(Associativity of ^) An FOL sentence P ^ (Q ^ R) is logically equivalent to (P ^ Q) ^ R, which is in turn equivalent to P ^ Q ^ R. That is,

P ^ (Q ^ R) ↔ (P ^ Q) ^ R ↔ P ^ Q ^ R

(Associativity of v) An FOL sentence P v (Q v R) is logically equivalent to (P v Q) v R, which is in turn equivalent to P v Q v R. That is,

P v (Q v R) ↔ (P v Q) v R ↔ P v Q v R

(Commutativity of ^) A conjunction P ^ Q is logically equivalent to Q ^ P. That is,

P ^ Q ↔ Q ^ P

As a result, any rearrangement of the conjuncts of an FOL sentence is logically equivalent to the original. For example, P ^ Q ^ R is equivalent to R ^ Q ^ P.

(Commutativity of v) A conjunction P v Q is logically equivalent to Q v P. That is,

P v Q ↔ Q v P

As a result, any rearrangement of the disjuncts of an FOL sentence is logically equivalent to the original. For example, P v Q v R is equivalent to R v Q v P.

(Idempotence of ^) A conjunction P ^ P is equivalent to P. That is,

P ^ P ↔ P

More generally (given Commutativity), any conjunction with a repeated conjunct is equivalent to the result of removing all but one occurrence of that conjunct. For example, P ^ Q ^ P is equivalent to P ^ Q.

(Idempotence of v) A disjunction P v P is equivalent to P. That is,

P v P ↔ P

More generally (given Commutativity), any disjunction with a repeated disjunct is equivalent to the result of removing all but one occurrence of that disjunct. For example, P v Q v P is equivalent to P v Q.

(Distribution Laws) For any sentence P, Q, and R:

P ^ (Q v R) ↔ (P ^ Q) v (P ^ R)
P v (Q ^ R) ↔ (P v Q) ^ (P v R)

(De Morgan's Laws) For any sentences P and Q:

¬¬P ↔ P
¬(P ^ Q) ↔ (¬P v ¬Q)
¬(P v Q) ↔ (¬P ^ ¬Q)