Conversion example

PC' : PC+4+4xFOU

Compute the sum of the values 0…N-1

memory

```
004   add   $9, $0, $0
008   add   $10, $0, $0
  TOP:
012   bne   $8, $10, END
016   add   $9, $9, $10
020   addi  $10, $10, 1
024   j     TOP
  END:
028
```

00	0	0	9	0	32
00	0	0	10	0	32
05	8	10	+3		
00	9	10	9	0	32
8	10	10	1		
2	3				

PC

6	26	
PC		00

Assembly & Machine Language

Assembly

1-to-1 mapping

Human readable

Machine Language

32 bits

NOT easy to understand.

Fixed format – easy for machine

Computer Arithmetic

Readings: Chapter 3

Develop Arithmetic Logic Units (ALUs) to perform CPU functions.

Introduce multiplication, division, floating point.

Full Adder

A	B	CI	CO	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

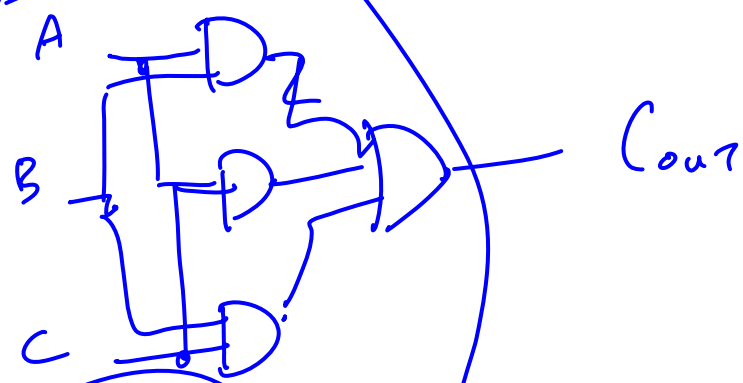
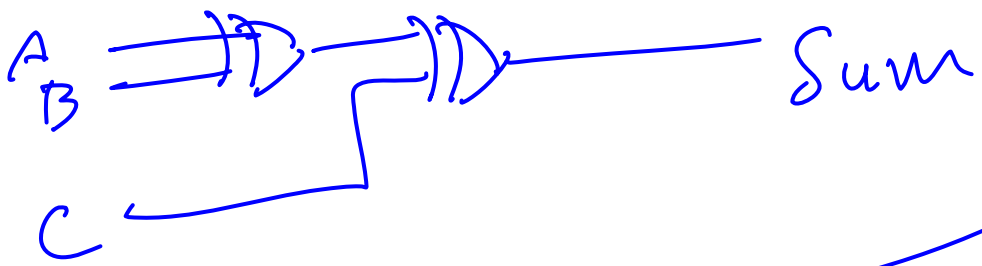
HA

XXXX

YYYY

FA

CarryOut = AB + AC + BC



Sum = A ⊕ B ⊕ C