CISC 3115

Declaring and Throwing Exceptions

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Outline

- Discussed
  - Approaches to handle errors (what-if and exceptions)
  - Concept of Exception
  - The Java throwable class hierarchy
    - system errors, runtime exceptions, checked errors, unchecked errors
- To discuss methods of
  - Declaring exception
  - Throwing exception
  - Catching exception

Motivation

- We can use exceptions to *separate notifying error from handling error*
- Is the following sufficient?

The Exception Approach: Advantage

- Separate notifying error from handling error

```
public static int quotient(int n1, int n2) {
   if (n2 == 0) {
     throw new ArithmeticException(
              "Divisor cannot be zero.");
   }
   return n1 / n2;
  }
}
```

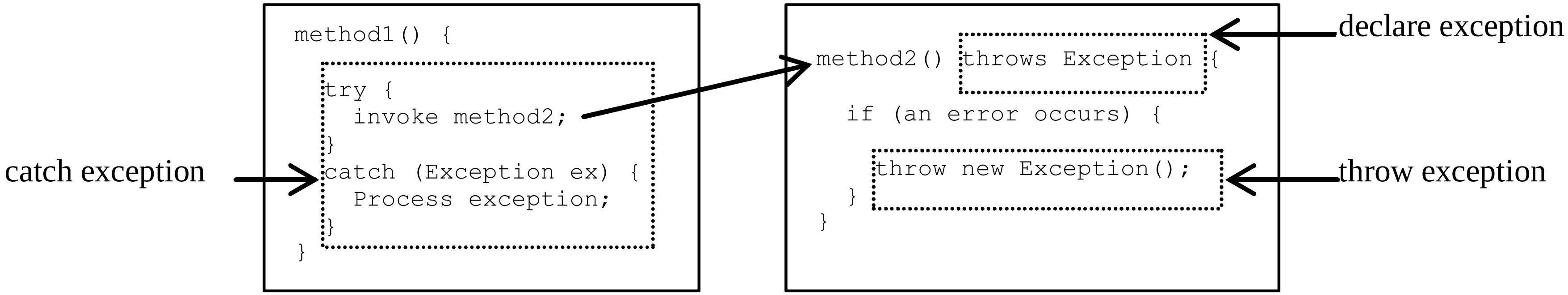
Notifying the caller an error occurred

```
public static void main(String[] args) {
                              ......
  try {
    int result = quotient(n1, n2);
    System.out.println(n1 + " / " + n2 +
              " is "  + result);
  } catch (ArithmeticException e) {
    System.out.println("Exception: " +
              e.getMessage());
  }
```

Handling the error upon receiving the notification

The Big Picture

- Declaring, Throwing, and Catching Exceptions



```
method1() {

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

```
method2() throws Exception {

  if (an error occurs) {

    throw new Exception();
  }
}
```

catch exception

declare exception

throw exception

Declaring Exception

- Every method must state the types of checked exceptions it might throw.
- Example

```
public void myMethod()  throws IOException { …
}
```

- One may declare one or more exceptions to be thrown
- Example

```
ublic void myMethod()  throws IOException, OtherException { …
}
```

Throwing Exceptions

- One can create an instance of an appropriate exception type and throw it in the method.
- Examples

```
throw new TheException();
```

Or

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

where TheException is a subclass of Throwable.

Declaring and 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");
  }
```

Declaring

Throwing

Catching Exception

- There are a few variations of try … catch …
- Frequently used:

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

Questions

- Mechanism to declaring, throwing, and catching/handling exceptions

Exercise 1

- Following the lecture, design and implement a DivideByZero class where
  - Write a quotient method that takes two parameters and perform division of the two and state the exception it throws when the denominator is 0
  - Write another method that invokes the quotient method and catch and handle the exception the method throws