

## \* Apriori Algorithm

1)

TID	Items
100	1 3 4
200	2 3 5
300	1 2 3 5
400	2 5

⇒ minimum support = 2

Scan D

C <sub>1</sub>	Item Set	Support Count	L <sub>1</sub>	Item Set	Sup.-c.
	{1}	2		{1,4}	2
	{2}	3		{2,4}	3
	{3}	3		{3,5}	3
	{4}	1	X	{5}	3
	{5}	3			

C <sub>2</sub>	ItemSet	Support Count	L <sub>2</sub>	ItemSet	Sup.-count
	{1,2}	1	X	{1,3,5}	2
	{1,3}	2		{2,3,4}	2
	{1,5}	1	X	{2,5}	3
	{2,3}	2		{3,5}	2
	{2,5}	3			
	{3,5}	2			

C <sub>3</sub>	Itemset	Support Count	L <sub>3</sub>	ItemSet	Sup.-count
	{1,2,3}	1	X	{2,3,5}	2
	{1,3,5}	1	X		
	{2,3,5}	2			

- Rules generations

Association Rules	Support	Confidence	Confidence(%)
$2^3 \rightarrow 5$	2	$\frac{2}{2} = 1$	100%
$3^5 \rightarrow 32$	2	$\frac{2}{2} = 1$	100%
$32^5 \rightarrow 3$	2	$\frac{2}{3} = 0.66$	66%
$2 \rightarrow 3^5$	2	$\frac{2}{3} = 0.66$	66%
$3 \rightarrow 2^5$	2	$\frac{2}{3} = 0.66$	66%
$5 \rightarrow 2^3$	2	$\frac{2}{3} = 0.66$	66%

- Find Confidence

$$\text{for, } 2^3 \rightarrow 5 = \frac{\text{sup.}(2^3 \cup 5)}{\text{sup}(2^3)} = \frac{2}{2} = 1$$

$$\text{for, } 3^5 \rightarrow 2 = \frac{\text{sup.}(3^5 \cup 2)}{\text{sup}(3^5)} = \frac{2}{2} = 1$$

$$\text{for, } 2^5 \rightarrow 3 = \frac{\text{sup.}(2^5 \cup 3)}{\text{sup}(2^5)} = \frac{2}{3} = 0.66$$

$$\text{for, } 2 \rightarrow 3^5 = \frac{\text{sup.}(2 \cup 3^5)}{\text{sup}(2)} = \frac{2}{3} = 0.66$$

$$\text{for, } 3 \rightarrow 2^5 = \frac{\text{sup.}(3 \cup 2^5)}{\text{sup}(3)} = \frac{2}{3} = 0.66$$

$$\text{for, } 5 \rightarrow 2^3 = \frac{\text{sup.}(5 \cup 2^3)}{\text{sup}(5)} = \frac{2}{3} = 0.66$$

2)	TID	Items	$\Rightarrow$ minimum support = 2
1		Bread, Milk	
2		Bread, Diaper, Beer, eggs	
3		Milk, Diaper, Beer, Cola	
4		Milk, Diaper, Beer, Cola	
5		Bread	

C <sub>1</sub>	Itemset	Support Count	L <sub>1</sub>	Itemset	Sup. count
	{Bread}	3		{Bread}	3
	{Milk}	3		{Milk}	3
	{Diaper}	4		{Diaper}	4
	{Beer}	3		{Beer}	3
	{Eggs}	1 X		{Cola}	3
	{Cola}	3			

C <sub>2</sub>	Itemset	Support Count	L <sub>2</sub>	Itemset	Sup. count
	{Bread, Milk}	2		{Bread, Milk}	2
	{Bread, Diaper}	2		{Bread, Diaper}	2
	{Bread, Beer}	1 X		{Milk, Diaper}	3
	{Bread, Cola}	1 X		{Milk, Beer}	2
	{Milk, Diaper}	3		{Milk, Cola}	3
	{Milk, Beer}	2		{Diaper, Beer}	3
	{Milk, Cola}	3		{Diaper, Cola}	3
	{Diaper, Beer}	3		{Beer, Cola}	2
	{Diaper, Cola}	3			
	{Beer, Cola}	2			

C3	Itemset	SupportCount	L3	Itemset	Sup-C
	{Bread, Milk, Diaper}	1	X	{Milk, Diaper, Beer}	2
	{Bread, Milk, Beer}	0	X	{Milk, Diaper, Cola}	3
	{Bread, Milk, Cola}	1	X	{Milk, Cola, Beer}	2
	{Bread, Diaper, Beer}	1	X	{Diaper, Cola, Beer}	2
	{Bread, Diaper, Cola}	1	X		
	{B Milk, Diaper, Beer}	2			
	{Milk, Diaper, Cola}	3			
	{Milk, Cola, Beer}	2			
	{Diaper, Cola, Beer}	2			

C4	Itemset	SupportCount
	{Milk, Diaper, Cola, Beer}	2

- Rules generations [ Milk (M) , Diaper (D) , Cola (C) , Beer (B) ]

Association Rules	Support	Confidence	Confidence (%)
M → D ^ C ^ B	2	2/3 = 0.66	66%
D → M ^ C ^ B	2	2/4 = 0.5	50%
C → M ^ D ^ B	2	2/3 = 0.66	66%
B → M ^ D ^ C	2	2/3 = 0.66	66%
D ^ C ^ B → M	2	2/2 = 1	100%
M ^ C ^ B → D	2	2/2 = 1	100%
M ^ D ^ B → C	2	2/2 = 1	100%
M ^ D ^ C → B	2	2/3 = 0.66	66%
M ^ D → C ^ B	2	2/3 = 0.66	66%
M ^ C → D ^ B	2	2/3 = 0.66	66%
M ^ B → D ^ C	2	2/2 = 1	100%
D ^ C → M ^ B	2	2/3 = 0.66	66%

$D^c B \rightarrow C^c M$	2	$\frac{2}{3} = 0.66$	66%
$C^c B \rightarrow M^c D$	2	$\frac{2}{2} = 1$	100%

- find Confidence.

$$\text{for, } M \rightarrow D^c C^c B = \frac{\text{sup.}(M \cup D^c C^c B)}{\text{sup.}(M)} = \frac{2}{3} = 0.66$$

$$\text{for, } D \rightarrow M^c C^c B = \frac{\text{sup.}(D \cup M^c C^c B)}{\text{sup.}(D)} = \frac{2}{4} = 0.5$$

$$\text{for, } C \rightarrow M^c D^c B = \frac{\text{sup.}(C \cup M^c D^c B)}{\text{sup.}(C)} = \frac{2}{3} = 0.66$$

$$\text{for, } B \rightarrow M^c D^c C = \frac{\text{sup.}(B \cup M^c D^c C)}{\text{sup.}(B)} = \frac{2}{3} = 0.66$$

$$\text{for, } D^c C^c B \rightarrow M = \frac{\text{sup.}(D^c C^c B \cup M)}{\text{sup.}(D^c C^c B)} = \frac{2}{2} = 1$$

$$\text{for, } M^c C^c B \rightarrow D = \frac{\text{sup.}(M^c C^c B \cup D)}{\text{sup.}(M^c C^c B)} = \frac{2}{2} = 1$$

$$\text{for, } M^c D^c B \rightarrow C = \frac{\text{sup.}(M^c D^c B \cup C)}{\text{sup.}(M^c D^c B)} = \frac{2}{2} = 1$$

$$\text{for, } M^c D^c C \rightarrow B = \frac{\text{sup.}(M^c D^c C \cup B)}{\text{sup.}(M^c D^c C)} = \frac{2}{3} = 0.66$$

$$\text{for, } M^c D \rightarrow C^c B = \frac{\text{sup.}(M^c D \cup C^c B)}{\text{sup.}(M^c D)} = \frac{2}{3} = 0.66$$

$$\text{for, } M^c \rightarrow D^B = \frac{\sup(M^c \cup D^B)}{\sup(M^c)} = \frac{2}{3} = 0.66$$

$$\text{for, } M^B \rightarrow D^c = \frac{\sup(M^B \cup D^c)}{\sup(M^B)} = \frac{2}{2} = 1$$

$$\text{for, } D^c \rightarrow M^B = \frac{\sup(D^c \cup M^B)}{\sup(D^c)} = \frac{2}{3} = 0.66$$

$$\text{for, } D^B \rightarrow C^M = \frac{\sup(D^B \cup C^M)}{\sup(D^B)} = \frac{2}{3} = 0.66$$

$$\text{for, } C^B \rightarrow M^D = \frac{\sup(C^B \cup M^D)}{\sup(C^B)} = \frac{2}{2} = 1$$

## \* FP - Growth

1)

Item	TID
E K M N O Y	1
D E K N O Y	2
A E K M	3
C K M U Y	4
C E I K O	5

→ minimum support = 3

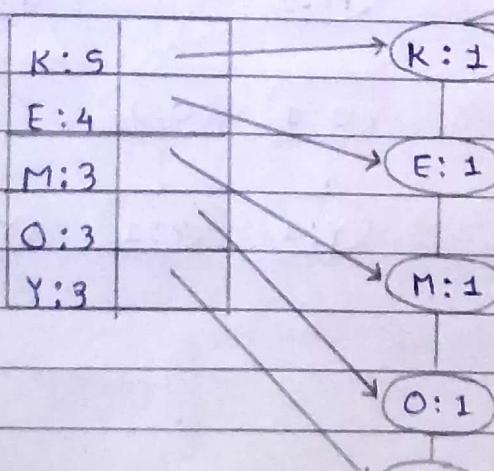
Item	Frequency
A	1 X
C	2 X
D	1 X
E	4
I	1 X
K	5
M	3
N	2 X
O	3
Y	3
U	1 X

K:5, E:4, M:3, O:3, Y:3

TID	Sorted Item
1	K E M O Y
2	K E O Y
3	K E M
4	K M Y
5	K E O

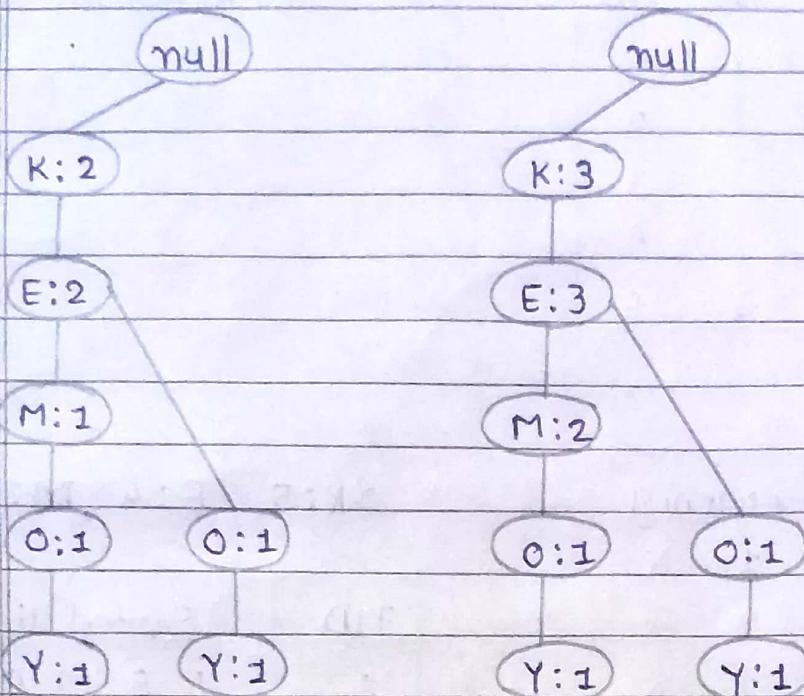
• K E M O Y

null



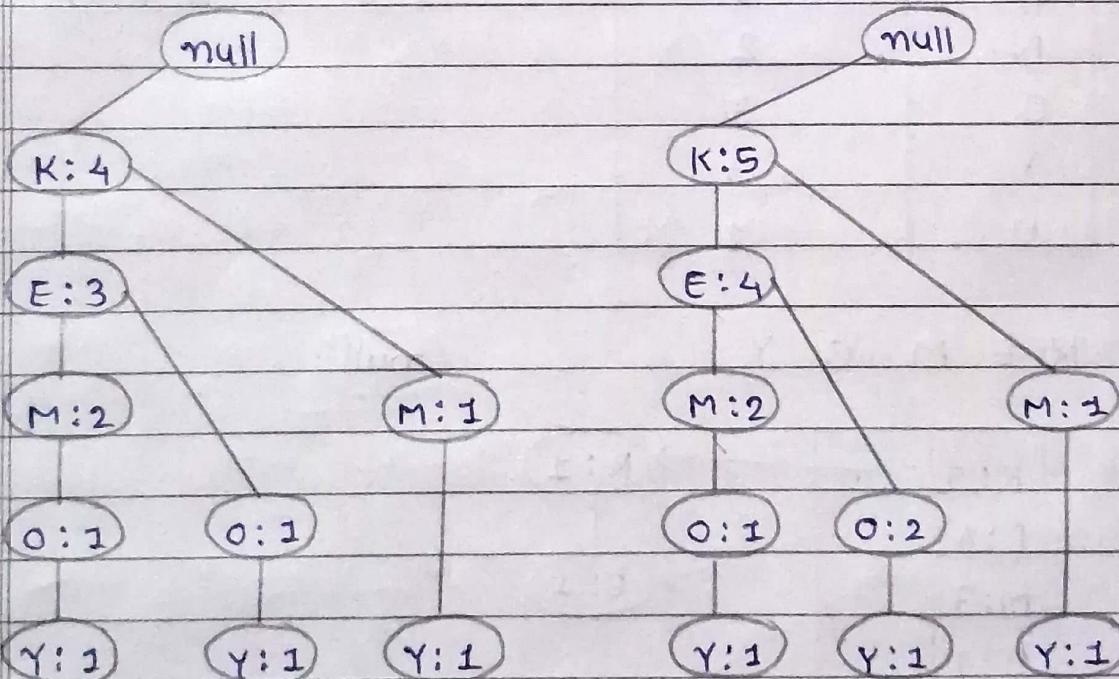
• K E O Y

• K E M



• K M Y

• K E O

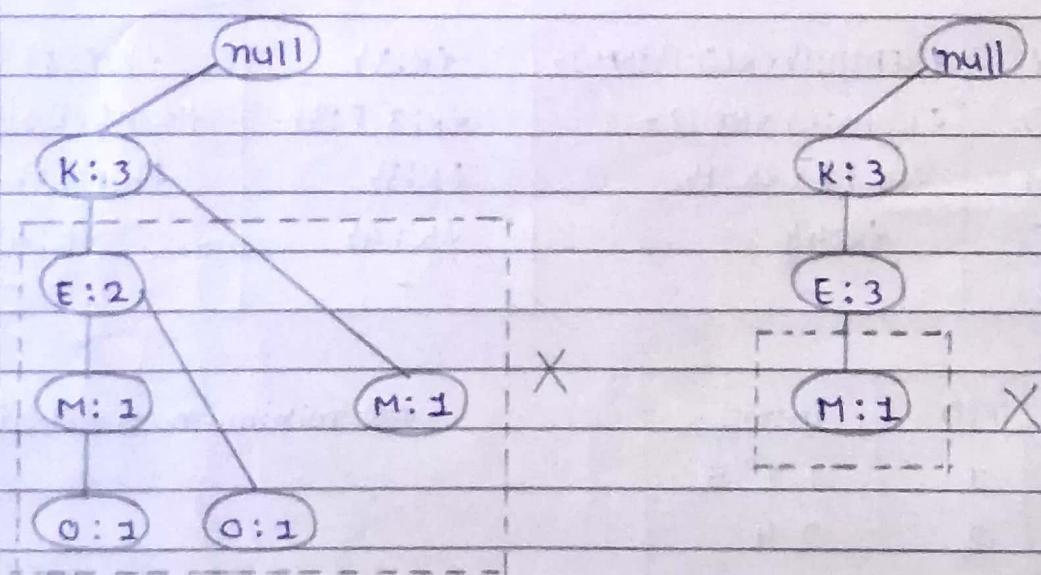


- Conditional Pattern Base

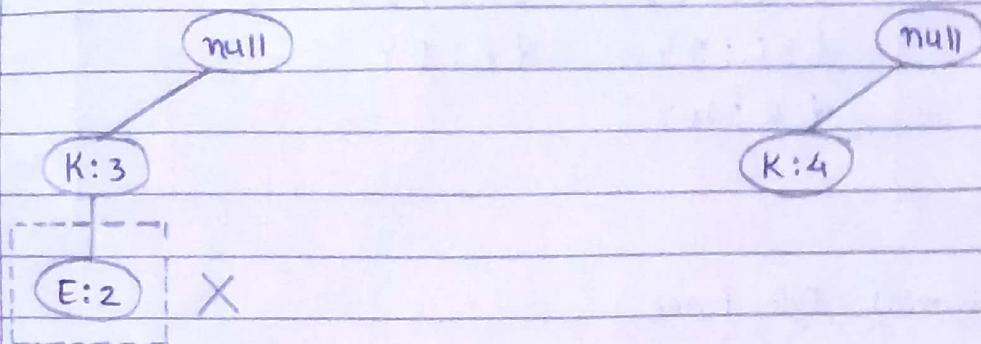
Item	Conditional Pattern Base
Y	{KEMO:1} {KEO:1} {KM:1}
O	{KEM:1} {KE:2}
M	{KE:2} {K:1}
E	{K:4}
K	-

- Conditional FP tree

Item	Conditional Pattern Base	Conditional FP-tree	Item	Conditional Pattern Base	Conditional FP-tree
Y	{KEMO:1} {KEO:1} {KM:1}	{K:3}	O	{KEM:1} {KE:2}	{K:3, E:3}



Item	Conditional Pattern Base	Conditional FP tree	Item	Conditional Pattern Base	Conditional FP tree
M	{K:E:2} {K:1}	{K:3}	E	{K:4}	{K:4}



- Conditional FP-tree & Frequent Patterns Generated

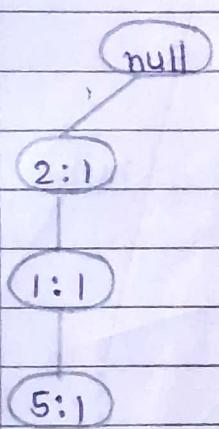
Item	Conditional Pattern Base	Conditional FP tree	Frequent Pattern Generated
Y	{KEM:0:1} {KEO:1} {KM:1}	{K:3}	{K,Y:3}
O	{KEM:1} {KE:2}	{K:3, E:3}	{K,O:3} {E,O:3} {K,E,O:3}
M	{KE:2} {K:1}	{K:3}	{K,M:3}
E	{K:4}	{K:4}	{K:4}
K	-	-	-

2)

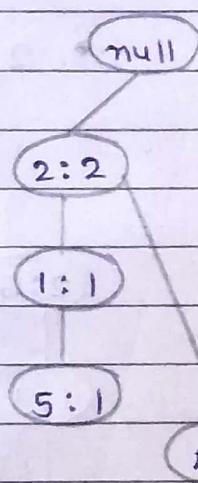
TID	Items	⇒ minimum support = 2
1	1 2 5	
2	2 4	
3	2 3	
4	1 2 4	
5	1 3	
6	2 3	
7	1 3	
8	1 2 3 5	
9	1 2 3	

Item	Frequency	TID	item Sorted
1	6	1	2 1 5
2	7	2	2 4
3	6	3	2 3
4	2	4	2 1 4
5	2	5	1 3
		6	2 3
		7	1 3
2:7, 1:6, 3:6		8	2 1 3 5
4:2, 5:2		9	2 1 3

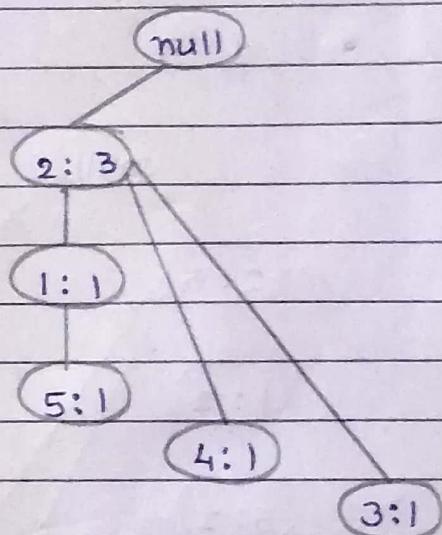
• 2 1 5



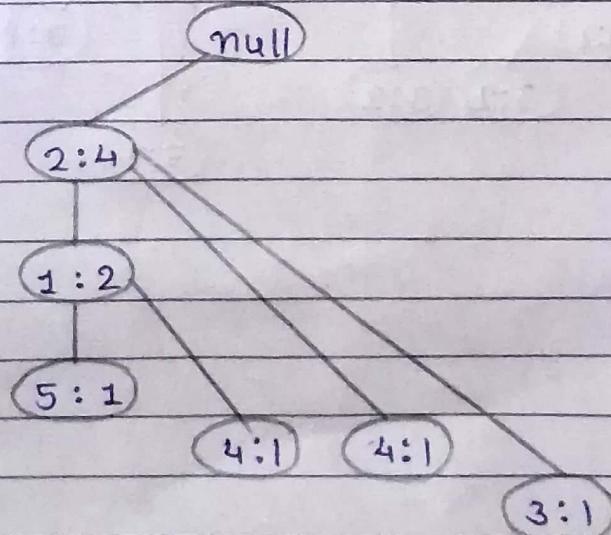
• 2 4



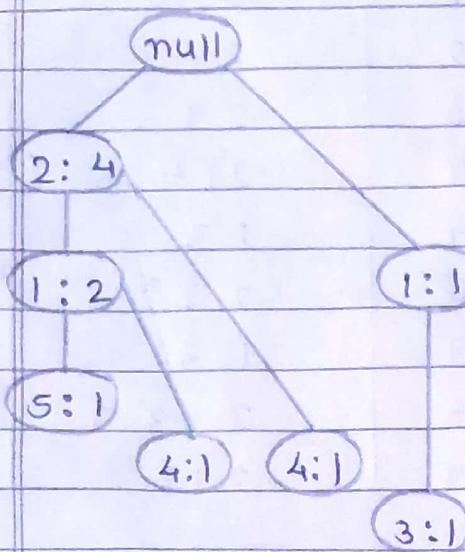
• 2 3



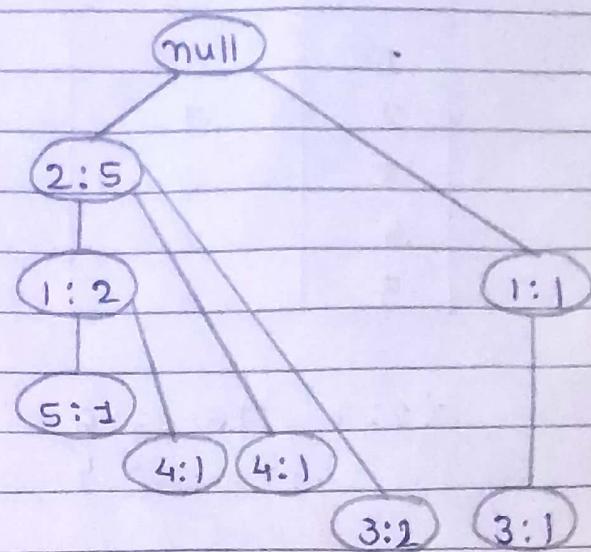
• 2 1 4



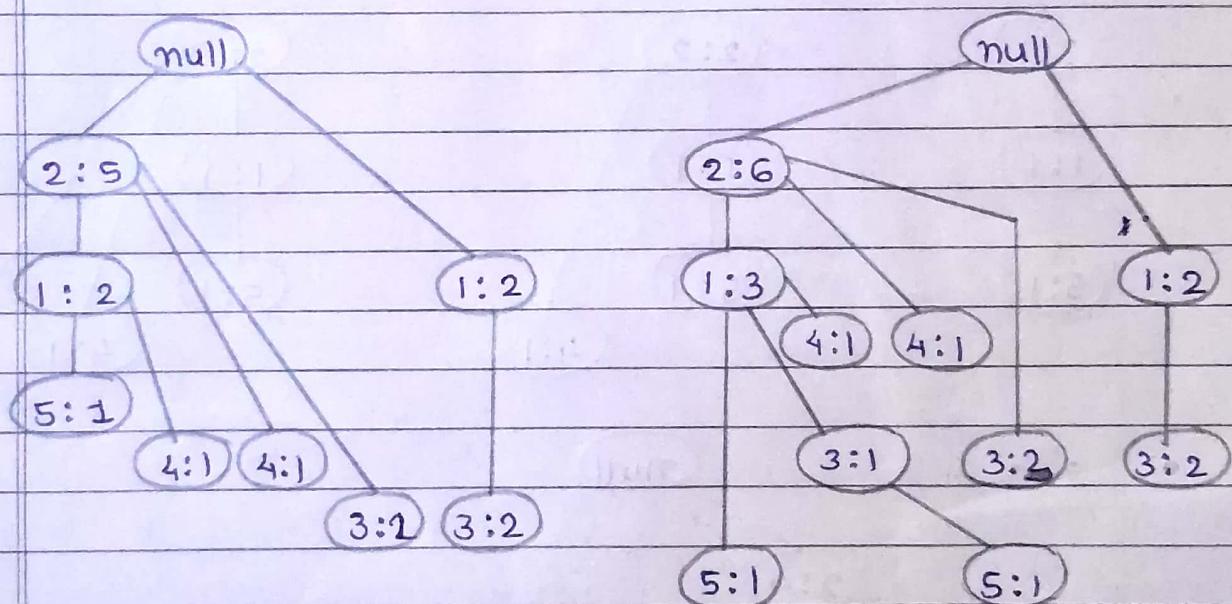
• 1 3



• 2 3

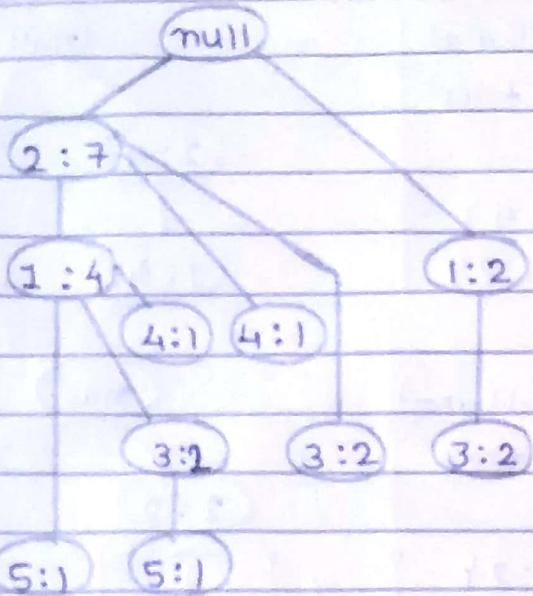


• 1 3



• 2 1 3 5

• 2 1 3

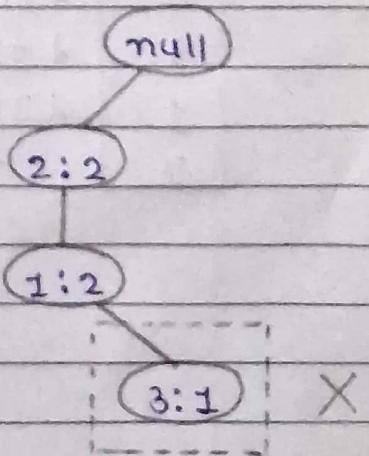


- Conditional Pattern Base

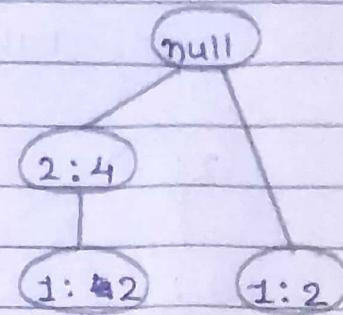
Item	Conditional Pattern Base
5	{21:5} {213:1}
3	{21:2} {2:2} {1:2}
4	{21:1} {2:1}
1	{2:4}
2	-

- Conditional FP tree

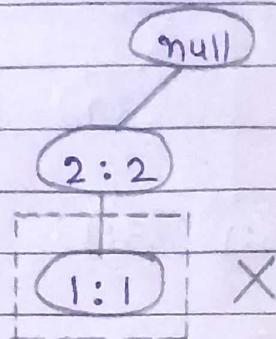
Item	Conditional Pattern Base	Conditional FP tree
5	{21:5} {213:1}	{2:2}



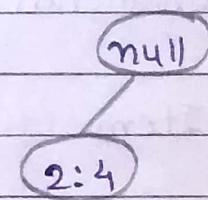
Item	Conditional Pattern Base	Conditional FP tree
3	{2:1:2} {2:2} {1:2}	{2:4} {1:2}



Item	Conditional Pattern Base	Conditional FP tree
4	{2:1:1} {2:1}	{2:2}



Item	Conditional Pattern Base	Conditional FP tree
1	{2:4}	{2:4}



- Conditional FP-tree & Frequent Patterns Generated

Item	Conditional Pattern Base	Conditional FP tree	Frequent Pattern Generated
5	{2:1:1} {2:13:1}	{2:2} {1:2}	{2,5:2} {1,5:2} {2,5:1}
3	{2:1:2} {2:2} {1:2}	{2:4} {1:2}	{2,3:4} {1,3:2} {2,1,3:2}
4	{2:1:1} {2:1}	{2:2}	{2,4:2}
1	{2:4}	{2:4}	{2,1:4}
2	-	-	-