Com S 127x
Fall 2015
Topics and review problems for Exam 2
Wednesday, November 18, in class

General information

This will be a 50-minute, timed, pencil-and-paper written exam. No books, no notes, no electronic devices, no headphones, no collaboration. The problems will primarily involve writing Python code or reading and interpreting Python code.

Summary of Exam topics

The exam covers everything we have done in class through Friday, November 6 and in labs through Lab 10. This corresponds pretty well to the first 10 chapters of the textbook (up through Lists, not including Files) although we have not discussed the third chapter (Debugging Interlude) in detail and we have not talked about "tuples" (at the end of the List chapter).

Note that, by necessity, **the exam is cumulative**. Everything we have been doing recently depends on the basics covered on the first exam. If you had any trouble on Exam 1, you should review it (and the corresponding review sheet).

See the review sheet from Exam 1 for general studying advice. In addition, you now know enough Python to do the the problems on codingbat.com, which many people find to be a fun way to practice conditionals and loops.

The list below is a rough overview of the new topics.

- Conditional statements
- Boolean expressions and operators
- More loops - using while loops, using nested loops
- Recognizing search problems, using multiple `return` statements
- String indexing and slices (substrings)
- String methods
- Lists
- Loops using list or string indices
- List methods: append, pop, find
- The `in` keyword
- List variables are references

Problems to practice on

Be sure you can do the problems from the 10/23 quiz,
http://web.cs.iastate.edu/~smkautz/cs127f15/examples/week9/quiz_oct_23.pdf

Be sure you can do the problems from the 10/23 worksheet,
http://web.cs.iastate.edu/~smkautz/cs127f15/examples/week9/class_exercises_oct_23.pdf

More problems!

1) Write a function **`is_prime(n)`** that determines whether the given number **`n`** is prime (greater than 1 and divisible only by 1 and itself). *For example*, 7 is prime, 6 is not prime.

2) Using the **`is_prime`** function from above, write a function **`next_prime(k)`** that returns the next prime number that is larger than the given value **`k`**. *For example*, given the number 14, the next prime would be 17 since 15, and 16 are not prime.

3) Using the **`next_prime`** function above, write a function **`list_primes(howmany)`** that returns a *list* of the first **`howmany`** prime numbers.

4) Write a function that determines whether a given string is a palindrome. (A palindrome is a string that is the same forward and backward, like "abcba" or "daad")

5) Write a function that, given an email address returns just the username (the part before the "@" symbol).

6) Write a function that, given a Python list of email addresses, returns a new list of just the usernames.

7) Write a function that, given a list of numbers, modifies the list by replacing every number with its square.

8) Write a function that given a string, returns a string in which each letter is replaced by the letter after it in the alphabet (where 'z' is replaced by 'a'). For example, given 'banana" return "cbobob". (Hint: use the built-in **`ord`** and **`chr`** functions)

9) Write a function that, given a list of numbers, determines whether any two numbers in the list add up to 42.

10) The Elections-R-Us company sells custom-made yard signs and buttons online. Signs are $2.00 each, and buttons are .25 each, but you get 4 free buttons for each yard sign ordered. There is a service charge of $25 for orders of fewer than 100 items. Write a function **`compute_cost(signs, buttons)`** that returns the cost of a given number of signs and buttons. *This function does not read input or print anything.*

> Example: The local Chicken Farm party orders 10 signs and 100 buttons for their candidate, Sal Monella. The signs are $20, they get 40 of the buttons free, and the remaining 60 buttons cost $15. Since more than 100 items ordered, there is no service charge, so the order total is $35.

11) Suppose you have defined variables

```
x = 42
y = "lunchtime"
```

a) Evaluate each expression below

```
y == "breakfast" or x != 42

x == 5 || (len(y) > 0 and not x <= 0)

not((x > 0 and x > 1) || x > 2)
```

b) Using the variables x and y above, for each phrase below, write a Python boolean expression that captures its meaning. Then determine whether the expression is true or false using the values of x and y above.

x is at least 25
x is between 25 and 50, inclusive (i.e., including the endpoints of the interval)
y is either 10 or 12 characters long
x is equal to the three times the length of y
the length of y is not divisible by 3
x is negative or else x is even and divisible by 3

12) Given the following function,

```
def foo(x, y):

  result = False
  if x > y:
      if y != 0:
          result = True

  if x == 0:
     result = True
  return result
```

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Give the return value for each of the calls:

```
foo(2, 1)
foo(0, -1)
foo(1, 1)
```

13) Rewrite the function foo above so that it returns the same results but does not contain any conditional statements (no `if` statements).