

1. Use a truth table to determine whether the following argument forms are valid.

(a) $p \rightarrow r$ $q \rightarrow r$ $\therefore p \vee q \rightarrow r$	(b) $p \rightarrow q \vee r$ $\neg q \vee \neg r$ $\therefore \neg p \vee \neg r$	(c) $p \vee q$ $p \rightarrow r$ $q \rightarrow s$ $\therefore r \vee s$
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2. Use valid argument forms to derive the conclusion $\neg q$ from the given premises:

$$\neg p \vee q \rightarrow r, \quad s \vee \neg q, \quad \neg t, \quad p \rightarrow t, \quad \neg p \wedge r \rightarrow \neg s.$$

3. Solve the following using argument forms.

Five friends have access to a chat room. Is it possible to determine who is chatting if the following information is known? (i) At least one of Kevin and Heather is chatting; (ii) Exactly one of Randy and Vijay is chatting; (iii) If Abby is chatting, then so is Randy; (iv) Vijay and Kevin are either both chatting or both not chatting; (v) If Heather is chatting, then so are Abby and Kevin.

4. You are given the following. Use it to prove that superman does not exist. (You need to use argument forms.)

“If Superman were able and willing to prevent evil, he would do so. If Superman were unable to prevent evil, he would be impotent; if he were unwilling to prevent evil, he would be malevolent. Superman does not prevent evil. If Superman exists, he is neither impotent nor malevolent.”

Use the first letters of able, willing, prevent, impotent, malevolent and exist to denote the various attributes of a Superman. For example ‘a’ is Superman is able to prevent evil. First list the 5 hypotheses and then provide the proof.