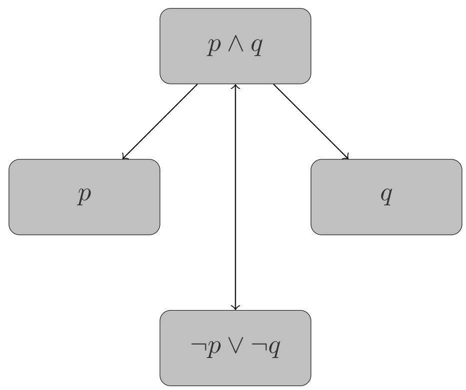
Please note: answer the first four questions in light of the rules of inference (the “flowcharts”) we have seen. The first four questions are very quick to answer, but the point is to have you process and practice the flowcharts we have seen. (Pay attention to “use” versus “prove”.)

1. Say we know Olaf likes warm hugs and Anna wants to build a snowman. What (if anything) can we conclude? Briefly explain why.

   Let p be the statement “Olaf like warm hugs” and q be the statement “Anna wants to build a snowman”. We know $p \wedge q$ is true from the above proposition.

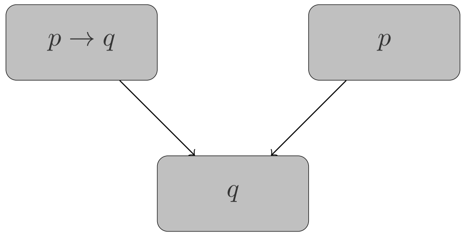
   From this, we can safely conclude that both p and q are true independently of each other, seen in the flowchart below.



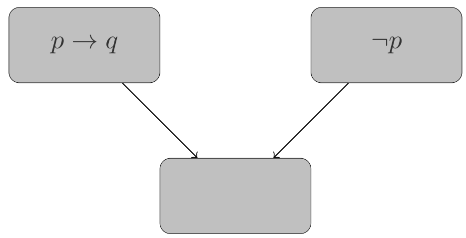
2. Say we know $\boxed{\text{If Olaf likes warm hugs, then Anna wants to build a snowman}}$. In addition to this, say we also know $\boxed{\text{Olaf likes warm hugs}}$. What (if anything) can we conclude? Briefly explain why.

   Let p be the statement "Olaf like warm hugs" and q be the statement "Anna wants to build a snowman". We know $p \rightarrow q$ is true from the above proposition.

   From this, we can safely conclude that q is true based upon $p \rightarrow q$ and p being true, seen in the flowchart below. The rule of inference used to derive this conclusion is *Modus Ponens*.



3. Say we know $\boxed{\text{If Olaf likes warm hugs, then Anna wants to build a snowman}}$. In addition to this, say we also know $\boxed{\text{Olaf does not like warm hugs}}$. What (if anything) can we conclude? Briefly explain why.



4. Say T is the set of all the world's turtles. Say $M(x)$ is the predicate $\boxed{x \text{ has 33 feet}}$. What steps would we have to take to prove $\boxed{\text{There exists } h \in T[M(h)]}$?

5. Say that c and d are both integers. Prove: if c is even and d is even, then $c - d$ is even.