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Programming in C++
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Lesson Note #14
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Adapted from C++ How To Program edited for our own purposes

Initializing Objects with Constructors

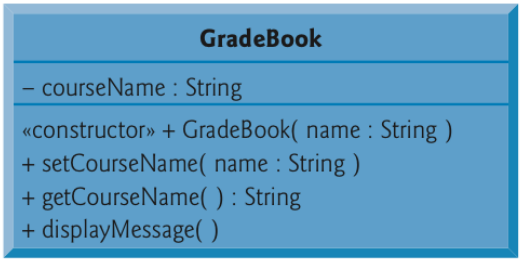
Initializing Objects with Constructors

- A constructor is used to initialize an object of the class when the object is created.
- A constructor is a special member function that must be defined with the same name as the class, so that the compiler can distinguish it from the class's other member functions.
- An important difference between constructors and other functions is that constructors cannot return values, so they cannot specify a return type (not even void). Normally, constructors are declared public.
- C++ requires a constructor call for each object that's created, which helps ensure that each object is initialized properly before it's used in a program.
- C++ requires a constructor call for each object that's created, which helps ensure that each object is initialized properly before it's used in a program.
- If a class does not explicitly include a constructor, the compiler provides a default constructor—that is, a constructor with no parameters.

Unless no initialization of your class's data members is necessary (almost never), provide a constructor to ensure that your class's data members are initialized with meaningful val- ues when each new object of your class is created.

Adding the Constructor to Class GradeBook's UML Class Diagram

- Like operations, the UML models constructors in the third compartment of a class in a class diagram.
- To distinguish a constructor from a class's operations, the UML places the word "constructor" between guillemets (« and ») before the constructor's name. By convention, you list the class's constructor before other operations in the third compartment.



```cpp
// Instantiating multiple objects of the GradeBook class and using
// the GradeBook constructor to specify the course name
// when each GradeBook object is created.
#include <iostream>
#include <string> // program uses C++ standard string class
using namespace std;

// GradeBook class definition
class GradeBook
{
public:
   // constructor initializes courseName with string supplied as argument
   GradeBook( string name )
   {
      setCourseName( name ); // call set function to initialize courseName
   } // end GradeBook constructor

   // function to set the course name
   void setCourseName( string name )
   {
      courseName = name; // store the course name in the object
   } // end function setCourseName

   // function to get the course name
   string getCourseName()
   {
      return courseName; // return object's courseName
   } // end function getCourseName

   // display a welcome message to the GradeBook user
   void displayMessage()
   {
      // call getCourseName to get the courseName
      cout << "Welcome to the grade book for\n" << getCourseName()
         << "!" << endl;
   } // end function displayMessage
private:
   string courseName; // course name for this GradeBook
}; // end class GradeBook

// function main begins program execution
int main()
{
   // create two GradeBook objects
   GradeBook gradeBook1( "CS101 Introduction to C++ Programming" );
   GradeBook gradeBook2( "CS102 Data Structures in C++" );

   // display initial value of courseName for each GradeBook
   cout << "gradeBook1 created for course: " << gradeBook1.getCourseName()
      << "\ngradeBook2 created for course: " << gradeBook2.getCourseName()
      << endl;
} // end main
```

```
gradeBook1 created for course: CS101 Introduction to C++ Programming
gradeBook2 created for course: CS102 Data Structures in C++
```