

3 Standard exceptions

The C++ Standard library provides a base class specifically designed to declare objects to be thrown as exceptions. It is called `std::exception` and is defined in the `<exception>` header. This class has a virtual member function called `what` that returns a null-terminated character sequence (of type `char *`) and that can be overwritten in derived classes to contain some sort of description of the exception.

```
#include <iostream>
#include <exception>

using namespace std;

class DivideByZero:public exception{
    virtual const char* what() const throw()
    {
        return "Error: Division by zero!\n";
    }
};

double safe_divide(int top, int bottom) throw(DivideByZero);

double safe_divide(int top, int bottom) throw(DivideByZero){
    if (bottom == 0) throw DivideByZero();
    return top / static_cast<double>(bottom);
}

int main(int argc, char **argv)
{
    int numerator;
    int denominator;
    double quotient;
    cout << "Enter numerator:";
    cin >> numerator;
    cout << "Enter denominator:";
    cin >> denominator;
    try
    {
        quotient = safe_divide(numerator, denominator);
    }
    catch(exception& e)
    {
        cout << e.what();
        exit(-1);
    }
    cout << numerator << "/" << denominator << "=" << quotient << endl;
    cout << "Bye\n";
    return 0;
}
```

- All exceptions thrown by components of the C++ Standard library throw exceptions derived from this `exception` class. These are:

exception	description
<code>bad_alloc</code>	thrown by <code>new</code> on allocation failure
<code>bad_cast</code>	thrown by <code>dynamic_cast</code> when it fails in a dynamic cast
<code>bad_exception</code>	thrown by certain dynamic exception specifiers
<code>bad_typeid</code>	thrown by certain dynamic exception specifiers
<code>bad_function_call</code>	thrown by empty function objects
<code>bad_weak_ptr</code>	thrown by <code>shared_ptr</code> when passed a bad <code>weak_ptr</code>

- Also deriving from **exception**, header `<exception>` defines two generic exception types that can be inherited by custom exceptions to report errors:

exception	description
logic_error	error related to the internal logic of the program
runtime_error	error detected during runtime