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| Rules of Inference | Tautology | Name |
| *p .*  ∴ *p* ∨ *q* | *p* → ( *p* ∨ *q*) | Addition |
| *p* ∧ *q*  ∴ *p* | (*p* ∧ *q*) → *p* | Simplification |
| *p*  *q .*  ∴ *p* ∧ *q* | (( *p* ) ∧ ( *q* )) → ( *p* ∧ *q* ) | Conjunction |
| *p*  *p* → *q*  ∴ *q* | [ *p* ∧ ( *p* → *q* ) ] → *q* | Modus ponens |
| ¬ *q*  *p* → *q*  ∴ ¬ *p* | [ ¬ *q* ∧ ( *p* → *q* ) ] → ¬ *p* | Modus tollens |
| *p* → *q*  *q* → *r*  ∴ *p* → *r* | [( *p* → *q* ) ∧ ( *q* → *r* )] → ( *p* → *r*) | Hypothetical syllogism |
| *p* ∨ *q*  ¬ *p .*  ∴ *q* | [( *p* ∨ *q*) ∧ ¬*p* ] → *q* | Disjunctive syllogism |
| *p* ∨ *q*  ¬ *p* ∨ *r*  ∴ *q* ∨ *r* | [( *p* ∨ *q* ) ∧ (¬ *p*∨ *r*)] → ( *q* ∨ *r* ) | Resolution |

**Demonstrate the validity of the following arguments (1 - 5)**

1. 2. 3.

4. If the band could not play rock music or the refreshments were not delivered on time, then the New Year’s party would have been cancelled and Alicia would have been angry. If the party were cancelled, then refunds would have had to be made. No refunds were made. Therefore, the band could play rock music.

5. If it does not rain or if it is not foggy, then the sailing race will be held and the life saving demonstration will go on. If the sailing race is held, then the trophy will be awarded. The trophy was not awarded. Therefore, it rained.

6. Using the following true statements and rules of inference, locate the treasure hidden in the estate. “If the house is next to a lake, then the treasure is not in the kitchen ”, “If the tree in front of yard is a mango tree, then the treasure is in the kitchen” , “The house is next to a lake”, “The tree in the front yard is a mango tree or the treasure is placed behind the mirror in the wall of the bed room”, and “If the tree in the back yard is an oak tree, then the treasure is in the drawing room”.

7. Write the following arguments in symbolic form. Then establish the validity of the argument. “If Roche gets the supervisor position and works hard, then she’ll get a raise”. “Whenever she gets the raise, she’ll buy a new car”. “She has not purchased a new car”.“**,** Either Roche did not get the supervisor’s position or she did not work hard”.