Sample Run of Program.

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

- predict the probabilities separately for both Burglary and JohnCalls being True.
- Use following commands to run the file.

➢ Command: python3 pa3.py “[<a,f>]” “[b]”

Num Samples	Prior Sampling	Rejection Sampling	Likelihood Weighting
10	0.0	0.0	0.0
50	0.0	0.0	0.0
100	0.0	0.0	0.0
200	0.0	0.0	0.0
500	0.0	0.0	1.211e-05
1000	0.0001001	0.0	0.0
10000	3.0072e-05	6.0159e-05	6.11e-05

Exact Inference 6.013131697154257e-05

➢ Command: python3 pa3.py “[<a,f>]” “[j]”

Num Samples	Prior Sampling	Rejection Sampling	Likelihood Weighting
10	0.04	0.03	0.06
50	0.054661565	0.034081633	0.04433333
100	0.065090909	0.051131313	0.04706071
200	0.054658647	0.051676235	0.04853766
500	0.050310837	0.051718449	0.05207239
1000	0.051131982	0.049886911	0.04800434
10000	0.050013138	0.049331933	0.04941681

Exact Inference 0.05000000000000001

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

- Use following commands to run the file.

➢ Command: python3 pa3.py “[<j,t>,<e,f>]” “[b]”

Num Samples	Prior Sampling	Rejection Sampling	Likelihood Weighting
10	0.0	0.0	0.0
50	0.0	0.075	0.0
100	0.045	0.025	0.0
200	0.0	0.0	0.003673469
500	0.022709249	0.016311762	0.024830891
1000	0.009362674	0.022167154	0.014768892
10000	0.021838636	0.016025653	0.017781941

Exact Inference 0.01643814928511476

- Comand : python3 pa3.py “[<j,t>,<e,f>]” “[m]”

Num Samples	Prior Sampling	Rejection Sampling	Likelihood Weighting
10	0.0	0.0	0.0
50	0.0	0.0	0.0
100	0.053571429	0.045	0.011071429
200	0.02748538	0.068055556	0.020151646
500	0.035520236	0.025937863	0.017956086
1000	0.034695443	0.024895644	0.016483785
10000	0.034376971	0.029849841	0.029703744
Exact Inference	0.0333138844276126		

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

- Use following commands to run the file.

- Command : python3 pa3.py “[<m,t>,<j,f>]” “[b]”

Num Samples	Prior Sampling	Rejection Sampling	Likelihood Weighting
10	0.0	0.0	0.0
50	0.0	0.0	0.0
100	0.0	0.0	0.0
200	0.05	0.0125	0.0
500	0.0	0.0	0.0
1000	0.0	0.0	0.004794521
10000	0.006051882	0.005471034	0.007114354
Exact Inference	0.006876246073421025		

- Command: python3 pa3.py “[<m,t>,<j,f>]” “[e]”

Num Samples	Prior Sampling	Rejection Sampling	Likelihood Weighting
10	0.0	0.0	0.0
50	0.0	0.0	0.0
100	0.0	0.0	0.0
200	0.0	0.0	0.0
500	0.0	0.0	0.0
1000	0.0	0.0	0.0
10000	0.004587501	0.005668110	0.0094103
Exact Inference	0.005612151520557885		

- For this query if we provide more number of samples, probability of the query event converges to exact inference.
- Following table shows the same:

Num Samples	Prior Sampling	Rejection Sampling	Likelihood Weighting
50000	0.006350031	0.005082430	0.004975822
100000	0.005906355	0.004800124	0.006528705
Exact Inference	0.005612151520557885		