Solutions to Final Exam Review Problems

1. No — \( B = 1011 \), which is odd

2. No — the leading bit is a “1” \( F = 1111 \), indicating that the number is negative

3. 3, including the null character at the end

4. 
   \[
   \begin{align*}
   &\text{l}w\ \$s0,x \\
   &\text{s}ll\ \$s0,3 \\
   &\text{s}w\ \$s0,z
   \end{align*}
   \]

5. 
   \[
   \begin{align*}
   &\text{l}w\ \$s0,y \\
   &\text{s}ra\ \$s0,1 \ # \text{NOTE: srl will not work---use ARITHMETIC right shift} \\
   &\text{s}w\ \$s0,z
   \end{align*}
   \]

6. 
   \[
   \begin{align*}
   &\text{l}w\ \$s0,x \\
   &\text{l}w\ \$s1,y \\
   &\text{a}dd\ \$s0,$$s0,$$s1 \\
   &\text{s}w\ \$s0,z
   \end{align*}
   \]

7. \( (1000\text{ins} \times 5\text{cyc/ins})/(4 \times 10^9\text{cyc/sec}) = (5/4) \times 10^{3-9}\text{sec} = 1.25\mu\text{sec} \)

8. \( (1000\text{ins} \times 2.5\text{cyc/ins})/(2.5 \times 10^9\text{cyc/sec}) = (1 \times 10^{3-9}\text{sec} = 1\mu\text{sec} \)

9. machine B executes more instructions per second since it takes less time to perform 1000 instructions than A does

10. \( .25 \times 3 + 2.5 \times 4 + .5 \times 2 = .75 + 1 + 1 = 2.75\text{cycles/ins} \). Note that the information about “1000 instructions” is unnecessary information.

11. The final value of \( i \) is 5.

12. No, the loop terminates as soon as the \( \text{\textbackslash n} \) is read, but before it can be stored in the array.

13. 
   \[
   \begin{align*}
   &\text{f}or\ (i = 4; i >= 0; i--) \{ \\
   &\text{p}utchar(\text{msg}[i]); \\
   &\text{p}utchar(\text{\textbackslash n}); \ # \text{OPTIONAL} */ \\
   &\text{p}utchar(\text{\textbackslash n}); \ # \text{OPTIONAL} */
   \end{align*}
   \]

   while (i >= 0) {
   
   \[
   \begin{align*}
   &\text{p}rintf("\%c",\text{msg}[i]); \\
   &\text{i}--; \\
   &\text{p}rintf("\text{\textbackslash n}"); \ # \text{OPTIONAL} */
   \end{align*}
   \]

HANDED OUT ON 8 DECEMBER 2015
14. \( c = 'h' - 'a' = 7 \). Note that we don't actually need to know the ASCII values of 'h' and 'a' to compute this—we only need to know that 'h' is 7 letters ahead of 'a'.

15. **a, b:**

<table>
<thead>
<tr>
<th></th>
<th>00</th>
<th>01</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The column of 1s corresponds to the term “\( c \)”. The second row (all 1s) corresponds to the term “\( \overline{ab} \)”. The last row (all 1s) corresponds to the term “\( a\overline{b} \)”. The answer is:

\[ c + \overline{ab} + a\overline{b} \]

16. 0xFFFFFFFF
17. 0x80000000
18. 50 = 32 + 16 + 2
19. 1000 1001 1010
20. The upper half of the diagram, including paths into and out of the PC and the two adders on top of the diagram.
21. `int largest(int a[], int size) {
    int i;
    int max = a[0];
    for (i = 1; i < size; i++) {
        if (a[i] > max) max = a[i];
    }
    return max;
}
`
22. `int largest(int a[], int size);`
23. `$t1$ contains 10, $t2$ contains 10, $t3$ contains 0, $s0$ contains 60`

**The above is not a full review!** You should also look at the review sheets for exams 1 and 2 and the exams themselves.