Full Adder

	x	y	z	f1 C	f2 S	
0	0	0	0		0	0
1	0	0	1		1	1
2	0	1	0		1	1
3	0	1	1	1	0	2
4	1	0	0		1	1
5	1	0	1	1	0	2
6	1	1	0	1	0	2
7	1	1	1	1	1	3

z= ci (carry in)
C = co (carry out)

C(x,y,z) = Sum(3,5,6,7)

x \ yz	00	01	11	10	
0			1		x=0
1		1	1	1	x=1

C=xy + xz + yz

S(x,y,z) = Sum(1,2,4,7)

x \ yz	00	01	11	10	
0		1		1	x=0
1	1		1		x=1

S = xy'z' + xyz + x'y'z + x'yz'
S = z'(xy' + x'y) + z(xy +x'y')
S = z'(x ⊕y) + z(x⊕y)'
S = (z⊕(x ⊕y))'

x \ yz	00	01	11	10	
0			1		yz x=0
1		1	1	1	x=1

z = x'y + xy'
z' = (x'y + xy')'
(x'y)' (xy')'
(x+y') (x'+y)
x(x'+y) + y'(x'+y)
xx' + xy + x'y' + y'y
xy+x'y'

x \ yz	00	01	11	10	
0			1		x=0
1		1	1	1	xz x=1

C=xy + xz + yz
C =z(xy' + x'y) + xy

x \ yz	00	01	11	10	
0			1		x=0
1		1	1	1	xy x=1

(x ↓ y) ↓ z
x ↓ (y ↓ z)

((x + y)' + z)'
(x + (y + z)')'

(x + y) z'
(x'(y + z))

xz' + yz'
x'y + x'z

x ↓ y ↓ z

(x + y +z)'

x ↑ y ↑ z (xyz)'

F = ((ABC)'(DE)')' (ABC)'' + (DE)'' ABC + DE

F = x ⊕ y

	x	y	z	x⊕y	(x⊕y)⊕z	y⊕z	x⊕(y⊕z)	x⊕y⊕z
0	0	0	0	0	0			0
1	1	0	1	0	1			1
2	0	1	0	1	1			1
3	0	1	1	1	0			0
4	1	0	0	1	1			1
5	1	0	1	1	0			0
6	1	1	0	0	0			0
7	1	1	1	0	1			1

F(x,y,z) = Sum(1,2,3,4,5,7)

	yz=00	yz=01	yz=11	yz=10
x=0		1	1	1
x=1	1	1	1	

F=z+x'y+xy'

	yz=00	yz=01	yz=11	yz=10	
x=0		1	1	1	z
x=1	1	1	1		

	yz=00	yz=01	yz=11	yz=10	
x=0		1	1	1	x'y
x=1	1	1	1		

	yz=00	yz=01	yz=11	yz=10	
x=0		1	1	1	xy'
x=1	1	1	1		

	x	y	z	xy	(xy)z	(yz)	x(yz)	xyz
0	0	0	0	0	0			
1	0	0	1	0	0			
2	0	1	0	0	0			
3	0	1	1	0	0			
4	1	0	0	0	0			
5	1	0	1	0	0			
6	1	1	0	1	0			
7	1	1	1	1	1			

	x	y	z	xy	(xy)z	(yz)	x(yz)	xyz
0	0	0	0	0	0	0	0	0
1	0	0	1	0	0	0	0	0
2	0	1	0	0	0	0	0	0
3	0	1	1	0	0	1	0	0
4	1	0	0	0	0	0	0	0
5	1	0	1	0	0	0	0	0
6	1	1	0	1	0	0	0	0
7	1	1	1	1	1	1	1	1

(xy) + z'

	x	y	z	x↑y	(x↑y)↑z	(y↑z)	x↑(y↑z)	x↑y↑z
0	0	0	0	1	1			
1	0	0	1	1	0			
2	0	1	0	1	1			
3	0	1	1	1	0			
4	1	0	0	1	1			
5	1	0	1	1	0			
6	1	1	0	0	1			
7	1	1	1	0	1			

x' + (yz)

	x	y	z	x↑y	(x↑y)↑z	(y↑z)	x↑(y↑z)	x↑y↑z
0	0	0	0	1	1	1	1	
1	0	0	1	1	0	1	1	
2	0	1	0	1	1	1	1	
3	0	1	1	1	0	0	1	
4	1	0	0	1	1	1	0	
5	1	0	1	1	0	1	0	
6	1	1	0	0	1	1	0	
7	1	1	1	0	1	0	1	

	x	y	z	x↑y	(x↑y)↑z	(y↑z)	x↑(y↑z)	x↑y↑z
0	0	0	0	1	1	1	1	1
1	0	0	1	1	0	1	1	1
2	0	1	0	1	1	1	1	1
3	0	1	1	1	0	0	1	1
4	1	0	0	1	1	1	0	1
5	1	0	1	1	0	1	0	1
6	1	1	0	0	1	1	0	1
7	1	1	1	0	1	0	1	0

(x↑y)↑z	((xy)'z)'	(xy) + z'
x↑(y↑z)	(x(yz)')'	x' + (yz)