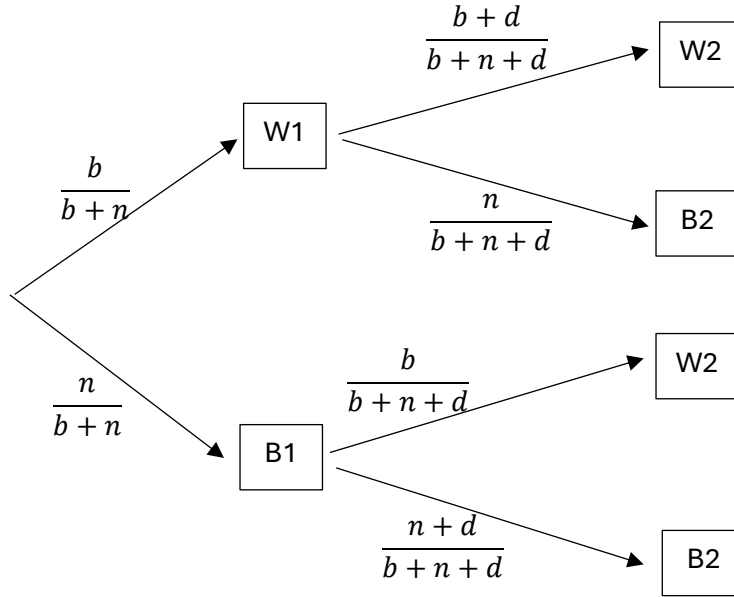


A box contains **b** white and **n** black balls. A ball is drawn and replaced with **d+1** of the same color, where **d** is a positive integer. Compute the probability that the first drawn ball was black, given that the second draw was black.



$$P(B1) = \frac{n}{b+n}$$

$$P_{B1}(B2) = \frac{n+d}{b+n+d}$$

$$\begin{aligned} P(B2) &= P_{B1}(B2) * P(B1) + P_{W1}(B2) * P(W1) = \frac{n+d}{b+n+d} * \frac{n}{b+n} + \frac{n}{b+n+d} * \frac{b}{b+n} = \\ &= \frac{(n+d)n + nb}{(b+n+d)(b+n)} \end{aligned}$$

$$\begin{aligned} P_{B2}(B1) &= \frac{P_{B1}(B2) * P(B1)}{P(B2)} = \\ &= \frac{\frac{n+d}{b+n+d} * \frac{n}{b+n}}{\frac{(n+d)n + nb}{(b+n+d)(b+n)}} = \frac{n+d}{b+n+d} * \frac{n}{b+n} * \frac{(b+n+d)(b+n)}{(n+d)n + nb} = \frac{n+d}{n+d+b} \end{aligned}$$

The probability that the first drawn ball was black given that the second draw was black is:

$$P_{B2}(B1) = \frac{n+d}{n+d+b}$$