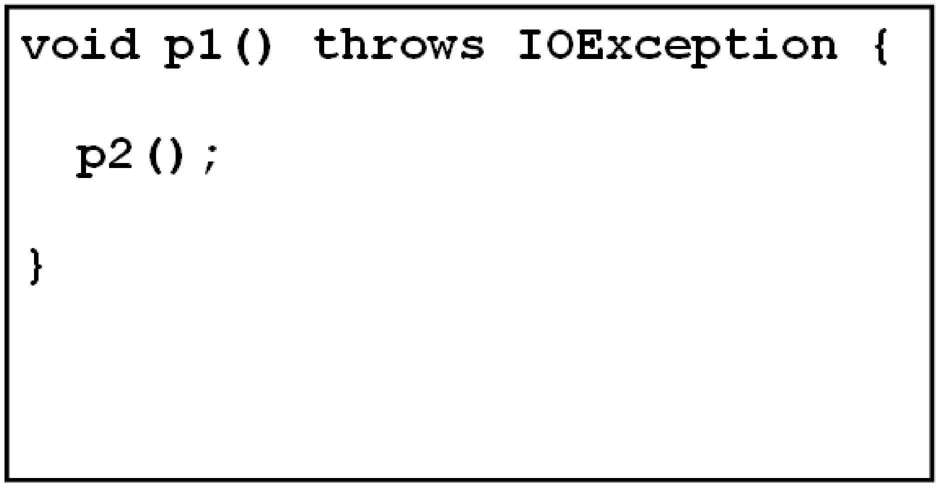
Catch or Declare Checked Exceptions

- Java forces you to deal with checked exceptions.
- You must invoke it in a **try-catch** block **or** declare to **throw** the exception in the calling method.
- For example, suppose that method **p1** invokes method **p2** and **p2** may throw a checked exception (e.g., **IOException**), you have to write the code as follow:



```
void p1() {
  try {
    p2();
  }
  catch (IOException ex) {
    ...
  }
}
```

(a)



```
void p1() throws IOException {

  p2();

}
```

(b)

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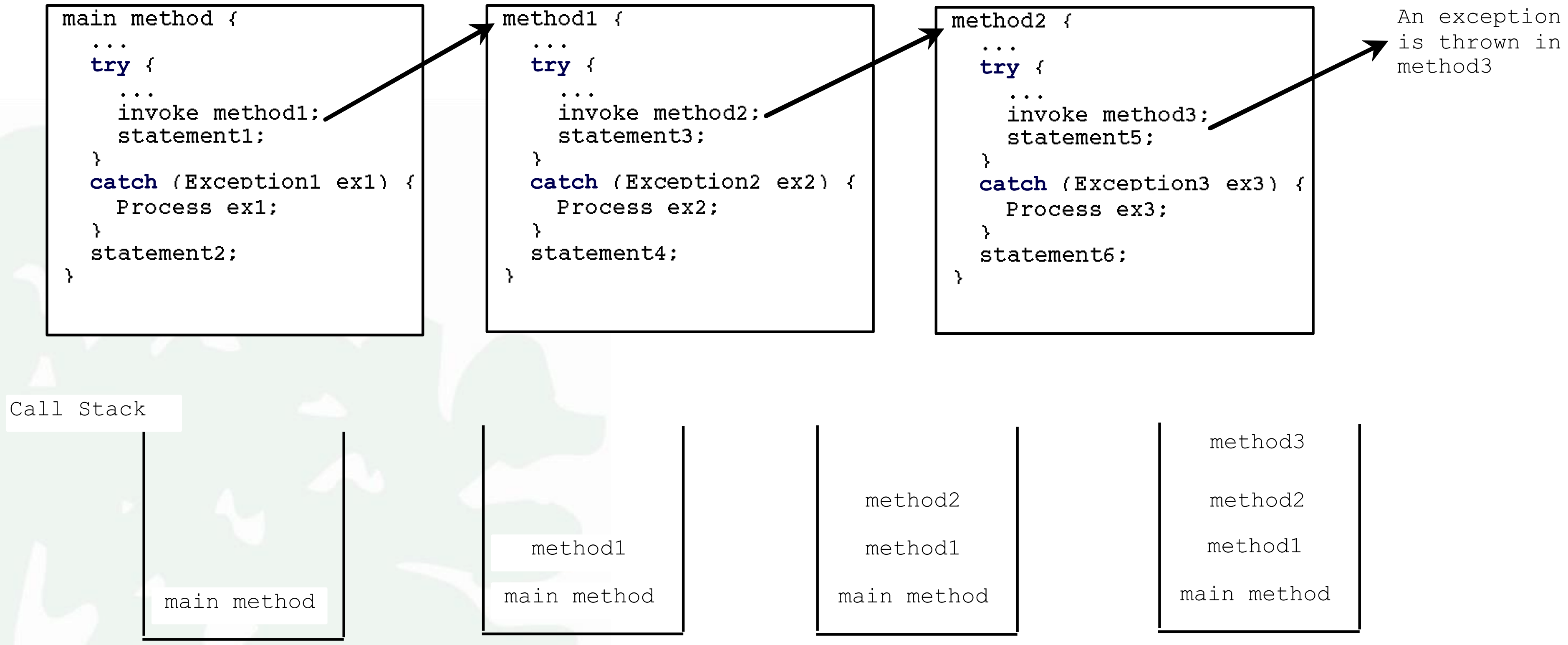
Catching Exceptions



```
main method {
  ...
  try {
    ...
    invoke method1;
    statement1;
  }
  catch (Exception1 ex1) {
    Process ex1;
  }
  statement2;
}
```

```
method1 {
  ...
  try {
    ...
    invoke method2;
    statement3;
  }
  catch (Exception2 ex2) {
    Process ex2;
  }
  statement4;
}
```

```
method2 {
  ...
  try {
    ...
    invoke method3;
    statement5;
  }
  catch (Exception3 ex3) {
    Process ex3;
  }
  statement6;
}
```

Catch or Declare Checked Exceptions

Suppose p2 is defined as follows:

```
void p2() throws IOException {
  if (a file does not exist) {
     throw new IOException("File does not exist");
  }

  ...
}
```

Catch or Declare Checked Exceptions

Java forces you to deal with checked exceptions. If a method declares a checked exception (i.e., an exception other than Error or RuntimeException), you must invoke it in a try-catch block or declare to throw the exception in the calling method. For example, suppose that method p1 invokes method p2 and p2 may throw a checked exception (e.g., IOException), you have to write the code as shown in (a) or (b).

```
void p1() {
  try {
    p2();
  }
  catch (IOException ex) {
    ...
  }
}
```

(a)

```
void p1() throws IOException {

  p2();

}
```

(b)

Example: Declaring, Throwing, and Catching Exceptions

- Objective: This example demonstrates declaring, throwing, and catching exceptions by modifying the setRadius method in the Circle class defined in Chapter 9. The new setRadius method throws an exception if radius is negative.

CircleWithException

TestCircleWithException

Run

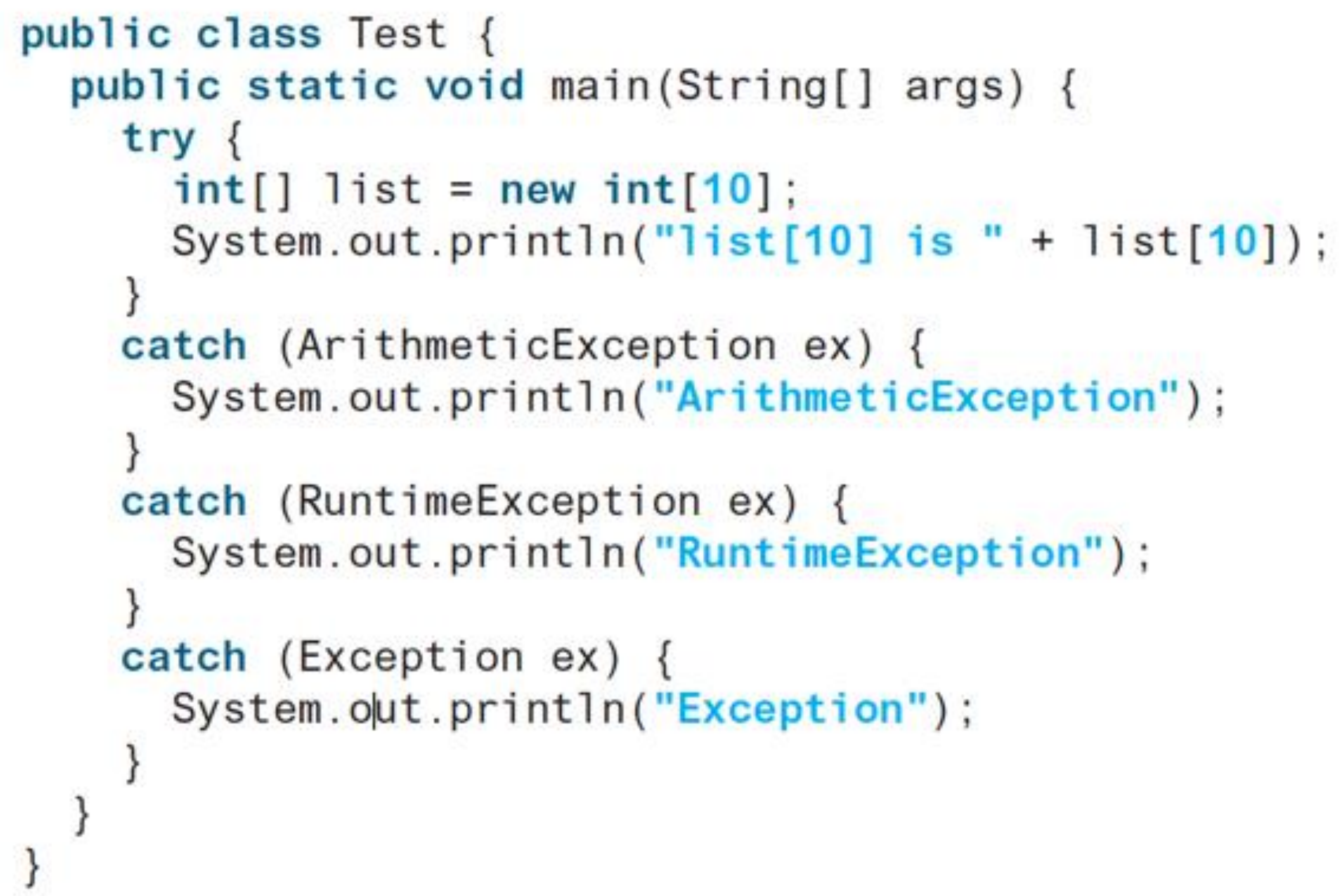
```java
public class CircleWithException {
  /** The radius of the circle */
  private double radius;

  /** The number of the objects created */
  private static int numberOfObjects = 0;

  /** Construct a circle with radius 1 */
  public CircleWithException() {
    this(1.0);
  }

  /** Construct a circle with a specified radius */
  public CircleWithException(double newRadius) {
    setRadius(newRadius);
    numberOfObjects++;
  }

  /** Return radius */
  public double getRadius() {
    return radius;
  }
```

throws IllegalArgumentException

```java
  /** Set a new radius */
  public void setRadius(double newRadius)
      throws IllegalArgumentException {
    if (newRadius >= 0)
      radius =  newRadius;
    else
      throw new IllegalArgumentException(
        "Radius cannot be negative");
  }

  /** Return numberOfObjects */
  public static int getNumberOfObjects() {
    return numberOfObjects;
  }

  /** Return the area of this circle */
  public double findArea() {
    return radius * radius * 3.14159;
  }
}
```

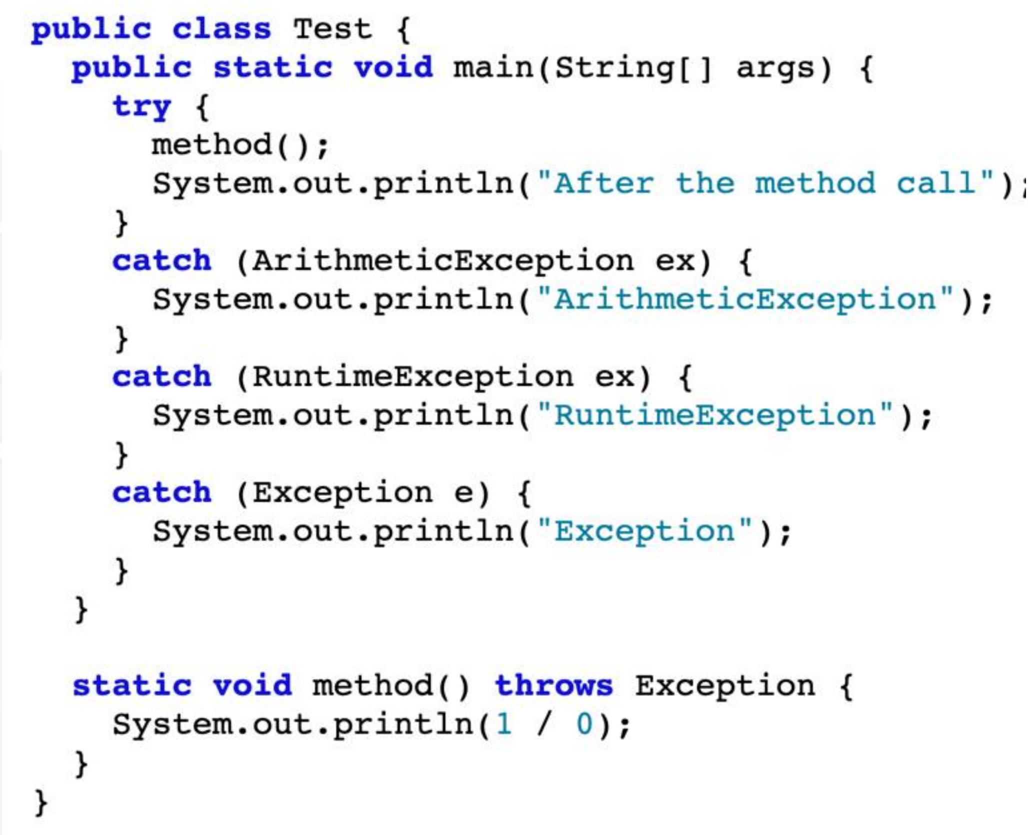
```java
public class TestCircleWithException {
  public static void main(String[] args) {
    try {
      CircleWithException c1 = new CircleWithException(5);
      CircleWithException c2 = new CircleWithException(-5);
      CircleWithException c3 = new CircleWithException(0);
    }
    catch (IllegalArgumentException ex) {
      System.out.println(ex);
    }

    System.out.println("Number of objects created: " +
      CircleWithException.getNumberOfObjects());
  }
}
```

What’s the Exception?



```
public class Test {
  public static void main(String[] args) {
    try {
      int[] list = new int[10];
      System.out.println("list[10] is " + list[10]);
    }
    catch (ArithmeticException ex) {
      System.out.println("ArithmeticException");
    }
    catch (RuntimeException ex) {
      System.out.println("RuntimeException");
    }
    catch (Exception ex) {
      System.out.println("Exception");
    }
  }
}
```

What’s the Exception?



```
public class Test {
  public static void main(String[] args) {
    try {
      method();
      System.out.println("After the method call");
    }
    catch (ArithmeticException ex) {
      System.out.println("ArithmeticException");
    }
    catch (RuntimeException ex) {
      System.out.println("RuntimeException");
    }
    catch (Exception e) {
      System.out.println("Exception");
    }
  }

  static void method() throws Exception {
    System.out.println(1 / 0);
  }
}
```

What’s the Exception

```
public class Test {
  public static void main(String[] args) {
    try {
      method();
      System.out.println("After the method call");
    }
    catch (RuntimeException ex) {
      System.out.println("RuntimeException in main");
    }
    catch (Exception ex) {
      System.out.println("Exception in main");
    }
  }

  static void method() throws Exception {
    try {
      String s ="abc";
      System.out.println(s.charAt(3));
    }
    catch (RuntimeException ex) {
      System.out.println("RuntimeException in method()");
    }
    catch (Exception ex) {
      System.out.println("Exception in method()");
    }
  }
}
```

The `finally` Clause

```
try {
  statements;
}
catch(TheException ex) {
  handling ex;
}
finally {
  finalStatements;
}
```

What happens?

1. If no exception arises in the try block, finally block is executed and the next statement after the try statement is executed.

2. If a statement causes an exception in the try block that is caught in a catch block, the rest of the statements in the try block are skipped, the catch block is executed, and the finally clause is executed. The next statement after the try statement is executed.

3. If one of the statements causes an exception that is not caught in any catch block, the other statements in the try block are skipped, the finally clause is executed, and the exception is passed to the caller of this method.

The finally block executes even if there is a return statement prior to reaching the finally block.

- **Note: The catch block may be omitted when the finally clause is used.**

animation

Trace a Program Execution

Suppose no exceptions in the statements

```
try {
  statements;
}
catch(TheException ex) {
  handling ex;
}
finally {
  finalStatements;
}

Next statement;
```

Trace a Program Execution

```
try {
   statements;
}
catch(TheException ex) {
   handling ex;
}
finally {
   finalStatements;
}

Next statement;
```

The final block is always executed

animation

Trace a Program Execution

```
try {
  statements;
}
catch(TheException ex) {
  handling ex;
}
finally {
  finalStatements;
}

Next statement;
```

Next statement in the method is executed

animation

Trace a Program Execution

```
try {
  statement1;
  statement2;
  statement3;
}
catch(Exception1 ex) {
  handling ex;
}
finally {
  finalStatements;
}

Next statement;
```

Suppose an exception of type Exception1 is thrown in statement2

animation

Trace a Program Execution

```
try {
  statement1;
  statement2;
  statement3;
}
catch(Exception1 ex) {
  handling ex;
}
finally {
  finalStatements;
}

Next statement;
```

The exception is handled.

animation

Trace a Program Execution

```
try {
  statement1;
  statement2;
  statement3;
}
catch(Exception1 ex) {
  handling ex;
}
finally {
  finalStatements;
}

Next statement;
```

The final block is always executed.

animation

Trace a Program Execution

```
try {
  statement1;
  statement2;
  statement3;
}
catch(Exception1 ex) {
  handling ex;
}
finally {
  finalStatements;
}

Next statement;
```

The next statement in the method is now executed.

animation

Trace a Program Execution

```
try {
  statement1;
  statement2;
  statement3;
}
catch(Exception1 ex) {
  handling ex;
}
catch(Exception2 ex) {
  handling ex;
  throw ex;
}
finally {
  finalStatements;
}

Next statement;
```

statement2 throws an exception of type Exception2.

animation

Trace a Program Execution

```
try {
  statement1;
  statement2;
  statement3;
}
catch(Exception1 ex) {
  handling ex;
}
catch(Exception2 ex) {
  handling ex;
  throw ex;
}
finally {
  finalStatements;
}

Next statement;
```

Handling exception

Trace a Program Execution

```
try {
  statement1;
  statement2;
  statement3;
}
catch(Exception1 ex) {
  handling ex;
}
catch(Exception2 ex) {
  handling ex;
  throw ex;
}
finally {
  finalStatements;
}

Next statement;
```

Execute the final block

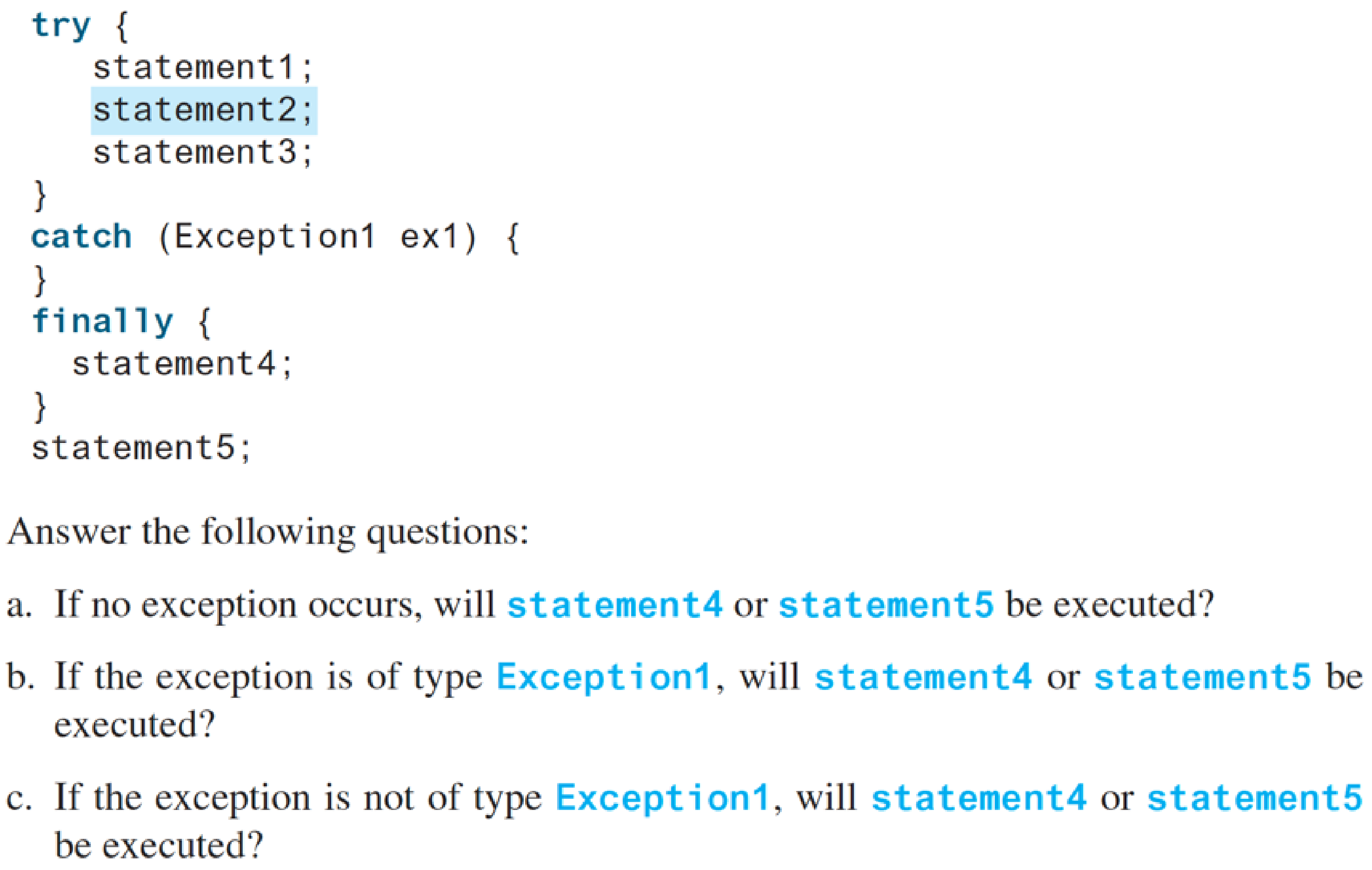
animation

Trace a Program Execution

```
try {
  statement1;
  statement2;
  statement3;
}
catch(Exception1 ex) {
  handling ex;
}
catch(Exception2 ex) {
  handling ex;
  throw ex;
}
finally {
  finalStatements;
}

Next statement;
```

Rethrow the exception and control is transferred to the caller

Answer this



```
try {
   statement1;
   statement2;
   statement3;
}
catch (Exception1 ex1) {
}
finally {
  statement4;
}
statement5;
```

Answer the following questions:

a. If no exception occurs, will `statement4` or `statement5` be executed?

b. If the exception is of type `Exception1`, will `statement4` or `statement5` be executed?

c. If the exception is not of type `Exception1`, will `statement4` or `statement5` be executed?

Cautions When Using Exceptions

- Exception handling separates error-handling code from normal programming tasks, thus making programs **easier** to read and to modify.

- Be aware, however, that exception handling usually requires **more time and resources** because it requires instantiating a new exception object, rolling back the call stack, and propagating the errors to the calling methods.

When to Throw Exceptions

- An exception occurs in a method.
- If you want the exception to be processed by its caller, you should create an exception object and throw it.
- If you can handle the exception in the method where it occurs, there is no need to throw it.

Rethrowing Exceptions

```
try {
  statements;
}
catch(TheException ex) {
  perform operations before exits;
  throw ex;
}
```

When to Use Exceptions

- When should you use the try-catch block in the code? You should use it to deal with **unexpected** error conditions.

- Do not use it to deal with simple, expected situations. For example, the following code

```
try {
  System.out.println(refVar.toString());
}
catch (NullPointerException ex) {
  System.out.println("refVar is null");
}
```

When to Use Exceptions

is better to be replaced by

```
if (refVar != null)
  System.out.println(refVar.toString());
else
  System.out.println("refVar is null");
```

Defining Custom Exception Classes

- Use the exception classes in the API whenever possible.
- Define custom exception classes if the predefined classes are not sufficient.
- Define custom exception classes by extending Exception or a subclass of Exception.

Custom Exception Class Example

In Listing 13.8, the setRadius method throws an exception if the radius is negative. Suppose you wish to pass the radius to the handler, you have to create a custom exception class.

```java
public class InvalidRadiusException extends Exception {
  private double radius;

  /** Construct an exception */
  public InvalidRadiusException(double radius) {
    super("Invalid radius " + radius);
    this.radius = radius;
  }

  /** Return the radius */
  public double getRadius() {
    return radius;
  }
}
```

```java
/** Set a new radius */
public void setRadius(double newRadius)
    throws InvalidRadiusException {
  if (newRadius >= 0)
    radius =  newRadius;
  else
    throw new InvalidRadiusException(newRadius);
}
```

InvalidRadiusException

CircleWithRadiusException

TestCircleWithRadiusException

Run

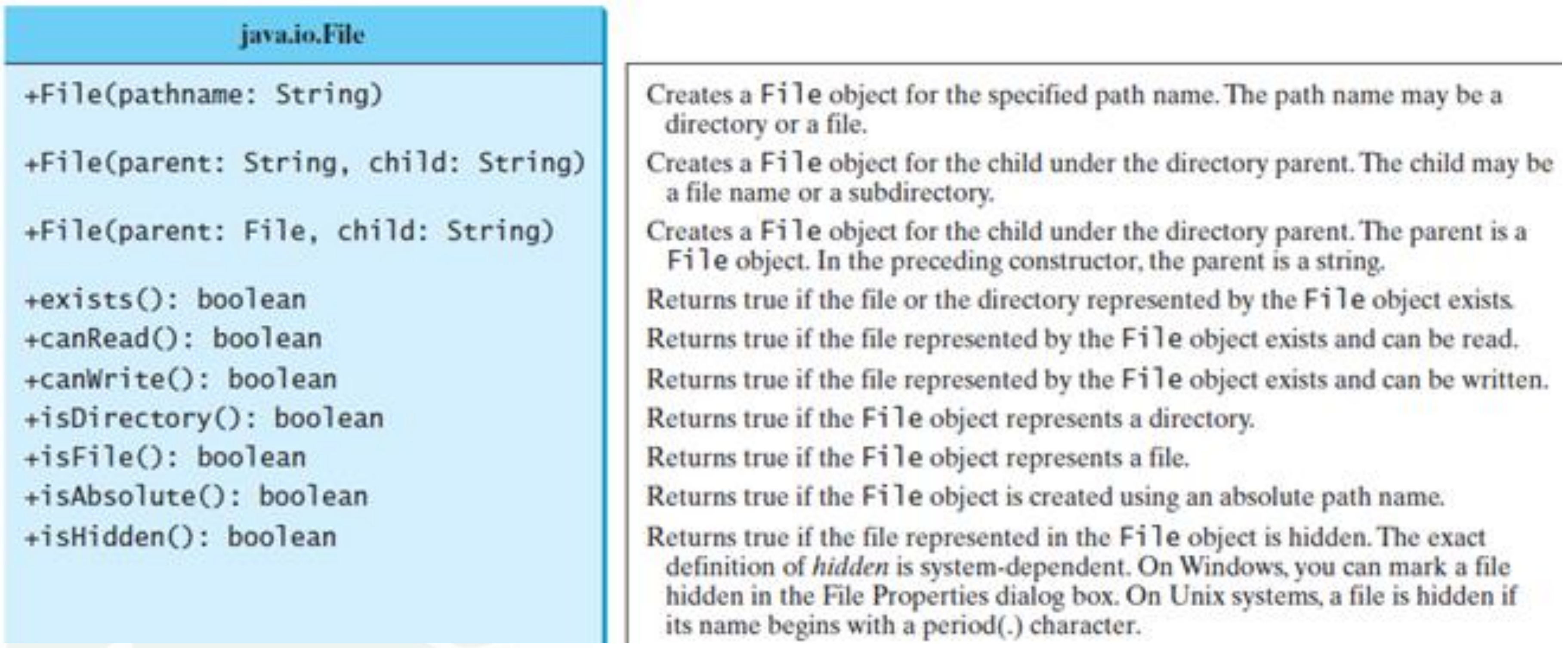
The File Class

The File class is intended to provide an abstraction that deals with most of the machine-dependent complexities of files and path names in a machine-independent fashion.

The filename is a string.

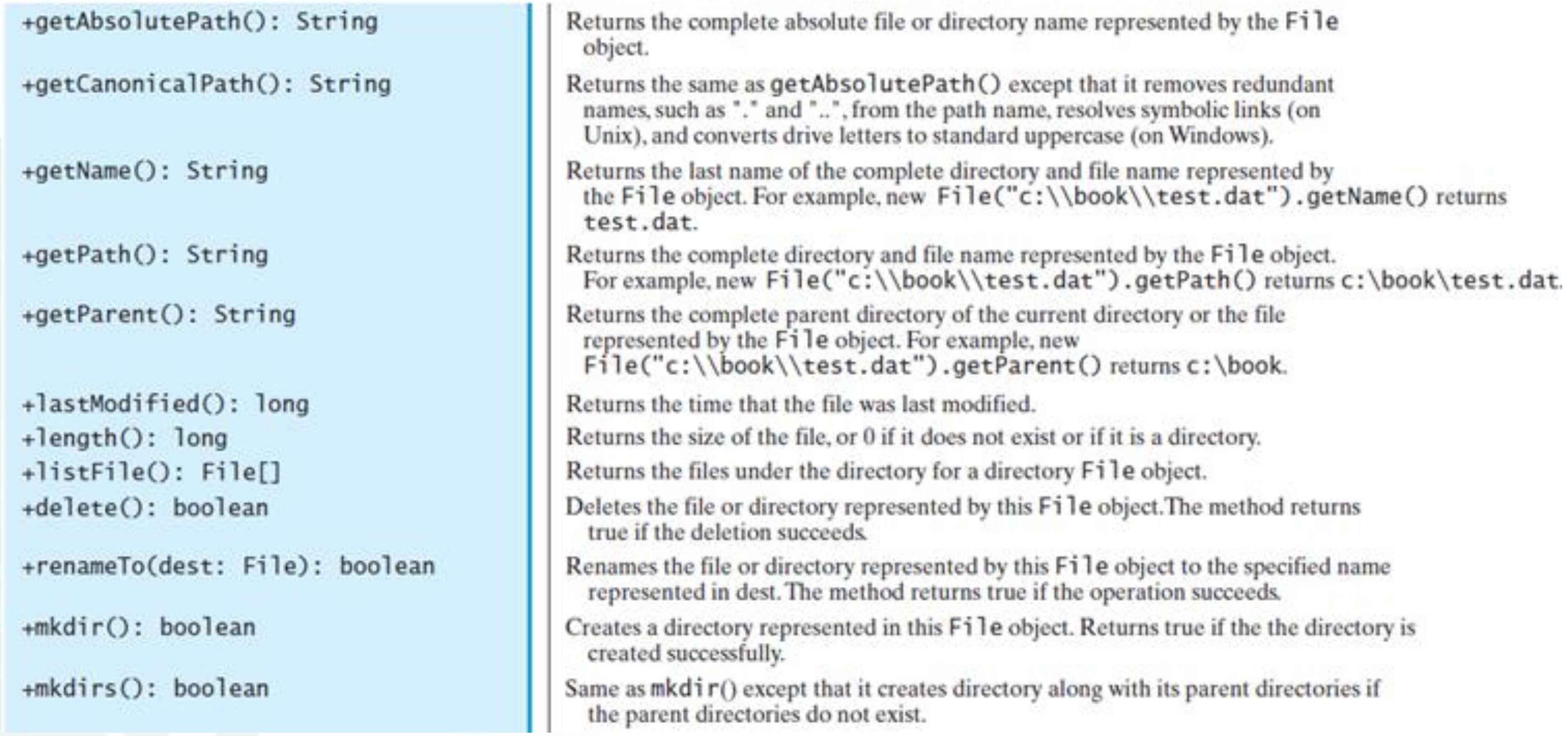
The File class is a wrapper class for the file name and its directory path.

File class



java.io.File	
+File(pathname: String)	Creates a File object for the specified path name. The path name may be a directory or a file.
+File(parent: String, child: String)	Creates a File object for the child under the directory parent. The child may be a file name or a subdirectory.
+File(parent: File, child: String)	Creates a File object for the child under the directory parent. The parent is a File object. In the preceding constructor, the parent is a string.
+exists(): boolean	Returns true if the file or the directory represented by the File object exists.
+canRead(): boolean	Returns true if the file represented by the File object exists and can be read.
+canWrite(): boolean	Returns true if the file represented by the File object exists and can be written.
+isDirectory(): boolean	Returns true if the File object represents a directory.
+isFile(): boolean	Returns true if the File object represents a file.
+isAbsolute(): boolean	Returns true if the File object is created using an absolute path name.
+isHidden(): boolean	Returns true if the file represented in the File object is hidden. The exact definition of *hidden* is system-dependent. On Windows, you can mark a file hidden in the File Properties dialog box. On Unix systems, a file is hidden if its name begins with a period(.) character.

File class



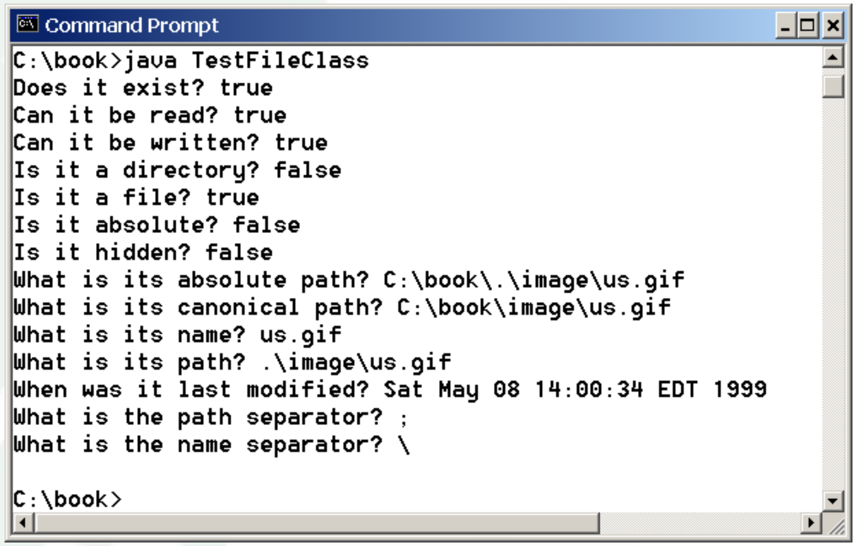
`+getAbsolutePath(): String`	Returns the complete absolute file or directory name represented by the `File` object.
`+getCanonicalPath(): String`	Returns the same as `getAbsolutePath()` except that it removes redundant names, such as "." and "..", from the path name, resolves symbolic links (on Unix), and converts drive letters to standard uppercase (on Windows).
`+getName(): String`	Returns the last name of the complete directory and file name represented by the `File` object. For example, new `File("c:\\book\\test.dat").getName()` returns `test.dat`.
`+getPath(): String`	Returns the complete directory and file name represented by the `File` object. For example, new `File("c:\\book\\test.dat").getPath()` returns `c:\book\test.dat`.
`+getParent(): String`	Returns the complete parent directory of the current directory or the file represented by the `File` object. For example, new `File("c:\\book\\test.dat").getParent()` returns `c:\book`.
`+lastModified(): long`	Returns the time that the file was last modified.
`+length(): long`	Returns the size of the file, or 0 if it does not exist or if it is a directory.
`+listFile(): File[]`	Returns the files under the directory for a directory `File` object.
`+delete(): boolean`	Deletes the file or directory represented by this `File` object.The method returns true if the deletion succeeds.
`+renameTo(dest: File): boolean`	Renames the file or directory represented by this `File` object to the specified name represented in dest. The method returns true if the operation succeeds.
`+mkdir(): boolean`	Creates a directory represented in this `File` object. Returns true if the the directory is created successfully.
`+mkdirs(): boolean`	Same as `mkdir()` except that it creates directory along with its parent directories if the parent directories do not exist.

Text I/O

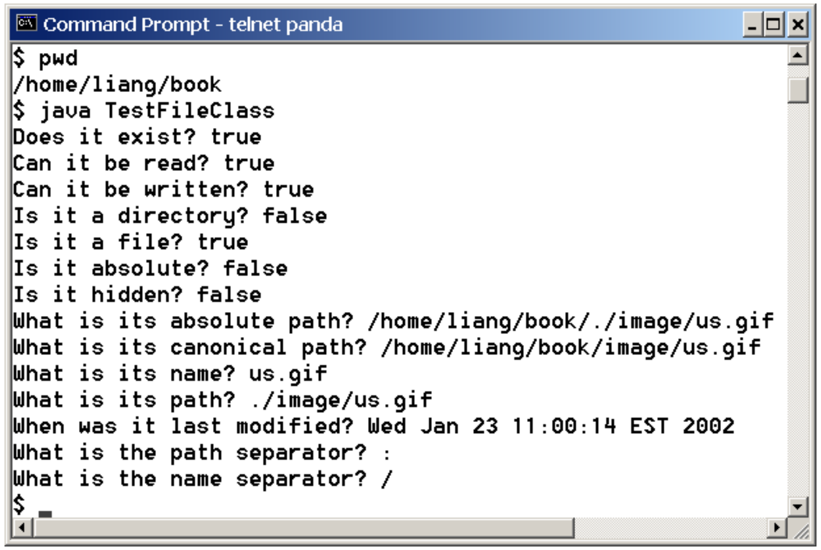
- A **File** object encapsulates the properties of a file or a path, but does not contain the methods for reading/writing data from/to a file.
- In order to perform I/O, you need to create objects using appropriate Java I/O classes.
- The objects contain the methods for reading/writing data from/to a file.
- This section introduces how to read/write strings and numeric values from/to a text file using the **Scanner** and **PrintWriter** classes.

Problem: Explore File Properties

Objective: Write a program that demonstrates how to create files in a platform-independent way and use the methods in the File class to obtain their properties. The following figures show a sample run of the program on Windows and on Unix.



```
C:\book>java TestFileClass
Does it exist? true
Can it be read? true
Can it be written? true
Is it a directory? false
Is it a file? true
Is it absolute? false
Is it hidden? false
What is its absolute path? C:\book\.\image\us.gif
What is its canonical path? C:\book\image\us.gif
What is its name? us.gif
What is its path? .\image\us.gif
When was it last modified? Sat May 08 14:00:34 EDT 1999
What is the path separator? ;
What is the name separator? \

C:\book>
```



```
$ pwd
/home/liang/book
$ java TestFileClass
Does it exist? true
Can it be read? true
Can it be written? true
Is it a directory? false
Is it a file? true
Is it absolute? false
Is it hidden? false
What is its absolute path? /home/liang/book/./image/us.gif
What is its canonical path? /home/liang/book/image/us.gif
What is its name? us.gif
What is its path? ./image/us.gif
When was it last modified? Wed Jan 23 11:00:14 EST 2002
What is the path separator? :
What is the name separator? /
$ _
```

TestFileClass Run

Writing Data Using PrintWriter

java.io.PrintWriter	
+PrintWriter(filename: String)	Creates a PrintWriter for the specified file.
+print(s: String): void	Writes a string.
+print(c: char): void	Writes a character.
+print(cArray: char[]): void	Writes an array of character.
+print(i: int): void	Writes an int value.
+print(l: long): void	Writes a long value.
+print(f: float): void	Writes a float value.
+print(d: double): void	Writes a double value.
+print(b: boolean): void	Writes a boolean value.
Also contains the overloaded println methods.	A println method acts like a print method; additionally it prints a line separator. The line separator string is defined by the system. It is \r\n on Windows and \n on Unix.
Also contains the overloaded printf methods.	The printf method was introduced in §4.6, "Formatting Console Output and Strings."

WriteData

Run

Try-with-resources

Programmers often forget to close the file. JDK 7 provides the followings new try-with-resources syntax that automatically closes the files.

try (declare and create resources) {

  Use the resource to process the file;

}

WriteDataWithAutoClose Run

Reading Data Using Scanner

java.util.Scanner	
+Scanner(source: File)	Creates a Scanner object to read data from the specified file.
+Scanner(source: String)	Creates a Scanner object to read data from the specified string.
+close()	Closes this scanner.
+hasNext(): boolean	Returns true if this scanner has another token in its input.
+next(): String	Returns next token as a string.
+nextByte(): byte	Returns next token as a byte.
+nextShort(): short	Returns next token as a short.
+nextInt(): int	Returns next token as an int.
+nextLong(): long	Returns next token as a long.
+nextFloat(): float	Returns next token as a float.
+nextDouble(): double	Returns next token as a double.
+useDelimiter(pattern: String): Scanner	Sets this scanner's delimiting pattern.

ReadData Run

Problem: Replacing Text

Write a class named ReplaceText that replaces a string in a text file with a new string. The filename and strings are passed as command-line arguments as follows:

```
java ReplaceText sourceFile targetFile oldString newString
```

For example, invoking

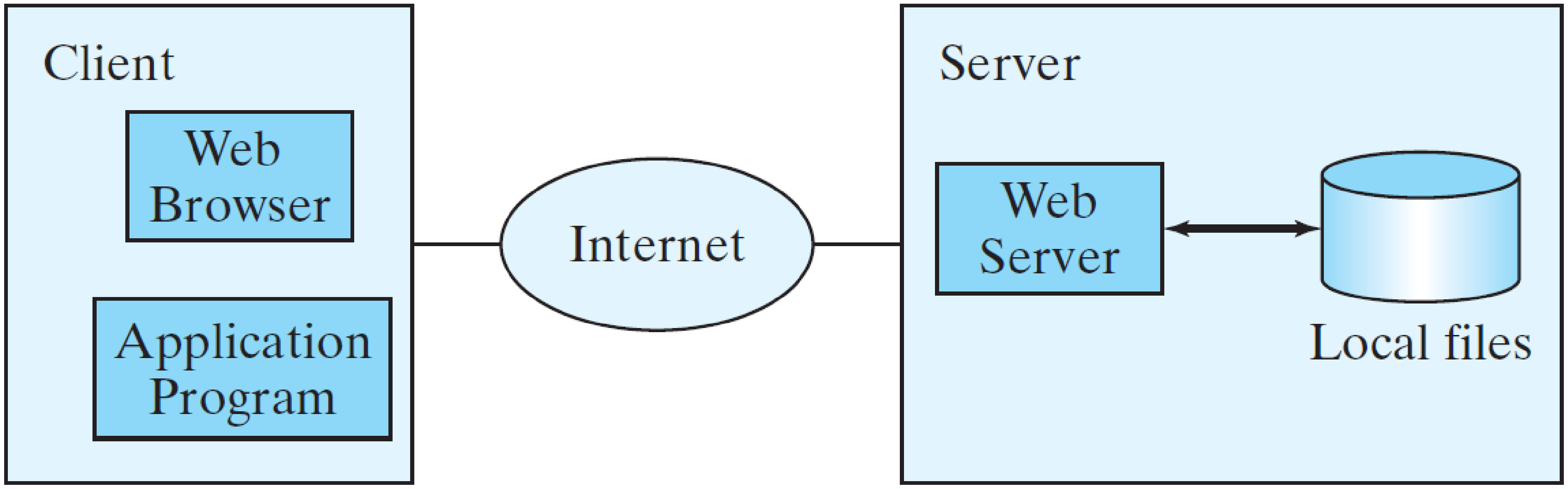
```
java ReplaceText FormatString.java t.txt StringBuilder StringBuffer
```

replaces all the occurrences of StringBuilder by StringBuffer in FormatString.java and saves the new file in t.txt.

ReplaceText   Run

Reading Data from the Web

Just like you can read data from a file on your computer, you can read data from a file on the Web.



Reading Data from the Web

URL url = **new** URL("**www.google.com/index.html**");

After a **URL** object is created, you can use the **openStream()** method defined in the **URL** class to open an input stream and use this stream to create a **Scanner** object as follows:

Scanner input = **new** Scanner(url.openStream());

ReadFileFromURL

Run