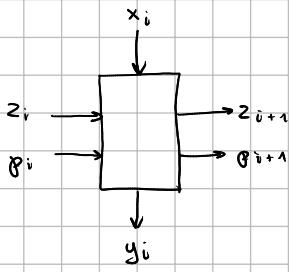


A1



z_i - same zero do tej pory
 p_i - kolejny z grupy 1

wie moze byc jednoscinsc $z_i \cdot p_i$

x_i	z_i	p_i	y_i	z_{i+1}	p_{i+1}
0	0	0	0	0	0
0	0	1	0	0	0
0	1	0	0	1	0
0	1	1	- - -	- - -	- - -
1	0	0	0	0	0
1	0	1	1	0	1
1	1	0	1	0	1
1	1	1	- - -	- - -	- - -

x_i	$z_i p_i$	z_{i+1}
0	0 0 - 0	0
1	0 1 0 0	1

 y_i

x_i	$z_i p_i$	z_{i+1}
0	0 0 0 - 0	0
1	0 0 0 - 0	1

 z_{i+1}

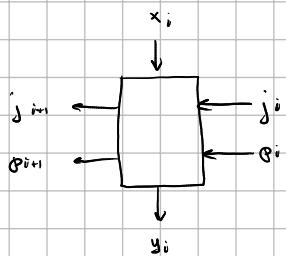
x_i	$z_i p_i$	p_{i+1}
0	0 0 - 0	0
1	0 1 - 1	1

$$y_i = x_i p_i + x_i z_i = x_i (z_i + p_i)$$

$$z_{i+1} = \bar{x}_i z_i$$

$$p_{i+1} = x_i p_i + x_i z_i = y_i$$

A3



j_i - do tej pory same jelywia
 p_i - kolejne '0' z pierwszej grupy

x_i	j_i	p_i	y_i	j_{i+1}	p_{i+1}
0	0	0	1	0	0
0	0	1	0	0	1
0	1	0	0	0	1
0	1	1	- - -	- - -	- - -
1	0	0	1	0	0
1	0	1	1	0	0
1	1	0	1	1	0
1	1	1	- - -	- - -	- - -

x_i	$j_i p_i$	y_i
0	1 0 - 0	0
1	1 1 - 1	1

$$y_i = \bar{j}_i p_i + x_i$$

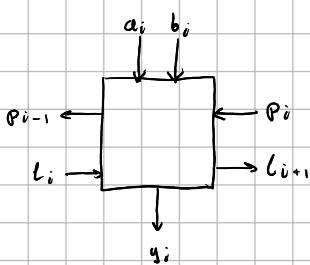
x_i	$j_i p_i$	j_{i+1}
0	0 0 - 0	0
1	0 0 - 0	1

$$j_{i+1} = x_i j_i$$

x_i	$j_i p_i$	p_{i+1}
0	0 1 - 1	0
1	0 0 - 0	0

$$p_{i+1} = \bar{x}_i p_i + \bar{x}_i j_i = \bar{x}_i (p_i + j_i)$$

A2



p_i - juz byla przeseta z prawej jedynka w A

l_i - juz byla przeseta z lewej jedynka w B

y_i - iloczyn liczb A i B miedzy skrajnymi jedynkami

$a_i b_i$	p_i	y_i
00	0 0 0 0	0
01	0 0 0 0	0
11	0 0 0 0	0
10	0 0 0 0	0

$a_i b_i$	p_i	y_i
00	0 0 1 0	0
01	0 1 1 0	0
11	1 1 1 1	1
10	1 1 1 1	1

$$y_i = l_i p_i a_i b_i$$

$$l_{i+1} = l_i + b_i$$

$a_i b_i$	p_i	y_i
00	0 0 1 1	0
01	1 1 1 1	1
11	1 1 1 1	1
10	0 0 1 1	1

$$p_{i-1} = p_i + a_i$$

B 1

$$y_1 = \sum (0, 1, 2, 3, 13, 15)$$

$$y_2 = \sum (0, 2, 5, 7, 8, 10, 13, 15)$$

$$y_3 = \sum (0, 2, 4, 5, 6, 7, 11, 13, 15)$$

$$y_1 y_2 = \sum (0, 2, 13, 15)$$

$$y_2 y_3 = \sum (0, 2, 5, 7, 13, 15)$$

$$y_1 y_3 = \sum (0, 2, 13, 15)$$

$$y_1 y_2 y_3 = \sum (0, 2, 13, 15)$$

	$x_3 x_2$	∞	01	11	10
∞		(1) 1 1 1			
01		0 0 0 0 0			
11		0 (1) 0			
10		0 0 0 0 0			

y_1

	$x_3 x_2$	∞	01	11	10
∞		1 0 0 (1)			
01		0 1 1 0			
11		0 1 1 0			
10		1 0 0 0 1			

y_2

	$x_3 x_2$	∞	01	11	10
∞		1 0 0 0 (1)			
01		1 1 1 0			
11		0 1 1 0			
10		0 0 0 1 0			

y_3

$$y_1 = \sum (0, 1, 2, 3) (13, 15)$$

$$y_2 = \overline{x_3} \overline{x}_2 + x_2 x_0$$

$$y_3 = x_3 x_1 x_0 + \overline{x_3} \overline{x}_0 + x_2 x_0$$

$$y_1 = \sum (0, 1, 2, 3) (13, 15)$$

$$y_2 = \sum (0, 2, 8, 10) (5, 7, 13, 15)$$

$$y_3 = \sum (11, 15) (0, 2, 4, 6) (5, 7, 13, 15)$$

	$x_3 x_2$	∞	01	11	10
∞		1 0 0 (1)			
01		0 0 0 0 0			
11		0 1 1 0			
10		0 0 0 0 0			

$y_1 y_2$

	$x_3 x_2$	∞	01	11	10
∞		1 0 0 0 (1)			
01		0 1 1 0			
11		0 1 1 0			
10		0 0 0 0 0			

$y_2 y_3$

	$x_3 x_2$	∞	01	11	10
∞		1 0 0 0 (1)			
01		0 0 0 0 0			
11		0 1 0 0 0			
10		0 0 0 0 0			

$y_1 y_3$

$$y_1 y_2 = \overline{x_3} \overline{x}_2 \overline{x}_0 + x_3 x_2 x_0$$

$$y_2 y_3 = \overline{x_3} \overline{x}_2 \overline{x}_0 + x_2 x_0$$

$$y_1 y_3 = \overline{x_3} \overline{x}_2 \overline{x}_0 + x_3 x_2 x_0$$

$$y_1 y_2 = \sum (0, 2) (13, 15)$$

$$y_2 y_3 = \sum (0, 2) (5, 7, 13, 15)$$

$$y_1 y_3 = \sum (0, 2) (13, 15)$$

	$x_3 x_2$	∞	01	11	10
∞		1 0 0 1			
01		0 0 0 0 0			
11		0 1 1 0			
10		0 0 0 0 0			

$$y_1 = \sum (0, 1, 2, 3) (13, 15)$$

$$y_2 = \sum (0, 2, 8, 10) (5, 7, 13, 15)$$

$$y_3 = \sum (11, 15) (0, 2, 4, 6) (5, 7, 13, 15)$$

$$y_1 y_2 = \sum (0, 2) (13, 15)$$

$$y_2 y_3 = \sum (0, 2) (5, 7, 13, 15)$$

$$y_1 y_3 = \sum (0, 2) (13, 15)$$

	0	1	2	3	13	15	0	2	5	7	8	10	13	15	0	2	4	5	6	7	11	13	15	
0, 1, 2, 3	y_1	X	X	X	X																			✓
13, 15	y_1					X X																		✓
0, 2, 8, 10	y_2						X X		X	X														✓
5, 7, 13, 15	y_2							X X		X X														✓
11, 15	y_3																		X	X				✓
0, 2, 4, 6	y_3											X X	X	X										✓
5, 7, 13, 15	y_3														X X	X	X	X X						
0, 2	y_{12}		X	X			X X																	
13, 15	y_{12}					X X																		
0, 2	y_{23}					X X									X X									
5, 7, 13, 15	y_{23}						X X		X X															✓
0, 2	y_{13}	X	X												X X									
13, 15	y_{13}					X X																		
0, 2	y_{123}		X	X			X X								X X									
13, 15	y_{123}					X X													X X					✓

B 3

$$\begin{aligned}y_1 &= \sum (5, 7, 8, 9, 10, 11) \\y_2 &= \sum (1, 3, 5, 7, 8, 10, 12, 14) \\y_3 &= \sum (0, 1, 2, 3, 5, 7, 8, 10, 15)\end{aligned}$$

$$\begin{aligned}y_1 y_2 &= \sum (5, 7, 8, 10) \\y_2 y_3 &= \sum (1, 3, 5, 7, 8, 10) \\y_1 y_3 &= \sum (5, 7, 8, 10)\end{aligned}$$

$$y_1 y_2 y_3 = \sum (5, 7, 8, 10)$$

$x_3 x_2$	00	01	11	10
$x_2 x_1$	00	0 0 0 0		
00	0	1 1 0		
01	0	1 1 0		
11	0	1 0 0		
10	1	1 0 1		

$x_3 x_2$	00	01	11	10
$x_2 x_1$	00	0 1 1 0		
00	0	1 1 0		
01	0	1 1 0		
11	1	0 0 1		
10	1	0 0 1		

$x_3 x_2$	00	01	11	10
$x_2 x_1$	00	1 1 1 1		
00	1	1 1 1		
01	0	1 1 0		
11	0	0 0 1		
10	1	0 0 1		

$$y_1 = x_3 \bar{x}_2 \bar{x}_0 + x_3 \bar{x}_2 x_0 + \bar{x}_3 x_2 x_0 \\(8, 10) + (7, 11) - (5, 7)$$

$$y_2 = \bar{x}_3 x_0 + x_3 \bar{x}_0 \\(1, 3, 5, 7) + (8, 10, 12, 14)$$

$$y_3 = \bar{x}_2 \bar{x}_0 + \bar{x}_3 x_0 + x_2 x_1 x_0 \\(0, 2, 8, 10) + (1, 3, 5, 7) + (7, 15)$$

$x_3 x_2$	00	01	11	10
$x_2 x_1$	00	0 0 0 0		
00	0	1 1 0		
01	0	1 1 0		
11	0	0 0 0		
10	1	0 0 1		

$x_3 x_2$	00	01	11	10
$x_2 x_1$	00	0 1 1 0		
00	0	1 1 0		
01	0	1 1 0		
11	0	0 0 0		
10	1	0 0 1		

$x_3 x_2$	00	01	11	10
$x_2 x_1$	00	0 0 0 0		
00	0	1 1 0		
01	0	1 1 0		
11	0	0 0 0		
10	1	0 0 1		

$$y_1 y_2 = x_3 \bar{x}_2 \bar{x}_0 + \bar{x}_3 x_2 x_0 \\(8, 10) + (5, 7)$$

$$y_2 y_3 = \bar{x}_3 x_0 + x_3 \bar{x}_0 \\(1, 3, 5, 7) + (8, 10)$$

$$y_1 y_3 = x_3 \bar{x}_2 \bar{x}_0 + \bar{x}_3 x_2 x_0 \\(8, 10) + (5, 7)$$

$x_3 x_2$	00	01	11	10
$x_2 x_1$	00	0 0 0 0		
00	0	1 1 0		
01	0	1 1 0		
11	0	0 0 0		
10	1	0 0 1		

$$y_1 y_2 y_3 = x_3 \bar{x}_2 \bar{x}_0 + \bar{x}_3 x_2 x_0$$

$$(8, 10) + (5, 7)$$

	4	5	7	8	9	10	11	1	3	5	7	8	10	12	14	0	1	2	3	5	7	8	10	15
8, 10	1																							
2, 11	1																							
5, 7	1																							
1, 3, 5, 7	2																							
8, 10, 12, 14	2																							
0, 2, 8, 10	3																							
1, 3, 5, 7	3																							
7, 15	3																							
8, 10	12																							
5, 7	12																							
1, 3, 5, 7	23																							
8, 10	23																							
8, 10	13																							
5, 7	13																							
8, 10	123																							
5, 7	123																							

$$y_1 = x_3 \bar{x}_2 \bar{x}_0 + x_3 \bar{x}_2 x_0 + \bar{x}_3 x_2 x_0$$

$$y_2 = \bar{x}_3 x_0 + x_3 \bar{x}_0$$

7 zavingt 8

$$y_3 = \bar{x}_2 \bar{x}_0 + \bar{x}_3 x_0 + x_2 x_1 x_0$$

C₁

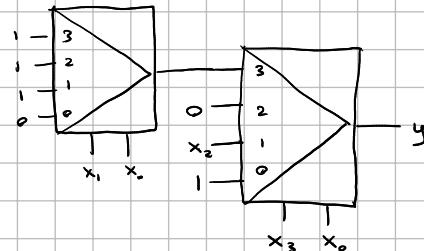
$$y = \sum(0, 2, 4, 5, 6, 7, 11, 13, 15)$$

x_3x_2	00	01	11	10
x_1x_0	00	1 0 0	1	
00	1	1 1	1	
01	0 1 1	0		
11	0	1 1	0	
10	0 0 1	0		

$$y = \bar{x}_3\bar{x}_0 + x_2x_0 + x_3x_1x_0$$

$x_3 \rightarrow 2$ rozy
 $x_2 \rightarrow 1$ rozy
 $x_1 \rightarrow 1$ rozy
 $x_0 \rightarrow 3$ rozy

x_3x_2	y
00	$1 \cdot 1 + x_2 \cdot 0 + x_1 \cdot 0 = 1 + 0 = 1$
01	$1 \cdot 0 + x_2 \cdot 1 + 0 \cdot x_1 \cdot 1 = 0 + x_2 + 0 = x_2$
10	$0 \cdot 1 + x_2 \cdot 0 + 1 \cdot x_1 \cdot 0 = 0 + 0 + 0 = 0$
11	$0 \cdot 0 + x_2 \cdot 1 + 1 \cdot x_1 \cdot 1 = x_2 + x_1$

C₂

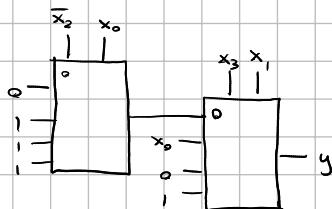
$$y = \sum(0, 1, 3, 5, 7, 10, 11, 14, 15)$$

x_3x_2	00	01	11	10
x_1x_0	00	1 1 1 0		
00	1	1 1	0	
01	0 1 1 0			
11	0 0 1 1			
10	0 0 1 1			

$$y = x_3x_1 + \bar{x}_3x_0 + \bar{x}_3\bar{x}_2\bar{x}_1$$

$x_3 \rightarrow 3$
 $x_2 \rightarrow 1$
 $x_1 \rightarrow 2$
 $x_0 \rightarrow 1$

x_3x_2	y
00	$0 \cdot 0 + 1 \cdot x_0 + 1 \cdot \bar{x}_2 \cdot 1 = x_0 + \bar{x}_2$
01	$0 \cdot 1 + 1 \cdot x_0 + 1 \cdot \bar{x}_2 \cdot 0 = x_0$
10	$1 \cdot 0 + 0 \cdot x_0 + 0 \cdot \bar{x}_2 \cdot 1 = 0$
11	$1 \cdot 1 + 0 \cdot x_0 + 0 \cdot \bar{x}_2 \cdot 0 = 1$

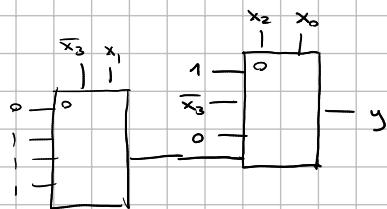
C₃

$$y = \sum(0, 1, 2, 3, 5, 7, 8, 10, 15)$$

x_3x_2	00	01	11	10
x_1x_0	00	1 1 1 1		
00	1	1 1	1 1	
01	0 1 1 0			
11	0 0 1 1			
10	1 0 0 1			

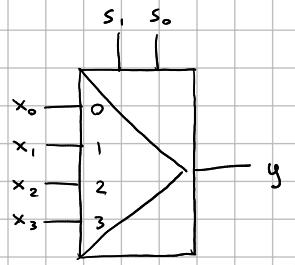
$$y = \bar{x}_2\bar{x}_0 + \bar{x}_3x_0 + x_2x_1x_0$$

$x_3 \rightarrow 1$
 $x_2 \rightarrow 2$
 $x_1 \rightarrow 1$
 $x_0 \rightarrow 3$



x_3x_2	y
00	$1 + 0 + 0 = 1$
01	$0 + \bar{x}_3 + 0 = \bar{x}_3$
10	$0 + 0 + 0 = 0$
11	$0 + \bar{x}_3 + x_1 = \bar{x}_3 + x_1$

Multiplexer 4 - 1



s_1	s_0	y
0	0	x_0
0	1	x_1
1	0	x_2
1	1	x_3

$$y = \overline{s}_1 \overline{s}_0 x_0 + \overline{s}_1 s_0 x_1 + s_1 \overline{s}_0 x_2 + s_1 s_0 x_3$$