Q1

Eggs – 80

Milk -- 40

Sugar – 15

Eggs milk sugar – 10

Eggs, milk – 20

Egg and sugar – 15

Milk, sugar – 10

Egg $\rightarrow$ milk. support = 0.2 = #(lhs+rhs)/#total = 20/#Total.

Hence #Total = 20/0.2

Egg, milk $\rightarrow$ sugar

Support = #(lhs+rhs)/#total = 10/100 = **0.1**

Confidence = #LHS&RHS/#LHS = 10/20 = **0.5**

Lift = confidence/benchmark confidence.

Benchmark confidence = #RHS/#Total = 15/100

Lift = 0.5 * (100/15) = **3.33**

Q2

Best rules found:

1. income=43759_max 80 ==> save_act=YES 80   conf:(1)

2. age=52_max income=43759_max 76 ==> save_act=YES 76   conf:(1)

3. income=43759_max current_act=YES 63 ==> save_act=YES 63   conf:(1)

4. age=52_max income=43759_max current_act=YES 61 ==> save_act=YES 61   conf:(1)

5. children=0 save_act=YES mortgage=NO pep=NO 74 ==> married=YES 73   conf:(0.99)

6. sex=FEMALE children=0 mortgage=NO pep=NO 64 ==> married=YES 63   conf:(0.98)

7. children=0 current_act=YES mortgage=NO pep=NO 82 ==> married=YES 80   conf:(0.98)

8. children=0 mortgage=NO pep=NO 107 ==> married=YES 104   conf:(0.97)

9. income=43759_max current_act=YES 63 ==> age=52_max 61   conf:(0.97)

10. income=43759_m   1 conf:(0.97)

11. income=43759_max current_act=YES 63 ==> age=52_max save_act=YES 61   conf:(0.97)

12. children=0 car=NO mortgage=NO pep=NO 62 ==> married

13. age=0_34 married=YES car=NO 69 ==> income=0_24386 66   conf:(0.96)

14. income=43759_max 80 ==> age=52_max 76   conf:(0.95)

15. income=43759_max save_act=YES 80 ==> age=52_max 76   conf:(0.95)

16. income=43759_max 80 ==> age=52_max save_act=YES 76   conf:(0.95)

17. age=0_34 car=NO mortgage=NO 68 ==> income=0_24386 64   conf:(0.94)

18. age=0_34 region=INNER_CITY married=YES 64 ==> income=0_24386 60   conf:(0.94)

19. age=0_34 car=NO save_act=YES 64 ==> income=0_24386 60   conf:(0.94)

20. age=0_34 save_act=YES current_act=YES pep=NO 64 ==> income=0_24386 60   conf:(0.94)

21. age=0_34 car=NO 107 ==> income=0_24386 100   conf:(0.93)

22. age=0_34 car=NO current_act=YES 86 ==> income=0_24386 80   conf:(0.93)

23. age=0_34 current_act=YES mortgage=NO 95 ==> income=0_24386 88   conf:(0.93)

24. age=0_34 married=YES current_act=YES mortgage=NO 67 ==> income=0_24386 62   conf:(0.93)

25. age=0_34 car=NO pep=NO 66 ==> income=0_24386 61   conf:(0.92)

26. age=0_34 married=YES current_act=YES pep=NO 66 ==> income=0_24386 61   conf:(0.92)

27. married=YES children=0 save_act=YES current_act=YES 87 ==> pep=NO 80   conf:(0.92)

28. age=0_34 current_act=YES pep=NO 95 ==> income=0_24386 87   conf:(0.92)

29. age=0_34 save_act=YES pep=NO 82 ==> income=0_24386 75   conf:(0.91)

30. age=0_34 children=0 81 ==> income=0_24386 74   conf:(0.91)

31. married=YES children=0 save_act=YES mortgage=NO 80 ==> pep=NO 73   conf:(0.91)

32. married=YES children=0 current_act=YES mortgage=NO 88 ==> pep=NO 80   conf:(0.91)

33. age=0_34 married=YES current_act=YES 99 ==> income=0_24386 89   conf:(0.91)

34. age=0_34 sex=FEMALE current_act=YES 75 ==> income=0_24386 68   conf:(0.91)

35. age=0_34 save_ac   f:(0.91)

36. age=0_34 mortgage=NO 125 ==> income=0_24386 113   conf:(0.9)

37. age=0_34 current_act=YES 103 ==> income=0_24386

38. age=0_34 sex=MALE 102 ==> income=0_24386 92   conf:(0.9)

39. age=0_34 save_act=YES mortgage=NO 80 ==> income=0_24386 72   conf:(0.9)

40. age=0_34 mortgage=NO pep=NO 80 ==> income=0_24386 72   conf:(0.9)

41. sex=FEMALE married=YES children=0 mortgage=NO 70 ==> pep=NO 63   conf:(0.9)

42. married=YES children=0 save_act=YES 119 ==> pep=NO 107   conf:(0.9)

43. age=0_34 married=YES mortgage=NO 89 ==> income=0_24386 80   conf:(0.9)

44. age=0_34 married=YES pep=NO 88 ==> income=0_24386 79   conf:(0.9)

45. age=0_34 sex=MALE current_act=YES 78 ==> income=0_24386 70   conf:(0.9)

46. age=0_34 region=INNER_CITY 97 ==> income=0_24386 87   conf:(0.9)

47. married=YES children=0 mortgage=NO 116 ==> pep=NO 104   conf:(0.9)

48. age=0_34 married=NO 67 ==> income=0_24386 60   conf:(0.9)

49. married=YES children=0 car=NO mortgage=NO 67 ==> pep=NO 60   conf:(0.9)

50. age=0_34 pep=NO 124 ==> income=0_24386 111   conf:(0.9)

51. age=0_34 save_act=NO 76 ==> income=0_24386 68   conf:(0.89)

52. age=0_34 region=INNER_CITY current_act=YES 76 ==> income=0_24386 68   conf:(0.89)

53. age=0_34 195 ==> income=0_24386 174   conf:(0.89)

54. age=0_34 save_act=YES 119 ==> income=0_24386 106   conf:(0.89)

55. age=0_34 married=YES 128 ==> income=0_24386 114   conf:(0.89)

56. age=0_34 pep=YES 71 ==> income=0_24386 63   conf:(0.89)

57. age=0_34 married=YES save_act=YES 77 ==> income=0_24386 68   conf:(0.88)

58. age=52_max married=YES car=YES 68 ==> save_act=YES 60   conf:(0.88)

59. age=0_34 sex=FEMALE 93 ==> income=0_24386 82   conf:(0.88)

60. children=0 car=NO

61. region=INNER_CITY children=0 pep=NO 73 ==> married=YES 64   conf:(0.88)

62. age=0_34 mortgage=YES 70 ==> income=0_24386 61   conf:(0.87)

63. children=0 car=NO current_act=YES pep=NO 69 ==> married=YES 60   conf:(0.87)

64. sex=FEMALE children=0 pep=NO 90 ==> married=YES 78   conf:(0.87)

65. car=NO mortgage=NO pep=YES 89 ==> current_act=YES 77   conf:(0.87)

66. children=1 save_act=YES current_act=YES 73 ==> pep=YES 63   conf:(0.86)

67. sex=FEMALE children=0 current_act=YES pep=NO 70 ==> married=YES 60   conf:(0.86)

68. car=YES save_act=YES mortgage=NO pep=NO 74 ==> married=YES 63   conf:(0.85)

69. region=INNER_CITY current_act=YES mortgage=NO pep=NO 78 ==> married=YES 66   conf:(0.85)

70. children=1 mortgage=NO 84 ==> pep=YES 71   conf:(0.85)

71. save_act=YES mortgage=NO pep=NO 142 ==> married=YES 120   conf:(0.85)

72. income=0_24386 children=0 pep=NO 71 ==> married=YES 60   conf:(0.85)

73. sex=FEMALE married=YES children=0 current_act=YES 71 ==> pep=NO 60   conf:(0.85)

74. children=0 pep=NO 167 ==> married=YES 141   conf:(0.84)

75. age=52_max pep=NO 83 ==> save_act=YES 70   conf:(0.84)

76. save_act=YES current_act=YES mortgage=NO pep=NO 108 ==> married=YES 91   conf:(0.84)

77. children=1 save_act=YES 95 ==> pep=YES 80   conf:(0.84)

78. children=0 car=YES pep=NO 76 ==> save_act=YES 64   conf:(0.84)

79. age=0_34 car=YES 88 ==> income=0_24386 74   conf:(0.84)

80. age=52_max sex=MALE 80 ==> save_act=YES 67   conf:(0.84)

81. region=INNER_CITY children=0 pep=NO 73 ==> current_act=YES 61   conf:(0.84)

82. region=INNER_CITY mortgage=NO pep=NO 96 ==> married=YES 80   conf:(0.83)

83. married=NO car=NO save_act=YES 72 ==> current_act=YES 60   conf:(0.83)

84. children=1 current_act=YES 101 ==> pep=YES 84   conf:(0.83)

85. married=YES childr

86. sex=FEMALE region=INNER_CITY pep=NO 77 ==> current_act=YES 64   conf:(0.83)

87. married=NO save_act=YES pep=YES 77 ==> current_a

88. married=NO save_act=YES pep=YES 77 ==> mortgage=NO 64   conf:(0.83)

89. sex=FEMALE save_act=YES mortgage=NO pep=NO 77 ==> married=YES 64   conf:(0.83)

90. sex=FEMALE married=YES children=0 94 ==> pep=NO 78   conf:(0.83)

91. sex=MALE mortgage=NO pep=NO 94 ==> married=YES 78   conf:(0.83)

92. age=0_34 sex=FEMALE income=0_24386 82 ==> current_act=YES 68   conf:(0.83)

93. income=24387_43758 mortgage=NO pep=NO 76 ==> married=YES 63   conf:(0.83)

94. age=52_max married=YES 128 ==> save_act=YES 106   conf:(0.83)

95. children=0 current_act=YES pep=NO 127 ==> married=YES 105   conf:(0.83)

96. sex=FEMALE region=INNER_CITY save_act=YES 86 ==> current_act=YES 71   conf:(0.83)

97. current_act=YES mortgage=YES pep=NO 86 ==> save_act=YES 71   conf:(0.83)

98. region=INNER_CITY married=YES mortgage=NO pep=NO 80 ==> current_act=YES 66   conf:(0.83)

99. married=NO save_act=YES 137 ==> current_act=YES 113   conf:(0.82)

100. region=INNER_CITY children=0 save_act=YES 74 ==> current_act=YES 61   conf:(0.82)

1) Rules where RHS is PEP=YES
   66. children=1 save_act=YES current_act=YES 73 ==> pep=YES 63   conf:(0.86)
   70. children=1 mortgage=NO 84 ==> pep=YES 71   conf:(0.85)
   77. children=1 save_act=YES 95 ==> pep=YES 80   conf:(0.84)
   84. children=1 current_act=YES 101 ==> pep=YES 84   conf:(0.83)
   85. married=YES children=1 89 ==> pep=YES 74   conf:(0.83)

   The types of customers that are likely to buy the personal equity plan are indicated on the LHS
   of each rule. So for example, rule 66 tells us that customers with 1 child, and a savings account
   and a current account are likely to buy pep.

Rules where RHS = pep=NO

27. married=YES childr   conf:(0.92)

31. married=YES childr   onf:(0.91)

32. married=YES children=0 current_act=YES mortgage=   nf:(0.91)

41. sex=FEMALE married=YES children=0 mortgage=NO 7   0.9)

42. married=YES children=0 save_act=YES 119 ==> pep=NO 107   conf:(0.9)

47. married=YES children=0 mortgage=NO 116 ==> pep=NO 104   conf:(0.9)

49. married=YES children=0 car=NO mortgage=NO 67 ==> pep=NO 60   conf:(0.9)

These rules can be similarly used to identify customer types who are not likely to buy the personal
equity plan.

2) Identify 2 rules and explain why they are interesting. This is an open-ended question. You can
   pick any 2 rules as long as they can explain what are the implications of the rule and how it can
   be useful.