CS 170 Section 003                Name:________________________________________
HW 1 – Spring 2013
Due: Th. Jan. 31 by start of class

Instructions: This is the first homework for CS170 (Section 003). Unlike labs, you are expected to do
homeworks on your own. Future homeworks will involve programming, but this first one is mostly written, and
you should turn it in on paper.

Honor Code: Like all work for this class, the Emory Honor Code applies. You should do your own work on
all problems, unless you are explicitly instructed otherwise. If you get stuck or have questions, ask your
instructor or a TA for help.
Initial here to indicate that you followed the Honor Code and this work is your own. _______________

1. Bits and Bytes. (Recall, for CS 'kilo' means a number that is a power of 2 that is close to 1000.)
   a) (5pts) How many bytes are in 3 megabytes? ________________________________

   b) (5 pts) How many bits are in 3 megabytes? ________________________________

2. (20 pts) Using ALL of the following terms, describe how we can write programs for a computer.

<table>
<thead>
<tr>
<th>program</th>
<th>high-level language</th>
<th>Java</th>
</tr>
</thead>
<tbody>
<tr>
<td>machine language</td>
<td>assembly language</td>
<td>compiler</td>
</tr>
<tr>
<td>source code (or source files)</td>
<td>virtual machine</td>
<td></td>
</tr>
</tbody>
</table>
3. ASCII Conversions

Letters in the English Alphabet are stored inside the computer as numbers. That is, each letter is *encoded* as a number. The encoding method used to represent the alphabet is known as the ASCII code (American Standard Code for Information Interchange). The website [http://www.ascii-code.com](http://www.ascii-code.com) contains ASCII code tables which shows the encoding from a decimal number to an English language character.

a) (10 pts) What text is encoded by the following sequence of (decimal) byte codes?

```
40 67 83 95 49 55 48 32 115 112 114 32 49 51 41
```

b) (10 pts) Give the sequence of decimal byte codes for the following phrase:

$123 \text{ abc!}$
4. (10 pts) Variable names:
   a) Give 3 valid identifiers in Java, two of which are NOT solely alphabetic.

   b) Give 3 Java keywords which could NOT be used as variable names:

   c) Give 3 illegal identifiers that are NOT Java keywords:

   d) Give 1 convention (i.e., not a syntax rule enforced by Java) that you should follow when naming identifiers.

5. (10pts) Using Google or another search engine of your choice, fill in the table below by finding the minimum and maximum integer values which can be represented by the following Java datatypes. Also for each datatype, how many bits would be required to encode such an integer?

<table>
<thead>
<tr>
<th>Datatype</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
<th>No. of Bits Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) byte</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) short</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) char</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) int</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) long</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. Algorithm Tracing
Consider the following algorithm:

\[
R = 52; \\
Q = 0; \\
D = 7; \\
as \text{ long as } R \geq D \text{ do} \\
\{ \\
R = R - D; \\
Q = Q + 1; \\
\}
\]

a) (20 pts) Trace out each step as begun below for you:

Initially: \hspace{1cm} R = 52 \hspace{1cm} Q = 0
After 1 Step: \hspace{1cm} R = \hspace{1cm} Q =
After 2 Steps: \hspace{1cm} R = \hspace{1cm} Q =
... (use as many rows as needed)

b) (10 pts) What does this algorithm accomplish? Explain the relationship between R, Q, and D WITHOUT simply explaining the algorithm in part a.