

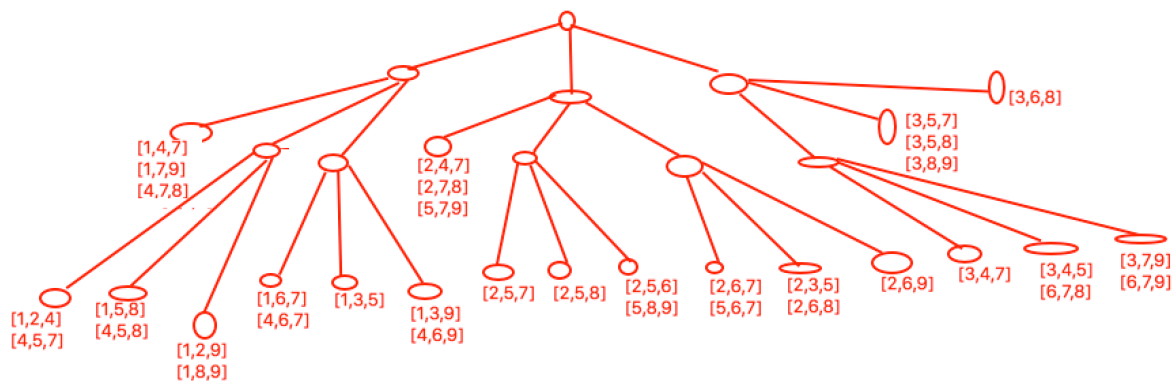
Q1

a .

1.the nested list of the hash tree hierarchically is :

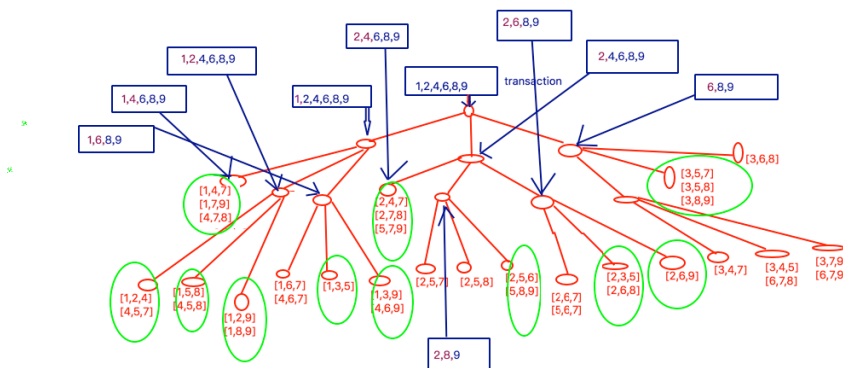
[[[[1,4,7], [1,7,9], [4,7,8]], [[[1,2,4], [4,5,7]], [[1,5,8], [4,5,8]], [[1,2,9], [1,8,9]]], [[[1,6,7], [4,6,7]], [1,3,5], [[1,3,9], [4,6,9]]]], [[[2,4,7], [2,7,8], [5,7,9]], [[2,5,7], [2,5,8], [[2,5,6], [5,8,9]]], [[[2,6,7], [5,6,7]], [[2,3,5], [2,6,8]], [2,6,9]]], [[[3,4,7], [[3,4,5], [6,7,8]], [[3,7,9], [6,7,9]]], [[3,5,7], [3,5,8], [3,8,9]], [3,6,8]]]

2.the hash tree is :



b .

there are **23** comparisons needed using the hash tree which I generate above. These candidates are in the green circles in the hash tree as following picture.



Q2

a.

all frequent itemsets with support ≥ 300 are:

"{'shopping bags'}"

"{'sausage'}"

"{'sausage', 'rolls/buns'}"

"{'pastry'}"

"{'whole milk', 'pastry'}"

"{'citrus fruit'}"

"{'whole milk', 'citrus fruit'}"

"{'bottled beer'}"

"{'newspapers'}"

"{'canned beer'}"

"{'pip fruit'}"

"{'fruit/vegetable juice'}"

"{'whipped/sour cream'}"

"{'whole milk', 'whipped/sour cream'}"

"{'brown bread'}"

"{'domestic eggs'}"

"{'frankfurter'}"

"{'margarine'}"

"{'coffee'}"

"{'pork'}"

"{'butter'}"

"{'curd'}"

"{'beef'}"

"{'napkins'}"
"{'chocolate'}"
"{'frozen vegetables'}"
"{'chicken'}"
"{'white bread'}"
"{'cream cheese '}"
"{'waffles'}"
"{'salty snack'}"
"{'long life bakery product'}"
"{'dessert'}"
"{'sugar'}"
"{'UHT-milk'}"
"{'berries'}"
"{'hamburger meat'}"
"{'hygiene articles'}"
"{'onions'}"
"{'whole milk'}"
"{'other vegetables'}"
"{'whole milk', 'other vegetables'}"
"{'rolls/buns'}"
"{'whole milk', 'rolls/buns'}"
"{'other vegetables', 'rolls/buns'}"
"{'soda'}"
"{'soda', 'whole milk'}"
"{'soda', 'rolls/buns'}"
"{'soda', 'other vegetables'}"
"{'yogurt'}"

"{'whole milk', 'yogurt'}"
 "{'yogurt', 'other vegetables'}"
 "{'yogurt', 'rolls/buns'}"
 "{'bottled water'}"
 "{'whole milk', 'bottled water'}"
 "{'root vegetables'}"
 "{'root vegetables', 'whole milk'}"
 "{'root vegetables', 'other vegetables'}"
 "{'tropical fruit'}"
 "{'whole milk', 'tropical fruit'}"
 "{'tropical fruit', 'other vegetables'}"

b.

the answer is

['Null Set 1', ['other vegetables 243', ['whole milk 557', ['other vegetables 176']]]]

['Null Set 1', [['rolls/buns 290', ['other vegetables 54']], ['whole milk 394', ['other vegetables 94',
 ['rolls/buns 87', ['other vegetables 43']]]], 'other vegetables 131']]

['Null Set 1', [['whole milk 551', [['other vegetables 219', ['rolls/buns 59']], 'rolls/buns 94']],
 'rolls/buns 131', ['other vegetables 208', ['rolls/buns 54']]]]

['Null Set 1', ['other vegetables 238', ['whole milk 481', ['other vegetables 228']]]]

['Null Set 1', ['other vegetables 185', ['whole milk 416', ['other vegetables 168']]]]