

# CSC671 Program Assignment 2 Report

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1. Alarm is false, infer Burglary and JohnCalls being true

a.  $[<A,f>][<B,t>]$ :

table 1.a  $[<A,f>][<B,t>]$

Num Samples	Prior Sampling	Rejection	LW
10	0	0	0
50	0	0	0
100	0	0.001010101	0.000243681
200	0	0	0.0000302157
500	0.00020	0	0.0000843752
1000	0	0	0.0000662128
10000	0.000050115	0.00006.0153	0.000055943
Exact	0.000060131	0.000060131	0.000060131

b. [ $\langle A, f \rangle$ ][ $\langle J, t \rangle$ ]

table 1.a [ $\langle A, f \rangle$ ][ $\langle J, t \rangle$ ]

Num Samples	Prior Sampling	Rejection	LW
10	0.07	0.02	0.06
50	0.046	0.04612245	0.06832642
100	0.04509091	0.0590101	0.05121299
200	0.05265344	0.0561608	0.04306063
500	0.04555269	0.05890191	0.04642987
1000	0.04772889	0.04903109	0.05346877
10000	0.05046458	0.05087379	0.05035507
Exact	0.05	0.05	0.05

2. JohnCalls is true, Earthquake is false, infer Burglary and MaryCalls being true.

a. [ $\langle J, t \rangle \langle E, f \rangle$ ][ $\langle B, t \rangle$ ]

table 2.a [ $\langle J, t \rangle \langle E, f \rangle$ ][ $\langle B, t \rangle$ ]

Num Samples	Prior Sampling	Rejection	LW
10	0	0	0
50	0	0	0
100	0.0142857	0.0166667	0
200	0.0111111	0.0162338	0.0165899
500	0.0161888	0.0068966	0.0139265
1000	0.0054233	0.0136945	0.0106443

10000	0.0155823	0.0170177	0.0171095
Exact	0.016438	0.016438	0.016438

b. [ $\langle J, t \rangle \langle E, f \rangle$ ][ $\langle M, t \rangle$ ]

table 2.b [ $\langle J, t \rangle \langle E, f \rangle$ ][ $\langle M, t \rangle$ ]

Num Samples	Prior Sampling	Rejection	LW
10	0	0	0
50	0	0.02	0.0034925
100	0.0111111	0.025	0.049105
200	0.0211111	0.01	0.0418664
500	0.0417783	0.0339901	0.0182046
1000	0.0319535	0.0252607	0.023289
10000	0.0296332	0.0363024	0.0303051
Exact	0.033314	0.033314	0.033314

3. MaryCalls is true, JohnCalls is true, infer Burglary and Earthquake being true.

a. [ $\langle M, t \rangle \langle J, t \rangle$ ][ $\langle B, t \rangle$ ]

table 3.a [ $\langle M, t \rangle \langle J, t \rangle$ ][ $\langle B, t \rangle$ ]

Num Samples	Prior Sampling	Rejection	LW
10	0	0	0
50	0	0	0
100	0	0	0.0144669

200	0	0	0.0117538
500	0.01	0.025	0.004515
1000	0	0	0.0037831
10000	0.0048743	0.0076944	0.0071548
Exact	0.0068762	0.0068762	0.0068762

b. [ $\langle M, t \rangle \langle J, t \rangle$ ][ $\langle E, t \rangle$ ]

table 3.b [ $\langle M, t \rangle \langle J, t \rangle$ ][ $\langle E, t \rangle$ ]

Num Samples	Prior Sampling	Rejection	LW
10	0	0	0
50	0	0	0
100	0	0	0.0082526
200	0	0	0.004225
500	0	0	0.0051104
1000	0.0111111	0.01	0.0087348
10000	0.0055236	0.0052509	0.0060111
Exact	0.0056122	0.0056122	0.0056122

All of the results show that the likelihood-weighting sampling method is much better than the prior sampling method and the rejection sampling method.