Lecture Graphical Models
https://ml01.zrz.tu-berlin.de/wiki/Main/SS09_GraphicalModels
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Sheet 5

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1. Max-Product algorithm

In the lecture, we got to know the Viterbi algorithm. Derive the equations of the
Viterbi algorithm from the general message passing algorithm used for inference.
Hint: you have to replace the **sum** operation in the message calculation by a
max operation.

2. Viterbi decoding

A former investment banker is put into prison for 7 days because of mortgage
loan frauds of about 50 billion Euro. From his dark dungeon, the banker cannot
directly observe the wheather, i.e., whether it is raining or whether it is sunny.
All he knows is that on the day he was thrown into the dungeon, the sun was
shining brightly. Furthermore, he knows that a sunny day follows a sunny day
with 80% probability, and a rainy day follows a rainy day with 60% probability.

The banker can, however, observe the shoes of his guard, which can be clean
(C), slightly dirty (SD) or heavily dirty (HD). The banker estimates from his
tremendous life experience that the guard's shoes are slightly dirty with 40%
probability and heavily dirty with 50% probability if it is raining outside. If it
is sunny, he estimates that the shoes are slightly dirty with 30% probability and
heavily dirty with 10% probability.

During days 2 to 7, the banker observes the guard's shoes to be $\{C, SD,
HD, C, HD, C\}$. What is the most probable wheather sequence for these six
days? Note that the prior for day 2 is given by the banker knowing that it was
sunny on the first day.