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Homework 1: Logic

5. Compound Proposition: True when p and q are true and r is false, false otherwise
    a. $p \wedge q \wedge \neg r$
    b. The conjunction ($\wedge$) between all the propositional variables implies that all propositional variables must evaluate to true (with negation, if stated) in order for the entire proposition to be true.
6. Compound Proposition from Truth Table
    a. Given any truth table, we can take every row in it that is true and form a compound proposition, for that row, that produces true as an output.
        i. Propositional variables that are false for that particular row are denoted as "$\neg p$", where p is the variable that must be false.
        ii. Others just say as "p" to indicate that p must be true.
        iii. Once we apply the appropriate negations to the false variables, we can connect the variables using the conjunction.
    b. Once every row's compound proposition is determined, we can then connect each row's proposition with a disjunction ($\vee$) to form a compound proposition.
    c. Lastly, we can use laws of propositional logic to simplify the proposition.
    d. Example:
        i. Say you have the following truth table:

p	q	Truth Value
T	T	T
T	F	F
F	T	T
F	F	T

        ii. For every row that is true, we can create a compound proposition
            1. $p \wedge q$
            2. $\neg p \wedge q$
            3. $\neg p \wedge \neg q$
        iii. We can stitch every row's compound proposition together using disjunctions to form a proposition for the table
            1. $(p \wedge q) \vee (\neg p \wedge q) \vee (\neg p \wedge \neg q)$
        iv. Lastly, this proposition can be simplified using laws of propositional logic