Duality Principle

- Any theorem or postulate in Boolean Algebra remains true if
  - 0 and 1 are swapped and
  - AND and OR are swapped
- Postulates:

Postulate	Dual Pairs	
Identity	$X+0=X$	$X\cdot 1=X$
Complements	$X+\overline{X}=1$	$X\cdot\overline{X}=0$
Commutativity	$X+Y=Y+X$	$X\cdot Y=Y\cdot X$
Associativity	$(X+Y)+Z=X+(Y+Z)$	$(X\cdot Y)\cdot Z=X\cdot(Y\cdot Z)$
Distributivity	$X+(Y\cdot Z)=(X+Y)\cdot(X+Z)$	$X\cdot(Y+Z)=(X\cdot Y)+(X\cdot Z)$

Duality Principle

- Theorems

Theorem	Dual Pairs	
Idempotency	$X+X=X$	$X \cdot X=X$
Null Elements	$X+1=1$	$X \cdot 0=0$
Involution	$\overline{\overline{X}}=X$	$\overline{\overline{X}}=X$
Covering	$X+(X \cdot Y)=X$	$X \cdot (X+Y)=X$
Covering	$X+(\overline{X} \cdot Y)=X+Y$	$X \cdot (\overline{X}+Y)=X \cdot Y$
Combining	$(X \cdot Y)+(X \cdot \overline{Y})=X$	$(X+Y) \cdot (X+\overline{Y})=X$
Combining	$(X \cdot Y)+(X \cdot \overline{Y} \cdot Z)=(X \cdot Y)+(X \cdot Z)$	$(X+Y) \cdot (X+\overline{Y}+Z)=(X+Y) \cdot (X+Z)$
DeMorgan's	$\overline{X+Y}=\overline{X} \cdot \overline{Y}$	$\overline{X \cdot Y}=\overline{X}+\overline{Y}$
Consensus	$(X \cdot Y)+(\overline{X} \cdot Z)+(Y \cdot Z)=(X \cdot Y)+(\overline{X} \cdot Z)$	$(X+Y) \cdot (\overline{X}+Z) \cdot (Y+Z)=(X+Y) \cdot (\overline{X}+Z)$
Shannon's	$f(X,Y,Z)=X \cdot f(1,Y,Z)+\overline{X} \cdot f(0,Y,Z)$	$f(X,Y,Z)=X+f(0,Y,Z) \cdot \overline{X}+f(1,Y,Z)$