CS 225
Data Structures

Sept. 27 – Queues and Iterators
#ifndef QUEUE_H
#define QUEUE_H

template <class QE>
class Queue {
  public:

  private:

};

#endif
What type of implementation is this Queue?

How is the data stored on this Queue?

Which pointer is “entry” and which pointer is “exit”?

What is the running time of enqueue()?

What is the running time of dequeue()?
What type of implementation is this Queue?

How is the data stored on this Queue?

```cpp
Queue<int> q;
q.enqueue(3);
q.enqueue(8);
q.enqueue(4);
q.dequeue();
q.enqueue(7);
q.dequeue();
q.dequeue();
q.enqueue(2);
q.enqueue(1);
q.enqueue(3);
q.enqueue(5);
q.dequeue();
q.enqueue(9);
```
```cpp
#ifndef QUEUE_H
#define QUEUE_H

template <class QE>
class Queue {
    public:
        Queue(); // ...etc...
        void enqueue(QE e);
        QE dequeue();
        bool isEmpty();

    private:
        QE *items_;
        unsigned capacity_;  
        unsigned count_;    
        unsigned entry_;    
        unsigned exit_;     

};
#endif
```

```cpp
Queue<char> q;
q.enqueue(m);
q.enqueue(o);
q.enqueue(n);
...
q.enqueue(d);
q.enqueue(a);
q.enqueue(y);
q.enqueue(i);
q.enqueue(s);
q.dequeue();
q.enqueue(h);
q.enqueue(a);
```
```cpp
#include <list>
#include <string>
#include <iostream>

struct Animal {
    std::string name, food;
    bool big;

    Animal(std::string name = "blob", std::string food = "you", bool big = true) :
        name(name), food(food), big(big) {
    /* none */
    }
}

int main() {
    Animal g("giraffe", "leaves", true), p("penguin", "fish", false), b("bear");
    std::list<Animal> zoo;

    zoo.push_back(g);
    zoo.push_back(p);  // std::list's insertAtEnd
    zoo.push_back(b);

    for (std::list<Animal>::iterator it = zoo.begin(); it != zoo.end(); it++) {
        std::cout << (*it).name << " " << (*it).food << std::endl;
    }
    return 0;
}
```
Iterators

Iterators give client code access to traverse the data!

Operators: Types of iterators:
Iterators encapsulated access to our data:
Exam 3 (Theory, C++) finishes today!
More Info: https://courses.engr.illinois.edu/cs225/fa2017/exams/

MP3: Available now!
Up to +7 extra for submission by Monday, Oct. 2!

Lab: lab_quacks start today!
Fun lab with one of my favorite debugging techniques!

POTD
Every Monday-Friday – Worth +1 Extra Credit /problem (up to +40 total)