I. Behavioral/Objective:

The learner will be able to determine and explain what makes a mathematical statement true or false including being able to create a truth table.

II. Anticipatory Set

The following situation will be on the board.

Your teacher tells you that if you pay her $100, then you will pass the class. The next day you pay the teacher $150 and at the end of the trimester you receive a failing grade.

Students will be asked to think about this situation and about whether any agreement was broken.

IV. Objective/Purpose:

Yesterday, we looked at the difference between inductive and deductive reasoning. Today we are exploring mathematical statements and what makes one true or false.

IV. Input

A. Task Analysis
   I. Anticipatory set. Think-pair-share format, end with class discussion. What action by the teacher would have broken the agreement? Or not broken the agreement?
   II. Discuss the hypothesis and conclusion of a statement. Look at truth tables for this opening statement. Look at another statement "If it is January, then it is winter." Create truth table for this statement.
   III. Have students compare and contrast truth tables and search for similarities. (Hint, truth tables are the same in both situations.)
   IV. Define counterexample. Ask students to think-pair about what a counterexample of the above two statements would be.
   V. Discuss as a class how to find counterexamples of statements and modeling for them how to do so.
   VI. Pass out worksheet with mathematical statements. Students must find counterexamples to the statements and in some cases, rewrite the statement so that it is now a true statement.

B. Thinking Levels: Blooms
   I. Understand – Explain what it means for a statement to be true or false.
   II. Analyze – Distinguish what makes a statement false and find counterexamples for the statement.

C. Learning Styles and/or Accommodations
    I. Interpersonal – worksheet is done individually
    II. Intrapersonal – Think/pair discussions is in small groups.

D. Materials
    I. Mathematical statements worksheets, whiteboard.

IV. Modeling how to find and write out a counterexample
1. First locate what parts of the statement we need to be true and false to make the entire statement false.
2. Think about possible situations that would satisfy what we are looking for. If none exist, the statement is true.
3. Once you find a counterexample, write the simplest example you can that makes the entire statement false.

IV. Checking for Understanding
1. During think-pair small group discussions I will be walking and listening to groups conversations to hear if they are thinking about the problem in the correct way.
2. There will be plicker checks to ensure that I can formatively assess each individual student and check for misunderstanding. They will answer the following question with plickers. “Find a counterexample: If two numbers are odd, then their sum is even.”

IV. Independent Practice

Worksheet handed out toward the end of the lesson is to be completed independently in class or at home.

IV. Closure

Can anyone think of a statement that someone has said to them? For example, a parent may have said “improve your grades or I will take your phone away”. What would it take to make your parent a liar?