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Elements of Artificial Intelligence
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Programming Assignment - 2

1) **Query – 1 & 2**
   [<a,f>|[b,j]
   Result – 1: Burglary

Number of samples	Prior sampling	Rejection	Likelihood weight
10	[0.0, 1.0],	[0.0, 1.0],	[0.000662910175671196 5, 0.9993370898243288],
50	[0.0, 1.0],	[0.0, 1.0],	[0.0, 1.0],
100	[0.0, 1.0],	[0.0, 1.0],	[0.0, 1.0],
200	[0.0, 1.0],	[0.0, 1.0],	[0.0, 1.0],
500	[0.00020080321285140 56, 0.9997991967871485],	[0.00020080321285140 56, 0.9997991967871485],	[0.000132667642974575 76, 0.9998673323570253],
1000	[0.0, 1.0],	[0.0, 1.0],	[3.0077444815211222e-05, 0.9999699225551849],
10000	[2.0049120395214178e-05, 0.9999799508796048]	[4.012439649520032e-05, 0.9999598756035049],	[[5.774618350509051e-05, 0.9999422538164948],
Enumeration(Exact)	[6.013131697154251e-05, 0.9999398686830285]		

Note: Since we have tabulated average of probabilities over 10 samples, the sum of probability distribution may not be equal to 1. For eg: if the probability outcome is [0,1] in 3 samples and [0,0] in 7 samples then the average over 10 outcome is [0,0.3]. This is issue due to averaging rather than probability calculation.

Result -2: JohnCalls. First item in every cell corresponds to true and second to false. All values are computed based on average of samples. So, it may not sum up to 1.

Number of samples	Prior sampling	Rejection	Likelihood weight
10	[0.07, 0.93]	[0.030000000000000006, 0.97]	[0.04000000000000001, 0.96]
50	[0.04016496598639456, 0.9598350340136055]	[0.048, 0.9519999999999997]	[0.0540698334709329, 0.9459301665290673]
100	[0.043, 0.9570000000000001]	[0.05599999999999999 4, 0.944]	[0.05707143794848977, 0.9429285620515102]
200	[0.06217656464138876 5, 0.9378234353586112]	[0.05075255449683426 7, 0.9492474455031656]	[0.03908671441332812, 0.9609132855866719]
500	[0.05297712722642119, 0.9470228727735789]	[0.04953653995019849, 0.9504634600498013]	[0.04782216539328519 6, 0.9521778346067146]
1000	[0.04930724672355312, 0.9506927532764469]	[0.04841948390036923, 0.9515805160996307]	[0.05079414303858361, 0.9492058569614163]
10000	[0.04959968837642067 5, 0.9504003116235793]	[0.04976549567713638, 0.9502345043228635]	[,[0.0502793794664713 6, 0.9497206205335287]
Enumeration(Exact)	[0.049999999999999996, 0.95]		

2) **Query – 3 & 4**
[<j,t><e,f>][b,m]
Result: Burglary. First item in every cell corresponds to true and second to false. All values are computed based on average of samples. So, it may not sum up to 1.

Number of samples	Prior sampling	Rejection	Likelihood weight
10	[0.0, 0.3],	[0.1, 0.4]	[0.0, 1.0]
50	[0.08333333333333333, 0.7166666666666666],	[0.0, 1.0]	[0.0, 1.0]
100	[0.016666666666666666, 0.9833333333333334]	[0.0, 1.0]	[0.015384615384615372, 0.9846153846153847],
200	[0.02838235294117647, 0.9716176470588236],	[0.03444444444444444, 0.9655555555555555],	[0.008294930875576055, 0.9917050691244238],
500	[0.00625, 0.99375],	[0.01979365079365079, 0.9802063492063493],	[0.00674841241702267, 0.9932515875829774],
1000	[0.014582030879984841, 0.9854179691200151],	[0.007777597050531338, 0.9922224029494686],	[0.020527283244301 98, 0.979472716755698],
10000	[0.015399697296126696, 0.9846003027038733],	[0.014650777890400915, 0.9853492221095991],	[0.020216289972563684, 0.9797837100274365],
Enumeration(Exact)	[0.01643814928511476, 0.9835618507148852]		

Result: Mary. First item in every cell corresponds to true and second to false. All values are computed based on average of samples. So, it may not sum up to 1.

Number of samples	Prior sampling	Rejection	Likelihood weight
10	[0.0, 0.3]	[0.0, 0.5]	[0.07666666666666667, 0.9233333333333335]
50	[0.05, 0.75]	[0.0, 0.9]	[0.02835820895522386, 0.9716417910447761]
100	[0.04206349206349206, 0.9579365079365081]	[0.02575757575757575 7, 0.9742424242424242]	[0.06238117106773818, 0.9376188289322618]
200	[0.03009803921568627 4, 0.9699019607843138]	[0.02252747252747252 7, 0.9774725274725276]	[0.02481566820276503 3, 0.9751843317972352]
500	[0.02331679894179893 7, 0.9766832010582011]	[0.02086811257069877 8, 0.9791318874293011]	[0.02637151964299940 7, 0.9736284803570004]
1000	[0.03262140796020279, 0.9673785920397974]	[0.03183936680304718 5, 0.968160633196953]	[0.02772789451891962 5, 0.9722721054810803]
10000	[0.03161974738909536 4, 0.9683802526109047]	[0.03599167220849552, 0.9640083277915045]	[0.0331077044171607, 0.9668922955828393]
Enumeration(Exact)	[0.03331388442761261, 0.9666861155723874]		

3) **Query – 5 &6**

Query:[<m,t><j,f>][b,e]
Result: Burglary. First item in every cell corresponds to true and second to false. All values are computed based on average of samples. So, it may not sum up to 1.

Number of samples	Prior sampling	Rejection	Likelihood weight
10	[0.0, 0.1]	[0.0, 0.1]	[0.0, 1.0]
50	[0.0, 0.3]	[0.0, 0.6]	[0.0, 1.0]
100	[0.0, 0.5]	[0.0, 0.5]	[0.006927263730826335 6, 0.9930727362691737],
200	[0.00404058204966191 3, 0.995959417950338],	[0.0, 0.9]	[0.004040582049661913, 0.995959417950338],
500	[0.0, 1.0]	[0.0, 1.0]	[0.004293599567201413, 0.9957064004327986],
1000	[0.01428571428571428 5, 0.9857142857142858]	[0.01, 0.99]	[0.005146583965893958, 0.994853416034106],
10000	[0.01226431694172996 4, 0.98773568305827],	[0.0101801101775546 3, 0.9898198898224454],	[0.006504483604628318, 0.9934955163953717],
Enumeration(Exact)	[0.006876246073421025, 0.993123753926579]		

Result: Earthquake. First item in every cell corresponds to true and second to false. All values are computed based on average of samples. So, it may not sum up to 1.

Number of samples	Prior sampling	Rejection	Likelihood weight
10	[0.0, 0.1]	[0.0, 0.1]	[0.0, 1.0]
50	[0.0, 0.3]	[0.0, 0.7]	[0.001999999999999999, 0.998]
100	[0.0, 0.5]	[0.0, 0.3]	[0.007927263730826337, 0.9920727362691736]
200	[0.008504213915075064, 0.991495786084925]	[0.0, 0.7]	[0.008504213915075064, 0.991495786084925]
500	[0.0, 1.0]	[0.0, 1.0]	[0.006066754765097246, 0.9939332452349026]
1000	[0.0, 1.0]	[0.0, 1.0]	[0.004550021643064448 5, 0.9954499783569355]
10000	[0.00404382313673132 8, 0.9959561768632688]	[0.003510239760239760 5, 0.9964897602397602]	[0.004968380813066129, 0.9950316191869341]
Enumeration(Exact)	[0.005612151520557884, 0.9943878484794422]		