

PIC 10B SPRING 2013 HOMEWORK 10

Assignment

Define the following functions for sets of integers.

- **SetUnion:** `set<int> × set<int> → set<int>` takes the union of the set elements.
- **SetIntersection:** `set<int> × set<int> → set<int>` takes the intersection of the set elements.
- **SetDifference:** `set<int> × set<int> → set<int>` takes the set difference between the first and second arguments.
- **SymmetricDifference:** `set<int> × set<int> → set<int>` takes the symmetric difference between the first and second arguments.
- **PowerSet:** `set<int> → set<set<int> >` returns a set of sets of integers.
- **Complement:** `set<int> × int → set<int>` takes the complement of the first argument `set<int>` with respect to the set $\{1, 2, 3, \dots, n\}$, where n is the second argument, which must be positive.

Note, you are NOT allowed to use the `algorithms` library. Also make sure these functions are compatible with the empty set.

In addition, overload the operators (Hint: Define these functions AFTER you have created the functions above).

- **operator+:** `set<int> × set<int> → set<int>` takes the union of the sets.
- **operator+:** `set<int> × int → set<int>` takes the union of the set with the `int` second argument.
- **operator+:** `int × set<int> → set<int>` takes the union of the set with the `int` first argument.
- **operator-:** `set<int> × set<int> → set<int>` takes the set difference of the sets.
- **operator-:** `set<int> × int → set<int>` takes the set difference of the set with the `int` second argument.
- **operator-:** `int × set<int> → set<int>` takes the set difference of the set with the `int` first argument.
- **operator^:** `set<int> × set<int> → set<int>` takes the intersection of the sets.
- **operator^:** `set<int> × int → set<int>` takes the intersection of the set with the `int` second argument.
- **operator^:** `int × set<int> → set<int>` takes the intersection of the set with the `int` first argument.
- **operator%:** `set<int> × set<int> → set<int>` takes the symmetric difference of the sets.
- **operator%:** `set<int> × int → set<int>` takes the symmetric difference of the set with the `int` second argument.

- `operator%`: `int × set<int> → set<int>` takes the symmetric difference of the set with the `int` first argument.
- `operator~`: `set<int> → set<int>` takes the complement with respect to the set $\{1, 2, 3, \dots, n\}$, where n is the largest member of the input set (e.g., the complement of $\{1, 2, 4, 6, 10\}$ is $\{3, 5, 7, 8, 9\}$). Define the complement of the empty set to be the empty set.
- `operator<<`: `ostream × set<int> → ostream` outputs the set of elements in set form (for example, $\{1, 3, 4, 6, 7\}$).
- `operator>>`: `istream × set<int> → istream` inputs the set of elements one integer at a time.
- `operator<<`: `ostream × set<set<int>> → ostream` outputs a set of sets in set form (for example, $\{\{1, 2\}, \{1, 3\}, \{1, 2, 3\}\}$).

Note, you are NOT allowed to use the `algorithms` library.

Place your code in a source file labeled *hw10.cpp*. ***If your file is not named this exactly, your homework will not be collected.*** As with all programs in this course, your code should contain useful comments. In particular, your name, the date, and a brief description of what the program does should appear at the top of your source file.

What to Turn in

Place in your Submit folder the source file *hw10.cpp* with exactly this name (all lowercase, no spaces). The files will be automatically collected on Friday 6/7/13 at 5:00pm.

Grading		
Correctness	No errors, input/output correct, output presented nicely	5 points
Sets	Correctly implements all Set operations	10 points
Style	Variable names, comments, indentation	5 points
	TOTAL	20 points

Note on grading: There is an automatic 5 point penalty for any homework that does not compile.

Please input a set of nonnegative numbers for a set (Enter -1 when you are finished):

7
5
6
3
12
9
-1

We'll refer to this set as A from now on.

$$A = \{3, 5, 6, 7, 9, 12\}$$

$$\sim A = \{1, 2, 4, 8, 10, 11\}$$

Please input a set of nonnegative numbers for a set (Enter -1 when you are finished):

2
3
5
7
11
13
17
-1

We'll refer to this set as B from now on.

$$B = \{2, 3, 5, 7, 11, 13, 17\}$$

$$\sim B = \{1, 4, 6, 8, 9, 10, 12, 14, 15, 16\}$$

Now we will do some arithmetic:

$$A+B = \{2, 3, 5, 6, 7, 9, 11, 12, 13, 17\}$$

$$A \cap B = \{3, 5, 7\}$$

$$A-B = \{6, 9, 12\}$$

$$B-A = \{2, 11, 13, 17\}$$

$$A \setminus B = \{2, 6, 9, 11, 12, 13, 17\}$$

The power set of $A \cap B$ is

$$\{\{\}, \{3\}, \{3, 5\}, \{3, 5, 7\}, \{3, 7\}, \{5\}, \{5, 7\}, \{7\}\}$$