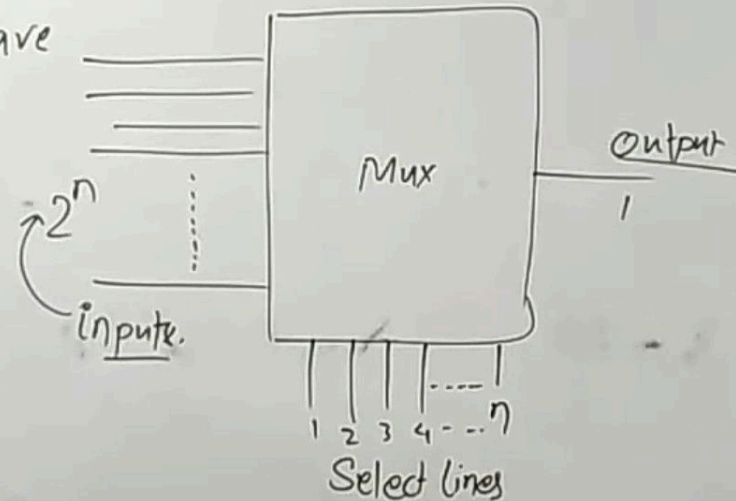# Combinational Circuit

1. Multiplexer (MUX.)

- A Mux. is a C.C which have many inputs and Single output depending upon Select lines.

- Select lines = n
  inputs = 2^n
  output = 1

- Many to one Circuit

- Data Selector.

- Parallel to Serial Converter

2^n

inputs.

Mux

output
1

1 2 3 4 -- n
Select lines

Combinational Circuit

1. Multiplexer (MUX.)

A Mux. is a C.C which have many inputs and single output depending upon select lines.
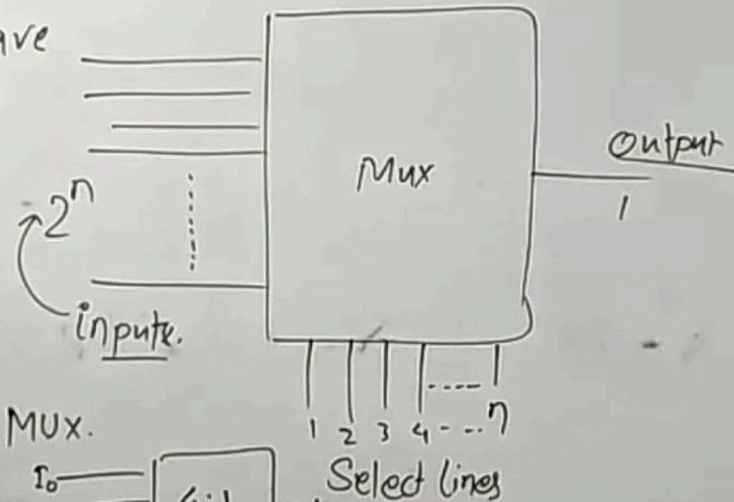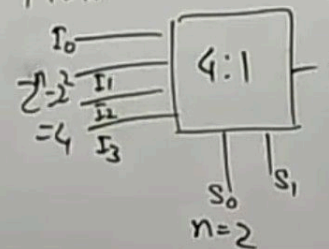
- Select lines = n
- inputs = 2^n
- output = 1

- Many to one Circuit
- Data Selector.
- Parallel to Serial Converter

$n = 5$

$i/p = 2^5 = 32$

$o/p = 1$
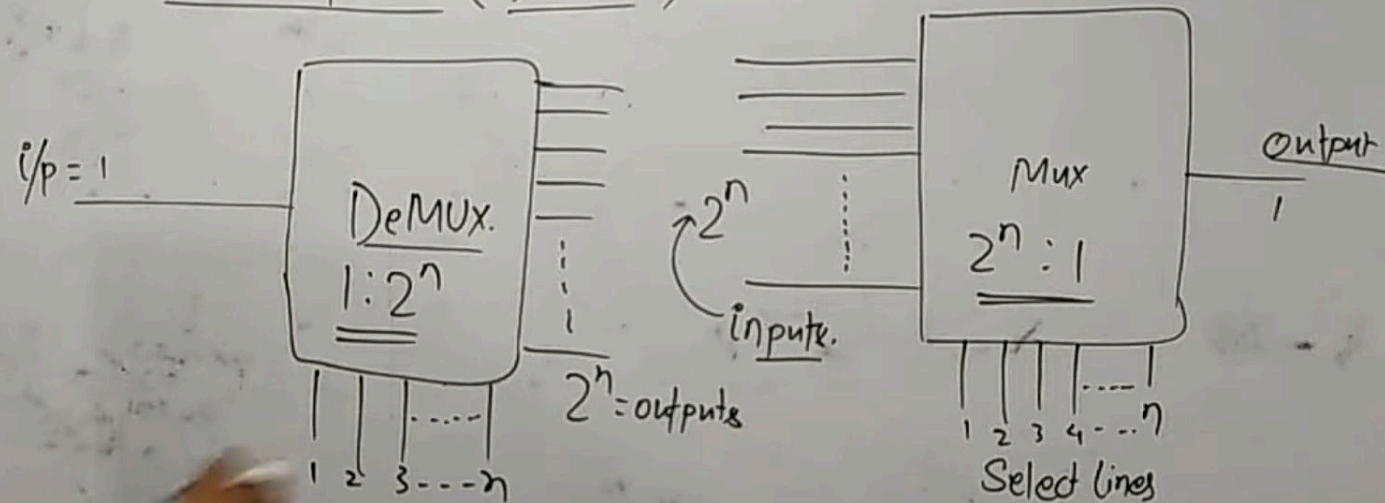
2^n inputs.

32:1 MUX.

$2^2 = 4$ with I_0, I_1, I_2, I_3 → 4:1

Mux

output
1

1 2 3 4 -- n
Select lines

I_0
I_1
I_2
I_3

4:1 → 1

S_0 S_1
$n = 2$

Combinational Circuit

2. DeMultiplexer (DeMUX.)

$i/p = 1$ → DeMUX. $1:2^n$

2^n = outputs

1 2 3 ---n

2^n ← inputs

MUX $2^n:1$ → output 1

1 2 3 4 ---n

Select lines

Combinational Circuit

2. DeMultiplexer (DeMux.)

$i/p = 1$

- Data Distributor
- One to Many Circuit

$\cdot$ Select lines $= n$
- Output $= 2^n$
- input $= 1$

DeMUX.
$1 : 2^n$

1 2 3 --- n

$2^n = $ outputs

$1 : 32 \rightarrow$ DeMUX.

$1 : 2^5 - S.L$

2^n
inputs.

Mux
$2^n : 1$

output
1

1 2 3 4 -- n
Select lines
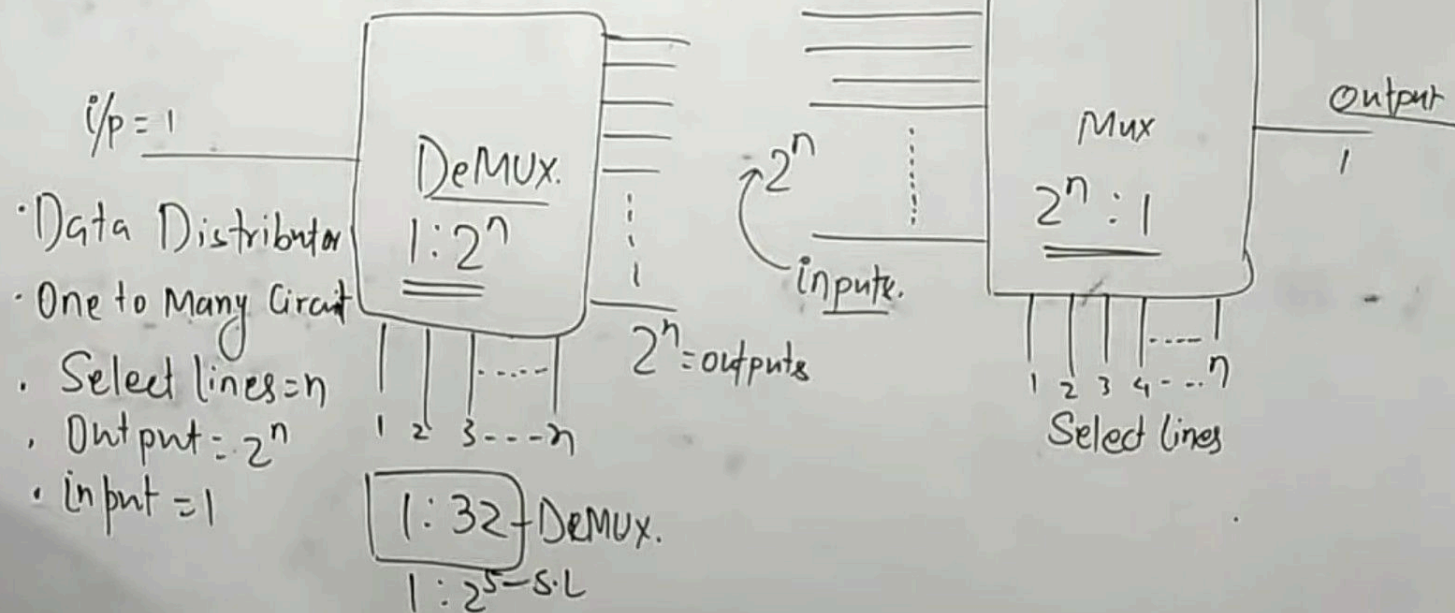
Combinational Circuit

2. DeMultiplexer (DeMux.)

$256 : 1$ Mux.

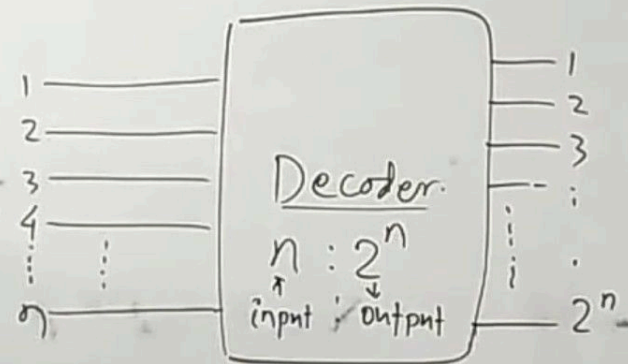$2^8 : 1$ $S.L = 8$

$1 : 16$ DeMUX.

$1 : 2^4$

$S.L = 4$

- input =

Combinational Circuit

2. Decoder

$$n : 2^n$$

- Some to many circuit inputs.
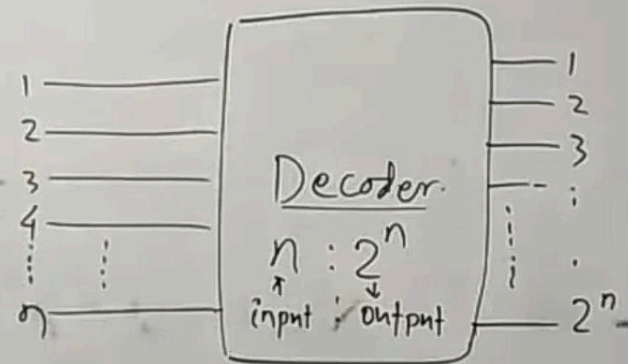- input = n
- output = 2^n

input = 6, o/p = 2^6 = 64

```
1 ─────────          ┌──────────────┐          ───── 1
2 ─────────          │              │          ───── 2
3 ─────────          │              │          ───── 3
4 ─────────          │   Decoder.   │          ───── :
: ─────────          │              │          ─── .
: ─────────          │   n : 2^n    │          ─── .
n ─────────          │  input output│          ───── 2^n
                     └──────────────┘
```

Combinational Circuit

3. Decoder

$$\boxed{n : 2^n}$$

- Some to many circuit inputs.
- input $= n$
- output $= 2^n$

Decoder

$$\underset{\uparrow}{n} : \underset{\downarrow}{2^n}$$

input : output

Encoder:

- Many to Some Circuit
- input $= 2^n$
- output $= n$

$i/p = 512$

$o/p = 2^9 = \boxed{9}$

Encoder $2^n : n$