Q.5 What do we know?

(note: red annotations)

prob of sending a message

prob of messages generated

$$X_0 = 2 \qquad M = 2 \quad , \quad p, q$$
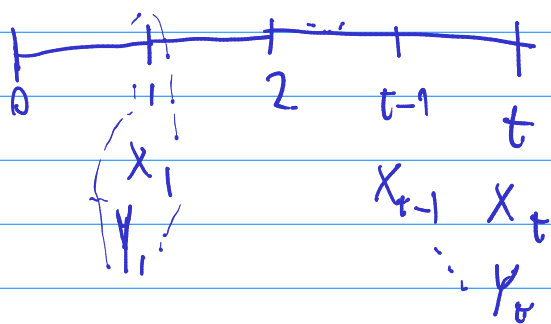
Y_t is the event that Y new messages were generated in epoch t.

$$P(Y_0 = 1) = 0 \qquad P(Y_0 = 2) = 0$$

If $X_{t-1} = 2$ then $P(Y_t = 1 \text{ or } Y_t = 2) = 0$

time line View

I want to calculate

$$P(Y_2 > 0)$$

To do this I need to have $X_1 < 2$

What is $P(X_1 < 2) = P(X_1 = 1) + P(X_1 = 0)$

$$P(X_1 = 0) = 0$$

$$P(X_1 = 1) = 2p(q-p)$$

$$P(Y_2 = 1) = 2qp(q-p)$$

Q.9 $P(M = 3 \,\&\, (I = 3 \text{ or } I = 2))$

$$= \left(\frac{1}{5}\right)\left(\frac{2}{5}\right) = \frac{2}{25}$$