CSI 30, Homework 1 on section 1.1

Due by Mon, Feb 6.

Here are seven questions for you to try. Write all your working out and answers on your own notepaper. Please use lots of space and as many pages as you want, so I can include corrections or comments - otherwise I will ask you to redo it. You do not need to write the questions, but it is very important that you show clearly any work you had to do to get your answers. Each question is worth 3 points for a total of 21.

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(1) Say if each of these is a true proposition, a false proposition or not a proposition:

  (a) p says "$3^4 > 100$"

  (b) q says "where is my phone?"

  (c) r says "$2^{10} = 1024$".

(2) Suppose p is false and q is true. Find the truth values of:

  (a) $\neg p$

  (b) $p \wedge q$

  (c) $p \vee \neg q$

  (d) $p \rightarrow q$

  (e) $q \rightarrow p$

(The answer to each of the five parts is either True or False.)

(3) Let p be the proposition "the votes have been counted" and q the proposition "the election is decided". Write each of these compound propositions in plain English:

  (a) $q \rightarrow p$

  (b) $p \wedge q$

  (c) $\neg p \vee \neg q$

(4) Convert the sentence "You get a speeding ticket if you drive over 65 miles per hour" into a compound proposition with p and q, saying what p and q are.

(5) "If I catch the bus then I am at work on time." For this statement write in English:

  (a) The contrapositive.

  (b) The converse.

  (c) The inverse.

  (d) The original statement "If I catch the bus then I am at work on time" is logically equivalent to exactly one of (a), (b) or (c). Which one?

(6) Write the truth table for: $(p \oplus q) \wedge (p \to q)$

(Use five columns for each of p, q, $p \oplus q$, $p \to q$, $(p \oplus q) \wedge (p \to q)$ in your table and the first of your four rows should be T, T, F, T, F.)

(7) For these two bitstrings

$$A = 110010$$
$$B = 100100$$

combine them into new bitstrings using these operations:

(a) bitwise OR

(b) bitwise XOR

(c) bitwise AND.
  (For example, bitwise OR here makes 110110.)

If you get stuck on a question or aren't sure if you understand it:

- Go over the relevant class notes and section in the textbook.

- Check if you get the right answer for a similar odd-numbered question in the textbook (answers at the back of the book).

- Ask me about it after class.

- Come to my office hours: Tue 3 - 4, Wed 3 - 4 in CP 317.

- Go to the Math Tutorial Lab in-person in CP 303 or online.