Example CSOP

- Fill in the Truth Table and write Boolean expression for function $f(X, Y, Z) = \sum(m_1, m_2, m_3, m_4, m_5, m_6, m_7)$
- Then write as CPOS form

M_0 X+Y+Z

X	Y	Z	f
0	0	0	0 ←
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

$f = \Pi(M_0)$

$= X+Y+Z$

↑ CPOS

MPOS

Example CPOS

- Fill in the Truth Table and write Boolean expression for function $g(X, Y, Z) = \prod(M_0, M_1, M_2, M_3, M_4, M_5, M_6)$
- Then write as CSOP form

$g = \sum(m_7)$

$= XYZ$

↑

CSOP

MSOP

X	Y	Z	g
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1 ←

m_7 XYZ

Example: CSOP and CPOS from Truth Table

- Consider the Truth Table below for the function *f*
- Write out all minterms as "products" and all Maxterms as "sums"
- Write the CSOP using m-notation
- Write the CPOS using M-notation

	a	*b*	*c*	*f*	Used minterms	Used Maxterms
M_0	0	0	0	0		$a+b+c$
m_1	0	0	1	1	$\bar{a}\cdot\bar{b}\cdot c$	
M_2	0	1	0	0		$a+\bar{b}+c$
m_3	0	1	1	1	$\bar{a}\,b\,c$	
m_4	1	0	0	1	$a\,\bar{b}\,\bar{c}$	
M_5	1	0	1	0		$\bar{a}+b+\bar{c}$
m_6	1	1	0	1	$a\,b\,\bar{c}$	
m_7	1	1	1	1	$a\,b\,c$	

$f = \sum(m_1, m_3, m_4, m_6, m_7)$

$= \prod(M_0, M_2, M_5)$

Basic Logic Gates

NOT

A	Output
0	1
1	0

AND

A	B	Output
0	0	0
0	1	0
1	0	0
1	1	1

OR

A	B	Output
0	0	0
0	1	1
1	0	1
1	1	1

XOR

A	B	Output
0	0	0
0	1	1
1	0	1
1	1	0

NAND

A	B	Output
0	0	1
0	1	1
1	0	1
1	1	0

NOR

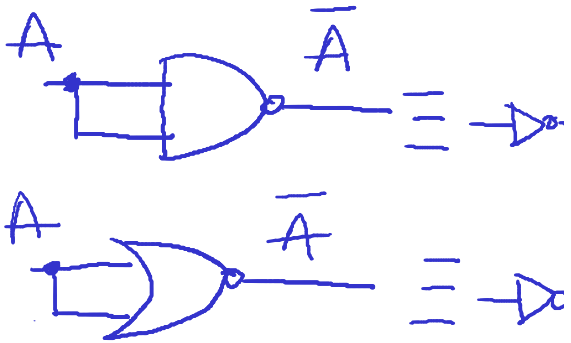
A	B	Output
0	0	1
0	1	0
1	0	0
1	1	0

XNOR

A	B	Output
0	0	1
0	1	0
1	0	0
1	1	1

- Get NOT from NAND or NOR: Tie inputs togeth

A	B	$A \cdot B$	$\overline{A \cdot B}$	$A+B$	$\overline{A+B}$
0	0	0	1	0	1
0	1	0			
1	0	0			
1	1	1	0	1	0

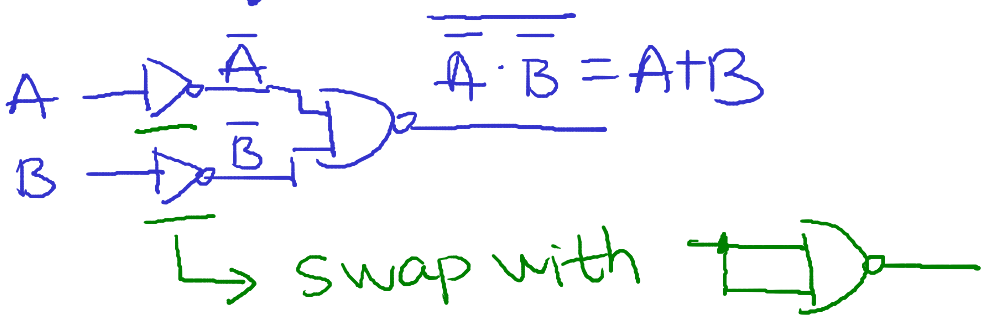


$A \cdot B = \overline{\overline{A \cdot B}}$ $\quad \overline{A \cdot B}$

- Get AND from NAND (similarly, OR from NOR):

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

- Get OR from NAND (simi, AND from NOR):



NAND
NOR
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Comple