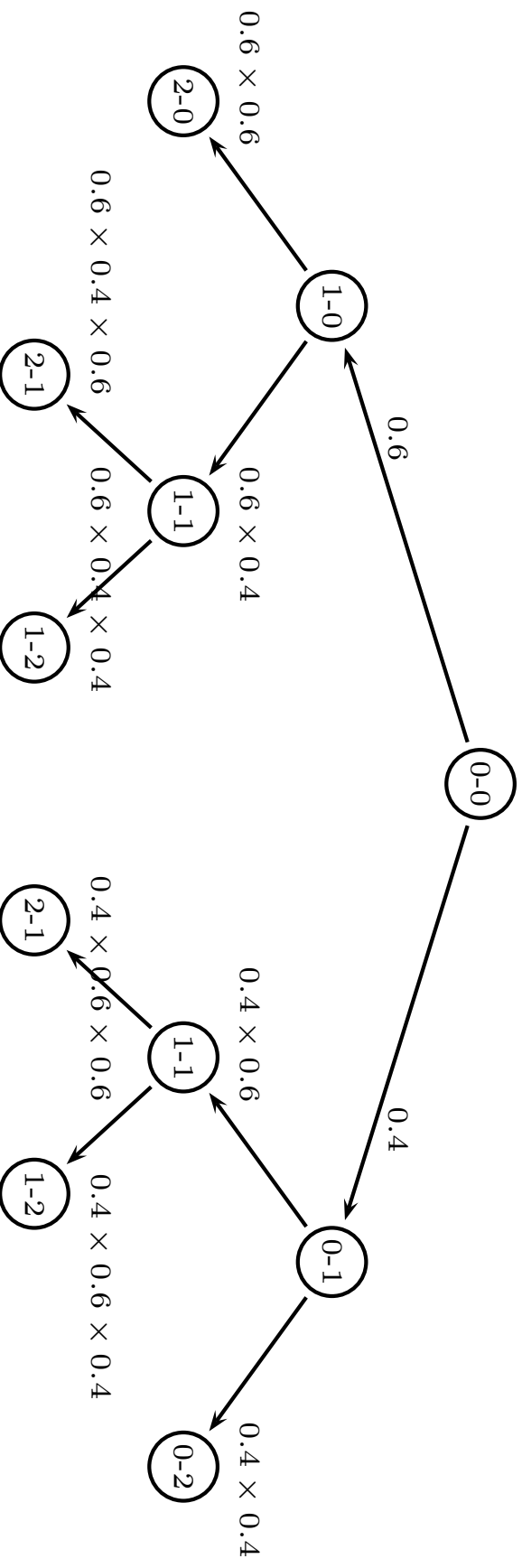


## Effect Of Repetition In Win Rate

*Alain Brobecker - 2024/11*

Let's suppose player A is winning  $\mathcal{P} = 60\%$  of his games against player B (no draws).

What are the chances that player A wins a match ending as soon as 2 games are won by one player?



$$P(2-0) = \mathcal{P}^2 = 0.6^2 = 36\%$$

$$P(2-1) = 2 \times \mathcal{P}^2 \times (1-\mathcal{P}) = 2 \times 0.6^2 \times 0.4 = 28.8\%$$

$$P(1-2) = 2 \times \mathcal{P} \times (1-\mathcal{P})^2 = 2 \times 0.6 \times 0.4^2 = 19.2\%$$

$$P(0-2) = (1-\mathcal{P})^2 = 0.4^2 = 16\%$$

$$P(\text{player A wins}) = P(2-0) + P(2-1) = 64.8\% > \mathcal{P}$$

$$P(\text{player B wins}) = P(1-2) + P(0-2) = 35.2\% < 1-\mathcal{P}$$

The conclusion is that when a match consists of repeated games, **the advantage of the stronger player increases with the number of games**. This is good and wanted for a world championship match (to remove the luck element), but will be more frustrating and uninteresting for casual play with players of very different strength.