A PENTAGRAM SHAPED BOARD GAME EXISTED IN ANTIQUITY

[Palamedes invented] both the 'five lines' [pentegramma] boardgame and dice-throwing.

—SOPHOCLES Fr. 429

και ιερον πεντεγραμμια και χαβων βολαί

The Golden Proportion is defined by the relation

$$\frac{a}{b} = \frac{a+b}{a}$$
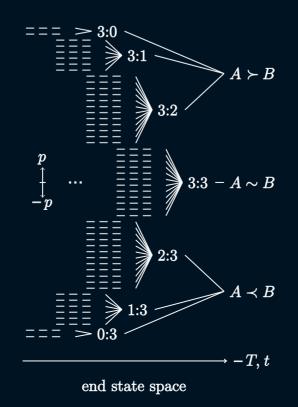
GOLDEN SECTION

THERE ARE TWO OPENING MOVES

swap ↔

replace →

NUMBER OF POSSIBLE POSITIONS

$$P = \frac{n!}{(n - 5\lambda - 5)! \cdot 5!} : 10$$

$$P_{\lambda=2} > 10^{26}$$
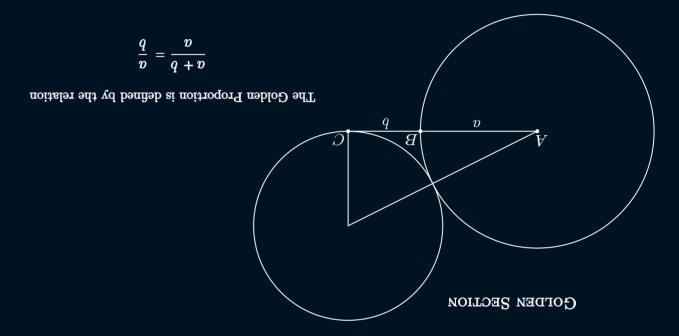
positions for λ players.

THE STATE SPACE BRANCHES RAPIDLY AND IS VERY COMPLEX

stop!

swap

start $A : B$

replace

$\rightarrow$ 3:0
$\rightarrow$ 3:1 $\Big\}$ $A \succ B$
$\rightarrow$ 3:2
$\hookleftarrow$ 3:3 $A \sim B$
$\rightarrow$ 2:3
$\rightarrow$ 1:3 $\Big\}$ $A \prec B$
$\rightarrow$ 0:3

T_{max} $m^\star$ T_{min} $-T$

State space (sketch)

EACH CREATES MULTITUDES OF POSITIONS

$\rightarrow$R(20)

5   200

↔S   →R

4   200   4   200

↔S   →R   ↔S   →R

400 RSS   20,000 RSR   16,000 RRS   800,000 RRR

replace tree

↔S

3   100

↔S   →R

4   200   4   200

↔S   →R   ↔S   →R

12 SSS   600 SSR   400 SRS   > 20,000 SRR

swap tree

main branches of the game tree

THE END OF THE STATE SPACE

3:0
3:1
3:2

p
$\uparrow$
$-p$ $\cdots$

3:3 − $A \sim B$

2:3

1:3

$A \prec B$

0:3

$\longrightarrow -T, t$

end state space

THE TWO TYPES OF WINS (THREE OUT)

(a) acute

(b) obtuse

THE TWO TYPES OF 'TWO OUT'

(a) across

(b) adjacent