Ans 3 De Morgan's Laws

De Morgan's laws describe how mathematical statements and concepts are related through their opposites. In set theory, De Morgan's laws relate the interaction of an and union of sets through complement. In propositional logic, De Morgan's laws relate conjunctions and disjunctions of propositions through negation. De Morgan's laws are also applicable in computer engineering for developing logic gates.
Interestingly, regardless of whether De Morgan's laws apply to sets, propositions, or logic gates, the structure is always the same.

De Morgan's laws

- Not (A and B) is the same as not A or not B.
- Not (A or B) is the same as not A and not B.

The same structure can be used to make observations in cardinality of sets, to calculate certain probabilities, and to write equivalent propositions.

In Propositional logic and Boolean algebra, De Morgan's laws are a pair of transformation rules that are both valid rules of inference. They are named after Augustus De Morgan, a 19-Century British mathematician. The rules allow the expression of Conjunctions and disconjunctions purely in terms of each other via negation.

The rules can be expressed in English as:

- The negation of a disjunction is the Conjunction of the negations; and the negation of a Conjunction is the disjunction of the negations;

- The Complement of the union of two sets is the same as the intersection of their Complements; and the intersection of two sets is the same as the union of their Complements or

not (A or B) = not A and not B; and
not (A and B) = not A or not B