AI Assignment 3.2 Probabilistic Inference using Full Joint Distributions

P(*hungry*) =
P(*hungry* ^ *cold*) + P*(hungry* ^ ¬*cold) =*
P(hungry ^ *cold* ^ *excited*) + P*(hungry* ^ *cold* ^ ¬*excited) + P(hungry* ^ ¬*cold* ^ *excited*) + P*(hungry* ^ ¬*cold* ^ ¬*excited) =*
P(hungry ^ *cold* ^ *excited* ^ *crying*) + P*(hungry* ^ *cold* ^ ¬*excited* ^ *crying) + P(hungry* ^ ¬*cold* ^ *excited* ^ *crying*) + P*(hungry* ^ ¬*cold* ^ ¬*excited* ^ *crying) +P(hungry* ^ *cold* ^ *excited* ^ ¬*crying*) + P*(hungry* ^ *cold* ^ ¬*excited* ^ ¬*crying) + P(hungry* ^ ¬*cold* ^ *excited* ^ ¬*crying*) + P*(hungry* ^ ¬*cold* ^ ¬*excited* ^ ¬*crying) =*
0.02 + 0.01 + 0.02 + 0.06 + 0.05 + 0.03 + 0.06 + 0.14 = <u>0.39</u>

P(¬*cold* | *hungry* ^ *cold*) = P(¬*cold* ^ *hungry* ^ *cold*)/P(*hungry* ^ *cold*) = P(false)/P(*hungry* ^ *cold*) = <u>0</u>

P(*excited* ∨ ¬*excited*) = P(true) = <u>1</u>

P(*hungry* ^ *cold* | *crying*) = P(*hungry* ^ *cold* ^ *crying*)/P(*crying*) = (0.02 + 0.05) / (0.02 + 0.01 + 0.05 + 0.03 + 0.03 + 0.01) = 0.07 / 0.15 = <u>0.47</u>

P(¬*crying*) = 1 - P(¬*crying*) = 1 – 0.15 = <u>0.85</u>

P(*cold* | *hungry*) = P(*cold* ^ *hungry*)/P(*hungry*) =
(0.02 + 0.02 + 0.05 + 0.06) / (0.02 + 0.01 + 0.02 + 0.06 + 0.05 + 0.03 + 0.06 + 0.14) = 0.15 / 0.39 = <u>0.38</u>

P(*cold* | *excited* ^ ¬*hungry*) = P(*cold* ^ *excited* ^ ¬*hungry*) / P(*excited* ^ ¬*hungry*) = (0.01 +0.05) / (0.02 + 0.01 + 0.02 + 0.06) = 0.06 / 0.11 = <u>0.55</u>

P(*crying* ∨ *excited*) = P(¬(¬*crying* ^ ¬*excited)*) = 1 - P(¬*crying* ^ ¬*excited)* = 1 – (0.06 + 0.14 + 0.10 + 0.28) = <u>0.42</u>

P(*excited* ^ ¬*hungry*) = 0.01 + 0.01 + 0.05 + 0.12 = <u>0.19</u>

P((*excited* ^ *cold*) ∨ (*crying* ^ *hungry*)) = P(*excited* ^ *cold*) + P(*crying* ^ *hungry*) - P((*excited* ^ *cold* ^ *crying* ^ *hungry*)) =
(0.02 + 0.02 + 0.01 + 0.05) + (0.02 + 0.01 + 0.05 + 0.03) - 0.02 = <u>0.19</u>