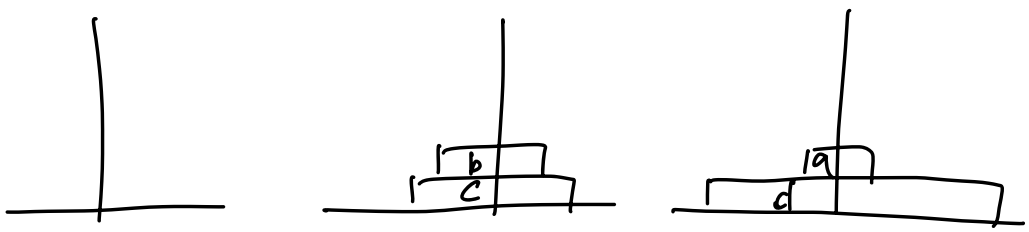
24-S1-Q1

Towers of Hanoi puzzle.



Q (a)(i) initiate state & goal state representation

(ii) require operators

(iii) search tree.

(b) ARM minsup = 25% minconf = 55%

FP-Growth all frequent itemsets

(i) Head-table & FP-Tre.

alphabetical order

(ii) show conditional pattern base

CFP for A.

(iii) justify {A, C} is fre. itemset.

Transaction ID	Items bought in code
1	A C H T
2	A H Y
3	B C H
4	B C
5	C Y
6	B C H M

Solution (a) (i) ① State Representations

represent each state in triple $(P_1\ P_2\ P_3)$

② Current state ((), (b, c), (a, d))

③ Goal state ((a, b, c, d), (), ())

(ii) ① Operators:

Move Disc X from Peg i to Peg j

preconditions (1) Peg i is not empty
and its top disc is X

(2) Either Peg j is empty,
or else the top disc
on Peg j is larger than X

② six possible forms

Move top disc from Peg 1 to Peg 2

Move top disc from Peg 1 to Peg 3

Move top disc from Peg 2 to Peg 1

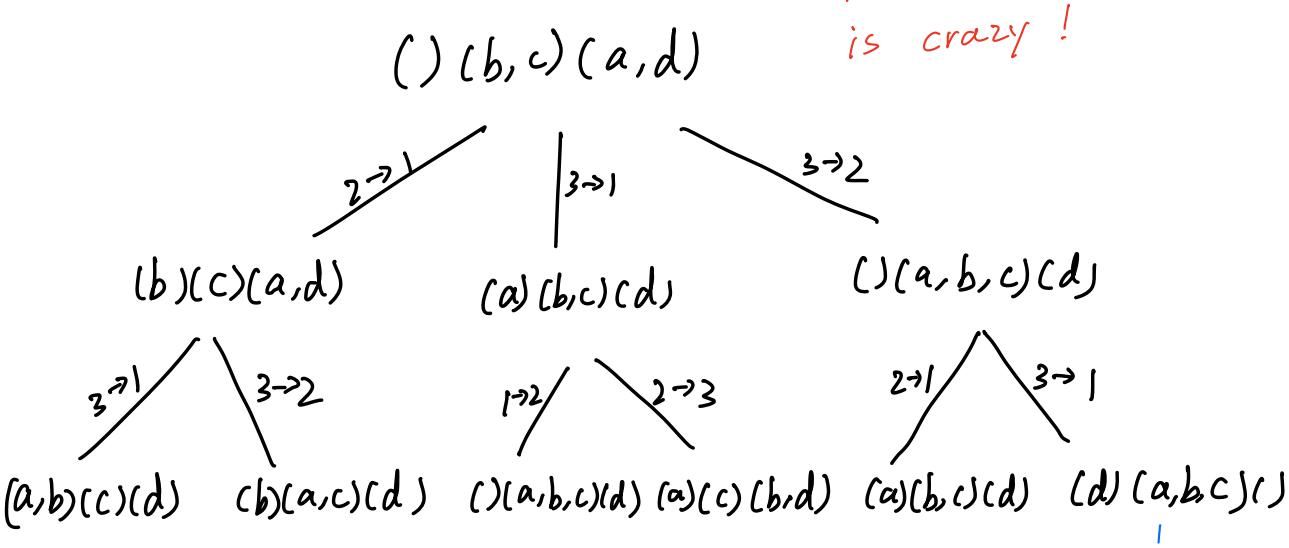
Move top disc from Peg 2 to Peg 3

Move top disc from Peg 3 to Peg 1

Move top disc from Peg 3 to Peg 2

(iii) Search - tree

complete search tree is crazy !



(a,d)(b,c)( )

(a,d)(c)(b)

(d)(a,c)(b)

(d)(c)(a,b)

(c,d)( )(a,b)

(c,d)(a)(b)

(b,c,d)(a)( )

(a,b,c,d)( )( )

Goal ✓

Solution (b) (i) ① minsup : $6 \times 25\% = 1.5 \approx 2$

minconf : $6 \times 55\% = 3.3 \approx 3$

②

Transaction ID	Items bought in Code
1	A C H T
2	A H Y
3	B C H
4	B C
5	C Y
6	B C H M

③ count

itemset	σ
A	2
B	3
C	5
H	4
M	1
T	1
Y	2

④ Remove M, T

itemset	σ
A	2
B	3
C	5
H	4
Y	2

⑤ Head Table

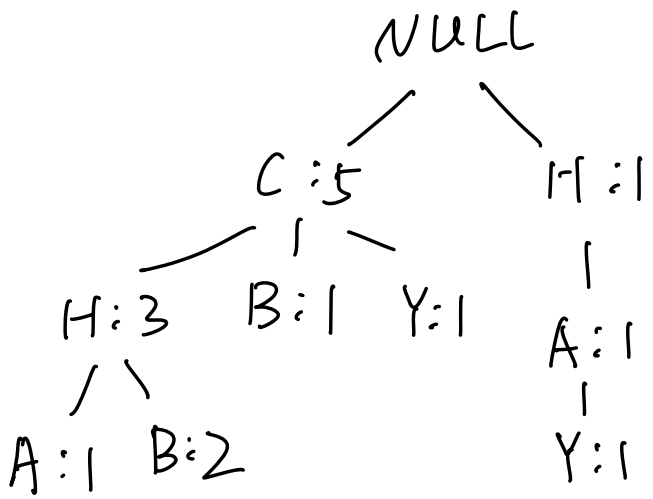
itemset	σ
C	5
H	4
B	3
A	2
Y	2

⑥ Sorted frequent list

frequent 1-itemset : {C=5} {H=4} {B=3} {A=2} {Y=2}

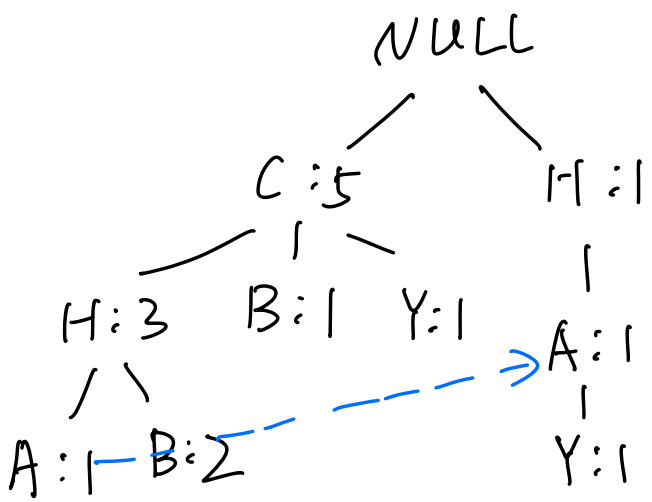
Transaction ID	Items bought in Code
1	C H A
2	H A Y
3	C H B
4	C B
5	C Y
6	C H B

① FP-Tree



(ii) ①

itemset	σ
C	5
H	4
B	3
A	2
Y	2



② conditional pattern base of A

{CH:1, H:1}

=> {C:1, H:2}

Sorted {H:2}

the Conditional Pattern Tree of A

{}
|
H:2

(iii)

① From the conditional patter base of {A} we see C appears only once alongside A

② Hence {A, C} has support count = 1
in the full data base, only TID 1 has both

③ Since 1 out of 6 transactions is below the 25% threshold

④ {A, C} is not frequent.