Exercise #1:

Given: Influenza is true and then it is false, Given the evidence that Fever is true

Use Bayes Role: (with Influenza true)

$$Bel(I=T) = P(I=T|F=T) = \frac{P(F=T|I=T) \times P(I=T)}{P(F=T)} = \frac{P(F=T, I=T)}{P(F=T)}$$

Joint probability use chain role:

$$P(F=T, I=T) = P(\underbrace{W, I=T, C}_{\text{Not defined}}, F=T)$$

$$\sum_{i,j} = \{ \underset{1}{P(W=i)} \times \underset{2}{P(I=T|W=i)} \times \underset{3}{P(C=j|W=i)} \times \underset{4}{P(F=T|I=T, C=j)} \}$$

W=i	C=j	1	2	3	4	Π(1,2,3,4)
0	0	0.5	0.5	0.8	0.9	0.18
1	1	0.5	0.1	0.8	0.99	0.0396
0	1	0.5	0.5	0.2	0.99	0.0495
1	0	0.5	0.1	0.2	0.99	0.009

0.2781 ↲ Sum of all products

$$P(F=T, I=T) = 0.2781$$

Joint probability use chain role:

$$P(F=T) = P(\underbrace{W, I, C}_{\text{Not defined}}, F=T)$$

$$\sum_{i,j,k} = \{ \underset{1}{P(W=i)} \times \underset{2}{P(I=k|W=i)} \times \underset{3}{P(C=j|W=i)} \times \underset{4}{P(F=T|I=k, C=j)} \}$$

W=i	C=j	I=k	1	2	3	4	$\Pi(1,2,3,4)$
0	0	0	0.5	0.5	0.8	0	0
1	1	1	0.5	0.1	0.8	0.99	0.0396
0	1	0	0.5	0.5	0.2	0.9	0.045
1	0	1	0.5	0.9	0.8	0.9	0.324
0	0	1	0.5	0.5	0.8	0.9	0.18
1	1	0	0.5	0.1	0.2	0.9	0.009
0	1	1	0.5	0.5	0.2	0.99	0.0495
1	0	0	0.5	0.1	0.2	0	0
							0.6471

$P(F=T) = 0.7479$

Now we plug it in: $\frac{P(F=T, I=T)}{P(F=T)} = \frac{0.2781}{0.6471} = 0.4297635605$

0.429764 or 42.9764% is the probability that given the evidence Fever is true then Influenza is true

Note: That we can just use the fact that there are only two conditions for Influenza (T/F). Thus we can do:

$P(I=T \mid F=T) + P(I=F \mid F=T) = 1 \rightarrow$

$P(I=F \mid F=T) = 1 - P(I=T \mid F=T)$

$= 1 - 0.4297635605$

$= 0.5702364395$

0.570236 or 57.0236% is the probability that given the evidence Fever is true then Influenza is false