Math 6d: Homework 6

HW#6 is due November 4th; submit to Google classroom 15 minutes before the class time. *Please, write clearly which problem you are solving and show all steps of your solution.*

Logic variables are basic statements labeled with A, B, C, ..., that can be evaluated as T or F.

For example, *A* = "*Bill is a knight*" and *C* = "*Carl is a knight*" can be evaluated (answered) as True or False.

Logic operations AND, OR, NOT combine variables (statements) in more complicated statements. A **truth table** for a logic operation evaluates all possible combinations of two variables that are combined by the logic operation.

Examples: Operation AND: A **AND** B = "Bill is a knight **AND** Carl is a knight" Operation OR: A **OR** B = "Bill is a knight **OR** Carl is a knight", Operations NOT: **NOT** A = "Bill is not a knight".

Truth tables: be sure to use the truth tables for AND, OR, NOT, XOR, NOT

Homework questions

Instructions: questions 1 and 2 should be written on a separate sheet(s) of paper. Do not write on the printout. For the Quiz preparation part (page 2 of the homework), write your answer on the printed page.

1. Verify the associative property of OR

Hint: create and fill out a truth table for the variables *P*, *Q*, and *R*, for the left and for the right side of the formula (equation). Then check if the left side is equal to the right side.

P OR (Q OR R) = (P OR Q) OR R:(left side) ?= (right side)

(left side)

P	Q R	Q or R	P OR(Q OR R)
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(right side)

$\begin{array}{ c c c c c } P & Q & R & P O R Q & (P O R Q) O R R \\ \hline \end{array}$
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How many rows do you have in a truth table for three logical variables?

2. In the same way as above, verify the associative property of XOR.

Assume these are the questions given on a quiz next week. Print, answer on this page, and attach the page with your answers to your homework:

Quiz preparation questions:

- 1. Represent the following statements with logic variables. You could pick any letter! "Pam is going to school."
 - "Quincy is going to school."
 - "Richard is going to school."
- 2. Use these variables to write logic formulas for each compound statement:
 - a. "Pam is not going to school."
 - b. "Pam is going to school, but Quincy is not."
 - c. "If Pam is going to school, then Quincy is going."
 - d. "Either Pam is not going to school or Quincy is not going to school."
 - e. "If Pam is going to school, then both Quincy and Richard are going."
- 3. Write a truth table for the compound statement using logic variables and operations. **"Richard is going to school, and Quincy is going to school."**

4. Create a truth table and evaluate the logic formula for the variables P and Q. (Not P) AND (P OR Q)