

Introduction to Computer Science I  
Spring 2014  
**Sample** MID-TERM EXAM

You have **50 minutes** to complete this 100 point exam.

1. (15 points) You are taking a course at Smith College this semester. One afternoon, the course ends, and you realize that you have a some time before you need to be back on your own campus; moreover, you have a book that you need to finish reading for a class that meets tomorrow, and if you don't get it done now, you know that you won't get it done at all.<sup>1</sup>

You also happen to get motion sick when you try to read **on** the bus, so your plan is to read the book while sitting on a bench near the bus stop, and then get on the next bus back to campus. For fun, you decide first to write a short Python program on your laptop to address some questions about how long you will be sitting at that bench, reading, and then waiting for the next bus. In writing this program, you consider the following:

- Assume that the bus comes by this stop every  $b$  minutes.
- Assume that it will take you  $r$  minutes to finish reading the book.
- Assume that the bus last came by  $p$  minutes ago.

You want to write a program that will read in those three values, and then calculate and show you:

- (a) The number of times that the bus will pass by while you are reading.
- (b) The number of minutes, after you finish your reading, that you will wait for the **next** bus to arrive.

**Write this program.**

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<sup>1</sup>Yes, this is an excruciatingly contrived situation that I am presenting for the purpose of this problem. Go with it.

2. (20 points) Consider the following function signature:

```
def reverse (lst):
```

**Write the body of this function** such that the order of the values inside the list to which `lst` refers are **reversed**.<sup>2</sup> That is, given the following statements and a properly written `reverse()` function...

```
x = [ 'a', 'b', 'c' ]
reverse(x)
print(x)
```

...the following output should appear...

```
['c', 'b', 'a']
```

3. (30 points) Write the following two functions that print patterns of stars (asterisks, that is) as described:

- `def print_triangle (size):`

Print a triangle of stars that is `size` characters in height and width. For example, `print_triangle(5)` should yield the following output:

```
*
**
***
****
*****
```

- `def print_xmas_tree (size):`

Print a Christmas tree-like pattern of stars (and one absolute value bar for the trunk) of the requested size. For example, `print_xmas_tree(6)` should emit:

```
  *
 ***
*****
*****
*****
*****
*****
|
```

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<sup>2</sup>You may know that Python already has a function for reversing lists in the manner. You may not, of course, use such a function here; the goal is to figure out how such a function works inside.

4. (30 points) Consider the following function signature...

```
def charlist_to_int (string):
```

This function's parameter is a sequence of characters, stored in a list, that is the textual representation of an integer value.<sup>3</sup> So, the character list will have something like: [ '3', '1', '5', '7' ], which this function should convert to the integer value 3,157.) (Do not worry about lists that contain non-digit characters. Such a malformed argument cannot be converted into an integer, and so we will ignore the possibility of such arguments here.)

**Write the body of this function**, which must convert the sequence of digit characters into an honest-to-goodness `int` value; the function then must return that value.

**Notice:** 5 of the points for this problem are for handling character sequences that specify a *negative* integer, such as { '-', '9', '0', '2' }, which should be converted into the integer  $-902$ . If this seems a complication that gets in the way of solving the rest of the problem, sacrifice the 5 points to focus on the other 25.

**Helpful information:** Within the computer's alphabet (ASCII), the characters '0' through '9' appear in order. Also note that character '0' is **not** the 0<sup>th</sup> character in the alphabet; that is, `ord('0')` is **not** 0.

5. (5 points) What is the secret password that Prof. Kaplan wrote on the board promptly at 9:00 am for one morning's lecture?

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<sup>3</sup>Once again, a similar function already exists in Python, and we've used it: `int()`, which operates on strings instead of character lists. We are again trying to create the code that just such a function might use internally, so you may not use `int()` in your solution.