CPSC 322: Introduction to Artificial Intelligence (Section 2)
Uncertainty: Introduction to Probability

Do this exercise in pairs. If there's an odd number, do it in a group of 3.

Submit the sheet before leaving.

Name of Student (last, first)	Student Number

Consider the joint probability distribution table below.

World	Cavity	Toothache	Catch	μ(w)
w_1	T	T	T	0.108
w_2	T	T	F	0.012
w_3	T	F	T	0.072
w_4	T	F	F	0.008
w_5	F	T	T	0.016
w_6	F	T	F	0.064
w_7	F	F	T	0.144
w_8	F	F	F	0.576

Question1: List all worlds w such that $w \models Catch = T$

w1, w3, w5, w7

Question 2: What's the probability of the following proposition g?

$g : Cavity = T \wedge Toothache = F$

0.072 + 0.008 = 0.080

Cavity	Toothache	Catch	μ(w)	μ_e(w)
T	T	T	0.108	0.108/ 0.2 = 0.54
T	T	F	0.012	0.012/0.2 = 0.06
T	F	T	0.072	0.072/0.2 = 0.36
T	F	F	0.008	0.008/0.2 = 0.04
F	T	T	0.016	0
F	T	F	0.064	0
F	F	T	0.144	0
F	F	F	0.576	0

Question 3: Compute the marginal probability distribution for P(Cavity).

P(Cavity = T) = 0.108 + 0.012 + 0.072 + 0.008 = 0.2

P(Cavity = F) = 0.016 + 0.064 + 0.144 + 0.576 = 0.8

Question 4: Given $e = (Cavity = T)$, what is the conditional probability $P(Toothache = T \mid Cavity = T)$? Show μ_e(w) for each row in the table above.

Normalizing factor: 0.108 + 0.012 + 0.072 + 0.008 = 0.2

$P(Toothache = T \mid Cavity = T) = 0.054 + 0.06 = 0.6$