

Programming Languages and Tools: Programming with C++ CS:3210:0003

Lecture/Lab #15

Activity

- Create file `eqfrac.cpp`
- Use the `Fraction` class from `03-25/07defaultconstr5.cpp`
- Add a function `eqFrac` that takes two `Fractions` and returns a `bool` that indicates whether the they are equivalent or not. Tests:
 - `eqFrac(1/5, 1/5) = true`
 - `eqFrac(1/2, 2/4) = true`
 - `eqFrac(1/5, 1/2) = false`
- Conditions
 1. Don't use `float` types
 2. Assume no negative fractions

Containers

- Datatype that stores a collection of unnamed objects, called **elements**
- Usually homogenous – same type of elements
- Ex: `std::string`
- C++ standard library has a Containers library

Dynamic Arrays - `std::vector`

- Container type that stores a sequence of values contiguously
- Implemented as a class template
 - template type parameter defines the type of elements
- Access elements using []:
- Member function `size()` returns length
- Syntax:

```
std::vector<int> intArray {0,1,2};  
intArray[0]; //first element
```
- Length is modifiable, e.g. using `resize()`

Dynamic Arrays - `std::vector`

C-Style Arrays	<code>std::vector</code>
Static	Dynamic
No call-by-value (decays to pointer)	Can call-by-value
C++ has better array types	This is the better array type
<code>int intArray[3] = {0,1,2}</code>	<code>std::vector<int> intArray {0,1,2}</code>

Stack Behavior with `std::vector`

Function Name	Stack Operation	Behavior	Notes
<code>push_back()</code>	Push	Put new element on top of stack	Adds the element to end of vector
<code>pop_back()</code>	Pop	Remove the top element from the stack	Returns void, removes element at end of vector
<code>back()</code>	Top or Peek	Get the top element on the stack	Does not remove item
<code>emplace_back()</code>	Push	Alternate form of <code>push_back()</code> that can be more efficient (see below)	Adds element to end of vector

- Using `resize()`, compiler reallocates memory, which can be expensive
- Reallocation:
 1. Allocate memory with new size of vector
 2. Copy all current elements into new memory
 3. Set vector to new memory
- Using stack operations, compiler is smarter with reallocation

Update Tennis with a Game Class