
ORACLE
ACADEMY

Java Foundations

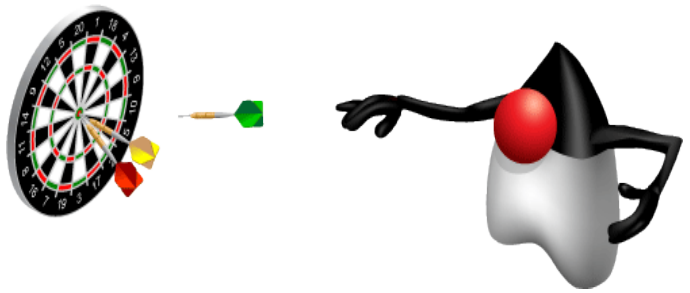
8-3
Exception Handling

ORACLE ACADEMY

Objectives

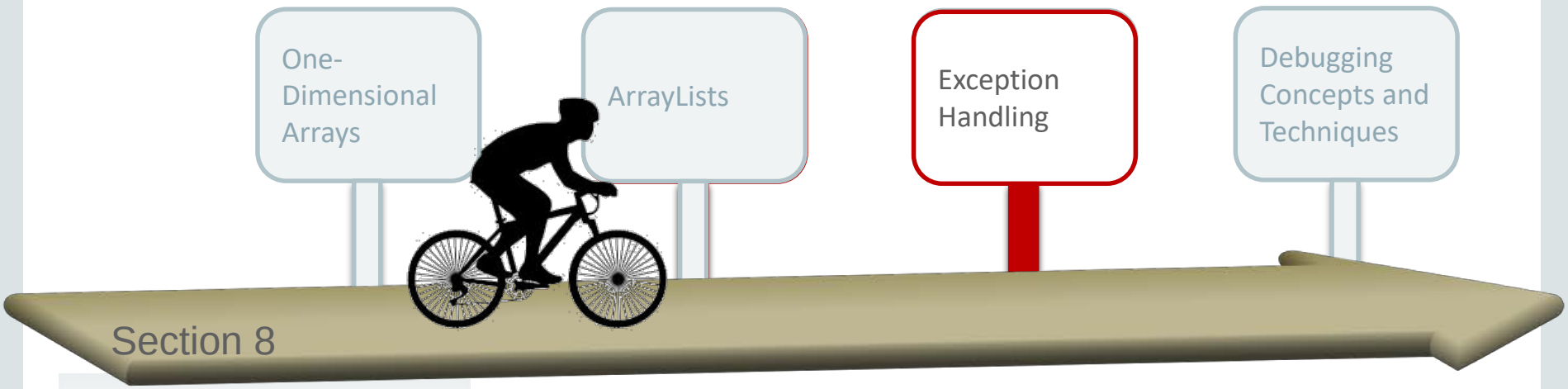
This lesson covers the following objectives:

- Explain the purpose of exception handling
- Handle exceptions with a `try/catch` construct
- Describe common exceptions thrown in Java



Topics

- What Is an Exception?
- Exception Handling with the `try/catch` Block
- Common Exceptions



What Is an Exception?

- To understand exception handling, you need to first understand what is an exception.
- An exception is an error that occurs during the execution of a program(run-time) that disrupts the normal flow of the Java program.
- However, you can handle such conditions within your program and take necessary corrective actions so that the program can continue with its execution(exception handling).

Why Should You Handle Exceptions?

If an exception occurs while your program is executing …

- Execution of the program is terminated.
- A stack trace, with the details of the exception, is printed in the console.

When You Don't Handle Exceptions: Example

- In Java, the following code throws an exception because you can't divide an integer by zero:

```
1 public class ExceptionHandling {
2
3   public static void main(String args[]) {
4       int d = 0;
5       int a = 10 / d;
6       System.out.print(a);
7   }
8 }
```

Exception occurs at this statement.

This statement isn't executed.

- A stack trace, with the details of the exception, is printed in the console.
- Execution of the program is terminated at line 4, and so the statement at line 5 isn't executed.

When You Don’t Handle Exceptions

- When Java encounters an error or condition that prevents execution from proceeding normally, Java "throws" an exception.
- If the exception isn't "caught" by the programmer, the program crashes.
- The exception description and current stack trace are printed to the console.

Dealing with Exceptions

- One way to deal with exceptions is to simply avoid them in the first place.
- For example, avoid an `ArithmeticException` by using conditional logic: Test to see if the condition will arise before you attempt the potentially risky operation.

```
int divisor = 0;

if(divisor == 0){
    System.out.println("Can't be zero!");
}
else{
    System.out.println( 5 / divisor );
}
```

Exception Categories

Java exceptions fall into two categories:

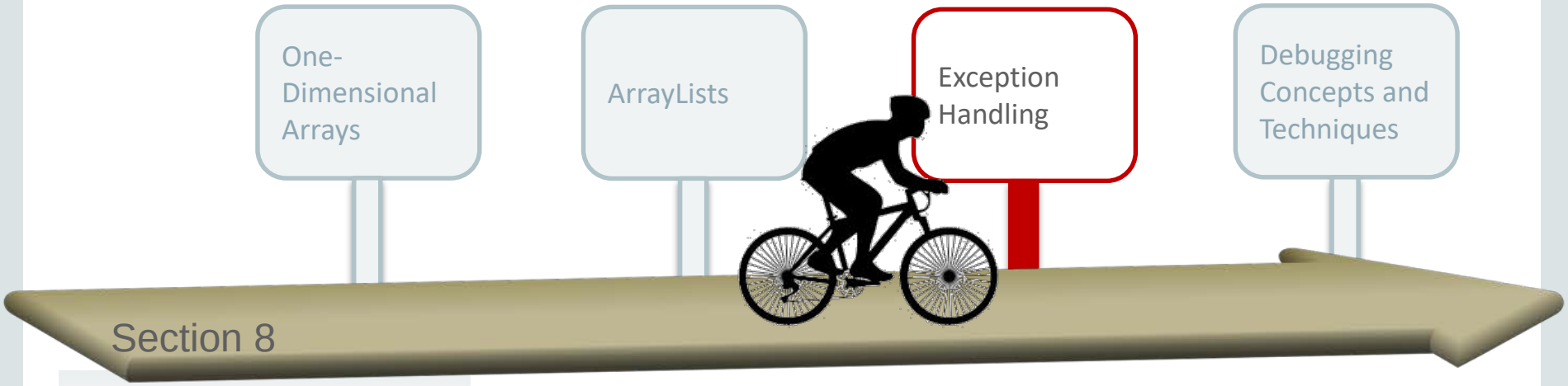
- Checked Exceptions:
  - Compiler checks and deals with exceptions. If the exceptions aren't handled in the program, it gives a compilation error.
  - Examples: `FileNotFoundException`, `IOException`
- Unchecked Exceptions:
  - Compiler does not check and deal with exceptions.
  - Examples: `ArrayIndexOutOfBoundsException`, `NullPointerException`, `ArithmeticException`

Exercise 1

- Import and open the `ExceptionsEx` project.
- Examine `ExceptionEx1.java`:
  - Execute the program and observe the output:
  - `ArrayIndexOutOfBoundsException` occurs.
  - Is it a good practice to handle the exception for this program?
  - Modify the program to compute the sum of the array.

Topics

- What Is an Exception?
- Exception Handling with the `try/catch` Block
- Common Exceptions



Handling Exceptions with the `try/catch` Block

- But not all exceptions can be prevented because you don't always know whether a given operation will fail before it's invoked.
- Another strategy is to use the **`try/catch`** block for exception handling.

Understanding the `try/catch` Block

- For code that's likely to cause an exception, you can write the code inside a special "`try`" block.
- You associate exception handlers with a `try` block by providing one or more `catch` blocks after the `try` block.
- Each `catch` block handles the type of exception indicated by its argument.
- The `ExceptionType` argument type declares the type of exception.

Flow Control in `try/catch` Blocks: Success

If the `try` block succeeds, no exception occurs.

```
try {
    // risky code that is likely to cause
    // an exception
}
catch(ExceptionType ex) {
    // exception handling code

}

System.out.println("We made it");
```

1

2

First the try block runs, and then the code after the catch block runs.

Flow Control in `try/catch` Blocks: Failure

If the `try` block **fails**, an exception occurs.

```
try {
    // risky code that is likely to cause
    // an exception
}
catch(ExceptionType ex) {
    // exception handling code

}

System.out.println("We made it");
```

1
2
3

The try block runs, an exception occurs, and the rest of the try block doesn't run.

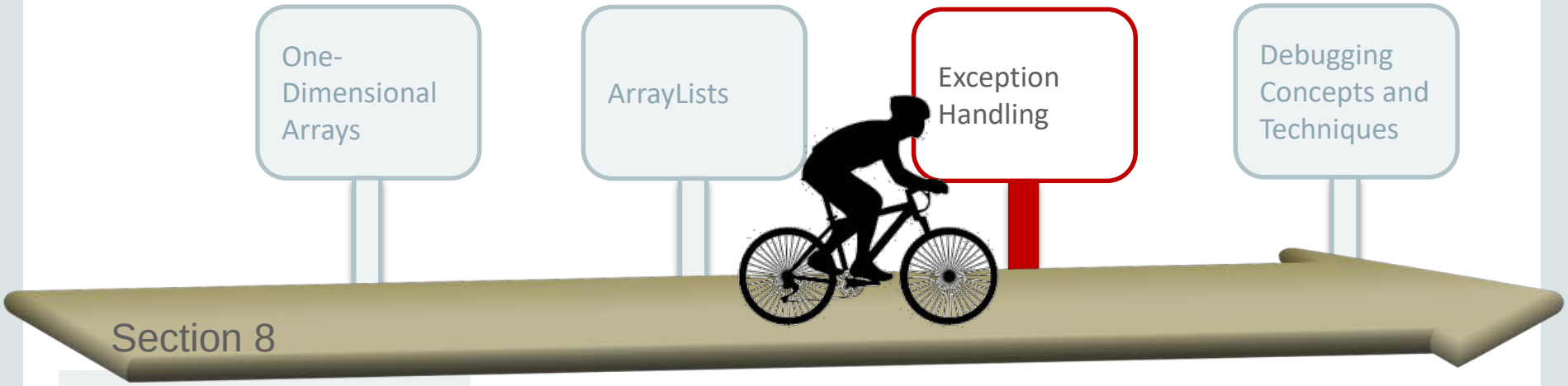
The catch block runs, and then the rest of the code runs.

Flow Control in try/catch Blocks: Example

```
1 public static void main(String args[]) {
2    int a = 100, res;
3    try{
4        System.out.println("Enter the value for b");
5        Scanner console = new Scanner(System.in);
6        int b = console.nextInt();
7        System.out.println("Enter the value for c");
8        int c = console.nextInt();
9        res = 10 / (b - c);
10       System.out.println(" The result is " + res);
11   }
12   catch(Exception e){
13       String errMsg = e.getMessage();
14       System.out.println(errMsg);
15   }
16   System.out.println("After catch block");
17}
```

Topics

- What Is an Exception?
- Exception Handling with the `try/catch` Block
- Common Exceptions



Examples of Exceptions

- `java.lang.ArrayIndexOutOfBoundsException`
  - Attempt to access a nonexistent array index
- `java.lang.NullPointerException`
  - Attempt to use an object reference that wasn't instantiated
- `java.io.IOException`
  - Failed or interrupted I/O operations

Understanding Common Exceptions

- Unchecked Exceptions - due to programming mistake :
  - Example: `ArrayIndexOutOfBoundsException` exception

```
01  int[] intArray = new int[5];
02  intArray[5] = 27;
```

  - Stack trace:

```
Exception in thread "main"
   java.lang.ArrayIndexOutOfBoundsException: 5
        at TestErrors.main(TestErrors.java:17)
```

Identifying `NullPointerException`

- This unchecked exception is thrown when an application attempts to use null when an object is required.
- These include:
  - Calling the instance method of a null object
  - Accessing or modifying the field of a null object

Invoking the `length` method on a null object

```
public static void main(String[] args) {

    String name=null;
    System.out.print("Length of the string"+ name.length());

}
```

Identifying IOException

```
public static void main(String[] args) {
    try {
        File testFile = new File("//testFile.txt");
        testFile.createNewFile();
        System.out.println("testFile exists:"
        + testFile.exists());
    }
    catch (IOException e) {
        System.out.println(e);
    }
}
```

Best Practices for Exception Handling

- Try to be as specific as possible with the type of error you're trying to catch.
- This allows the program to provide you with specific feedback on what went wrong.

- Catch a generic exception is often too imprecise to be useful, but can be done as a last resort.

```
catch (Exception e) {
      System.out.println(e);
}
```

Example of Bad Practice

```
public static void main(String[] args) {
try {
     File testFile = new File("//testFile.txt");
     testFile.createNewFile();
     System.out.println("testFile exists:"
        + testFile.exists());

    }
    catch (Exception e) {
         System.out.println("Error Creating File");
    }
}
```

Catching any exception

No processing of exception class?

Somewhat Better Practice

```
public static void main(String[] args) {
try {
     File testFile = new File("//testFile.txt");
     testFile.createNewFile();
     System.out.println("testFile exists:"
        + testFile.exists());

    }
    catch (IOException e) {
         System.out.println(e);
    }
}
```

Catching specific exception

The toString() is called on this object.

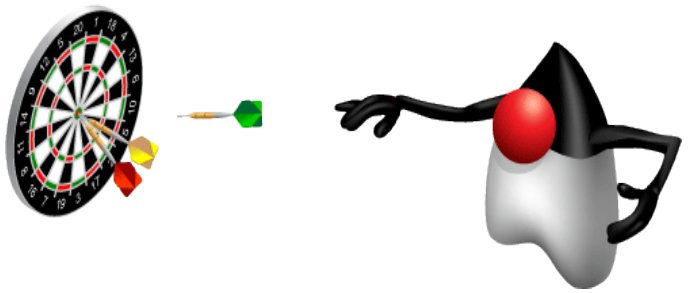
Exercise 2

- Import and open the `ExceptionsEx` project.
- Examine `Calculator.java` and `ShoppingCart.java`.
- Modify the programs to implement exception handling:
  - `Calculator.java`:
    - Identify the exception that might occur.
    - Change the divide method signature to indicate that it throws an exception.
  - `ShoppingCart.java`:
    - Catch the exception in the class that calls the divide method.

Summary

In this lesson, you should have learned how to:

- Explain the purpose of exception handling
- Handle exceptions with a `try/catch` construct
- Describe common exceptions thrown in Java




ORACLE
ACADEMY