1. How many rows are there in a table with \( p \) propositions \( \text{anded} \) together, \( p_1 \land p_2 \land p_3 \ldots \land p_n \)? Prove your answer.

2. Determine if these are true or false:
   - if pigs can fly, then \( 1 + 1 = 3 \)
   - if \( 1+1=3 \), then pigs can fly
   - if \( 1+1=2 \), then pigs can fly

3. Construct a truth table for \((p \rightarrow q) \lor (\neg p \rightarrow r)\)

4. Show that \( p \leftrightarrow q \) and \( \neg p \leftrightarrow \neg q \) are logically equivalent
5. p is ”it snows tonight” and q is ”I will stay at home.”

What is:

(a) The conditional \( p \rightarrow q \)

(b) The contrapositive

(c) The converse

(d) The inverse

(e) Which above are logically equivalent?

6. An old legend says that the barber in a remote town shaves those people, and only those people, who do not shave themselves. Can there be such a barber?

7. Each inhabitant of a remote village always tells the truth or always lies. A villager will only give ”yes” or ”no” response to a question a tourist asks. Suppose you are a tourist visiting this area and come to a fork in the road. One branch leads to the ruins you want to visit; the other leads deep into the jungle. A villager is standing at the fork in the road. What one question can you ask the villager to determine which branch to take?