

CS 14: Data Structures and Algorithms

Quiz 0

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Time: 30 Minutes

Start here: Please fill in the following important information using a **permanent** pen **before** you do **anything** else! Your exam will **not** be graded if you use a pencil or erasable ink on this page.

Name (print): _____

Student ID (print): _____

Signature: _____

Now have **two** neighbors **confirm** your identity by **signing** below. Provide **official** identification (your UCR card, driver's license, etc.) if requested. Your exam will **not** be graded without these.

Neighbor 1: _____

Neighbor 2: _____

Instructions: Read these instructions carefully before you start. This quiz is intended primarily to give the instructors a sense for where the class stands. It is **not** worth a significant portion of your grade. Read each question carefully and answer to the best of your ability. And please don't **guess**, in this quiz it's better not to answer than to answer by guessing!

Switch off your phones, pagers, and other noisy gadgets! You are **not** allowed to have anything but a pen and this exam on your desk. You are **not** allowed to talk to anyone during the exam. If you have a question, raise your hand **quietly** and someone will assist you. You have to **remain seated quietly** until we have collected all the exams. Remember that you can **not** claim grading errors if you do not use a **permanent** pen for your answers.

Do not open before you are told to do so!

Score: _____ **out of 25 points.**

1 Warmup

(5 points)

Determine whether the following statements are **true** or **false**.

(1 point each)

1. The expressions “`a[i++]`” and “`a[++i]`” access the **same** array element (assume `int a[10]` and `int i = 0`).
2. The expressions “`i = i + 1`”, “`i += 1`”, and “`++i`” **increase** the value of `i` (assume `int i`; if false, state your reason in one word).
3. An algorithm A which requires $O(n \log n)$ time is **always** faster than an algorithm B which requires $O(n^2)$ time.
4. Recursion (in algorithms) is **related** to induction (in mathematics).
5. In the 1930s, Los Angeles had one of the largest **public** transportation systems in the United States.

2 Definitions

(4 points)

Define or **briefly explain** each of the following terms in one sentence.

(1 point each)

1. Inheritance:
2. Polymorphism:
3. Abstract base class:
4. Constructor:

3 General Topics (12 points)

1. **Protection** of member variables and member functions in classes for C++. (5 points)

(a) What are the three levels of protection provided?

(b) Describe each in one sentence, focusing on the differences between them.

2. **Operator overloading** in C++. (4 points)

(a) Define or briefly explain operator overloading?

(b) Why would you use it? Explain or provide an example.

4 Advanced Topics (4 points)

1. **Templates** in C++. (2 points)

(a) Define or briefly explain a `template` and why you might use one.

(b) What is the C++ syntax for instantiating a variable named `vec` as an instance of a `vector` template containing `ints`?

2. Consider the following C++ code snippet (you might have to make certain assumptions not explicitly stated): **(2 points)**

```
const int MAX = 10;

int foo(int bar) {
    cout << "input was: " << bar << endl;
    if ( bar > MAX ) {
        out_of_range e("input out of range");
        throw e;
    }
    return bar++;
}

int main ( int argc, char **argv ) {
    int input = atoi(argv[1]);
    int output = input;
    try {
        output = foo (input);
        cout << "output is: " << output << endl;
    } catch ( exception &e ) {
        cout << "exception caught: " << e.what() << endl;
    }
}
```

What is the program output if the input is:

- (a) 5
- (b) 10
- (c) 15
- (d) not provided (i.e. no arguments are given)