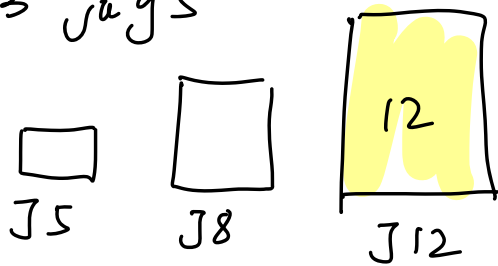
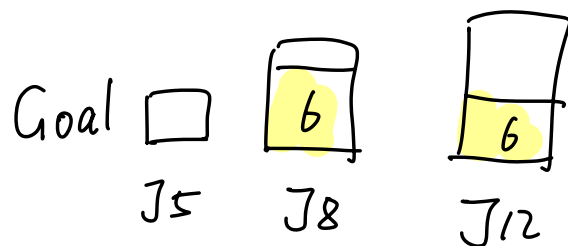


22-S1-Q1

(a) 3 jugs



(x, y, z)



(i) initial & Goal ?

(ii) operators

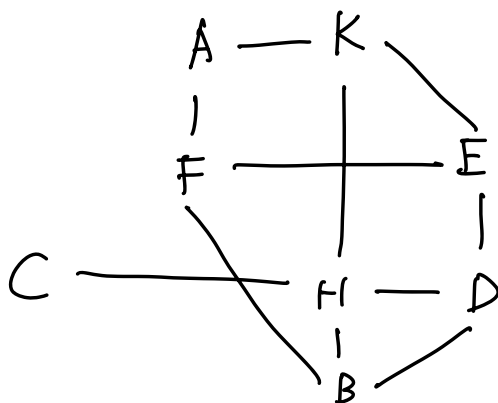
(iii) complete search tree

(b) DFS & BFS

$D \rightarrow A$ $\alpha\beta$ order

Open/Closed list.

explain. smaller ?



(c) ARM

(i) two main tasks in ARM

(ii) two key factor : FP-Growth faster than
Apriori

(iii) metrics

Solution(a)(i) ① initial $(0, 0, 12)$

② Goal $(0, 6, 6)$

(ii) ① operators : Transfer J_i 's contents into J_j

1: $J_5 \rightarrow J_8$

2: $J_5 \rightarrow J_{12}$

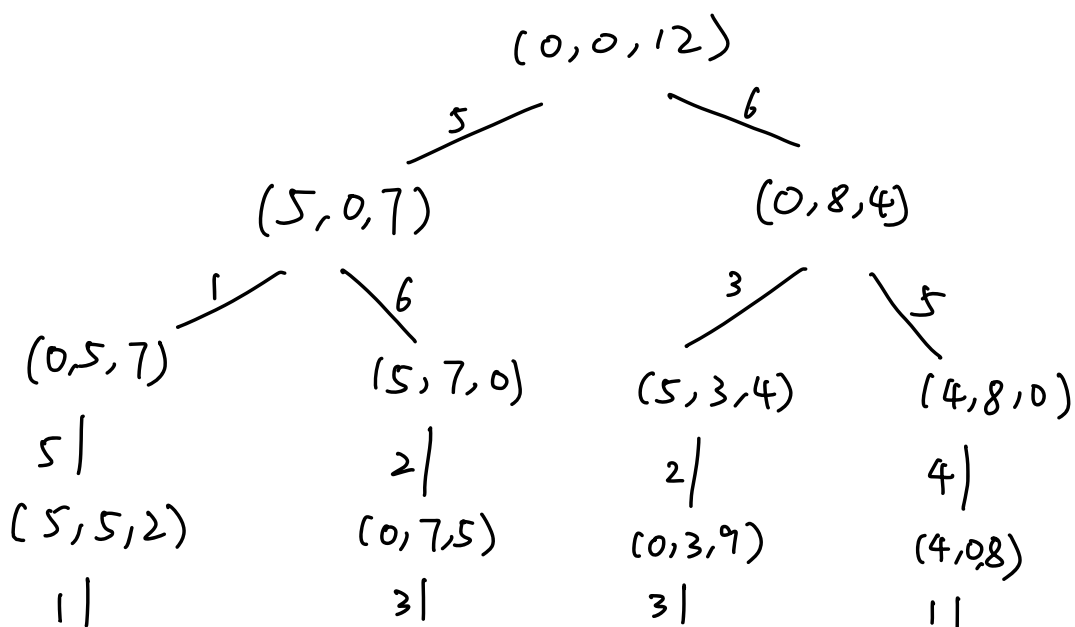
3: $J_8 \rightarrow J_5$

4: $J_8 \rightarrow J_{12}$

5: $J_{12} \rightarrow J_5$

6: $J_{12} \rightarrow J_8$

③ 5 8 12 $(0, 0, 12) \rightarrow (0, 6, 6)$



(2,8,2)

4 |

(2,0,10)

(5,2,5)

2 |

(0,2,10)

(3,0,9)

6 |

(3,8,1)

3 |

(5,6,1)

2 |

(0,6,6)

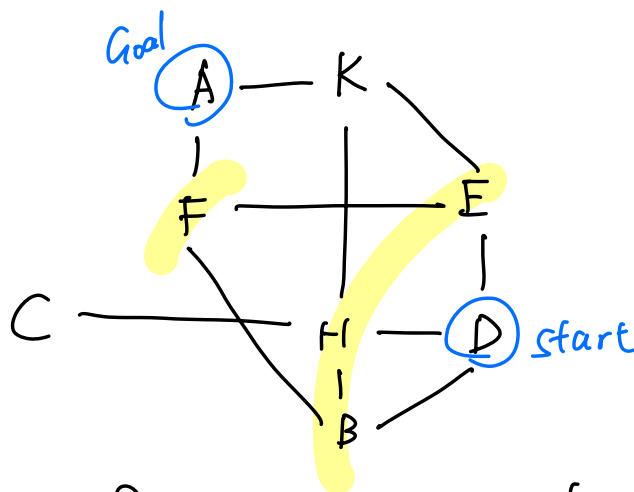
✓ achieve goal

(0,4,8)

5 |

(5,4,3)

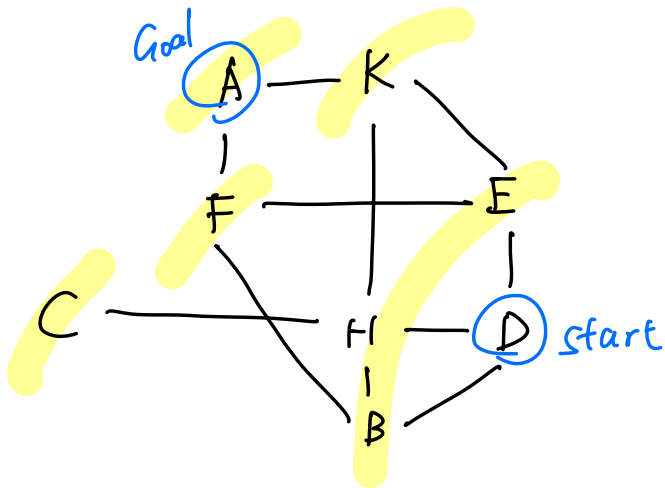
(b) ① depth - first search



Index	Open	Closed.
0	D	[]
1	B E H	D
2	F E H	B D
3	A E H	F B D

DFS use. 4 steps to find node A

② Breath First Search



Index	Open	Closed
0	D	[]
1	BEH	D
2.	EHF	BD
3	HFK	EBD
4	FKC	HEBD
5	KCA	FHEBD
6	CA	KFHEBD
7	A	CKFHEBD

BFS use 8 steps to find node A

③ Conclusion : In this graph, the DFS path to A is quite direct, so DFS ends up examining fewer nodes than BFS before finding the goal

(c) (i) ① Frequent itemsets Generation :

Find all the itemsets that satisfy the minsup threshold. These itemsets are called frequent itemsets

② Rule Generation

Extract all the high-confidence rules from the frequent itemsets. These rules are called Strong rules.

(ii) ① FP-Growth uses a highly compressed representation of the dataset called an FP-tree which avoid storing many duplicates

② It avoid the repeated, full-database scans

required by Apriori, Apriori typically scans once per candidate-itemset size, because it recursively mines conditional FP trees instead.

(iii) ① support : frequency of rule's itemset in the data

② confidence : conditional probability
$$\text{confidence}(X \rightarrow Y) = \frac{\text{support}(X \cup Y)}{\text{support}(X)}$$

③ lift :
$$\text{Lift}(X \rightarrow Y) = \frac{\text{confidence}(X \rightarrow Y)}{\text{support}(Y)}$$