Introduction to:
Computers & Programming:
Review for Midterm 2

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Summary

• Some Procedural Matters
• Summary of what you need to Know
  – For the Test and To Go Further in the Class
• The Practice Midterm (and Last Semester's Midterms)
Procedural Matters Regarding the Midterm

• The test is next class
• I will take attendance – please bring your School ID
• The test will be graded on a curve
• The midterm counts for 20% of the final grade
Grade Scope

• We will be using Grade Scope again.
• This time, I will include extra pages in between part 2 questions.
• Please answer questions on the designated pages if possible.
• Don't include answers on the backs of pages – Backs of pages will not be scanned (or graded)
Type of Questions that Could Be on the Test

- **Section I: Answer questions about Code**
  - What is printed out?
    - Look for “print” commands (sometimes include several rounds of interaction for a complex program)
  - What value is returned by a function?
    - Look for “return” commands
  - What is the value of a certain variable
    - Look at assignment statements (with =)
  - Open ended questions:
    - What does a function do? Example: it checks if input is in correct form.
    - What conditions will cause a program to end? For clues, look at if and while statements.

- **Section II: Write functions that solve stated problems**
  - Read questions carefully
  - Common errors involve misreading questions and writing functions that solve problems other than those stated in the question
What you should know

• Old Topics: algorithm, function, program, operator, input, output, side effect, variable, data types, if statements, else, decision trees, loops

• New Topics: Turtles, Strings, Lists, sequence operations, file input/output, catching exceptions

• Old stuff from last midterm: define functions, assign values to variables; return values from functions and operators; use print statements, including the sep and end keywords; import modules; use data types and coerce one data type to another; write functions that work and are easy to understand, use comments and clear variable/function names; if/elif/else statements; use for loops and while loops.

• New Stuff: random numbers, turtle graphics (drawing lines, circles, turning left and right, putting the pen up and down, etc.); problems involving manipulating strings (slices, identifying characters by indices, building new strings using loops, etc.); lists (slices, identifying items by indices, changing parts of lists, using list.append, list.pop, list.reverse and various other list methods); using max, min and sort with lists, strings, characters, etc.; try/except structures, reading from a .txt, .csv and .tsv files, writing to .txt, .csv and .tsv files.
Functions

• Programming language Functions have 3 optional features:
  – Input
  – Output
  – Side effects

• Input to a function via its parameters

• Using the “input” function to solicit interactive input from a user

• *print* versus *return*
  – *print* is significant for its side effect—printing to the computer screen
  – *return*
    • Exits block (function)
    • Provides a value to a function call – Example:
      – If: function1(a) returns 5 and function2(b) returns 10
      – Then: function(a) + function(b) = 15
Turtle Graphics

- `my_screen = turtle.Screen()`
- `my_turtle = turtle.Turtle()`
- `my_turtle.pu()`
- `my_turtle.pd()`
- `my_turtle.fd()`
- `my_turtle.left()`
- `my_turtle.circle()`
- `my_turtle.setposition(X,Y)`
Strings and Characters

- Characters: chr(number), ord(char), '\n', '\t', etc.
  - Comparison with >, >=, <=, >=, e.g., 'Z'<'a'

- Indices and Slicing
  - my_string = 'big bad wolf'
  - my_string[0], my_string[-4], my_string[3:6], my_string[3:], my_string[3:], my_string[::], my_string[-4:], my_string[-4:-1]

- String operators, functions, methods
  - len(string), 'abc'.upper(), 'AbC'.lower(), string1+string2
  - Comparison with >, >=, <, <=, e.g., 'Abc'>'ABc'

- Loops (for or while) with accumulator variables, e.g.,
  ```python
def some_function(input_string):
    output = ""
    number = 0
    for char in input_string:
      number = change_number_in_some_way(number)
      output = output+change_char_in_some_way(char)
    return(output)
```
Lists 1

• Indices and Slicing
  – List1 = [1,2,3,4,5]
  – list1[1:3] → [2,3]
  – list1[3] → [1,2]
  – list1[1:] → [2,3,4,5]
  – list1[:] → [1,2,3,4,5] (a copy of the original list)

• Functions/methods/operations that change list (mutability)
  – list1.append(6)
  – list1.extend([7,8,10])
  – list1.reverse()
  – List1[0] = 9  ## list1 → [9, 8, 7, 6, 5, 4, 3, 2, 1]
  – list1.sort()  ## list1 → [1, 2, 3, 4, 5, 6, 7, 8, 9]
  – list2 = [[5,'sandwich'],[2,'egg'],[10,'enchilada']]
  – list2.sort()  ## list2 → [[2, 'egg'], [5, 'sandwich'], [10, 'enchilada']]
Lists 2

- Comparisons with >,>=,<,<=, Max, Min, sort
  - list2 = [[5,'sandwich'],[2,'egg'],[10,'enchilada']]
  - list2.sort()  ## list2 → [[2, 'egg'], [5, 'sandwich'], [10, 'enchilada']]  
  - max(list2) → [10,'enchilada']
  - [5,'sandwich']>=[2,'egg']

- loops with accumulator variables

```python
def make_derived_list(inlist):
    output = []
    for item in in_list:
        output.append(derive_something_from(item))
    return(output)
```
Randomness

- Import `random`
- `random.choice(sequence)` – returns 1 item
  - `random.choice('ABCD')`
  - `random.choice(['Duck1','Duck2','Goose'])`
- `random.randint(start,end)` – returns 1 integer between start and end (inclusive)
  - `random.randint(1,10)` ## returns 1,2,3,4,5,6,7,8,9 or 10
- `random.random()` ## returns float between 0 and 1
- Picking a random card and removing it from a deck:
  - `index = random.randint(0,len(deck)-1)`
  - `card_picked = deck.pop(index)}`
def get_input_from_file():
    found_file = False
    while (not found_file):
        try:
            input_stream = open(input('What file do you want? '))
            for line in input_stream:
                print(line,end="")
            input_stream.close()
            found_file = True
        except:
            print('You did not provide a valid file. Try again!')
Reading in a .tsv file.

- `def get_tsv_records(input_file):
    import os
    labels = []
    records = []
    with open(input_file) as instream:
        for line in instream:
            line = line.strip(os.linesep)
            record = line.split('	')
            if len(labels) == 0:
                labels = record
            else:
                records.append(record)
    return(labels, records)`
Writing to a .tsv file.

- `defun write_records_to_tsv(labels, records, outfile)`
  
  ```python
  with open(outfile,'w') as outstream:
      outstring = ''
      for label in labels:
          outstring = outstring+label+'\t'
      outstring = outstring.strip('\t')
      outstring = outstring+'\n'
      outstream.write(outstring)
  for record in records:
      outstring = ''
      outstring = outstring+label+'\t'
      outstring = outstring.strip('\n')
      outstring = outstring+'\n'
      outstream.write(outstring)
  ```
Practice Midterms

• I will go over this in detail today (see website)
  – practice midterm and practice midterm answers

• One of last term's midterm 2s are also online:
  – old midterm and old midterm answers

• Other midterms available online
  – On my webpage, find previous Intro to Programming Classes
  – There may be some overlap with practice midterm
  – You can look at both sections of CSCI-UA.0002 and V22.0002 (the previous number for this class)
    • However, the material covered may have changed a little. For example, last term's midterm 2 did not cover file input/output

• Structure is the same as the midterm:
  – 4 Part 1 questions
  – 2 out of 3 Part 2 questions
Timing

• There are 6 questions do be completed in 1:15
  – I suggest budgeting your time, e.g.,
    • 7 min X 4 part 1 questions = 28 min
      – Skip part 1 questions that are too hard and go back to them later
    • 15 min X 2 part 2 question = 30 min
    • Extra time for going over budget: 17 minutes

• The practice test may be longer and harder than the actual test, so don't let the practice test make you nervous.

• Previous year's tests are better for estimating timing.
Reminder: A Test is a Game

• Unfortunately, tests are imperfect for measuring a person's expertise because (independent of such expertise) some people know how to play the *test game* better than others

• How to win the test game
  – Study sample test instructions
  – Time is a crucial factor (you have 1 hour and fifteen minutes)
  – Do easy problems before hard ones
  – Do not spend a lot of time on low-point problems
  – Do not get stuck on details that you don't need
    • Solving all problems is more important than doing 1 problem elegantly
  – Go for partial credit on program questions (most points)
    • If you cannot program some detail – write pseudo code
    • Basic solution strategy is more important than perfect syntax
The Midterm is Next Class

• Please feel free to ask me any questions
• We will go over the practice midterm in class: ask questions
• Suggested Studying Methods
  – Obvious
    • look over previous class lectures, notes, homeworks, etc
    • Practice problems of your choosing
  – Previous tests in other classes
  – Midterm1 for this year (both sections that I taught)
• Good luck!