

CSI 30, Homework 1 on Section 1.1

Due by Mon, Sept 14.

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.

Section 1.1 Propositional logic

(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: $(p \oplus q) \wedge (p \rightarrow q)$

(Use five columns for each of $p, q, p \oplus q, p \rightarrow q, (p \oplus q) \wedge (p \rightarrow q)$ 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.)

Many of you are using AI to help with homework questions. You can paste them in and get step by step answers most of the time. If you are using AI, the smart way is:

- Study the relevant class notes and section in the textbook first.
- Try the homework questions yourself.
- Use AI help if you're having trouble.
- Make sure you understand the answers you're handing in - there will be similar questions on exams.

If you're still stuck on a question:

- Ask me about it after class.
- Come to my office hours: Mon 12:00 - 1:00, Wed 12:00 - 1:00 in CP 317.
- Go to the Math Tutorial Lab in-person in CP 303 or online.

Note – If I don't have time to grade every question then I will just grade two random ones. Then your score will be awarded as follows

- First graded question: 25%
- Second graded question: 25%
- You provided answers to all questions: 25%
- Homework was done neatly and submitted on time: 25%