CS 441: Discrete Structures for Computer Science

Fall 2024

Recitation 1

Name: _____ **Username (abc123):** _____

1. Which of these sentences are propositions? What are the truth values of those that are propositions?

   (a) $2 + 3 = 5$

   (b) Wash your hands

   (c) Swimming is fun

   (d) $2x \geq x$

   (e) 4.3 is an integer

2. Let p and q be the propositions "Swimming at the shore is allowed" and "Sharks have been spotted near the shore," respectively. Express each of these compound propositions as an English sentence.

   (a) $\neg q \wedge \neg p$

   (b) $\neg q \rightarrow p$

   (c) $p \leftrightarrow \neg q$

3. For each of the following sentences, determine whether an inclusive or, or an exclusive or, is intended. Explain your answer.

   (a) Coffee or tea comes with dinner

   (b) A password must have at least three digits or be at least eight characters long.

   (c) The prerequisite for the course is a course in number theory or a course in cryptography.

   (d) You can pay using U.S. dollars or euros.

4. Construct a truth table for each of these compound propositions.

   (a) $(p \vee \neg q) \rightarrow q$

   (b) $(p \rightarrow q) \leftrightarrow (\neg p \vee q)$

   (c) $(p \wedge q) \rightarrow (p \vee q)$

5. State the converse, contrapositive, and inverse of each of the following conditional statements.

   (a) I will wear a sweater only if it is below freezing.

   (b) I come to class whenever there is a quiz.

   (c) If I have a connecting flight, it is necessary for me to fly business class.

6. Determine whether each of the following conditional statements is true or false. Explain your answers.

   (a) If $1 + 1 = 2$ then $2 + 2 = 5$.

   (b) If $1 + 1 = 3$ then $2 + 2 = 4$.

   (c) If $1 + 1 = 2$ then $2 + 2 = 4$.

   (d) If monkeys can fly then $1 + 1 = 3$.

7. Determine whether each of the following biconditional statements is true or false. Explain your answers.

   (a) $1 + 1 = 2$ if and only if $2 + 2 = 5$.

   (b) $1 + 1 = 3$ if and only if $2 + 2 = 4$.

   (c) $1 + 1 = 2$ if and only if $2 + 2 = 4$.

   (d) Monkeys can fly if and only if $1 + 1 = 3$.