Problem set 1 Question 1a)

P(A) = 0.1

P(B) = 0.4

P(C|A) = 0.5

P(C|B) = 0.2

P(C|A,B) = 1

To find P(A|C) = P(A) P(C|A)/P(C) we need to find P(C).

Using A’ to mean “Not A” etc. :

P(C) = P(C|A,B)P(A,B) + P(C|A,B’)P(A,B’) + P(C|A’,B)P(A’,B) + P(C|A’,B’)P(A’,B’)

We know P(C|A,B) = 1 and P(C|A’,B’) = 0.

Need P(C|A,B’)

We know P(C|A) = 0.5.

P(C|A) = P(C|A,B)P(A,B|A) + P(C|A,B’)P(A,B’|A)

0.5 = 1.P(B) + P(C|A,B’)P(B’)

0.5 = 0.4 + 0.6.P(C|A,B’)

so P(C|A,B’) = 1/6

Similarly

P(C|B) = P(A) + P(C|B,A’)P(A’)

0.2 = 0.1 + 0.9P(C|B,A’)

so P(C|A’,B) = 1/9

Finally

P(C) = P(A,B) + 1/6 P(A,B’) + 1/9 P(A’,B)

= 0.04 + (0.1)(0.6)/6 + (0.9)(0.4)/9

=0.04 + 0.01 + 0.04

= 0.09

Therefore P(A|C) = P(A) P(C|A)/P(C)

= 0.1\*0.5/0.09

= 5/9

b) P(B|C) = P(B) P(C|B)/P(C) = 0.4\*0.2/0.09 = 8/9

e) P(A’,B|C) = P(C|A’,B) P(A’,B)/P(C) = (1/6) \* 0.36/0.09 = 2/3