Names: ______________________________

There are 6 problems on 2 pages of this assignment. Decide as a group on your answer, and justify it by explaining your reasoning.

1. Complete the following truth table for propositions $p$ and $q$. Let $F$ be a contradiction, and remember that $\sim p$ and $\overline{p}$ mean the same thing.

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<th>$p \land \overline{q}$</th>
<th>$\overline{p} \lor q$</th>
<th>$p \rightarrow q$</th>
<th>$p \leftrightarrow q$</th>
<th>$q \rightarrow p$</th>
<th>$(p \land q) \rightarrow F$</th>
<th>$\overline{p} \rightarrow \overline{q}$</th>
<th>$(p \rightarrow q) \land (q \rightarrow p)$</th>
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2. Identify all logically equivalent propositions among the ten in Question 1.

Meanwhile, back in the Land of Logalia... Be sure to (clearly and completely) justify your answers!

3. Before you are allowed into the castle, you must identify the type of the two guards, Branwyn and Caradoc. Branwyn says: If I am a Knight, then so is Caradoc.

Can you enter the castle?
4. What if in Question 3, Caradoc had instead said: If Branwyn is a Knight, then I am a Knave. 
   Could you enter the castle now?

5. Two trolls Yip and Zap are being tried for stealing a chicken. The farmer Lucinda and her 
   son Humbert have been called as witnesses. Lucinda says: If Yip is guilty, then so is Zap. 
   Humbert says: Either Yip is innocent or Zap is guilty. 
   Based on this evidence, the magistrate (who has the power to put you to death for a wrong 
   answer) asks you to decide: are Lucinda and Humbert necessarily of the same type?

6. You heard rumours that a fabulous treasure is being guarded by a dragon who is also either 
   a Knight or a Knave (but clearly not both). You see a dragon and cautiously approach to 
   ask whether it is guarding the treasure. The dragon replies: I am guarding the treasure if 
   and only if I am a Knight. 
   Do you know if the dragon is a Knight or a Knave? Do you know if this dragon is the one 
   guarding the treasure?