

NAME: _____

CS 330 Final
Spring 2013

Doodle here.

1. *OOP Languages: Java, C++, Ruby, C#, Python*

Define the three features common to object-oriented languages.

2. *This Ain't Rock and Roll—It's Generics!*

Templates let you apply code to a variety of types without pigeon-holing them into an inheritance hierarchy. The generic code can be applied to any type that supports the operators and methods used. Each time the compiler encounters a reference to the generic code applied to a new type, it compiles a version of the code specific to that type.

Write a C++ template for the function `max(a, b)` which returns a value using the expression `a > b ? a : b`.

How will the compiler handle each of the following calls? Assume `max` has not been referenced anywhere else in your code.

(a) `max(3, 7)`

(b) `max(3.0, 7.0)`

(c) `max(3, 7.0)`

3. C == C++

Name two weaknesses of C that C++ overcame.

4. Consider this potential implementation of map:

```
map f [] = []  
map f (first:rest) = f first:map f rest
```

One of you asked, “Write a line of code in Haskell that sums up all the numbers in an array using `map`.” Describe what’s wrong with this request. How could you fix the request?

5. *Guard the Parameter!*

In what situations would you benefit from using call-by-value (C), call-by-reference (C++), and call-by-need (Haskell)?

6. *Lambda to the Slaughter*

The king has just decreed that all functions shall no longer hold first-class citizenship, henceforth and forevermore. However, he has not yet finalized his decision with the royal seal, and you may be able to change his mind, since you are his head adviser. What arguments will you use to persuade him that functions should be first-class citizens?

7. *T*

How does static typing differ from dynamic typing? What are the advantages and disadvantages of each?

What's unique about duck-typing?

8. *First Classes, Now...*

Your boss tells you, “I need you to use C’s template functionality to solve this problem.” Sadly, C doesn’t support templates. Even more sadly, your boss doesn’t take correction well. The last person that protested ended up mopping floors. How might you “add” templates to C?