

# The Uniting Theorem

## Two-Level Simplification

**Key Tool: The Uniting Theorem —  $A(B' + B) = A$**

A	B	F
0	0	0
0	1	0
1	0	1
1	1	1

We can visualize how the uniting theorem works by looking at an example truth table.

B's values change within the on-set rows  
*B is eliminated, A remains*

A's values don't change within the on-set rows  
*F is not a function of B*

A	B	G
0	0	1
0	1	0
1	0	1
1	1	0

$$G = A'B' + AB' = (A' + A)B' = B'$$

B's values stay the same within the on-set rows  
*A is eliminated, B remains*

A's values change within the on-set rows  
*F is not a function of A*

### Essence of Simplification:

find two element subsets of the ON-set where only one variable changes its value. This single varying variable *can be eliminated!*

So using the above method, the equation  $ABC + ABC'$  would become **AB**

And the equation  $ABC + ABC' + AB'C + AB'C'$  would become

$$AB + AB'$$

Which would become

$$A$$