Homework #1: Memory Allocation and Operators

The objective of this homework is to familiarize the students with object oriented programming in C++ and have them practice memory allocation and operators overloading. To this end, let us define the class `Set` to represent the set of integers. This class should have the following attributes and member functions:

1. `MaxCard` The maximal cardinality of the set
2. `Elems` An integer array containing all the elements of the set
3. `Card` The effective number of element in the set
4. Default constructor
5. One constructor with one argument: the maximal cardinality of the set
6. One destructor
7. `AddElem` Add a new element to the set
8. `RmvElem` remove one element from the list (by shifting the other elements)
9. `Member` Verify if a given element is member of the set
10. `Copy` copy one set in another
11. `Equal` verify the equality of two sets
12. `Intersect` compute the intersection of two sets
13. `Union` compute the union of two sets
14. `Print` display the set, use the mathematics notation

Step 1
Write the class set with the above functions, and in a test function, diversify the declaration of instances of the class Set. Experiment the calls to all the functions defined.

Step 2
Add the following member functions:

15. Copy constructor
16. Assignment operator

Test these two functions.

Step 3
Add the following operators as member functions or as friend functions:

17. operator & verify if a given integer is a member of the set
18. operator == verify the equality of two sets
19. operator!= verify the inequality of two sets
20. operator * compute the intersection of two sets
21. operator + compute the union of two sets
22. operator - compute the difference of two sets
23. operator <= verify the inclusion of one set inside another
24. operator << display the content of a set
25. operator >> input the content of a set

Experiment the calls to all these operators.

Remarks:

- Pay attention to the design of a clean, well-organized and efficient program.
- Add any function and/or data structure, not mentioned above but needed to enhance your application.
- Identical or similar applications will be ignored. Submission of source code uploaded from Internet is not allowed. Sharing your code with your classmates is a cheating practice that should be avoided.

How to submit: Comment and organize your program as a project and upload it on the submission system. Email attached submissions will not be considered.

Deadline: The homework should be submitted before Sunday February 25. The submission system will not allow any submission after this date.