Rules

• You may work together, but you are expected to turn in your own writeup of answers.

• HW is due by the beginning of class on Wednesday, Sept. 23rd, 2009

• Email questions to TAs/professor or ask in class.
Hints

- In Boolean expressions, the order of operations is always inner most parenthesis first, then the not, then the and, finally the or.

- Example : (not A and (B or C))
  - First - perform OR (because of parens)
  - Second - perform NOT
  - Third - perform AND
Try the nim5 program. What switches do you, the user, need to turn on to win? (Light the “U-Win” bulb?)

http://scratch.mit.edu/projects/cs105/35736
2. Barcode Hopping

- Find two different UPC-A (12-digit) barcodes from products from the same company. (Remember, the company code is the 5 digits starting with the second digit.)
- What are the products and the codes?
3. Missing Barcode Numbers

(A) 04119000069?
(B) 02?254665153
(C) 0280002156?6
(D) The names of these three items have something in common. What are these three items? What could you make with these items? (Hint: Google can sometimes tell you what product name corresponds to a complete barcode.)
4. True or False?

(A)

• False and ((not True or False) and (True and False))

(B)

• ((not (True and False) and True) or False) or (False and not False)

(C)

• ((not not True or not False) or False) and (not False or ((not False and False) or False))
5. Logical Switches

Which logical formula captures the behavior of the circuit?
6. Relay Circuit

a. Fill in the truth table for this relay circuit.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>False</td>
<td>False</td>
<td>True</td>
</tr>
<tr>
<td>False</td>
<td>True</td>
<td>False</td>
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<tr>
<td>True</td>
<td>False</td>
<td>True</td>
</tr>
<tr>
<td>True</td>
<td>True</td>
<td>True</td>
</tr>
</tbody>
</table>

b. Find an expression for the table

c. Invent a name for this logic gate.
7. What Can They Be?

- (A) Write a logical expression \(C = \text{something that can include } A \text{s, } B \text{s, nots, ands, and ors}\) to match the truth table on the left.

- (B) Write a logical expression \(C = \text{something that can include } A \text{s, } B \text{s, nots, ands, and ors}\) to match the truth table on the right.
8. True or False?

X = True, Y = False, C = True

(A)
- (Y or (not C or Y)) and (X and Y)

(B)
- (not not ((X and Y) and C) or not Y) or (Y and not Y)

(C)
- ((not not X or not Y) or not Y) and (not Y or ((not not Y and Y) or Y))
9. Pictures and Words

(A) An 8 megapixel digital camera has an image size of 3264 x 2448 pixels. How many bits is a picture from this camera? (Hint: 1 pixel contains 24 bits!)

(B) At normal speaking rates, a person takes about 350 seconds to say a thousand words. How many bits is a thousand words recorded at 192 kilobits per second?