

Programming in C++

Vectors

Curtis Larsen

Utah Tech University—Computing

Spring 2025

Objectives

Objectives:

- ▶ Understand the need for vectors
- ▶ Understand functionality of vectors
- ▶ Demonstrate use of vectors

Functionality of vectors

Purpose

Purpose of vectors.

- ▶ Store sequential collection of items of same type
- ▶ Read items in collection
- ▶ Process all items in collection
- ▶ Modify items in collection
- ▶ Add items to collection
- ▶ Remove items from collection

Use of `std::vector`

Standard Usage

Standard usage

- ▶ `#include <vector> // to access the vector class`
- ▶ `std::vector<int> picture; // to declare a vector of integers`
- ▶ `picture.resize(size); // to make room for size integers`
- ▶ `picture[0] = 32; // to store a value at the first position`
- ▶ `picture[size-1] = 29; // to store a value at the last position`
- ▶ `int x = picture[0]+primes[9]; // to read values from a vector`
- ▶ `picture[0] = 42; // to modify the value at the first position`

Constructor Variations

- ▶ `std::vector<int> picture;`
// to declare a vector of integers, size=0
- ▶ `std::vector<int> picture(0);`
// to declare a vector of integers, size=0
- ▶ `std::vector<int> picture(5);`
// to declare a vector of integers, size=5
- ▶ `std::vector<int> picture(5, 7);`
// to declare a vector of integers, size=5, all initialized to 7
- ▶ `std::vector<int> picture{2, 3, 5, 7};`
// initialize a vector of integers

Storage Type

Can store any type, just put it in the `<>`

- ▶ `std::vector<std::string> words;`
// to declare a vector of strings
- ▶ `std::vector<Widget> parts;`
// to declare a vector of Widget objects
- ▶ `std::vector<double> rational(100);`
// to declare a vector of 100 doubles
- ▶ `std::vector<double> irrational(100, 3.14);`
// to declare a vector of 100 doubles, all initialized to 3.14

Resize

Vector size

- ▶ `rational.size();` // fetch the size, valid index: `[0, size)`
- ▶ `rational.empty();` // bool (same as `size() == 0`)
- ▶ `rational.resize(75);` // to change the size to 75
- ▶ `rational.resize(150, 2.5);`
// to change the size to 150, all new positions are initialized to 2.5
- ▶ `rational.clear();` // same as `resize(0)`
- ▶ `rational.push_back(value);`
// increase size by 1, and store value in new slot
- ▶ `rational.pop_back();`
// decrease size by 1, discarding last value

Processing All Elements

Processing all elements in a vector

```
std::vector<int> primes;  
...  
for(unsigned int i = 0; i < primes.size(); i++) {  
    std::cout << primes[i] << std::endl;  
}
```

Processing All Elements

Processing all elements in a vector

```
std::vector<int> primes;  
...  
for(auto iter = primes.begin(); iter != primes.end(); iter++)  
    std::cout << *iter << std::endl;  
}
```

Processing All Elements

Processing all elements in a vector

```
std::vector<int> primes;  
...  
for(const auto item : primes) {  
    std::cout << item << std::endl;  
}
```

Documentation

More

► C++ Reference