# Week 5-2 : Name Spaces, Operator Overloading

## Part2. Operator Overloading

operators(+,-,*,/,=…) were defined as function name
It can be look like operate objects.

| Operators that can be overloaded | | | | | | | |
|---|---|---|---|---|---|---|---|
| + | - | * | / | % | ^ | & | \| |
| ~ | ! | = | < | > | += | -= | *= |
| /= | %= | ^= | &= | \|= | << | >> | >>= |
| <<= | == | != | <= | >= | && | \|\| | ++ |
| -- | ->* | , | -> | [] | () | new | delete |
| new[] | delete[] | | | | | | |

| Operators that cannot be overloaded | | | |
|---|---|---|---|
| . | .* | :: | ?: |

Only member function operator : =, (), [], ->

# 1. Two forms of the operator overloading

## ① Member function

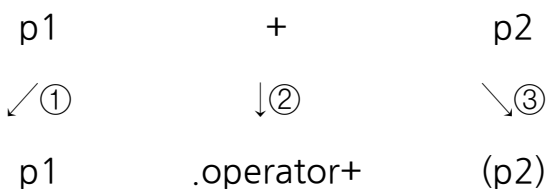
```
#include <iostream>
using namespace std;
class Point
{
private:
        int x,y;
public:
        Point(int argX,int argY);
        void ShowPosition();
        Point operator+(Point &p);
};

Point::Point(int argX,int argY)
{
        x=argX;
        y=argY;
}

void Point::ShowPosition()
{
        cout<<x<<" "<<y<<endl;
}
Point Point::operator+(Point &p)
{
        Point temp(x+p.x,y+p.y);
        return temp;
}

int main(void)
{
        Point p1(1,1);
        Point p2(2,2);
        Point p3=p1+p2;
        p3.ShowPosition();

        return 0;
}
```




① object which calls member function
② function name
③ function's parameter

## ② Global function

```
#include <iostream>
using namespace std;
class Point
{
private:
	int x,y;
public :
	Point(int argX,int argY);
	int getX();
	int getY();
	void ShowPosition();
	friend Point operator+(Point &p);
};

Point::Point(int argX,int argY)
{
	x=argX;
	y=argY;
}

void Point::ShowPosition()
{
	cout<<x<<" "<<y<<endl;
}
int Point::getX()
```

```
{
        return x;
}
int Point::getY()
{
        return y;
}
Point operator+(Point &p1,Point &p2)
{
        Point temp(p1.x+p2.x,p1.y+p2.y);
        return temp;
}

int main(void)
{
        Point p1(1,1);
        Point p2(5,2);
        Point p3=p1+p2;
        p3.ShowPosition();

        return 0;
}
```

friend Point operator+(Point &p);

using 'friend' to access 'p' declared by private

| | | |
|---|---|---|
| p1 | + | p2 |
| operator+ | (p1 | ,p2) |

## 2. Single operator's overloading

| prefix increment | postfix increment |
|---|---|
| ++p | p++ |
| **p.operator++()**<br><br>Point& operator++()<br>{<br>xpos+=1;<br>ypos+=1;<br>return *this<br>} | **p.operator++(int)**<br><br>const Point operator++(int)<br>{<br>const Point retobj(xpos, ypos); //<br>const Point retobj(*this);<br>xpos+=1;<br>ypos+=1;<br>return retobj;<br>} |
| **operator++(Point &ref)**<br><br>Point& operator--(Point &ref)<br>{<br>ref.xpos-=1;<br>ref.ypos-=1;<br>return ref;<br>} | **operator++(Point &ref, int)**<br><br>const Point operator++(Point &ref, int)<br>{<br>const Point retobj(ref);<br>ref.xpos+=1;<br>ref.ypos+=1;<br>return retobj;<br>} |

①

return *this;

this : pointer which point object itself

*this : refer pointed object = return itself

②

prefix and postfix increment are distinguished by int parameter

③

prefix increment return : reference value

postfix increment return : value, temporary object

## Case3. cout, cin Overloading

```
#include <iostream>
using std::endl;
using std::cout;

using std::ostream;

class Point{
private:
	int x,y;
public:
	Point(int _x=0, int _y=0):x(_x), y(_y) {}
	friend ostream& operator<<(ostream& os, const Point& p);
};

ostream& operator<<(ostream& os, const Point& p){
	os<<"("<<p.x<<","<<p.y<<")"<<endl;
	return os;
}

int main() {
	Point p(1,3);
	cout<<p;
	return 0;
}
```

cout : ostream's object/ cin : istream's object

## [Exercise]

1.Satisfy the following conditions by modifying below code, using overloading by global function.

- Add z member function to the point class.
- Change the x, y, z member variable to the “private” and make the getX(), getY(), getZ() for the access to the variable.
- Declare operator - and operator* additionally. Operations should use accessors because member variable is “private”.
- Declare namespace point and also declare Point p1(3,3,3), p2(2,2,2),p3; in the namespace. Print the p3 member variables by

declaring print() function.

- Write the code that prints the all operations(+,-,*) result. (ex. p1+p2 =>p3)

```
#include <iostream>
using namespace std;
class Point
{
public:
        int x,y;
         Point(int argX,int argY);
         int getX();
         int getY();
         void ShowPosition();
         friend Point operator+(Point &p);
};

Point::Point(int argX,int argY)
{
         x=argX;
         y=argY;
}

void Point::ShowPosition()
{
         cout<<x<<" "<<y<<endl;
}
int Point::getX()
{
         return x;
}
int Point::getY()
{
         return y;
}
Point operator+(Point &p1,Point &p2)
{
         Point temp(p1.x+p2.x,p1.y+p2.y);
         return temp;
}

int main(void)
{
         Point p1(1,1);
         Point p2(5,2);
         Point p3=p1+p2;
         p3.ShowPosition();

         return 0;
}
```

2. Make a program of managing book. Print out formatted number automatically using operator overloading.

-format : [012] 222.3012

**참고** ☞

1. using setw() for setting field width.
   ex. input >> setw( 3 ) >> number.areaCode;
2. (,),space ignore
   ex. input.ignore( 2 ); // skip ) and space

## BookNumber.h

```
#include <iostream>
#include <string>
using namespace std;

class BookNumber
{
    friend ostream &operator<<( ostream &, const BookNumber & );
    friend istream &operator>>( istream &, BookNumber & );
private:
    string bookArea;
    string number1;
    string number2;
};
```

## 출력결과 ☞