

2)

1.try with resource

```
try(Scanner sc = new Scanner(System.in)){
    //..
} // sc.close();
```

2.try with catch

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

3.try with finally

```
try{
    //...
}
finally{
    //...
}
```

4.try with catch and finally

```
try{
    //..
}
catch(Exception e){
    // ...
}
finally{
    //...
}
```

day10 - demo02/src/com/sunbeam/Program02.java - Spring Tool Suite 4

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Program02.java

```
38     System.out.println("Result: " + result);
39 }
40 */
41
42 // detect the problem and throw the problem
43 public static int divide(int num, int den) {
44     if(den == 0)
45         throw new RuntimeException("Cannot Divide by Zero.");
46     int res = num / den;
47     return res;
48 }
49 public static void main(String[] args) {
50     Scanner sc = new Scanner(System.in);
51     System.out.print("Enter numerator and denominator: ");
52     int num = sc.nextInt();
53     int den = sc.nextInt();
54     try {
55         int result = divide(num, den);
56         System.out.println("Result: " + result);
57     }
58     catch (RuntimeException e) {
59         System.out.println("Divide Error");
60     }
61 }
62 }
63 }
```

Problems Javadoc Declaration Console

<terminated> Program02 [Java Application] C:\Nilesh\setup\sts-4.15.1.RELEASE\plugins\org.eclipse.jdt.core\src\com\sunbeam\Program02.java
Enter numerator and denominator: 22 0
Divide Error

Throw the exception when you cannot handle it (take appropriate action) in the method.

When exception is thrown, all statements between throw can corresponding/nearest catch block will be skipped.

Method whose execution "may" fail should be tried i.e. "try" to execute.

If no problem occurred, the whole try block is executed and catch block is skipped.

If problem occurs, control will jump to matching catch block (from throw statement) and handling logic written in catch will be executed.

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Program02.java x

```
38     System.out.println("Result: " + result);
39 }
40 */
41
42 // detect the problem and throw the problem
43 public static int divide(int num, int den) {
44     if(den == 0)
45         throw new RuntimeException("Cannot Divide by Zero.");
46     int res = num / den;
47     return res;
48 }
49 public static void main(String[] args) {
50     Scanner sc = new Scanner(System.in);
51     System.out.print("Enter numerator and denominator: ");
52     int num = sc.nextInt();
53     int den = sc.nextInt();
54     try {
55         int result = divide(num, den);
56         System.out.println("Result: " + result);
57     }
58     catch (RuntimeException e) {
59         System.out.println("Divide Error");
60     }
61 }
62 }
63 }
```

Problems @ Javadoc Declaration Console x

<terminated> Program02 [Java Application] C:\Nilesh\setup\sts-4.15.1.RELEASE\plugins\org.eclipse.jdt.core\src\com\sunbeam\Program02.java:22: error: Divide by zero

Enter numerator and denominator: 22 0

Divide Error

Program --> Runtime Problems

- Programmer's mistakes
- User's mistakes
- Depends on execution env (OS/Network/...)

Exceptions -- OOP languages

- Handle problems at runtime
- Flexible approach (Different handling in different calls to the method).

Java -- Runtime Problems -- Throwable

- Error (non-recoverable problems)
 - e.g. OutOfMemoryError, StackOverflowError, AssertionError, ...
- Exception (recoverable problems)
 - e.g. RuntimeException, NullPointerException, ArrayIndexOutOfBoundsException, ...

```
day11 - demo05/src/com/sunbeam/Program05.java - Spring Tool Suite 4
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Program05.java × Program04.java
1 package com.sunbeam;
2
3 // generic class with bounded type parameter (T)
4 class Box<T extends Number> {
5     private T obj;
6     public void set(T obj) {
7         this.obj = obj;
8     }
9     public T get() {
10        return this.obj;
11    }
12 }
13
14 public class Program05 {
15     public static void main(String[] args) {
16
17     }
18 }
19
```

```
graph TD; Object --> Number; Number --> Byte; Number --> Short; Number --> Integer; Number --> Long; Number --> Float; Number --> Double; Number --> Boolean;
```

Problems @ Javadoc Declaration Console ×
<terminated> Program04 [Java Application] C:\Nilesh\setup\sts-4.15.1.RELEASE\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_17.0.3.v20220515-1416\jre\bin\javaw.exe (Feb 12, 2024, 11:57:42 AM – 11:57:42 AM) [pid: 5576]

11
22
33

01:59:58 Search 01:57:36

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Program02.java x

```
38     System.out.println("Result: " + result);
39 }
40 */
41
42 // detect the problem and throw the problem
43 public static int divide(int num, int den) {
44     if(den == 0) X 30 6
45         throw new RuntimeException("Cannot Divide by Zero.");
46     int res = num / den; 5
47     return res;
48 }
49 public static void main(String[] args) {
50     Scanner sc = new Scanner(System.in);
51     System.out.print("Enter numerator and denominator: ");
52     int num = sc.nextInt(); 30
53     int den = sc.nextInt(); 6
54     try {
55         int result = divide(num, den);
56         System.out.println("Result: " + result); 5
57     } catch (RuntimeException e) {
58         System.out.println("Divide Error");
59     }
60 }
61 }
62 }
63 }
```

Problems Javadoc Declaration Console x

<terminated> Program02 [Java Application] C:\Nilesh\setup\sts-4.15.1.RELEASE\plugins\org.eclipse.jdt.core\src\com\sunbeam\Program02.java

Enter numerator and denominator: 30 6

Result: 5

Search Windows Google YouTube Facebook Twitter LinkedIn Instagram Pinterest Tumblr Reddit WhatsApp Signal Discord Slack Zoom Teams Skype Viber WeChat Weibo Twitter Facebook Instagram LinkedIn YouTube TikTok Snapchat Twitter Facebook Instagram LinkedIn YouTube TikTok <span style="border: 1px solid blue; border-radius: 50%; padding: 2px 5

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Program02.java x

```
38     System.out.println("Result: " + result);
39 }
40 */
41
42 // detect the problem and throw the problem
43 public static int divide(int num, int den) {
44     if(den == 0) 22 0
45         throw new RuntimeException("Cannot Divide by Zero.");
46     int res = num / den; xxx not executed
47     return res;
48 }
49
50 public static void main(String[] args) {
51     Scanner sc = new Scanner(System.in);
52     System.out.print("Enter numerator and denominator: ");
53     int num = sc.nextInt(); 22
54     int den = sc.nextInt(); 0
55     try {
56         int result = divide(num, den);
57         System.out.println("Result: " + result); xxx not executed +
58     } catch (RuntimeException e) {
59         System.out.println("Divide Error");
60     }
61 }
62
63
```

Problems Javadoc Declaration Console

<terminated> Program02 [Java Application] C:\Nilesh\setup\sts-4.15.1.RELEASE\plugins\org.eclipse.jdt.core\src\com\sunbeam\Program02.java:22: error: division by zero

Enter numerator and denominator: 22 0

Divide Error

Search

11:53 AM

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Program02.java x

```
38         System.out.println("Result: " + result);
39     }
40     */
41     // detect the problem and throw the problem
42     public static int divide(int num, int den) {
43         if(den == 0)
44             throw new RuntimeException("Cannot Divide");
45         int res = num / den;
46         return res;
47     }
48
49     public static void main(String[] args) {
50         Scanner sc = new Scanner(System.in);
51         // try {
52             System.out.print("Enter numerator and denominator: ");
53             int num = sc.nextInt();
54             int den = sc.nextInt();
55             int result = divide(num, den);
56             System.out.println("Result: " + result);
57         // }
58         // catch (RuntimeException e) {
59         //     System.out.println("Divide Error");
60         // }
61     }
62 }
63
```

Problems Declaration Console x
<terminated> Program02 [Java Application] C:\Nilesh\setup\sts-4.15.1.RELEASE\plugins\org.eclipse.justj.openjdk.hotspot.jre.full

Enter numerator and denominator: Four Two
Exception in thread "main" java.util.InputMismatchException
at java.base/java.util.Scanner.throwFor(Scanner.java:939)
at java.base/java.util.Scanner.next(Scanner.java:1594)
at java.base/java.util.Scanner.nextInt(Scanner.java:2258)
at java.base/java.util.Scanner.nextInt(Scanner.java:2212)
at com.sunbeam.Program02.main(Program02.java:53)

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Program02.java x

```
39     System.out.println("Result: " + result);
40 }
41 */
42
43 // detect the problem and throw the problem
44 public static int divide(int num, int den) {
45     int res = num / den;
46     return res;
47 }
48 public static void main(String[] args) {
49     Scanner sc = new Scanner(System.in);
50     try {
51         System.out.print("Enter numerator and denominator: ");
52         int num = sc.nextInt();
53         int den = sc.nextInt();
54         int result = divide(num, den);
55         System.out.println("Result: " + result);
56     }
57     catch (InputMismatchException e) {
58         System.out.println("Invalid User Input.");
59     }
60 //     catch (RuntimeException e) {
61 //         System.out.println("Divide Error");
62 //     }
63 }
64 }
```

Enter numerator and denominator: 22 0
Exception in thread "main" **java.lang.ArithmeticException**: / by zero
at com.sunbeam.Program02.divide(Program02.java:45)
at com.sunbeam.Program02.main(Program02.java:54)

Java division (/) operator internally checks denominator and if it is zero, it will throw the exception -- **ArithmeticException**.

day10 - demo02/src/com/sunbeam/Program02.java - Spring Tool Suite 4

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Program02.java x

```
39         System.out.println("Result: " + result);
40     }
41     */
42
43     // detect the problem and throw the problem
44     public static int divide(int num, int den) {
45         int res = num / den;
46         return res;
47     }
48     public static void main(String[] args) {
49         Scanner sc = new Scanner(System.in);
50         try {
51             System.out.print("Enter numerator and denominator: ");
52             int num = sc.nextInt();
53             int den = sc.nextInt();
54             int result = divide(num, den);
55             System.out.println("Result: " + result);
56         }
57         catch (InputMismatchException e) {
58             System.out.println("Invalid User Input.");
59         }
60         catch (ArithmaticException e) {
61             System.out.println("Divide Error");
62         }
63     }
64 }
```

try with multiple catch blocks.

multiple try with single/common catch
is not possible.

Writable Smart Insert 63 : 6 : 1724

Search

Windows Taskbar icons: File Explorer, Google Chrome, Mozilla Firefox, Microsoft Edge, Zoom

System tray icons: Volume, Network, Battery, Signal, 12:21 PM

```
86         System.out.println("Divide Error");
87     }
88 }
*/
89
90
91 // detect the problem and throw the problem
92 public static int divide(int num, int den) {
93     int res = num / den; // divide operator may throw ArithmeticException
94     return res;
95 }
96
97 public static void main(String[] args) {
98     Scanner sc = new Scanner(System.in);
99     // we can write common catch block for multiple exceptions
100    try {
101        System.out.print("Enter numerator and denominator: ");
102        int num = sc.nextInt(); // may throw InputMismatchException
103        int den = sc.nextInt();
104        int result = divide(num, den);
105        System.out.println("Result: " + result);
106    } catch (InputMismatchException | ArithmeticException e) {
107        System.out.println("Some Problem Occurred.");
108    }
109 }
110
111 }
```

Problems Javadoc Declaration Console

<terminated> Program02 [Java Application] C:\Nilesh\setup\sts-4.15.1.RELEASE\plugins\org.eclipse.jdt.core\src\com\sunbeam\Program02.java

Enter numerator and denominator: 22 0

Some Problem Occurred.



12:30 PM

```
86         System.out.println("Divide Error");
87     }
88 }
*/
90
91 // detect the problem and throw the problem
92 public static int divide(int num, int den) {
93     int res = num / den; // divide operator may throw ArithmeticException
94     return res;
95 }
96 public static void main(String[] args) {
97     Scanner sc = new Scanner(System.in);
98     // we can write common catch block for multiple exceptions
99     try {
100         System.out.print("Enter numerator and denominator: ");
101         int num = sc.nextInt(); // may throw InputMismatchException
102         int den = sc.nextInt();
103         int result = divide(num, den);
104         System.out.println("Result: " + result);
105     }
106     catch (InputMismatchException | ArithmeticException e) {
107         System.out.println("Some Problem Occurred.");
108     }
109 }
110 }
```

Problems Javadoc Declaration Console

<terminated> Program02 [Java Application] C:\Nilesh\setup\sts-4.15.1.RELEASE\plugins\org.eclipse.jdt.core\src\com\sunbeam\Program02.java

Enter numerator and denominator: Four Two
Some Problem Occurred.

```
111
112     // detect the problem and throw the problem
113     public static int divide(int num, int den) {
114         int res = num / den; // divide operator may throw ArithmeticException
115         return res;
116     }
117     public static void main(String[] args) {
118         Scanner sc = new Scanner(System.in);
119         // we can write common catch block for multiple exceptions
120         try {
121             System.out.print("Enter numerator and denominator: ");
122             int num = sc.nextInt(); // may throw InputMismatchException
123             int den = sc.nextInt();
124             int result = divide(num, den);
125             System.out.println("Result: " + result);
126             //sc.close(); // will not execute if exception occurs
127         }
128         catch (InputMismatchException | ArithmeticException e) {
129             //sc.close(); // will not execute if exception doesn't occur
130             System.out.println("Some Problem Occurred.");
131         }
132         finally {
133             sc.close(); // will execute irrespective of exception
134             // alternate option is to use try-with-resource -- learned yesterday
135         }
136     }
```

Writable

Smart Insert

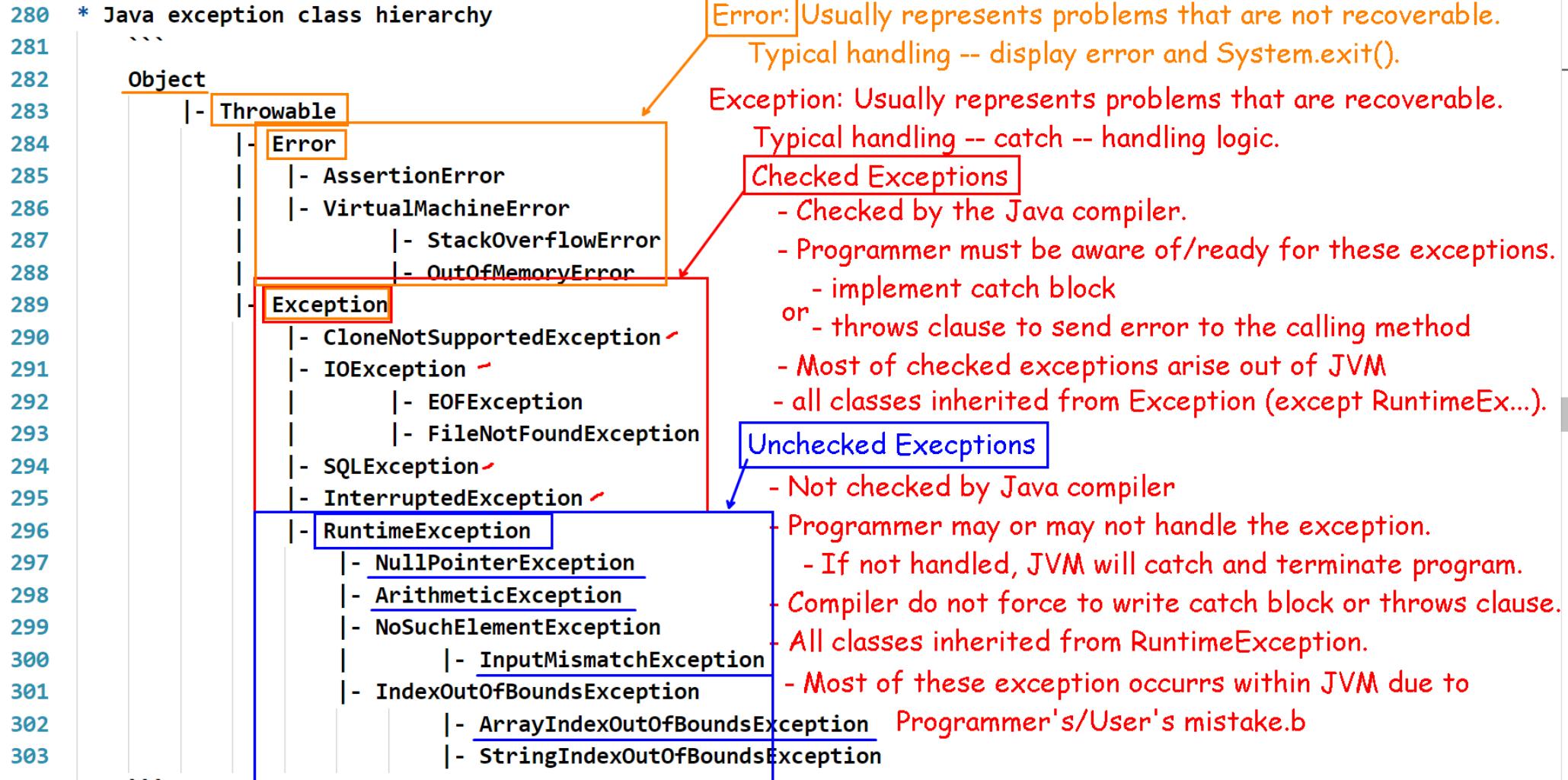
132 : 16 [7]



Search



12:35 PM



day11 - demo01/src/com/sunbeam/Program01.java - Spring Tool Suite 4 You are screen sharing Stop Share

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Program01.java x

```
1 package com.sunbeam;
2
3 import java.util.Scanner;
4
5 public class Program01 {
6     public static int divide(int num, int den) {
7         return num / den;
8     }
9     public static void main(String[] args) {
10        Scanner sc = new Scanner(System.in);
11        System.out.print("Enter two numbers: ");
12        int n = sc.nextInt();
13        int d = sc.nextInt();
14        int r = divide(n, d);
15        System.out.println("Result: " + r);
16    }
17 }
18
```

exception class

Enter two numbers: 22 0

Exception in thread "main" java.lang.ArithmaticException: / by zero

at com.sunbeam.Program01.divide(Program01.java:7)
at com.sunbeam.Program01.main(Program01.java:14)

message
stack trace

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Program01.java

```
3 import java.util.Scanner;
4
5 public class Program01 {
6     public static int divide(int num, int den) {
7         return num / den;
8     }
9     public static void main(String[] args) {
10        Scanner sc = new Scanner(System.in);
11        try {
12            System.out.print("Enter two numbers: ");
13            int n = sc.nextInt();
14            int d = sc.nextInt();
15            int r = divide(n, d);
16            System.out.println("Result: " + r);
17        }
18        catch(Throwable e) {
19            System.out.println("Exception Message: " + e.getMessage());
20        }
21    }
}
```

Problems Declaration Console

<terminated> Program01 [Java Application] C:\Nilesh\setup\sts-4.15.1 RELEASE\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_17.0.3.v20220515-1416\jre\bin\javaw.exe (Feb 12, 2024, 9:56:17 AM – 9:56:20 AM) [pid: 12220]

Enter two numbers: 22 0

Exception Message: / by zero

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Program01.java x

```
6°   public static int divide(int num, int den) {  
7     return num / den;  
8 }  
9°   public static void main(String[] args) {  
10    Scanner sc = new Scanner(System.in);  
11    try {  
12      System.out.print("Enter two numbers: ");  
13      int n = sc.nextInt();  
14      int d = sc.nextInt();  
15      int r = divide(n, d);  
16      System.out.println("Result: " + r);  
17    }  
18    catch(Throwable e) {  
19      //System.out.println("Exception Message: " + e.getMessage());  
20      e.printStackTrace();  
21    }  
22  }  
23 }  
24 }
```

Problems @ Javadoc Declaration Console x

<terminated> Program01 [Java Application] C:\Nilesh\setup\sts-4.15.1.RELEASE\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_17.0.3.v20220515-1416\jre\bin\javaw.exe (Feb 12, 2024, 9:57:52 AM – 9:57:54 AM) [pid: 1360]

Enter two numbers: 22 0

java.lang.ArithmetricException: / by zero
at com.sunbeam.Program01.divide(Program01.java:7)
at com.sunbeam.Program01.main(Program01.java:15)

Search z m n c f e d s r t y h g b p o l m w x v u j k i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a z y x w v u t s r q p o n m l k j i h g f e d c b a

day11 - demo01/src/com/sunbeam/Program01.java - Spring Tool Suite 4

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Program01.java x

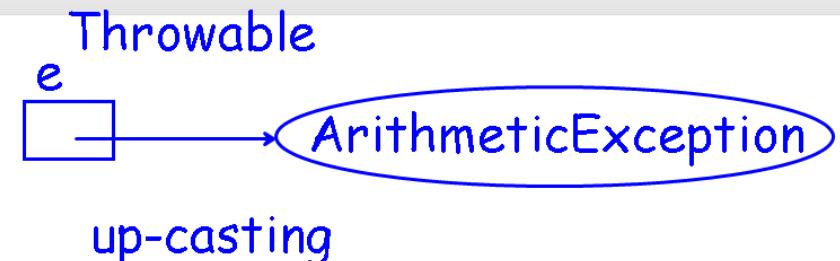
```
public static int divide(int num, int den) {
    return num / den;
}
public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    try {
        System.out.print("Enter two numbers: ");
        int n = sc.nextInt();
        int d = sc.nextInt();
        int r = divide(n, d);
        System.out.println("Result: " + r);
    }
    catch(Throwable e) {
        //System.out.println("Exception Message: " + e.getMessage());
        e.printStackTrace();
    }
}
```

Throw
e

up-ca

generic

Ex
ha
re



- generic catch block:

Exception of any type can be handled in a super-exception type reference (like Throwable, Error, Exception, or RuntimeException as appropriate).

```
Problems @ Javadoc Declaration Console <terminated> Program01 [Java Application] C:\Nilesh\setup\sts-4.15.1.RELEASE\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_17.0.3.v20220515-1416\jre\bin\javaw.exe (Feb 12, 2024, 9:57:52 AM – 9:57:54 AM) [pid: 1360]
Enter two numbers: 22 0
java.lang.ArithException: / by zero
    at com.sunbeam.Program01.divide(Program01.java:7)
    at com.sunbeam.Program01.main(Program01.java:15)
```



day11 - demo03/src/com/sunbeam/Program03.java - Spring Tool Suite 4

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Program03.java x

```
16 public class Program03 {  
17     public static void main(String[] args) {  
18         Box b1 = new Box();  
19         b1.set(new Double(3.14));  
20         Double r1 = (Double) b1.get();  
21         System.out.println("r1 = " + r1);  
22  
23         Box b2 = new Box();  
24         b2.set(new Date());  
25         Date r2 = (Date) b2.get();  
26         System.out.println("r2 = " + r2);  
27  
28         Box b3 = new Box();  
29         b3.set("123");  
30         Integer r3 = (Integer) b3.get();  
31         System.out.println("r3 = " + r3);  
32     }  
33 }  
34
```

type-checking is done by JVM at runtime.
-- Not Typesafe.

Problems @ Javadoc Declaration Console x

<terminated> Program03 [Java Application] C:\Nilesh\setup\sts-4.15.1.RELEASE\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_17.0.3.v20220515-1416\jre\bin\javaw.exe (Feb 12, 2024, 11:46:13 AM – 11:46:14 AM) [pid: 14520]

```
r1 = 3.14  
r2 = Mon Feb 12 11:46:14 IST 2024  
Exception in thread "main" java.lang.ClassCastException: class java.lang.String cannot be cast to class java.lang.Integer (java.lang.String and java.lang.Integer are in module java.base of loader 'bootstrap')  
        at com.sunbeam.Program03.main(Program03.java:30)
```

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Package Explorer X Program03.java Program04.java

```
16 public class Program04 {  
17     public static void main(String[] args) {  
18         Box<Double> b1 = new Box<Double>();  
19         b1.set(new Double(3.14));  
20         Double r1 = b1.get();  
21         System.out.println("r1 = " + r1);  
22  
23         Box<Date> b2 = new Box<Date>();  
24         b2.set(new Date());  
25         Date r2 = b2.get();  
26         System.out.println("r2 = " + r2);  
27  
28         Box<String> b3 = new Box<String>();  
29         b3.set("123");  
30         //Integer r3 = b3.get(); // compiler error: compile time type checking = type-safety  
31         String r3 = b3.get();  
32         System.out.println("r3 = " + r3);  
33     }  
34 }
```

Problems @ Javadoc Declaration Console X
<terminated> Program04 [Java Application] C:\Nilesh\setup\sts-4.15.1.RELEASE\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_17.0.3.v20220515-1416\jre\bin\javaw.exe (Feb 12, 2024, 11:55)
r1 = 3.14
r2 = Mon Feb 12 11:51:43 IST 2024
r3 = 123

Search

day11 - demo03/src/com/sunbeam/Program03.java - Spring Tool Suite 4

File Edit Source Refactor Navigate Search Project Run Window Help

Package Explorer X Program03.java X Program04.java

```
31     b3.set("123");
32     Integer r3 = (Integer) b3.get();
33     System.out.println("r3 = " + r3);
34 }
35 */
36 public static void main(String[] args) {
37     // Java collections -- type-safety problem -- till Java 1.4
38     ArrayList list = new ArrayList();
39     list.add(11);
40     list.add(22);
41     list.add(33);
42     list.add("44");
43     for(Object ele : list) {
44         Integer num = (Integer) ele;
45         System.out.println(num);
46     }
47 }
48 }
49 }
```

no type-check at compile time (can store any Object)

runtime type-check -- ClassCastException

11
22
33

Exception in thread "main" **java.lang.ClassCastException: class java.lang.String cannot be cast to class ja**

Search Writable Smart Insert 39 : 22 : 864

11:54 AM

The screenshot shows the Spring Tool Suite 4 interface with the following details:

- Package Explorer:** Displays four projects: demo01, demo02, demo03, and demo04. Each project has a JRE System Library entry.
- Editor:** Shows the content of `Program04.java`. The code demonstrates type-safety issues with `ArrayList<Integer>`. It includes a comment about the Java collections type-safety problem until Java 1.4. A specific line is highlighted: `//list.add("44"); // -- compiler error -- compile time type-checking = type-safety`.
- Console:** Displays the output of the application's execution. The output shows the integers 11, 22, and 33, indicating that the commented-out line was not executed.
- Bottom Bar:** Includes standard Windows-style icons for search, task switching, and system status.

```
11
22
33
```

The screenshot shows the Spring Tool Suite 4 interface. The top menu bar includes File, Edit, Source, Refactor, Navigate, Search, Project, Run, Window, and Help. The toolbar below has various icons for file operations like Open, Save, Find, and Build. The left sidebar shows two open files: Program05.java and Program04.java. The main editor area contains the following Java code:

```
13
14 public class Program05 {
15     public static void main(String[] args) {
16         Box<Integer> b1 = new Box<>(); // Integer is-a Number
17         b1.set(new Integer(123));
18         System.out.println("Integer: " + b1.get());
19
20         Box<Double> b2 = new Box<>(); // Double is-a Number
21         b2.set(new Double("3.14"));
22         System.out.println("Double: " + b2.get());
23
24         Box<Number> b3 = new Box<>(); // Number
25         b3.set(new Long(1));
26         System.out.println("Number: " + b3.get());
27
28         //Box<String> b4 = new Box<>(); // compiler error: String is not Number
29         //Box<Boolean> b5 = new Box<>(); // compiler error: Boolean is not Number
30         //Box<Object> b4 = new Box<>(); // compiler error: Object is not Number
31     }
}
```

Problems @ Javadoc Declaration Console

<terminated> Program05 [Java Application] C:\Nilesh\setup\sts-4.15.1.RELEASE\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_17.0.3.v20220515-1416\jre\bin\javaw.exe (Feb 12, 2024, 12:09:30 PM – 12:09:30 PM) [pid: 15452]

Integer: 123

Double: 3.14

Number: 1

Writable

Smart Insert

27 : 9 : 677



Search



12:09 PM

```

4 class Box<T extends Number> {
5     private T obj;
6     public void set(T obj) {
7         this.obj = obj;
8     }
9     public T get() {
10        return this.obj;
11    }
12 }
13
14 public class Program05 {
15     public static void main(String[] args) {
16         Box<Integer> b1 = new Box<>(); // Integer is-a Number
17         b1.set(new Integer(123));
18         System.out.println("Integer: " + b1.get());
19
20         Box<Double> b2 = new Box<>(); // Double is-a Number
21         b2.set(new Double("3.14"));
22         System.out.println("Double: " + b2.get());
23
24         Box<Number> b3 = new Box<>(); // Number
25         b3.set(new Long(1));
26         System.out.println("Number: " + b3.get());
27
28         //Box<String> b4 = new Box<>(); // compiler error: String is not Number
29         //Box<Boolean> b5 = new Box<>(); // compiler error: Boolean is not Number

```

The diagram illustrates the relationship between the `Box` class and its subclasses. It shows three boxes labeled `b1`, `b2`, and `b3` pointing to objects labeled `obj`. The `obj` boxes are annotated with their respective type names: `Integer`, `Double`, and `Long`. Above each `obj` box is a red annotation indicating the type of the `Box` object it belongs to: `Box<Integer>`, `Box<Double>`, and `Box<Number>`.

File Edit Selection View Go ... 🔍 private

day11.md x day10.md class-notes.txt U

day11.md > # Core Java > ## Generic Programming > ### Generic Classes

```
96     Box<Integer> b3 = new Box<Integer>();  
97     b3.set(new Integer(11));  
98     String obj3 = b3.get(); // Compiler Error  
99     System.out.println("obj3 : " + obj3);  
100    ...  
101 * Instantiating generic class  
102   ```Java  
103     Box<String> b1 = new Box<String>(); // okay  
104  
105     Box<String> b2 = new Box<>(); // okay -- type inference -- type of object is inferred/guessed looking at  
106       reference declaration  
107  
108     Box<> b3 = new Box<>(); // compiler error -- type must be given while declaring reference  
109  
110     Box<Object> b4 = new Box<String>(); // compiler error  
111  
112     Box b5 = new Box(); // ? -- compiler warning "raw types"  
113  
114     Box<Object> b6 = new Box<Object>(); // ? -- Not usually required/used  
115    ...  
116 #### Generic types naming convention  
117 1. T : Type
```

Object
↑ is-a
String

Box<Object>
X is not
Box<String>

main* 0 0 0 0 Java: Ready

Search

Ln 109, Col 58 Spaces: 4 UTF-8 CRLF Markdown

12:19 PM