

# Homework 8

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## Problem 1

Parameter	Constraint
$\Pr(\text{Disease} = \text{true})$	$\geq 0.008942$
$\Pr(\text{Test} = \text{true} \mid \text{Disease} = \text{false})$	$\leq 0.002219$
$\Pr(\text{Test} = \text{false} \mid \text{Disease} = \text{true})$	N/A

Setting  $\Pr(\text{Test} = \text{false} \mid \text{Disease} = \text{true})$  doesn't seem to have an effect significant enough to satisfy  $\Pr(\text{Disease} = \text{true} \mid \text{Test} = \text{true}) \geq 0.3$  on its own.

## Problem 2

- A) The answer can be found by selecting the value of “On” for the Light Sensor variable, and the value of “Off” for the Sound Sensor variable, then using SamIam's MPE function. Alternatively, one can select the value for each remaining variable with the highest calculated probability given the values for Light Sensor and Sound Sensor.

Variable	Value
Battery	OK
Dog Barking?	No
Dog Bowel Trouble	Yes
Dog Outside	Yes
Expecting Guests	No
Family Home	No
Hearable Barking?	No
Light Sensor Health	OK
Outdoor Light	On
Sound Sensor Health	OK

- B) The answer can be found by selecting the value of “Yes” for the Family Home variable, and the value of “No” for the Expecting Guests variable, then using SamIam’s MAP function to find the most probable values of Light Sensor and Sound Sensor. Alternatively, these can be found using SamIam’s MPE function, or by calculating the probabilities of each node with the given variables set and choosing the most probable setting of Light Sensor and Sound Sensor.

Variable	Value
Light Sensor	Off
Sound Sensor	Off

- C)  $\mathbb{Z} = \{\text{Battery, Family Home}\}$

Choosing the variable Battery blocks the path through it between the sensors; there is no other way to block this path other than including this variable in  $\mathbb{Z}$ .

Choosing the variable Family Home blocks the alternative path between the two sensors, although there are several other variable choices that accomplish the d-separation of the two sensors.

- D) This is a multiply-connected network as the variables

$\{\text{Family Home, Expecting Guests, Outdoor Light}\}$

form a loop.