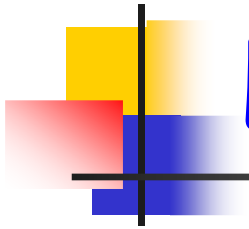
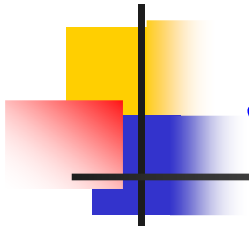


Lecture-6

- Standard template library
  - vector
  - list
- Operator overloading
- Inline functions
- Casting in C++
- Namespaces

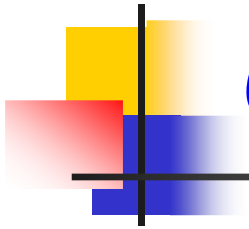


Standard template library

- Defines many useful classes.
- Popular among them
  - vector, list, map, iterators, etc.
  - Each of these is a template class.
  - Has many useful functions.
- References:

  http://www.cplusplus.com/reference/stl/

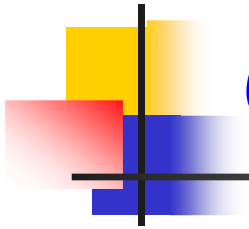
They list all the functions, coding examples and many nice features for strings, vectors, lists and iterators.



Operator overloading

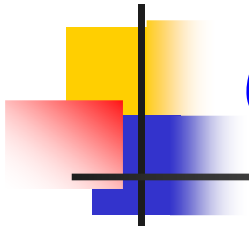
- On two objects of the same class, can we perform typical operations like
  - Assignment (=), increment (++), decrement(--)
  - Write to a stream (<<)
  - Reading to a stream (>>)
- Can be defined for user defined classes.

  ⇒ Operator overloading
- Most of the common operators can be overloaded.
- Operators – can be member/non-member functions



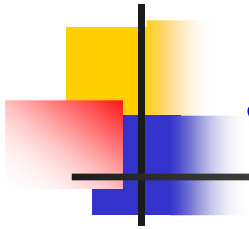
Operator overloading … cont.

- Arity of operator
  - Number of parameters required.
- Unary operators – take one argument
  - *E.g.*, ++, --, !, ~, etc.
  - C unary operators remain unary in C++
- Binary operators – take two arguments.
  - *E.g.*, =, >, <, +, -, etc.
  - C binary operators remain binary.
- Typical overloaded operators
  - +, -, >, <, +=, ==, !=, <=, >=, <<, >>, [ ]



Operator functions rules

- Member function operators
  - Leftmost operand must be an object (or reference to an object) of the class.
  - If left operand is of a different type, operator function must NOT be a member function
- Built-in operators with built-in data types CANNOT be changed.
- Non-member operator function must be a **`friend`** if
  - **`private`** or **`protected`** members of that class are accessed directly



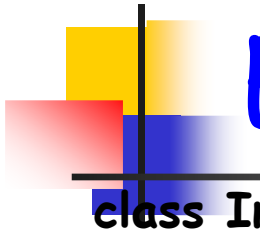
Syntax

- Member function

```
return_type classname :: operatorSymbol (args)
  {
    // code
  }
```

- Non-member function

```
return_type operatorSymbol (args)
  {
    // code
  }
```

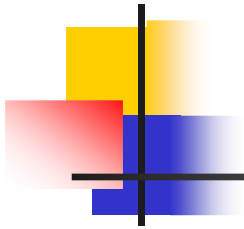


Example

```
class Integer
   {              private:
            int value;
          public:
            Integer (int val) : value (val) {  }
            void operator ++( ) { value++; }  // Member op
            friend Integer operator +      // Non-member op
                  (const Integer& i, const Integer& j);
   };

   Integer operator + (const Integer&i, const Integer& j)
   {
          return Integer (i.value + j.value);
   }

Examples:
   Integer a(10);  Integer b(20); a++; b++
   Integer c = b+a;
```



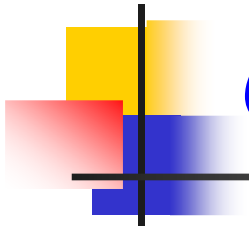
Inline functions

- Normal functions
  - Carry operational overhead
  - Function call, parameter passing, etc.
- Inline functions
  - No overhead related to function calls
  - Might be as simple as a memory access

```
class myClass
{
        public:
                int x;
                inline int getX ( ) { return x; }
};
```

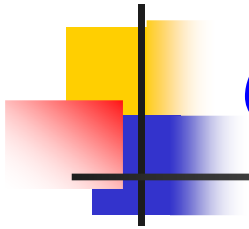
Inline functions … contd.

- Compiler decides if a function defined as "inline" can be "inline" or not.
- Too much of code for any function defined as inline
  - Compiler may treat as a regular (non-inline) function
- Note: Code for an inline function
  - Can be in the class itself, or
  - Can be in the same file as the class definition.
  - CANNOT be defined in any file outside the class definition



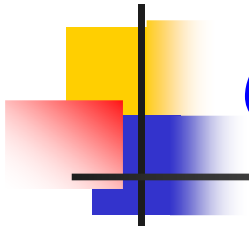
C++ type casting

- Casting: converting a variable/object of one type/cast to another.
- C type casting can create run time errors in C++.
- C++ needs to casting between "related" classes
- C++ provides additional casting methods
  - dynamic_cast
  - static_cast
  - reinterpret_cast
  - const_cast



C++ type casting … contd.

- E.g., Base b, *bp; Derived d, *dp
- dynamic_cast:
  - Casting from derived to base class, NOT from base to derived to base class.
    - bp = dynamic_cast <base*> (d); // Allowed
    - dp = dynamic_cast <derived *>(b); // NOT allowed
- static_cast:
  - Casting from base to derived and vice-versa.
    - bp = dynamic_cast <base*> (d); // Allowed
    - dp = dynamic_cast <derived *>(b); // allowed



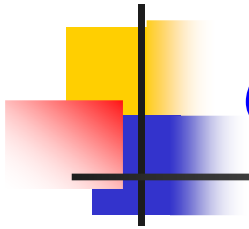
Casting … contd.

- reinterpret_cast:
  - Binary copy of values from one pointer to another
  - Can cast any type to any other type, even for unrelated class objects.
    - **Class A {.. }; Class B {..}; // not related to A**

      A *pa = new A;

      B *pb = reinterpret_cast<B*> pa;

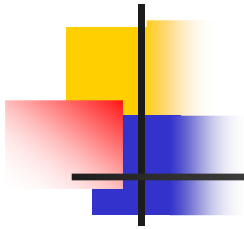
    Suggestion: Don't use it unless you know what you are doing.
- const_cast:
  - Set or remove the const'ness of an object
  - Const object can be passed as an non-const argument to a function.



const_cast - example

```
#include <iostream>
using namespace std;
void myPrint (char * str)
{
   cout << str << endl;
 }

int main ( )
{
   const char * c = "sample text";
   myPrint ( const_cast<char *> (c) );
   return 0;
}
```



Namespaces

- A way to give "scope" to different variables, as opposed to a global scope.
  - E.g., namespace myNameSpace
    { int a, b; }
  - a and b are visible ONLY in myNameSpace
  - Can be accessed using the keywork "using"
    - using namespace myNamespace
      a = 3; b = 4;
    - myNamespace::a = 3; myNamespace::b = 4;
    - using myNamespace::a
      cout << "value of a is: " << a << endl;