



Unit 6.2: Containers

CS2308

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What is a Container?

- A variable that stores multiple values is called a container.
- Examples:
 - Arrays
 - Linked Lists

Using Built-In Containers

- The `<vector>` library gives us access to the vector class, which stores many values.
- Memory is automatically managed for vectors.
- Values in a Vector are stored contiguously in memory.
 - What does that tell us?
- The storage data type is specified in `<square brackets>`

Adding and Retrieving Values

- **push_back**: add an element to the back of the list.
- **front**: get the first element in the list
- **back**: get the last element in the list
- **pop_back**: delete the last element in the list
- **empty**: true if size==0

Example 1

```
int main(int argc, char** argv){  
    vector<int> v;  
    v.push_back(1);  
    v.push_back(2);  
    v.push_back(3);  
    while(!v.empty()){  
        cout << v.back() << ' ';  
        v.pop_back();  
    }  
    cout << endl << "Size: " << v.size() << endl;  
} //try to guess the output
```

For Loops with Vectors

- C++ gives us a compact notation to use with Vectors.
- `for (data type i : vector name)`
- The loop will run once for each element stored in the list.

Example 2

```
int main(int argc, char** argv){  
    vector<int> v;  
    v = {1, 2, 3};  
    for (int n : v){  
        cout << "Number from v: " << n << endl;  
    }  
    cout << "Size of v: " << v.size() << endl;  
} //try to guess the output
```


Iterators

- The [square brackets] can be used to access elements of Vectors.
- Iterators are like references to Vector elements.
- The **begin** and **end** member functions return iterators to the first and last elements.
- Iterators can be incremented and de-referenced like pointers.

Example 3

```
int main(int argc, char** argv){
    vector<int> v;
    v = {1, 2, 3};
    cout << "v[0]: " << v[0] << endl;
    vector<int>::iterator i = v.begin();
    for (; i < v.end(); i++){
        cout << *i << ' ';
    }
    cout << endl;
} //try to guess the output
```

Sources of Info

- <https://www.geeksforgeeks.org/vector-in-cpp-stl/>
- <https://en.cppreference.com/w/cpp/container/vector>
- <https://www.cplusplus.com/reference/vector/vector/>

Questions or Comments?

