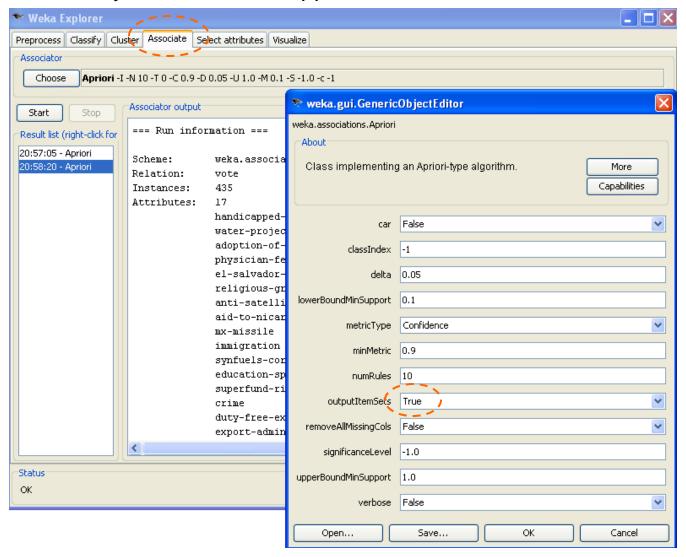**Q1:**
Using the default setting, list the 10 best rules generated with their corresponding support and confidence. List 5 itemsets of sizes 1 through 4, which satisfy the minimum support.

Best rules found:

 1. adoption-of-the-budget-resolution=y physician-fee-freeze=n 219 ==> Class=democrat 219   conf:(1)
 2. adoption-of-the-budget-resolution=y physician-fee-freeze=n aid-to-nicaraguan-contras=y 198 ==> Class=democrat 198   conf:(1)
 3. physician-fee-freeze=n aid-to-nicaraguan-contras=y 211 ==> Class=democrat 210   conf:(1)
 4. physician-fee-freeze=n education-spending=n 202 ==> Class=democrat 201   conf:(1)
 5. physician-fee-freeze=n 247 ==> Class=democrat 245   conf:(0.99)
 6. el-salvador-aid=n Class=democrat 200 ==> aid-to-nicaraguan-contras=y 197   conf:(0.99)
 7. el-salvador-aid=n 208 ==> aid-to-nicaraguan-contras=y 204   conf:(0.98)
 8. adoption-of-the-budget-resolution=y aid-to-nicaraguan-contras=y Class=democrat 203 ==> physician-fee-freeze=n 198   conf:(0.98)
 9. el-salvador-aid=n aid-to-nicaraguan-contras=y 204 ==> Class=democrat 197   conf:(0.97)
10. aid-to-nicaraguan-contras=y Class=democrat 218 ==> physician-fee-freeze=n 210   conf:(0.96)

Minimum support: 0.45 (196 instances)

size 1

```
Size of set of large itemsets L(1): 20

Large Itemsets L(1):
handicapped-infants=n 236
adoption-of-the-budget-resolution=y 253
physician-fee-freeze=n 247
el-salvador-aid=n 208
el-salvador-aid=y 212
religious-groups-in-schools=y 272
anti-satellite-test-ban=y 239
aid-to-nicaraguan-contras=y 242
mx-missile=n 206
mx-missile=y 207
immigration=n 212
immigration=y 216
synfuels-corporation-cutback=n 264
education-spending=n 233
superfund-right-to-sue=n 201
superfund-right-to-sue=y 209
crime=y 248
duty-free-exports=n 233
export-administration-act-south-africa=y 269
Class=democrat 267
```

size 2

```
Size of set of large itemsets L(2): 17

Large Itemsets L(2):
adoption-of-the-budget-resolution=y physician-fee-freeze=n 219
adoption-of-the-budget-resolution=y anti-satellite-test-ban=y 201
adoption-of-the-budget-resolution=y aid-to-nicaraguan-contras=y 215
adoption-of-the-budget-resolution=y education-spending=n 201
adoption-of-the-budget-resolution=y Class=democrat 231
physician-fee-freeze=n anti-satellite-test-ban=y 197
physician-fee-freeze=n aid-to-nicaraguan-contras=y 211
physician-fee-freeze=n education-spending=n 202
physician-fee-freeze=n Class=democrat 245
el-salvador-aid=n aid-to-nicaraguan-contras=y 204
el-salvador-aid=n Class=democrat 200
el-salvador-aid=y religious-groups-in-schools=y 197
religious-groups-in-schools=y crime=y 214
anti-satellite-test-ban=y aid-to-nicaraguan-contras=y 210
anti-satellite-test-ban=y Class=democrat 200
aid-to-nicaraguan-contras=y Class=democrat 218
education-spending=n Class=democrat 213
```

size 3

```
Size of set of large itemsets L(3): 6

Large Itemsets L(3):
adoption-of-the-budget-resolution=y physician-fee-freeze=n aid-to-nicaraguan-contras=y 198
adoption-of-the-budget-resolution=y physician-fee-freeze=n Class=democrat 219
adoption-of-the-budget-resolution=y aid-to-nicaraguan-contras=y Class=democrat 203
physician-fee-freeze=n aid-to-nicaraguan-contras=y Class=democrat 210
physician-fee-freeze=n education-spending=n Class=democrat 201
el-salvador-aid=n aid-to-nicaraguan-contras=y Class=democrat 197
```

size 4

```
Size of set of large itemsets L(4): 1

Large Itemsets L(4):
adoption-of-the-budget-resolution=y physician-fee-freeze=n aid-to-nicaraguan-contras=y Class=democrat 198
```
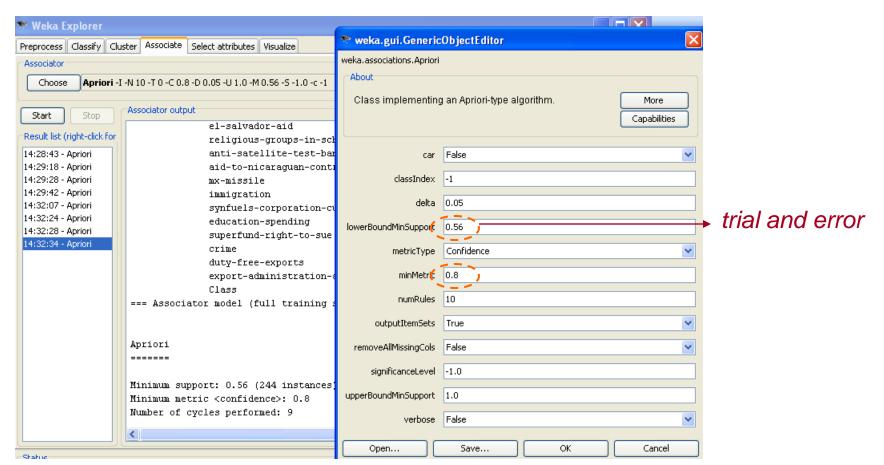
Q2:

Determine the highest possible support to generate non-empty itemsets. List the corresponding 10 best rules generated with minimum confidence .80 and a sample of the generated itemsetsof sizes 1 through 4.

Assumption:

1. At least itemsets of size 1 and size 2

2. At most 10 best rules

trial and error

```
Apriori
=======


Minimum support: 0.56 (244 instances)
Minimum metric <confidence>: 0.8
Number of cycles performed: 9


Generated sets of large itemsets:


Size of set of large itemsets L(1): 7


Large Itemsets L(1):
adoption-of-the-budget-resolution=y 253
physician-fee-freeze=n 247
religious-groups-in-schools=y 272
synfuels-corporation-cutback=n 264
crime=y 248
export-administration-act-south-africa=y 269
Class=democrat 267

Size of set of large itemsets L(2): 1

Large Itemsets L(2):
physician-fee-freeze=n Class=democrat 245

Best rules found:

 1. physician-fee-freeze=n 247 ==> Class=democrat 245       conf:(0.99)
 2. Class=democrat 267 ==> physician-fee-freeze=n 245        conf:(0.92)
```

size 1

size 2

Other possible answer

```
Minimum support: 0.52 (226 instances)
Minimum metric <confidence>: 0.8
Number of cycles performed: 10


Generated sets of large itemsets:


Size of set of large itemsets L(1): 12


Large Itemsets L(1):
handicapped-infants=n 236
adoption-of-the-budget-resolution=y 253
physician-fee-freeze=n 247
religious-groups-in-schools=y 272
anti-satellite-test-ban=y 239
aid-to-nicaraguan-contras=y 242
synfuels-corporation-cutback=n 264
education-spending=n 233
crime=y 248
duty-free-exports=n 233
export-administration-act-south-africa=y 269
Class=democrat 267


Size of set of large itemsets L(2): 2


Large Itemsets L(2):
adoption-of-the-budget-resolution=y Class=democrat 231
physician-fee-freeze=n Class=democrat 245


Best rules found:

 1. physician-fee-freeze=n 247 ==> Class=democrat 245      conf:(0.99)
 2. Class=democrat 267 ==> physician-fee-freeze=n 245      conf:(0.92)
 3. adoption-of-the-budget-resolution=y 253 ==> Class=democrat 231      conf:(0.91)
 4. Class=democrat 267 ==> adoption-of-the-budget-resolution=y 231      conf:(0.87)
```