



# Digital teknik

Lkaa

2008



# Tal systemer

- 10 talssystemet
  - 0,1,2,3,4,5,6,7,8,9 (ti tal!)

Position	6	5	4	3	2	1	0
Tal:	2	4	3	7	1	9	6
	$10^6$	$10^5$	$10^4$	$10^3$	$10^2$	$10^1$	$10^0$



# Binære tal

- Digitalteknik:
  - Binære talsystem eks: 1001B
  - Oktale talsystem eks: 162
  - Hexadecimale talsystem eks 10AH
- 4 bit = nibble
- 8 bit = byte
- 16 bit = word



# Binære tal

Position	6	5	4	3	2	1	0
Tal:	1	0	1	1	0	1	0
	$2^6$	$2^5$	$2^4$	$2^3$	$2^2$	$2^1$	$2^0$
I alt: $90_{(10)}$	64	0(32)	16	8	0(4)	2	0(1)



# Oktal talsystem

Binært	Oktalt	Decimalt
000	0	0
001	1	1
010	2	2
011	3	3
100	4	4
101	5	5
110	6	6
111	7	7
1000	10	8



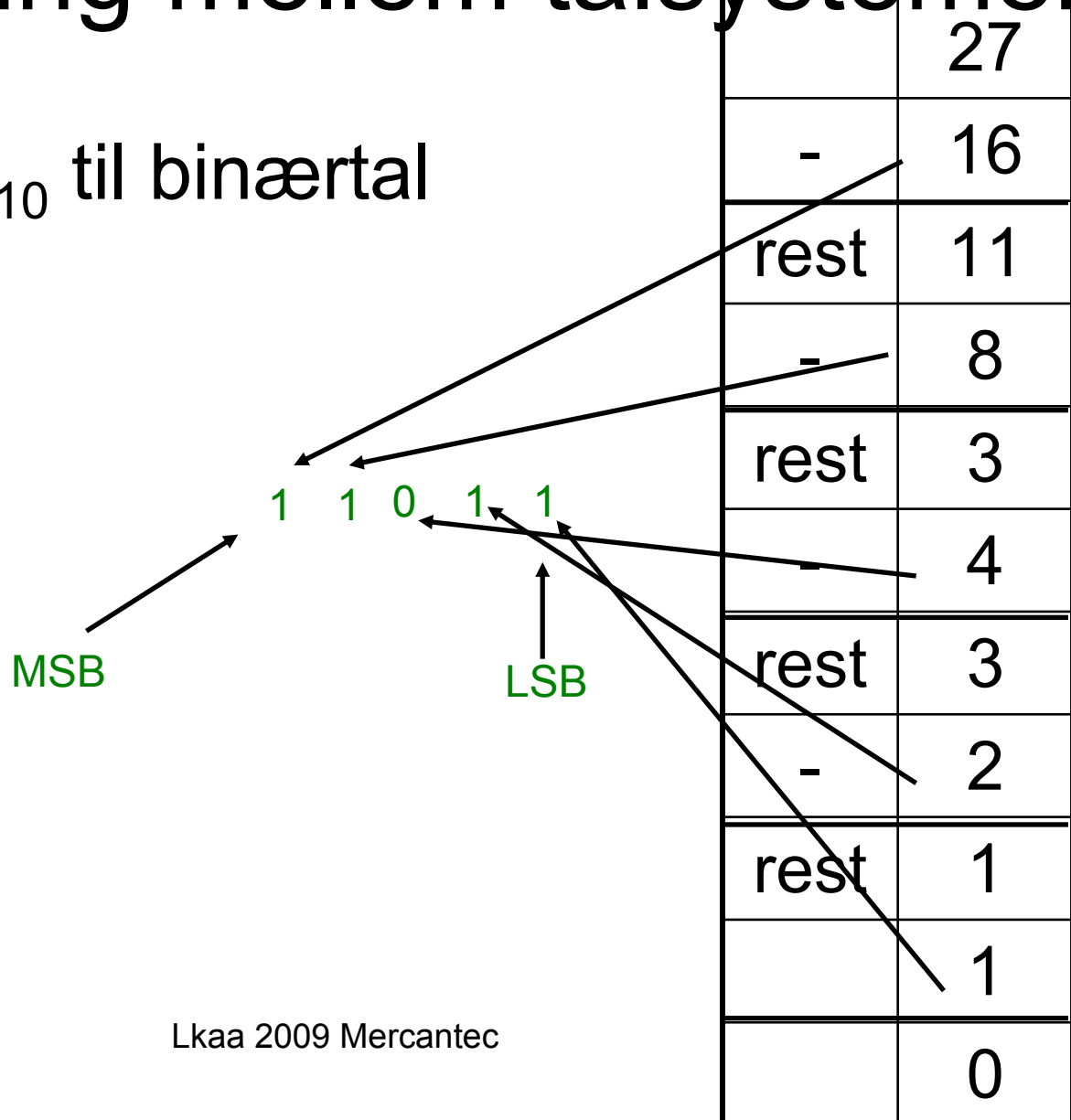
# Hexadecimal

- Tallene: 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F benyttes til Hex tal!

Position			4	3	2	1	0
Tal: 2F4AH				2	F	4	A
			$16^4$	$16^3$	$16^2$	$16^1$	$16^0$
			65536	4096	256	16	1
I alt: $12106_{(10)}$				8192	3840	64	10

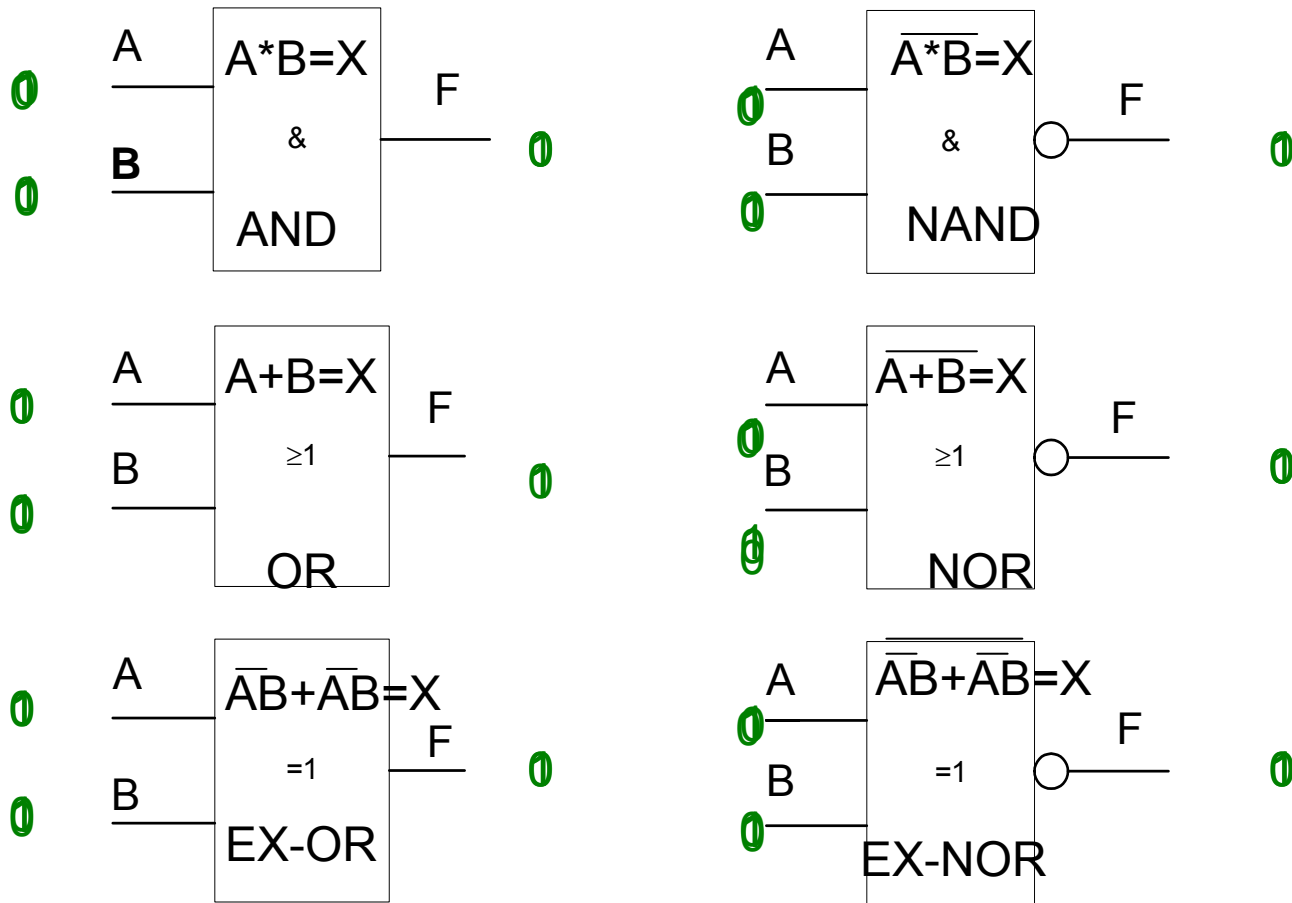
# Omsætning mellem talsystemer

- Omsæt 27<sub>10</sub> til binærtal





# Logiske gates

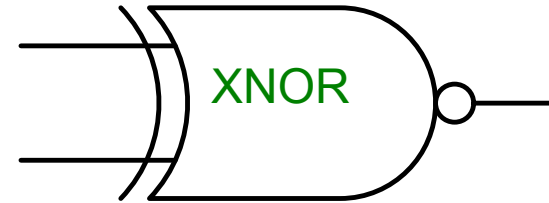
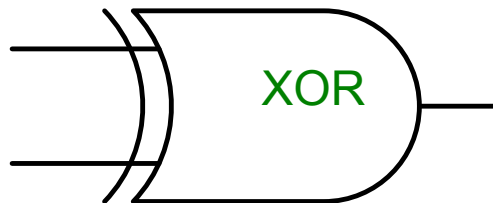
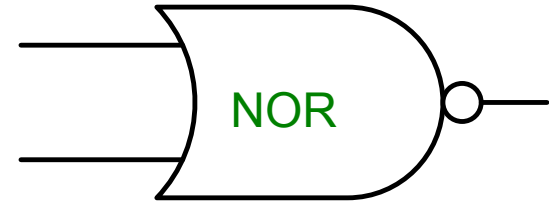
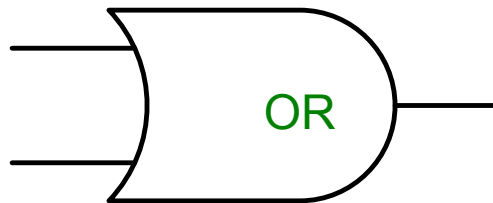
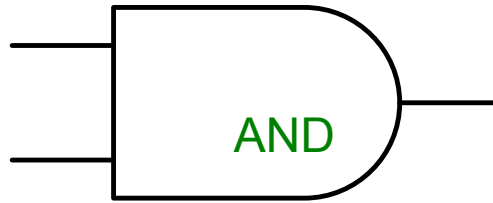






# Logiske gates

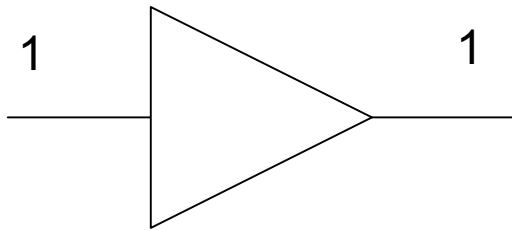
## Amerikanske symboler



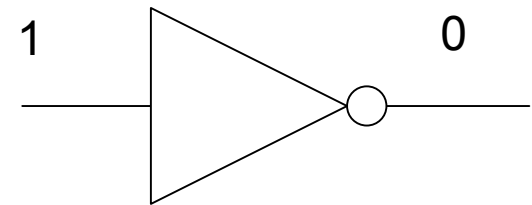


# Buffer & inverter

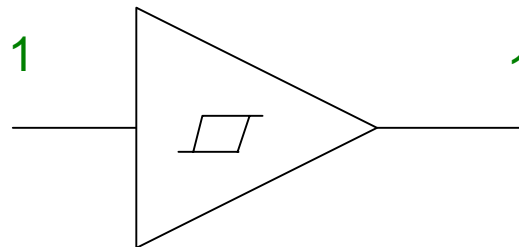
Buffer



Inverter



Schmitt-trigger



Retter flanker op!



# Flip-flop

- Flip-flop ændre ikke tilstand på udgangen, selvom indgangs signalet ”fjernes”
- FF husker sit udgangs tilstand!!!
- Gates følger indgangs signalerne



# Flip-flop

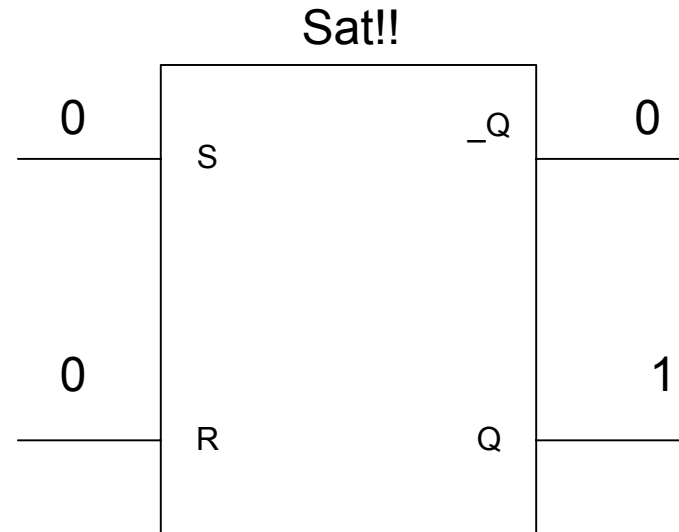
- FF udgang:  $Q$  og  $\overline{Q}$
- $\overline{Q}$  er negeret i forhold til  $Q$

Indg	Udg. $Q$	Udg. $\overline{Q}$
1	1	0
0	0	1



# RS Flip-flop

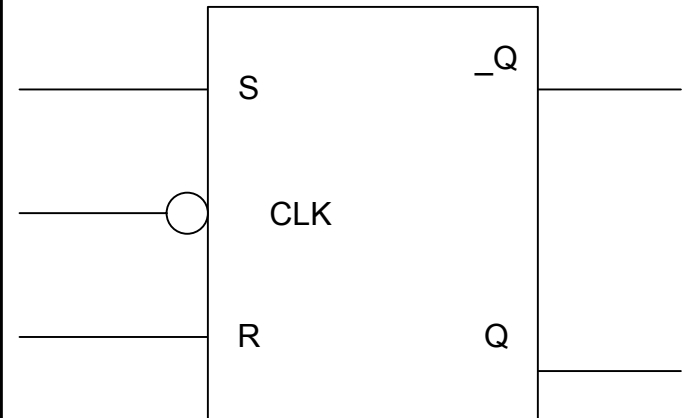
R	S	Q	$\overline{Q}$	
0	1	0	1	
1	0	1	0	
0	0	$Q_n$	$\overline{Q_n}$	Låst
1	1	1	1	Udef.



# Implus styret RS-FF



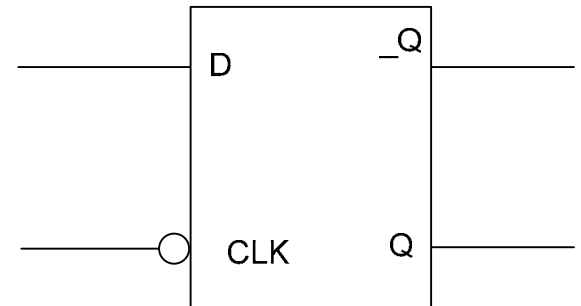
S	R	C	Q	$\overline{Q}$	
X	X	0	$Q_n$	$Q_n$	Låst
0	0	1	$Q_n$	$Q_n$	Låst
0	1	0	0	1	
1	0	1	1	0	
1	1	1	1	1	Udef.





# D-FF

D	C	Q	$\overline{Q}$	
X	0	$Q_n$	$Q_n$	Låst
0	1	0	1	
1	1	1	0	

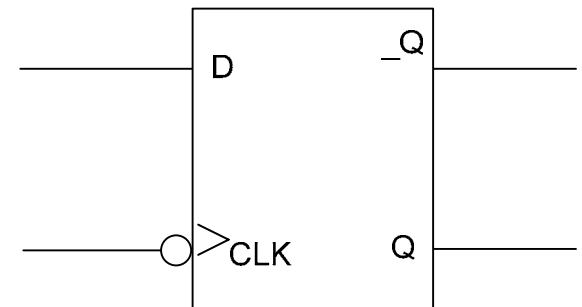




# D-FF positiv flanke

- Skiftet sker når C går op

D	C	Q	$\overline{Q}$	
X	0	$Q_n$	$Q_n$	Låst
0	↑	0	1	
1	↑	1	0	

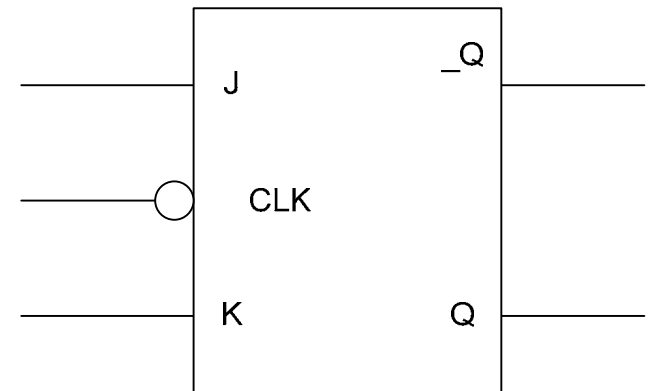






# JK(Jack Killy)-FF

J	K	C	Q	$\overline{Q}$	
X	X	0	$Q_n$	$\overline{Q_n}$	lå
0	0	↑	$Q_n$	$\overline{Q_n}$	lå
0	1	↑	0	1	
1	0	↑	1	0	
1	1	↑	toggle		





# JK-FF

