MGF Notes / Week 9 - Conditional Statements

Topic 1: Identifying statements
Problem 1: Determine if "The sky is blue" is a statement. Explain why it is or is not a statement.
Problem 2: Is "Close the door!" a statement? Justify your answer based on the definition of a statement.

Topic 2: Identifying simple and compound statements
Problem 1: Classify the statement "It is raining and the sun is shining" as simple or compound. Identify the components if compound.
Problem 2: Determine if "The car is red" is a simple or compound statement. Explain your reasoning.

Topic 3: Negation of a statement
Problem 1: Write the negation of the statement "The room is warm." Ensure the negation is clear and logical.
Problem 2: Find the negation of "All dogs bark." Provide the negated statement in a complete sentence.

Topic 4: Understanding quantifiers
Problem 1: Explain the difference between the quantifiers "all" and "some" in the statement "All cats are fluffy" versus "Some cats are fluffy."
Problem 2: Identify the quantifier in the statement "There exists a number that is even." Describe its meaning.

Topic 5: Negation of a quantified statement
Problem 1: Negate the statement "All students are present." Write the negation and explain the change in quantifier.
Problem 2: Find the negation of "Some birds cannot fly." Provide the negated statement and justify the quantifier used.

Topic 6: Symbolic translation of negations, conjunctions, and disjunctions: Basic
Problem 1: Translate the statement "It is not sunny and it is warm" into symbolic form using ~ for negation, $\wedge$ for conjunction, and $\vee$ for disjunction.
Problem 2: Write the symbolic form of "The light is on or the door is open." Use appropriate logical symbols.

Topic 7: Symbolic translation of negations, conjunctions, and disjunctions: Advanced
Problem 1: Translate "It is not the case that both the car is red and the truck is blue" into symbolic form. Use ~, $\wedge$, and $\vee$ as needed.
Problem 2: Convert "Either the game is canceled or it is not raining and the field is dry" into symbolic form. Show the structure clearly.

Topic 8: Introduction to truth tables with negations, conjunctions, or disjunctions
Problem 1: Construct a truth table for the statement ~p $\vee$ q, where p and q are propositions. List all possible truth values.
Problem 2: Create a truth table for p $\wedge$ ~q. Show all combinations of truth values for p and q.

Topic 9: Truth tables with conjunctions or disjunctions
Problem 1: Build a truth table for the statement (p $\wedge$ q) $\vee$ r. Include all possible truth values for p, q, and r.
Problem 2: Construct a truth table for p $\vee$ (q $\wedge$ r). Show the truth values for all combinations of p, q, and r.

Topic 10: Completing rows of truth tables: Conjunctions and disjunctions
Problem 1: Complete the truth table for p $\vee$ ~q for the row where p is true and q is false. Provide the final truth value.
Problem 2: For the statement (p $\wedge$ q) $\vee$ r, compute the truth value for the row where p is false, q is true, and r is true.

Topic 11: Using De Morgan's Laws to identify negations and equivalent statements
Problem 1: Apply De Morgan's Laws to find the negation of p $\wedge$ q. Verify the equivalent statement using a truth table.

equivalent statement using a truth table.
Problem 2: Use De Morgan's Laws to negate p ⬚ q. Confirm the equivalence of the negated statement with a truth table.

Topic 12: Using logic to test a claim: Conjunction or disjunction
Problem 1: Test the claim "The store is open and the sale is on" using logic. If the store is open (true) but the sale is not (false), is the claim true? Explain.
Problem 2: Evaluate the claim "It is sunny or the park is open." If it is not sunny (false) and the park is open (true), determine if the claim holds and justify.