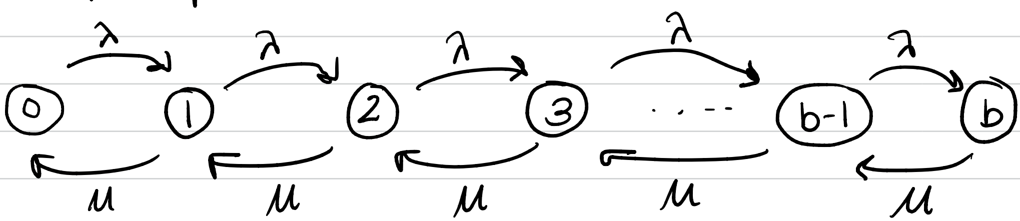
Challenge Project:

M|M|1|b



$$\frac{\pi_0 T \lambda}{T} = \frac{\pi_1 T \mu}{T}$$

$$\pi_0 \lambda = \pi_1 \mu$$

$$\pi_1 = \frac{\lambda}{\mu} \pi_0$$

$$(\lambda + \mu)\pi_1 = \lambda \pi_0 + \mu \pi_2$$

$$\lambda \left(\frac{\lambda}{u} \pi_0\right) \cancel{+ \mu \left(\frac{\lambda}{u} \pi_0\right)} = \cancel{\lambda \pi_0} + \mu \pi_2$$

$$\pi_1 = u \pi_0$$

$$\pi_2 = \frac{\lambda}{u}^2 \pi_0 = u^2 \pi_0$$

$$\pi_2 = u^2 \pi_0$$

$$\pi_3 = u^3 \pi_0$$

$$\sum_{k=0}^{b} u^b \pi_0$$

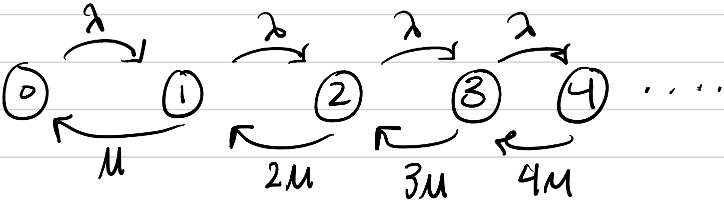
$$\vdots$$

$$\pi_b = u^b \pi_0$$

$$\pi_0 \sum_{k=0}^{b} u^b = 1 = \pi_0 \frac{1 - u^{b+1}}{1 - u}$$

$$\pi_0 = \frac{1 - u}{1 - u^{b+1}} = \boxed{\pi_k = \frac{1 - u}{1 - u^{b+1}} \cdot u^k}$$

M|M|∞



$$\pi_1 = \frac{\lambda}{\mu}\pi_0$$

$$(\lambda+\mu)\pi_1 = \lambda\pi_0 + 2\mu\pi_2$$

$$\pi_2 = \frac{1}{2}\left(\frac{\lambda}{\mu}\right)^2\pi_0$$

$$(\lambda+2\mu)\pi_2 = \lambda\pi_1 + 3\mu\pi_3$$

$$\pi_k = \frac{1}{k!}\left(\frac{\lambda}{\mu}\right)^k\pi_0$$

$$\left(\pi_k = \frac{1}{k!}u^k\pi_0\right)$$

$$1 = \sum_{k=0}^{\infty}\frac{1}{k!}\left(\frac{\lambda}{\mu}\right)^k\pi_0 \quad = \quad \pi_0 = e^{-u}$$

$$\pi_k = \frac{1}{k!}u^k e^{-\frac{\lambda}{u}} \quad = \quad \pi_k = \frac{u^k e^{-u}}{k!}$$