

DeMorgan's Law

Simplify the following expression using DeMorgan's theorem.

1. $Q = C + BC$

$C + (BC)$	Original Expression
$C + (B + C)$	DeMorgan's Law
$(C + C) + B$	Commutative, Associative Laws
$1 + B$	Compliment Law
1	Identity Law

2. $Q = \overline{A \cdot (\overline{B \cdot A})}$

$Q = A(B * A)$

3.

$$Q = \overline{\overline{(A + B)} \cdot \overline{(A \cdot B)}} + \overline{A} \cdot B$$

$$Q = \overline{\overline{(A + B)}} + \overline{\overline{(A \cdot B)}} + \overline{A} \cdot B$$

$$Q = (A + \overline{B}) + (\overline{A} \cdot \overline{B}) + \overline{A} \cdot B$$

$$Q = A + \overline{B} + \overline{A} \cdot \overline{B} + \overline{A} \cdot B$$

$$Q = A \cdot (1 + \overline{B}) + (\overline{B} + \overline{A} \cdot B)$$

$$Q = A \cdot 1 + (\overline{B} + \overline{A})$$

$$Q = A + \overline{B} + \overline{A}$$

$$Q = \overline{B} + (A + \overline{A})$$

$$Q = \overline{B} + 1$$

$$Q = 1$$

4.

$$Q = \overline{\overline{\overline{A.C.BD}}} + \overline{\overline{C.D}}$$

$$Q = \overline{\overline{\overline{A.C.B}}} + \overline{\overline{D}} + \overline{\overline{C}} + \overline{\overline{D}}$$

$$Q = \overline{\overline{A.C.B}} + \overline{\overline{D}} + C$$

$$Q = (\overline{\overline{A}} + \overline{\overline{C}}).\overline{\overline{B}} + \overline{\overline{D}} + C$$

$$Q = \overline{\overline{A.B}} + \overline{\overline{B.C}} + \overline{\overline{D}} + C$$

$$Q = \overline{\overline{A.B}} + C.(\overline{\overline{B}} + 1) + \overline{\overline{D}}$$

$$Q = \overline{\overline{A.B}} + C.1 + \overline{\overline{D}}$$

$$Q = \overline{\overline{A.B}} + C + \overline{\overline{D}}$$