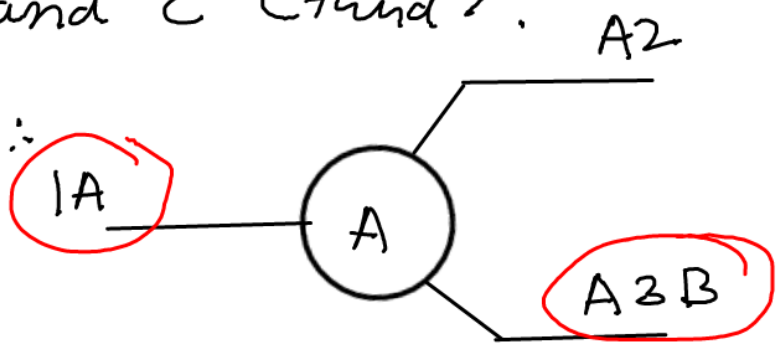
Demonstration for multiple processes.

Generic problem statement :- A mixture containg two components is passed to produced two streams. One of those streams is then mixed with a new stream containg the same 2 components, but in different proportion. This new mixture is then passed through another process. The output are two streams. One of these is the product.

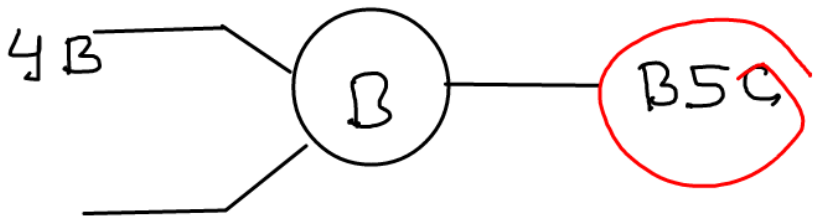
(Circled streams are those whose composition & the total amount are exactly known).

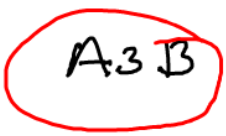
Solution (Assume steady state process). Number of processes :- 3. Say, A (first) B (mixing) and C (third).

First process :-



Second process :-





Third process

The streams that are input & output for the entire system are. 1A, A2, 4B, C6, C7.

	1A	A2	A3B	4B	B5C	C6	C7
Total.	✓	×	✓	×	✓	×	✓
Compnt 1	✓	×	✓	×	✓	×	✓
Compnt 2	✓	×	✓	×	✓	×	✓

✓ ⇒ Known. × ⇒ Unknown.

NOTE :- In real solution, the table will be filled with values.

⇒ The two unknowns can be expressed in terms of one variable.

Total number of possible material balances :

$= 2 \times 4 = 8.$

Number of independent material balances

$= 2 \times 3 = 6.$

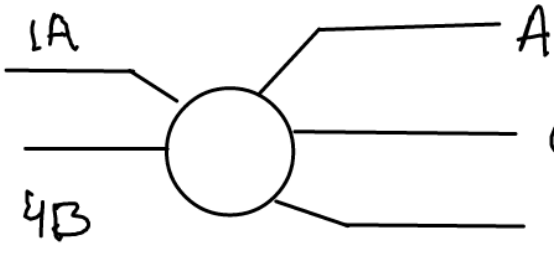
Number of unknown variables = 6.

⇒ df for the overall system is 0 ∴

we can solve this problem.

'df' calculation for different process:

Overall system (only considering the inputs & outputs)



Independent equations = 2.

unknowns = 6

df = 4.

Process A : Equations = 2

Unknowns = 2

df = 0

Process B :- Equations = 2

Unknowns = 2

df = 0

Process C : Equations = 2.

Unknowns = 2

df = 0.

We should select the material balances of process A, B & C to perform calculations