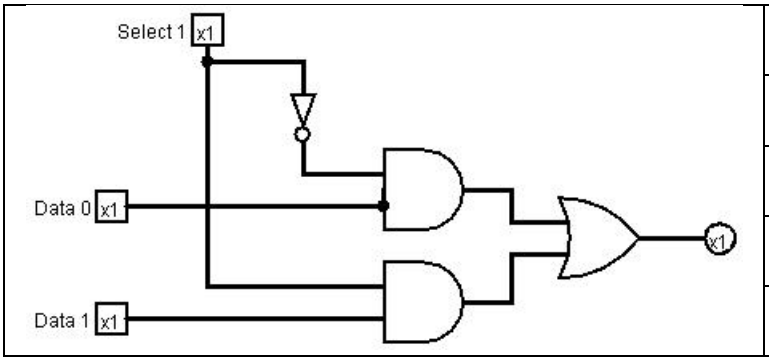
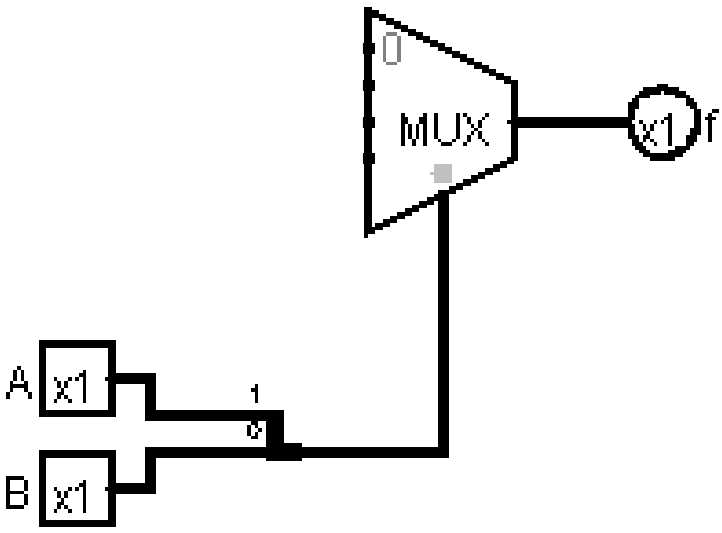
1. More on MUXes
    a. Truth table for simple 2-bit 2 to 1 MUX
    b. Idealized picture below



Data 0	Data 1	Select	Output
10	11	0	
01	00	1	
11	01	0	
10	01	1	

    c. Can use MUXes to implement functions

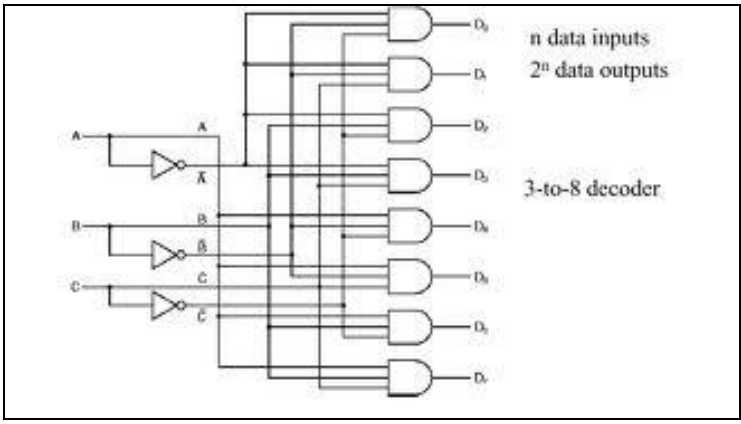
        i. Example below: implement an AND gate using a 2 to 1 MUX

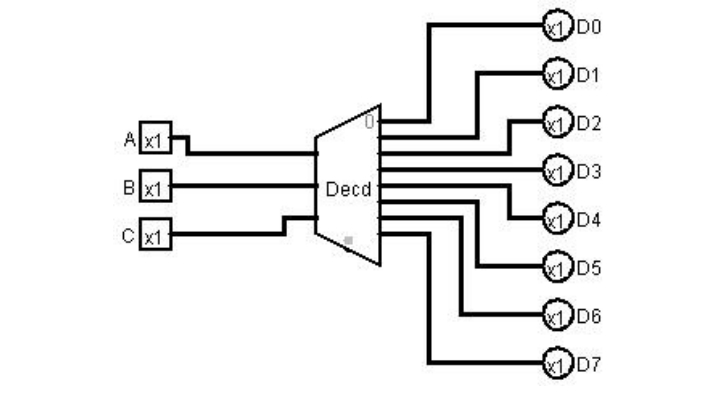


2. Decoders

   a. One-hot encoded

   b. Additional input attached to all AND gates can be used in two ways

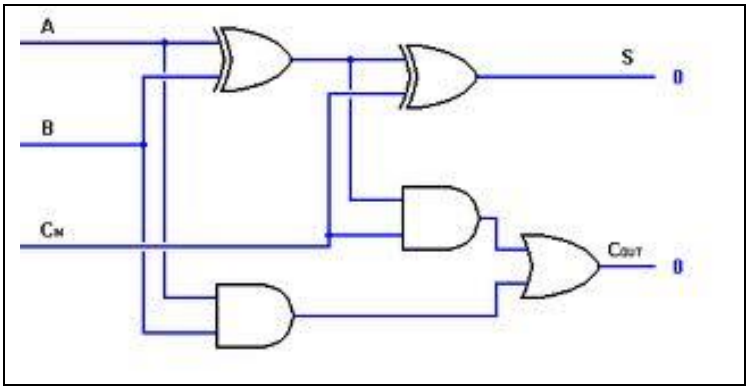


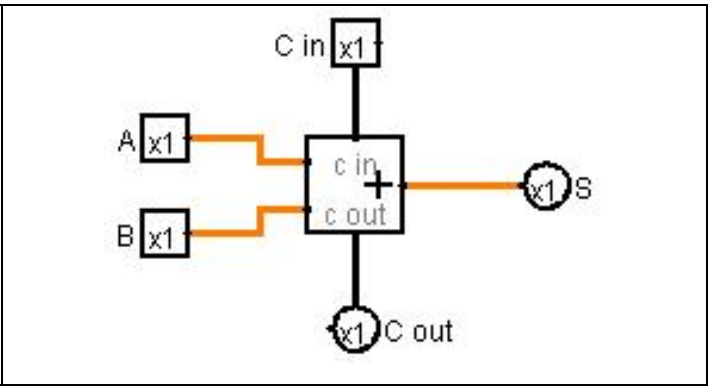


3. Adder

   a. *Half adder*

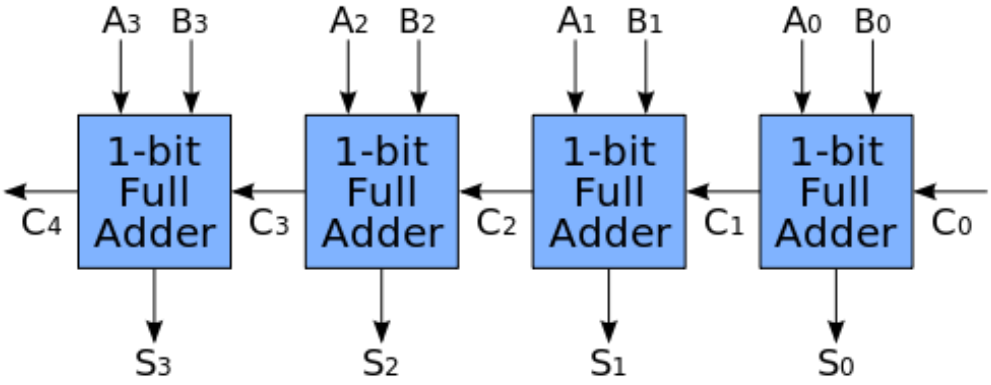
   b. *Full adder*



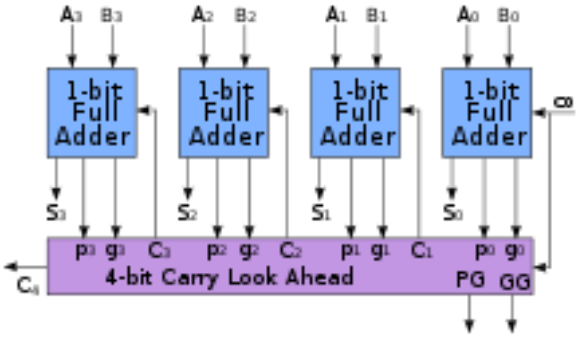


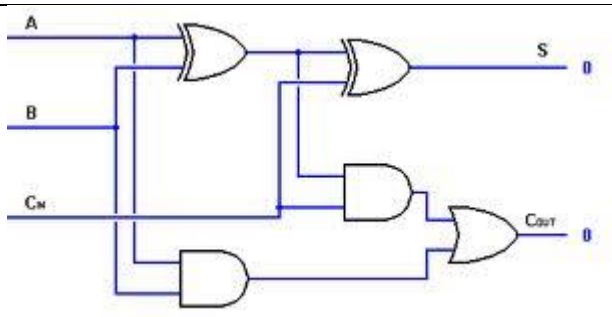
c. Types of multiple-bit adders

i. *Ripple-carry*



4. Carry-lookahead adders (CLA)





Full adder

a. Want to provide all carry bits for an adder at the same time

b. Generate two signals for each bit position

i. *Generate*, or *g*

ii. *Propagate*, or *p*

c. C_{i+1} =

i. G_i =

ii. P_i =

iii. Can expand this out

1. C_1 =

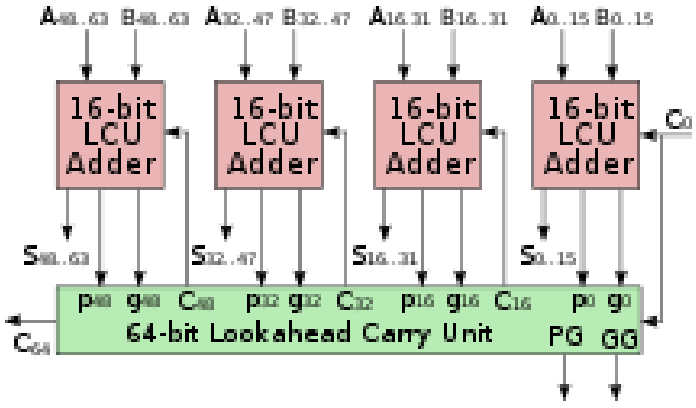
2. C_2 =

3. C_3 =

4. C_4 =

d. Process

e. Can expand this 4-bit adder to further levels



5. Subtractors

a. Circuit below