

### Problem of the Day

- The nuts and bolts problem is defined as follows. You are given a collection of n bolts of different widths, and n corresponding nuts.
- You can test whether a given nut and bolt go together, from which you learn whether the nut is too large, too small, or an exact match for the bolt.
- The differences in size between pairs of nuts or bolts can be too small to see by eye, so you cannot rely on comparing the sizes of two nuts or two bolts directly.

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• You are to match each bolt to each nut.

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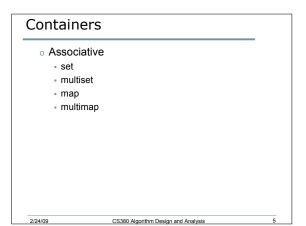
- 1. Give an O(n<sup>2</sup>) algorithm to solve the nuts and bolts problem.
- 2. Suppose that instead of matching all of the nuts and bolts, you wish to find the smallest bolt and its corresponding nut. Show that this can be done in only 2n 2 comparisons.
- 3. Match the nuts and bolts in expected O(n lg n) time.

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# Standard Template Library

- · Two important parts
  - o Containers
  - o Iterators
- Containers
  - Sequential
    - vector
    - dequeue
    - list

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### Iterators

- Iterators are objects that behave like pointers
- Used to access items stored in containers

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- Each STL container object provides two member functions:
  - .begin()
  - o .end()

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## **Using Iterators**

- Because an iterator is an object of an inner class called iterator that is defined inside of a container class, we need to use the scope resolution operator to obtain an interator of a container
- To define an iterator object for vecors:
   vector<int>::iterator iter;
- · What about this?
  - o vector<int> vect;

 • vector<int>::iterator iter = vect.begin();

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### Example finclude <iostream> minclude <vector> // needed to use vectors using namespace std;

#### int main()

ł

}

vector<int> vect; // Create a vector of int

## for (int x = 0; x < 10; x++) vect.push\_back(x\*x);</pre>

//print everything using iterators. vector<int>:iterator iter = vect.begin(); while (iter != vect.end())

{
 cout << \*iter << " ";
 iter ++;</pre>

# } return 0;

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Algorithms in STL
<ul> <li>Many algorithms including:</li> </ul>
<ul> <li>binary_search</li> </ul>
o count
₀ for_each
o find
<ul> <li>max_element</li> </ul>
<ul> <li>min_element</li> </ul>

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- random\_shuffle
- o sort

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## Example

See code

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4.3 Program D	esign Ex	ample: Rating the Field	
biggest problem is keep that a program which life. She is also persua Polly really likes to centimeters tall. Her fin height; whether they ar of the same height, a bigoing over. If all equal of the bunch. If two or by last name, then by 1	ing track of v ranks the m ive enough t dance, and st criteria is e a little tal e wants som height cand more people irst name if	atheme suitces who come a' courting. Indeed, her who her best consear. So his smart crossiph to realize an from most to least desirable would simplify her o have tabled you into writing the program. 16 10 the strength of the strength of the strength of finding summers who is as close as possible to this for a solver descent, matter, along all candidates more as done as possible to 7 kilograms without lakes are over this link, she will take the lightest are identical by all these theoretexistics, such them the candidatest ranked by mans, who then used files:	
George Bush	195	110	
Harry Trunan	180	75	
Bill Clinton	180	75	
John Kennedy	180	65	
Ronald Reagan	165	110	
Richard Nixon	170	70	
Jinny Carter	180	77	
yields the following out	put:		
Clinton, Bill			
Truman, Harry			
Kennedy, John			
Carter, Jimmy			
Nixon, Richard			
Bush, George			
Reagan, Ronald			