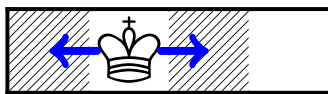


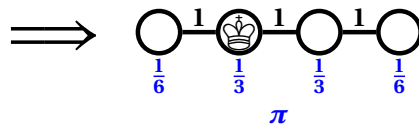
# Do The Manual Calculations (Don't Try Monte Carlo)

## Stage 0 (Practice boards)

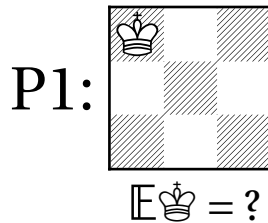
All moves reversible!



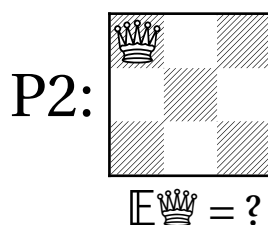
Proposals: Uniform  
Acceptances: 100%



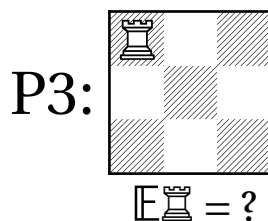
P0: Expected return:  $\mathbb{E}_{\text{King}} = 3$



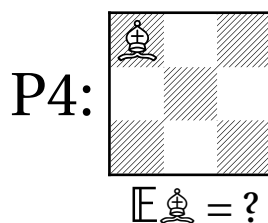
The King ( $\text{♔}$  /  $\text{♚}$ ): moves one step horizontally or vertically (to a square with common boundary) or one step diagonally (to a square with common corner)



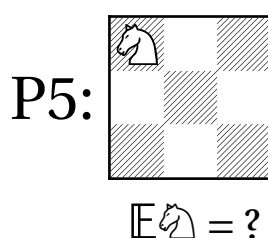
The Queen ( $\text{♑}$  /  $\text{♙}$ ): moves a finite number of steps in the same direction, either horizontally or vertically (along a sequence of squares connected by common boundaries) or diagonally (along a sequence of squares connected by common corners)



The Rook ( $\text{♖}$  /  $\text{♜}$ ): moves a finite number of steps in the same direction, either horizontally or vertically (along a sequence of squares connected by common boundaries)



The Bishop ( $\text{♗}$  /  $\text{♝}$ ): moves a finite number of steps in the same direction diagonally (along a sequence of squares connected by common corners)

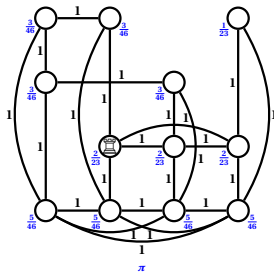
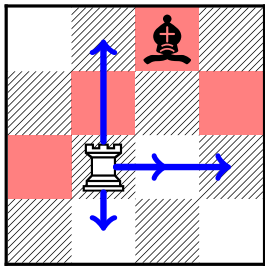


The Knight ( $\text{♞}$  /  $\text{♟}$ ): moves two steps in the same direction horizontally or vertically and then one step in a perpendicular direction; or one step horizontally or vertically and then two steps in a perpendicular direction.

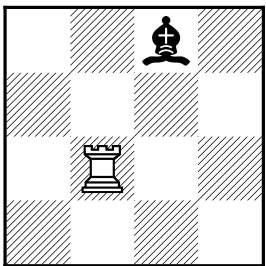
$$\{P1, P2, P3, P4, P5\} = \{6, 8, 9, \frac{28}{3}, \frac{40}{3}\}$$

# Stage 1 (Simple boards)

All moves reversible (no captures)!



S1:



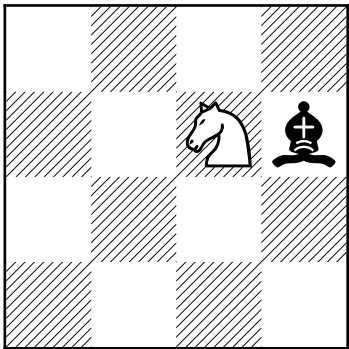
Proposals: Uniform

Acceptances: 100%

Expected return:  $\mathbb{E} \text{R} = 11.5$

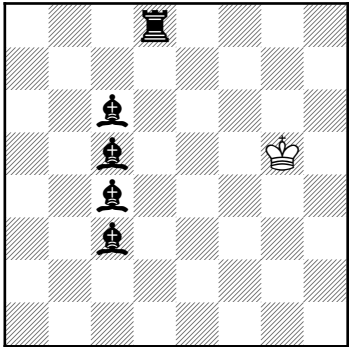
Answer format: 23/2

A:



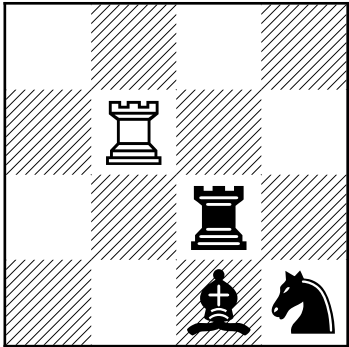
$\mathbb{E} \text{N} = ?$

B:



$\mathbb{E} \text{K} = ?$

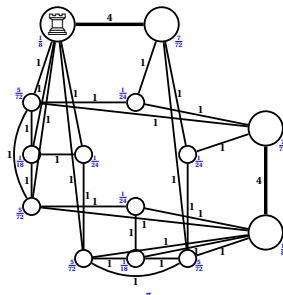
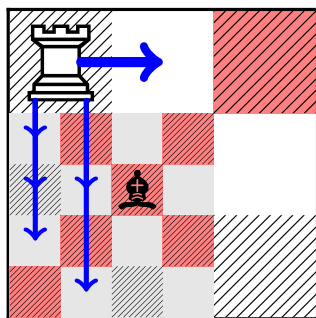
C:



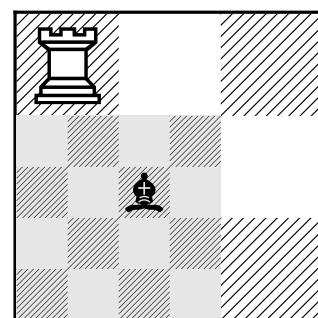
$\mathbb{E} \text{R} = ?$

## Stage 2 (Composite boards)

All moves reversible (no captures)!



S2:



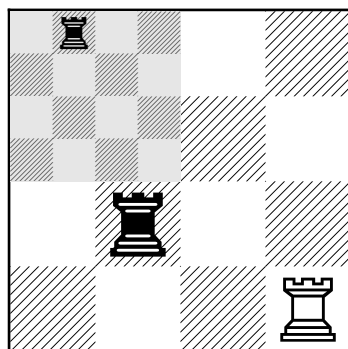
Proposals: Uniform

Expected return:  $\mathbb{E}_{\pi} = 8$  (acceptances)

Acceptances:  $\mathbb{P} = \min \left\{ 1, \frac{\text{Area}_{\text{end}}}{\text{Area}_{\text{start}}} \right\}$

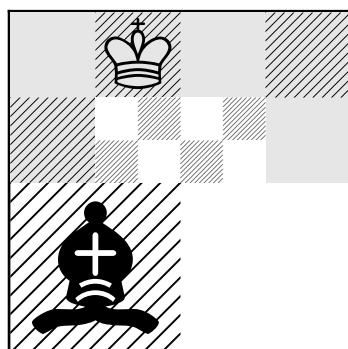
Answer format: 8/1

D:



$\mathbb{E}_{\pi} = ?$

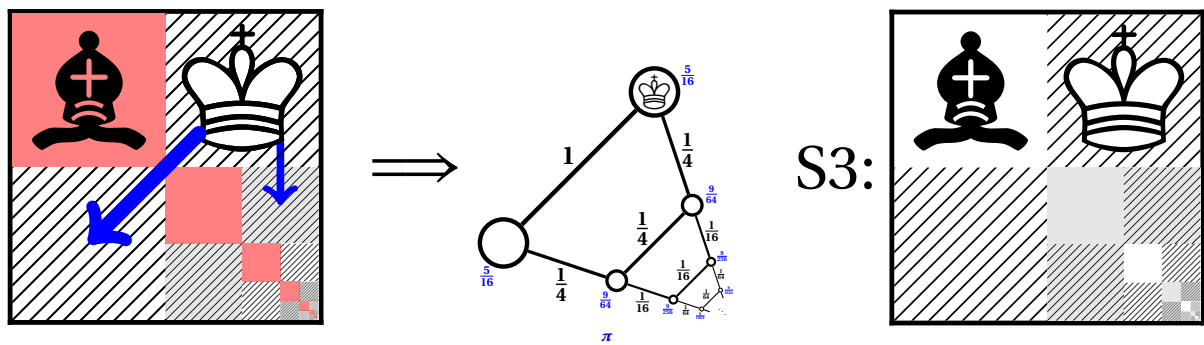
E:



$\mathbb{E}_{\pi} = ?$

# Stage 3 (Infinite boards)

All moves reversible (no captures)!



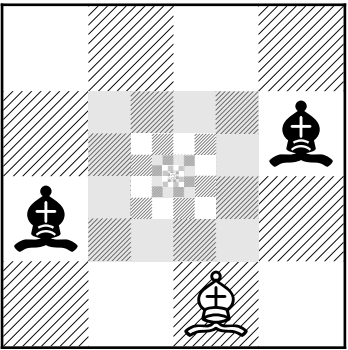
Proposals:  $\mathbb{P} \propto \min \left\{ 1, \sqrt{\frac{\text{Area}_{\text{end}}}{\text{Area}_{\text{start}}}} \right\}$

Expected return:  $\mathbb{E}_{\text{king}} = 3.2$  (acceptances)

Acceptances:  $\mathbb{P} = \min \left\{ 1, \sqrt{\frac{\text{Area}_{\text{end}}}{\text{Area}_{\text{start}}}} \right\}$

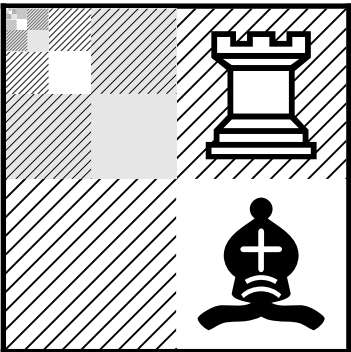
Answer format: 16/5

F:



$\mathbb{E}_{\text{king}} = ?$

G:

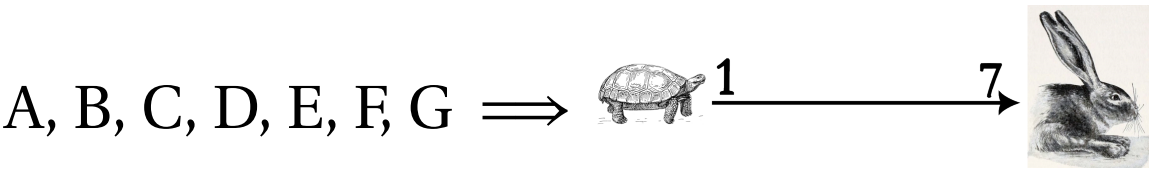


$\mathbb{E}_{\text{king}} = ?$

## Intermezzo (Checker board)

[illegible]

# Final Stage (Combined boards)



Proposals:  $\mathbb{P} \propto \min \left\{ 1, \sqrt{\frac{\text{Area}_{\text{end}}}{\text{Area}_{\text{start}}}} \right\}$

Acceptances:  $\mathbb{P} = \min \left\{ 1, \sqrt{\frac{\text{Area}_{\text{end}}}{\text{Area}_{\text{start}}}} \right\}$

5	7	
3	4	6
	1	2

Final stage expected returns:

