CS 125 - Lecture 2

Objectives:

- Pseudo code – Motivation and Examples
- Mental Model of Memory
- Designing Data Structures

To Do:

- Reading assignment before next lecture (see Lecture page).
- Sign up for Turing's Craft: (See CS125 FAQ website)
- Laptop setup issues? Post screenshot on Piazza
- HW0 on friday.
- Sunday Debug-Your-Brain starts in 11 days time.

1. Computer Science Terminology – did your neighbor do the readings? YES/NO
Discuss with your neighbor what a Computer Scientist means by the following terms and give an example of each:

- algorithms
- composition
- memory locations
- primitives
- abstraction
- address

Q1: How many bits are in a byte?

Q2: What number is represented by the bit pattern 010110?

2. Using 8 bits, write these decimal numbers in binary representation:

$3_{10}$ =

$10_{10}$ =

$67_{10}$ =

$7_{10}$ =

$254_{10}$ =

3. Binary representation is an abstraction

$$010110_2$$

4. Arithmetic can be done with binary numbers:

$$\begin{array}{r} 10010_2 \\ +\ 00110_2 \\ \hline \phantom{00000}_2 \end{array}$$

5. **Representing algorithms?**
(http://userpages.wittenberg.edu/bshelburne/Comp150/Algorithms.htm)

- Use natural languages
- Use formal programming languages
- **Pseudo-Code** - natural language constructs modeled to look like statements available in many programming languages

**Pseudo-Code** is a numbered list of instructions to perform some task.

1. *ordered sequence of operations*
2. each instruction is computable
3. complete

Three Categories of **Algorithmic Operations:**

1. sequential operations – instructions executed in order
2. conditional "question asking" operations – select from alternatives
3. iterative operations (loops) – repeating a block of instructions

6. Computing a Quiz Average: Pseudo-code to calculate a quiz average

```
1.  get number of quizzes
2.  sum := 0
3.  count := 0
4.  while count < number of quizzes
        -  get quiz grade
        -  sum = sum + quiz grade
        -  count = count + 1
5.  average = sum / number of quizzes
6.  display average
```

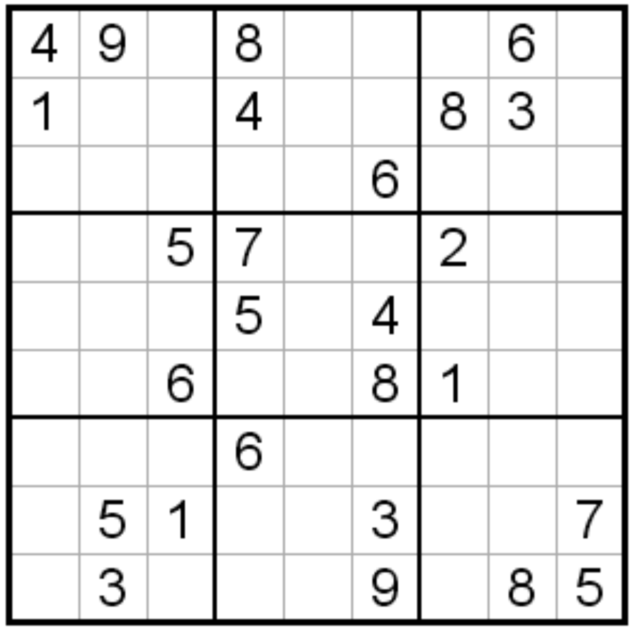
7. Write pseudo-code to print the highest quiz score:

8. Mapping the data model of “Computing a Quiz Average”:

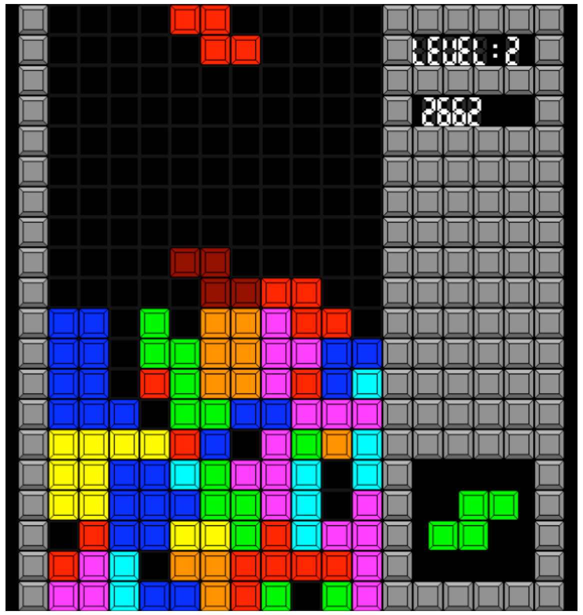
Computing a Quiz Average: Pseudo-code to calculate a quiz average

```
1. get number of quizzes
2. sum := 0
3. count := 0
4. while count < number of quizzes
     - get quiz grade
     - sum = sum + quiz grade
     - count = count + 1
5. average = sum / number of quizzes
6. display average
```

| Memory Address | Value |
|---|---|
| 11 | |
| 10 | |
| 9 | |
| 8 | |
| 7 | |
| 6 | |
| 5 | |
| 4 | |
| 3 | |
| 2 | |
| 1 | |
| 0 | |



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4 | 9 | | 8 | | | | 6 | |
| 1 | | | 4 | | | 8 | 3 | |
| | | | | | 6 | | | |
| | | 5 | 7 | | | 2 | | |
| | | | 5 | | 4 | | | |
| | | 6 | | | 8 | 1 | | |
| | | | 6 | | | | | |
| | 5 | 1 | | | 3 | | | 7 |
| | 3 | | | | 9 | | 8 | 5 |



9. Design a data structure for Sudoku:

10. Design a data structure for Tetris: