


10: EXCEPTIONS AND TEMPLATES

Programming Technique II
(SCSJ1023)

*Adapted from Tony Gaddis and Barret Krupnow (2016), Starting out with
C++: From Control Structures through Objects*

Exceptions

Introduction to Exceptions


 Indicate that something unexpected has occurred or been detected.

 Allow program to deal with the problem in a controlled manner.

 Can be as simple or complex as program design requires.

Terminology

 **Exception:** object or value that signals an error ⇒
exceptional circumstance ⇒ run-time errors.


 **Throw an exception:** send a signal that an error has
occurred.

 **Catch/ Handle an exception:** process the exception;
interpret the signal.

Keywords

 **throw**: send a signal that an error has occurred.

 **try**: followed by a block { }, is used to invoke code that throws an exception.

 **catch**: followed by a block { }, is used to detect and process exceptions thrown in preceding **try** block. Takes a parameter that matches the type thrown.

Flow of Control

✿ A function that throws an exception is called from within a `try` block.

- ✿ If the function **throws an exception**:
- ◆ The function terminates and the `try` block is immediately exited.
 - ◆ A `catch` block to process the exception is searched for in the source code immediately following the `try` block.

✿ If a `catch` block is found that matches the exception thrown, it is executed. If no `catch` block that matches the exception is found, the program terminates.

Example 1a: Using throw

```
//Function that throws an exception
int totalDays(int days, int weeks)
{
    if ((days < 0) || (days > 7))
        throw "Invalid number of days!";
    //the argument to throw is a c-string
    else
        return (7 * weeks + days);
}
```

Example 1b: Using try...catch

```
try
{
    totDays = totalDays(days, weeks);
    cout << "Total days: " << days;
}
```

```
catch (char *msg)
{
    cout << "Error: " << msg;
}
```

//code in the try-block is called **protected code**

//code in the catch-block is called **exception handler**

Example 1: What Happens?

✿ `try` block is entered. `totalDays` function is called to.

✿ If 1st parameter is between 0 and 7, total number of days is returned and `catch` block is skipped over (**no exception thrown**).

✿ If **exception is thrown**, function and `try` block are exited, `catch` blocks are scanned for 1st one that matches the data type of the thrown exception. `catch` block executes.