California State University, Sacramento
College of Engineering and Computer Science

Computer Science 28: Discrete Mathematics

Spring 2020 – Assignment #2 – Basic Logic & Proof

About

This homework will give you something fun to do over Spring Break. It will be due the Monday after we "come back" *(i.e. start using Zoom again)*.

Submit your homework by taking photos of your work (done by hand) and e-mail it to: dcook@csus.edu. Please feel free to have more than one solution per photo. Please don't upload them to Canvas.

Boolean Algebra

1. Use Boolean algebra. Simply the following. Label all the laws you apply.

   n ∧ ¬n ∨ (n ∧ (q ∨ ¬q))

2. Use Boolean algebra to simplify the following. Label all the laws you apply.

   (p ∨ ¬q) → (p ∧ q)

3. Use Boolean algebra. Simply the following. Label all the laws you apply.

   ¬ a ∧ ¬ b ∨ c ∧ ¬ c ∨ ¬ a ∧ b

Arguments

4. The following argument from the movie *Monty Python and the Holy Grail.*

   "If it's made of wood then it floats. If it's a duck then it floats. Therefore, a duck is wood."

   Convert the English sentence to an argument (using single letters). Show **why** it is valid or invalid. You must use a truth table for credit.

5. Prove (or disprove) the following argument.

   "If they are a student, then they'll come to class or use Zoom. Students can't come to class. Therefore, if they are a student, then they will use Zoom."

   Convert the English sentence to an argument (using single letters). Show **why** it is valid or invalid. Then use any method you like to prove or disprove it.

6. Prove (or disprove) the following argument by using a truth table.

   "If its toilet paper, then its being horded. If it's being horded, then it must be guarded. Therefore, toilet paper must be guarded!"

   Convert the English sentence to an argument (using single letters). Show **why** it is valid or invalid.

Simple Proofs

7. Prove the following (show your work):

   *If **a** is odd, **b** is even, and **c** odd then **a** × **b** × **c** is even*

8. Prove the following (show your work):

   *If **a** is divisible by 2 and **b** is divisible by 6 then **a** × **b** is divisible by 4.*