***Commutative property:***

* The commutative property is the property which produces the same results when adding or multiplying the two variables and its reverse order. It is represented in the binary operations “AND” and “OR” gate.

AND operation:

A∙B = B∙A 🡪 A is 1 and B is 0, the commutative property for AND operation 🡪 1∙0 = 0∙1 🡪 0 = 0 🡪 both produce the same result.

OR operation:

A+B = B+A 🡪 A is 1 and B is 0, the commutative property for OR operation 🡪 1+0 =0+1 🡪 1 = 1 🡪 both produce the same result.

***Associative property:***

* The associative property is the property which produces the same results when the group of variables is added or multiplied together within the parentheses and its reverse order. It is represented in the binary operations “AND” and “OR” gate.

AND operation:

 (A∙B)∙C = A∙(B∙C) 🡪 For example: 🡪 A is 1, B is 0, and C is 1, the associative property for AND operation 🡪 (1∙0)∙1 = 1∙(0∙1) 🡪 0∙1 = 1∙0 🡪 0 = 0 🡪 both produce the same result.

 OR operation:

 (A+B)+C = A+(B+C) 🡪 For example: 🡪 A is 1, B is 0 and C is 1, associative property for OR operation (1+0)+1 = 1+(0+1) 🡪 1+1 = 1+1 🡪 1 = 1 🡪 both produce the same result.

***Distributive property:***

* The distributive property is the property when the variable multiplied by a group of variable added together produces the result which is same as that of the variable multiplied separately and then added together. The distributive property is represented in the binary operations “AND” and “OR” gate.

AND operation:

 A∙(B+C) = (A∙B)+(A∙C) 🡪 A is 1, B is 0, and C is 1, distributive property for AND operation 🡪 1∙(0+1) = (1∙0)+(1∙1) 🡪 1∙1 = 0+1 🡪 1 = 1 🡪 both produce the same result.

OR operation:

 A+(B∙C) = (A+B) ∙(A+C) 🡪 A is 1, B is 0 and C is 1, distributive property for OR operation: 🡪 1+(0∙1) = (1+0) ∙(1+1) 🡪 1+0 = 1∙1 🡪 1 = 1 🡪 both produce the same result.

***Identity property:***

* The identity property is the property which produces the same results when sum of 0 and one variable produces the variable itself or product of 1 with one variable produces the variable itself. It is represented in the binary operations such as “AND” and “OR” gate.

AND operation**:**

A∙1 = A 🡪 A is 1, identity property for AND operation: 🡪 1∙1 = 1 🡪 1 = 1

**OR operation:**

A+0 = A 🡪 A is 1, identity property for OR operation: 🡪 1+0 = 1 🡪 1 = 1

***Complement property*:**

* The product of variable with its complement produces 0 and the Sum of variable with its complement produces the 1.

AND operation**:**

A∙ Ᾱ = 0 🡪 A is 1, complement property for AND operation: 🡪 1 = 0 🡪 1∙0 = 0 🡪 0 = 0

OR operation**:**

A+Ᾱ = 1 🡪 A is 1, complement property for OR operation: 🡪 1+ = 1 🡪 1+0 = 1 🡪 1 = 1

***DeMorgan’s law property*:**

* The DeMorgan’s law states that the complement of results produced in AND gate is equivalent to the complement of the individual inputs and then passed into an OR gate. The DeMorgan’s law also states that the complement of result produced in OR gate is equivalent to the complement of the individual inputs and then passed into an AND gate.

AND operation**:**

(Ᾱ) = Ᾱ + 🡪 A is 1 and B is 0, DeMorgan’s law property for AND operation: 🡪 () = + 🡪 = 0+1 🡪 1 = 1

OR operation**:**

(Ᾱ+) = Ᾱ 🡪 A is 1 and B is 0, DeMorgan’s law property for OR operation: 🡪 🡪 🡪 0 = 0