Velkommen til ny gruppetime

...

Hva vi skal gå gjennom

ALU
Porter
Sannhetsverditabeller
Addere

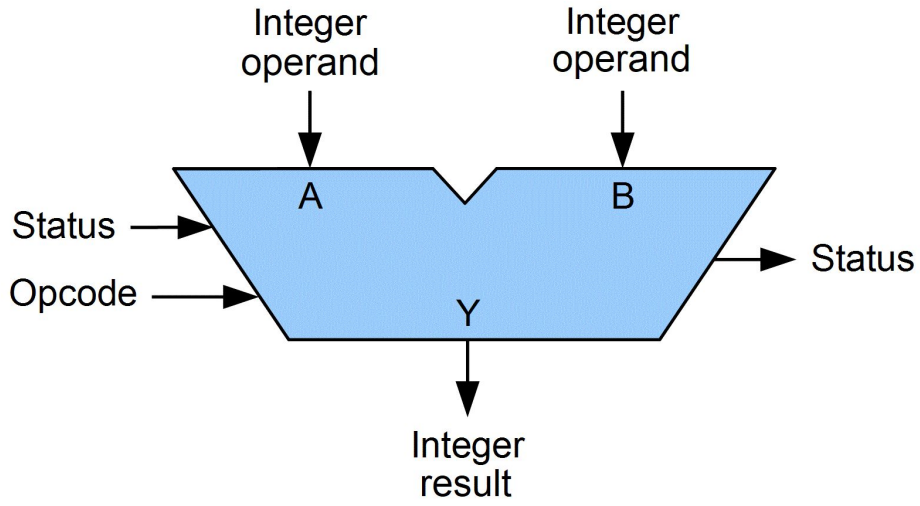
Menti, Q & A

3856 9429



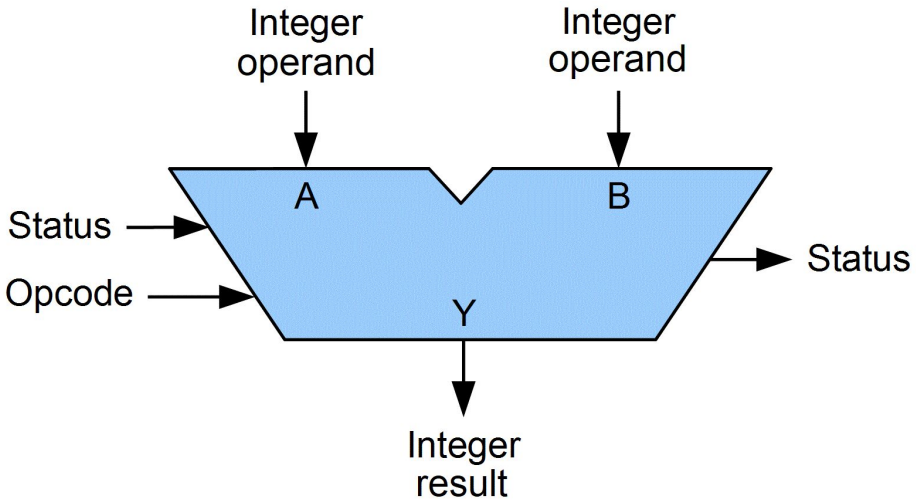
Hva er en ALU?

Gjør matte i CPU



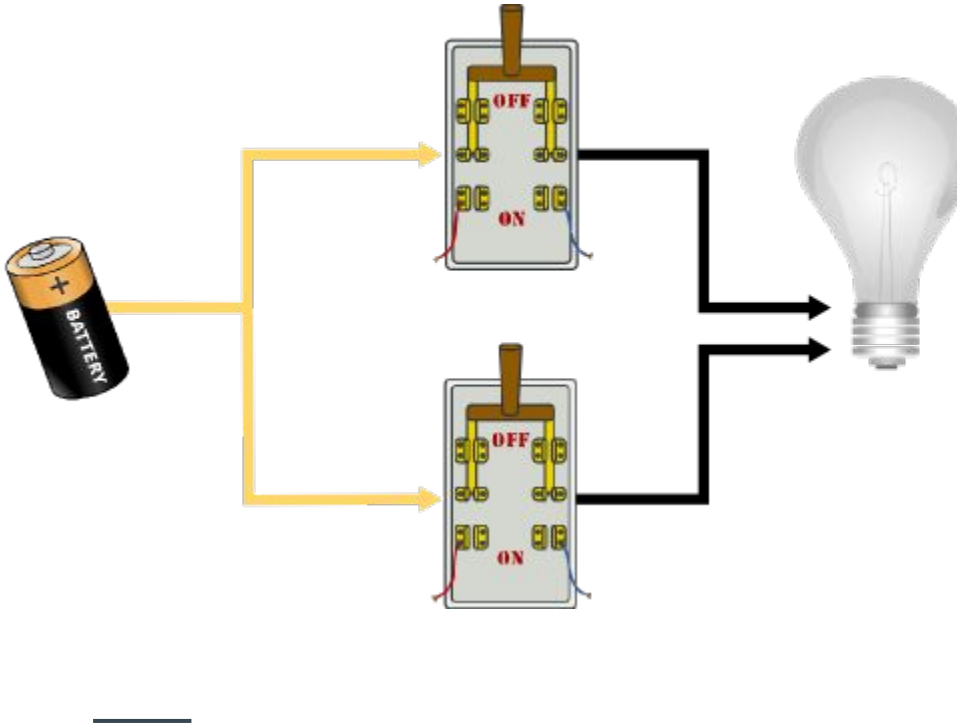
Hva er en ALU?

Gjør matte i CPU
ADD, SUB og andre logiske operasjoner



ALU’en bruker porter

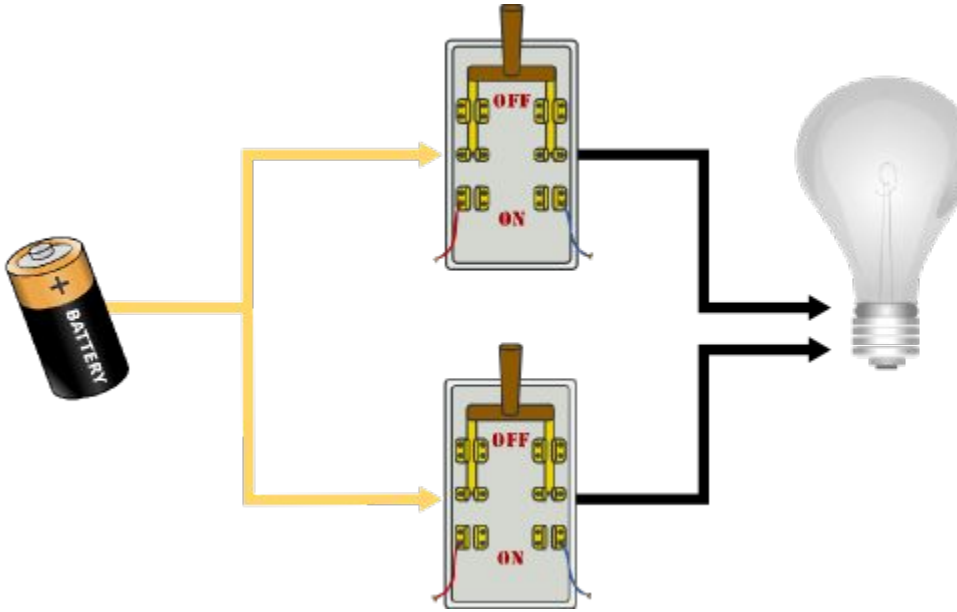
Byggesteinene til ALU’en
Utfører logiske operasjoner

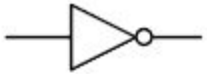


ALU’en bruker porter

Byggesteinene til ALU’en
Utfører logiske operasjoner

Tar inn signaler, og gir ut signaler basert på regler



Logic Gate	Symbol	Description	Boolean
AND		Output is at logic 1 when, and only when all its inputs are at logic 1,otherwise the output is at logic 0.	$X = A \cdot B$
OR		Output is at logic 1 when one or more are at logic 1.If all inputs are at logic 0,output is at logic 0.	$X = A+B$
NAND		Output is at logic 0 when,and only when all its inputs are at logic 1,otherwise the output is at logic 1	$X = \overline{A \cdot B}$
NOR		Output is at logic 0 when one or more of its inputs are at logic 1.If all the inputs are at logic 0,the output is at logic 1.	$X = \overline{A+B}$
XOR		Output is at logic 1 when one and Only one of its inputs is at logic 1. Otherwise is it logic 0.	$X = A \oplus B$
XNOR		Output is at logic 0 when one and only one of its inputs is at logic1.Otherwise it is logic 1. Similar to XOR but inverted.	$X = \overline{A \oplus B}$
NOT		Output is at logic 0 when its only input is at logic 1, and at logic 1 when its only input is at logic 0.That's why it is called and INVERTER	$X = \overline{A}$

```
# AND
a & b
```

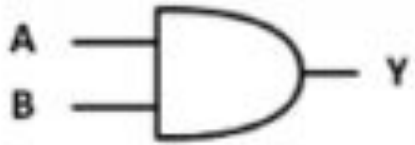
```
# OR
a | b
```

```
# NAND
!(a & b)
```

```
# XOR
a ^ b
```

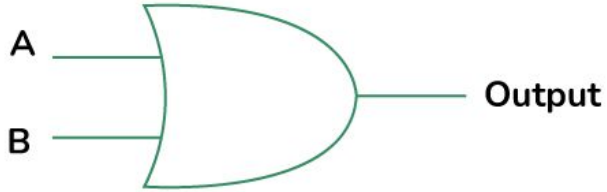
```
# NOT
!a
```

Inputs		Output
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1



$$Y = A.B$$

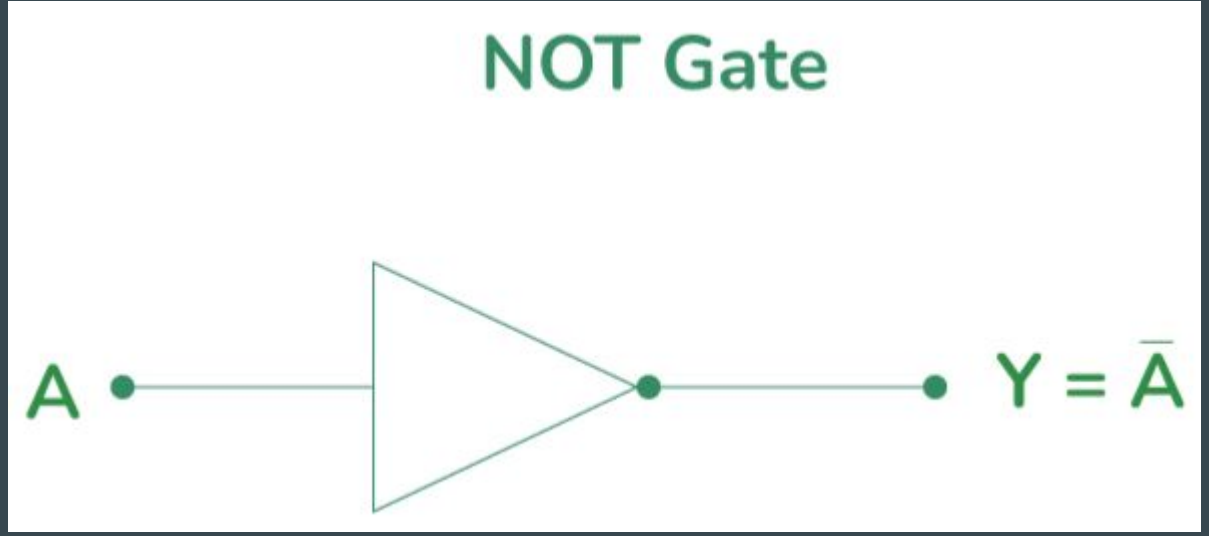
2-Input OR Gate



Truth Table

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

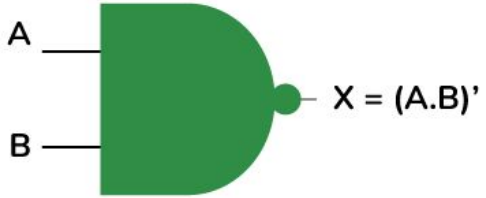
NOT Gate



Truth Table

A (Input)	Y = Ā (Output)
0	1
1	0

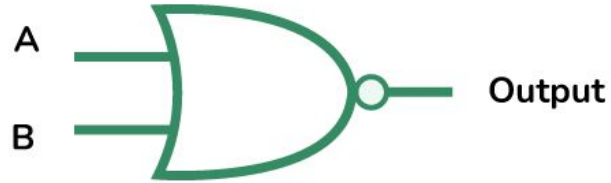
2-Input NAND Gate



Truth Table

Input A	Input B	X = (A.B)'
0	0	1
0	1	1
1	0	1
1	1	0

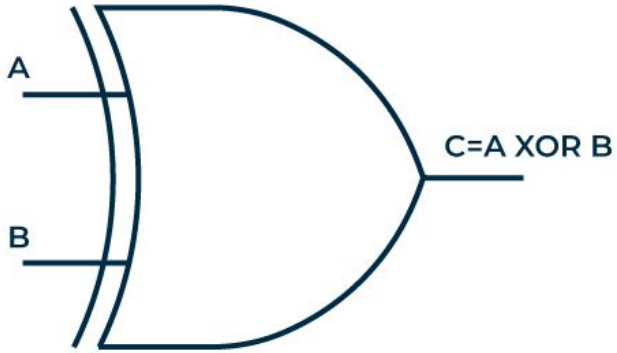
2- Input NOR Gate



Truth Table

Input A	Input B	0 = (A + B)'
0	0	1
0	1	0
1	0	0
1	1	0

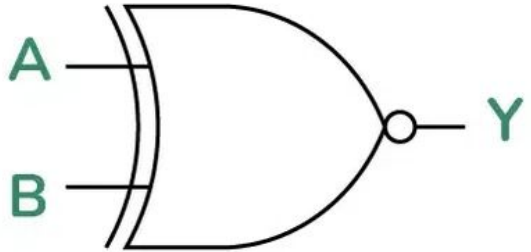
What is XOR gate



Truth Table of XOR gate

A	B	C=A⊕B
0	0	0
0	1	1
1	0	1
1	1	0

What is XNOR Gate?



Truth Table

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

Sannhetsverditabell

Inputs		A . B	B . A	A + B	B + A
A	B				
0	0	0	0	0	0
0	1	0	0	1	1
1	0	0	0	1	1
1	1	1	1	1	1

Table 4.10

A	B	C	Output
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

Hvordan ser sannhetsverditabellen ut?

A’ B

((Not A) AND B))

Hvordan ser sannhetsverditabellen ut?

A’ + BC

((Not A) OR (B AND C))

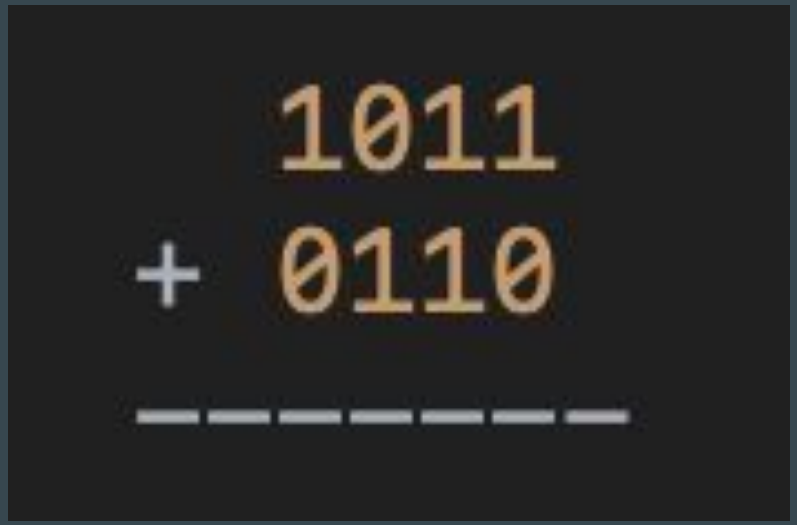
Addere

Først, forstå binær addisjon

Vanlig addisjon:



Binær addisjon:



Hva er en adder?

En funksjon som tar input, legger de sammen, og gir et output

Hva er en adder?

En funksjon som tar input, legger de sammen, og gir et output

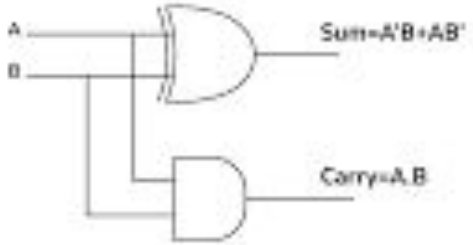
En adder legger sammen binære tall

Halvadder

2 innganger, A og B
2 utganger, sum og carry out

Eksempel:

1 + 0 → SUM=1, CARRY=0
1 + 1 → SUM=0, CARRY=1 (fordi $1+1=10_2$)



Truth Table

A	B	S	C
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

Fulladder

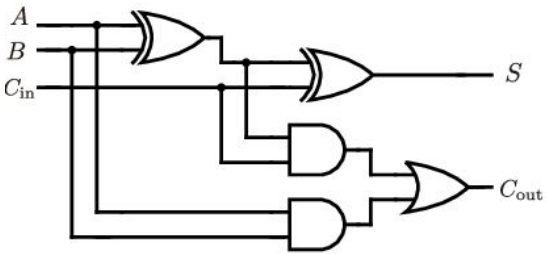
3 innganger, A og B og carry in
2 utganger, sum og carry out

Eksempel:

A=1, B=0, Cin=1 → SUM=0, CARRY=1 (fordi $1+0+1 = 10_2$)

A=1, B=1, Cin=0 → SUM=0, CARRY=1 (fordi $1+1+0 = 10_2$)

A=1, B=1, Cin=1 → SUM=1, CARRY=1 (fordi $1+1+1 = 11_2$)



Inputs			Outputs	
A	B	C_{in}	S	C_{out}
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

Men hvorfor bruker vi ikke bare full-addere hvis halvaddere er dårligere og ikke funker bra nok?



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11 11 0

Og sånn funker en ALU

Hvilke av disse utsagnene er sanne?

- [x] Man kan lage enhver funksjon med å bare ha INV og OR
- [ ] Inngangen og utgangen på en inverter er fysisk koblet sammen.
- [ ] ALU står for Adder-Logikk-Unit
- [ ] Det er ikke mulig å ha et oddeantall trinn i en pipeline
- [ ] Det finnes bare en type transistorer.
- [x] En utgang av en port kan være inngang på flere porter
- [x] Det er kun en utgang på en port
- [x] En XNOR er det inverterte av en XOR