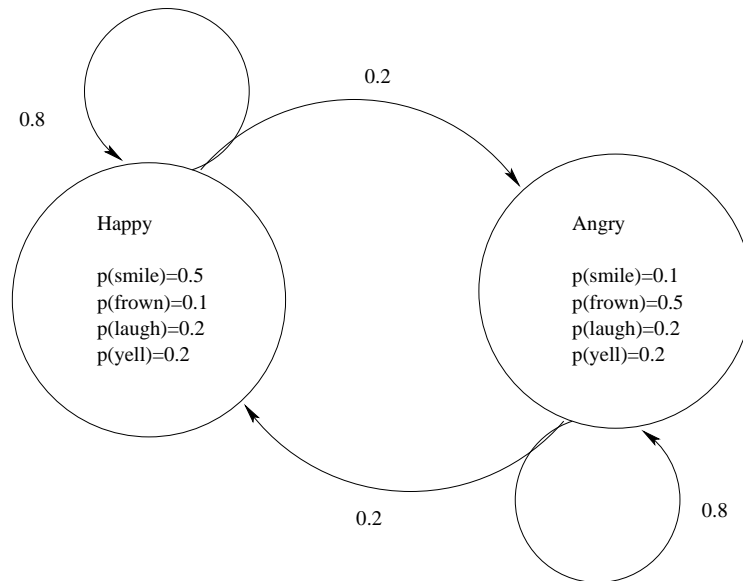# HMMs

Andrew lives a simple life. Some days he's Angry and some days he's Happy. But he hides his emotional state, and so all you can observe is whether he smiles, frowns, laughs, or yells. We start on day 1 in the Happy state, and there's one transition per day.

Definitions:
q_t = state on day t.
O_t = observation on day t.

Generate the five elements of HMM.

(a) What is $P(q_2 = Happy)$?

(b) What is $P(O_2 = frown)$?

(c) What is $P(q_2 = Happy|O_2 = frown)$?

(d) What is $P(O_{100} = yell)$?

(e) Assume that $O_1 = frown$, $O_2 = frown$, $O_3 = frown$, $O_4 = frown$, and $O_5 = frown$. What is the most likely sequence of states?