106H Midterm 1 Review

These questions are designed to help you think about course material, not to show you actual exam questions (though some are). Answers will be short answer, short essay, or coding.

Research shows that the best way to study for an exam is with other people. In group study, the people who start knowing more learn more (think about why), so don't think that it is only valuable to study with people who know more than you do.

- 1. Write any function from a lab, especially recursive ones.
- 2. Get a program from class or from another student. Cross out every other line of code, then try to rewrite them. Discuss.
- 3. Write comments and tests for each other, then try to write code and compare answers.
- 4. What is a recursive function? What are the features of a useful recursive function?
- 5. Consider different kinds of recursion we have seen: returning a single number, returning a list of numbers, taking a single list parameter, adding variables to keep track of state, recursion for printing lines, triangles. Write examples for all of these and compare structure and base cases.
- 6. What does the following function return when called on 3? Why? Give examples of other function that behave the same way.

```
def factorial(n):
if n<=2:
    return n
else:
    factorial(n-1)</pre>
```

- 7. Show how to make and manipulate lists in the interpreter. Show (using indexing and slicing) changing elements, removing elements, adding elements, adding lists, selecting sublists.
- 8. Write a function that removes an element from a list. Write it recursively with two parameters.
- 9. Write a set of functions to remove the third occurrence of some number in a list (two parameters).
- 10. Write a function that takes a letter and a sentence and returns true if the letter occurs in the sentence.
- 11. Write a recursive function that manages nested lists of arbitrary depth, e.g. nested_sum, nested_reverse.
- 12. Write accumulate. (Hint: write one of the more specific functions first to show yourself the structure.) Show a call to accumulate that will return the sum of elements in a list.
- 13. Draw the namespaces for a series of function calls.
- 14. Correctly write your lab section, lecture section, and your TAs' first and last names.

- 15. Look at some Python code and identify definitions, function calls, assignment, slicing, mutation.
- 16. Demonstrate how to type cast a number to a string and vice versa.
- 17. Correctly interpret math and logic expressions using operators we have covered in class.
- 18. Demonstrate passing and using a function-valued parameter.
- 19. Write a recursive function to traverse a list and compute sum, find element, print elements, etc.
- 20. Explain abstraction/composition and give an example from class.
- 21. Write a function that uses if (and possibly elif, else) to control the flow of code.
- 22. Given a function and parameters, predict its behavior. What does it print? What will it return?
- 23. Describe the properties of an isoceles marsupial.
- 24. Write a recursive function that prints a line of asterisks/spaces. Use the functions in another function to draw shapes.
- 25. Give two reasons why we should write tests before we write code.
- 26. Given a series of expressions typed into the interpreter, show the interpreter's response, e.g.

>>> /			
7	<	your	answer
>>> x			
error	<	your	answer
>>> def f():			
pass			
>>> f			
<fcn f=""></fcn>	<	your	answer
>>> 3 // 4			
	<	your	answer
>>> 11 % 6			
	<	your	answer
>>>			
def f(x):			
x = x + 1			
return x			
>>> x = 7			
>>> f(x)			
	<	your	answer
>>> x		-	

- 27. What is truth? What is truth in Python? Which operators return booleans? What values can be interpreted as booleans?
- 28. What does this error msg mean, and how might you fix it?

TypeError: unsupported operand type(s) for +: 'int' and 'NoneType'

- 29. What advantages are typically associated with short code? When would short code be bad?
- 30. List three ways, discussed in class, to improve your own learning during class.
- 31. Integer division is useful for indexing. What is its companion operation?
- 32. (2 pts) The volume of a box is computed as L*W*H. Given a box with length m, width m, and height m, which of the following answers is a low estimate, as discussed in class? Show your work.

(a)

- (b) none of these
- 33. (2 pts) The distance travelled for an object starting from rest is given as

$$distance = a * t^2/2$$

Given $a = 32 m/s^2$ and t = 250 s, which of these is closest? Show your work.

(a)

- (b) none of these
- 34. (2 pts) The volume of a cylinder is given as

$$volume = \pi r^2 h$$

. Which of the following would be a high ballpark figure for height and radius ? Show your work.

(a)

- (b) none of these
- 35. (2 pts) The data record for a cow requires 64 kilobytes of memory. How much memory is required to store the data for two billion cows? Show your work.
 - (a) 256 terabytes
 - (b) 128 terabytes
 - (c) 128 gigabytes
 - (d) 256 gigabytes
 - (e) none of these

- 36. (2 pts) Suppose you have only eight different letters you can use to name horned toads¹, and all horned toad names are 10 letters long. Using powers of two, about how many different horned toads names are available? Show your work.
 - (a) eight billion
 - (b) eight million
 - (c) four billion
 - (d) four million
 - (e) none of these

¹This is because of ancient horned toad naming customs - ask any horned toad.