

Username:

CS441

2025-09-03

Name:

Discrete Structures for CS

rec_1

Problem 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

Answer.

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Discrete Structures for CS

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Problem 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) $p \leftrightarrow \neg q$

Answer.

- a)
- b)
- c)

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Discrete Structures for CS

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Problem 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.)

Answer.

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

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Problem 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.

Answer.

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Discrete Structures for CS

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Problem 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 $1 + 1 = 3$.

Answer.

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Discrete Structures for CS

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Problem 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 $1 + 1 = 3$.