

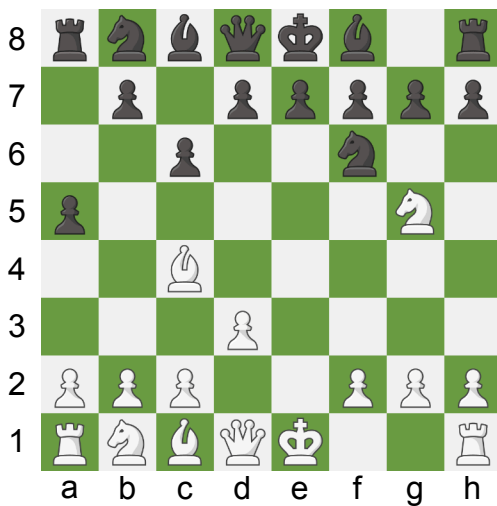
## 5. Elo Rating System

The Elo rating system was developed by a physicist name Arpad Elo.

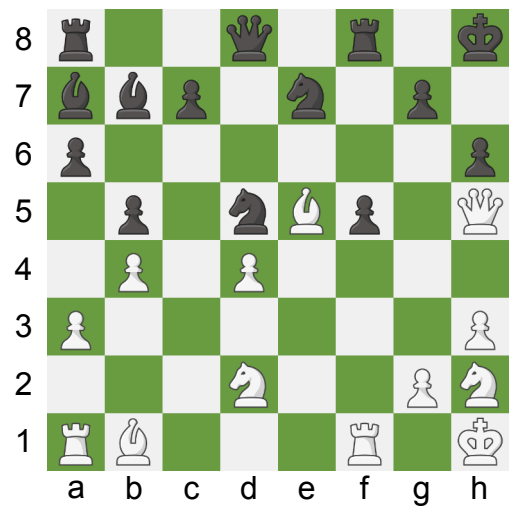
- A player with a 400 Elo advantage is 10 times more likely to win the game.
- The points lost by one player are gained by their opponent.
- When the outcome is what the ratings predict, then the rating change is small, but when the outcome is unlikely, a larger number of Elo points change hand. Strong players gain few Elo points from weaker opponents.

## Challenge Puzzles

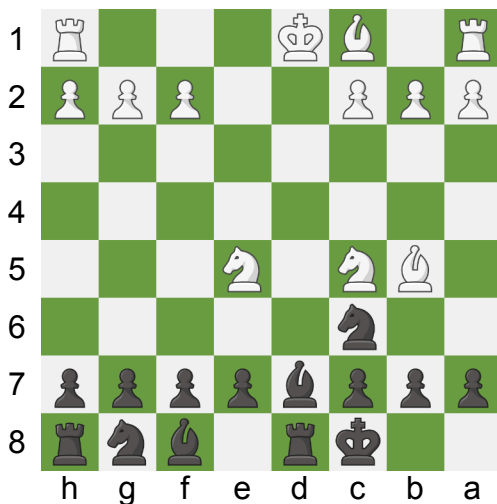
① White to play - mate in 1.



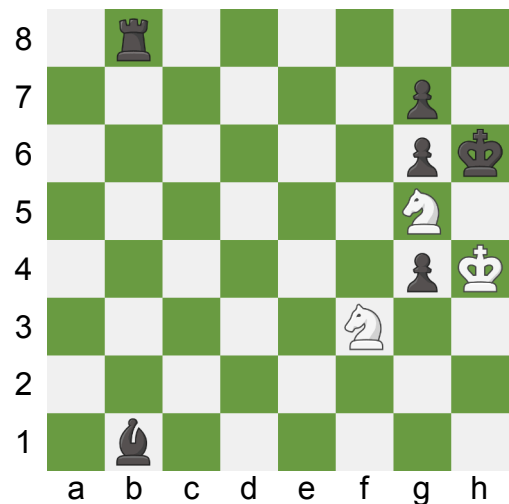
② White to play - mate in 2.



③ Black to play - mate in 2.



④ White to play - mate in 2.



Hints.

- ① There is only one piece that can check the king.
- ② Use the queen.
- ③ Look for a double check.
- ④ The black king is trapped and can't move.

Answers.

- ① 1. ♖xf7 # 1-0
- ② 1. ♔xh6+ ♚g8 2. ♔xg7 # 1-0
- ③ 1. ... ♗g4+ 2. ♔e1 ♜d1 # 0-1
- ④ 1. ♞e5 Then checkmate with ♞g4 or ♞f7 depending on black's response.



This is how X's Elo score is updated after playing against Y:

- Let  $N$  be the difference of X's and Y's Elo ratings prior to the game (i.e., positive if X's rating was higher, and negative if Y's rating was higher).
- Calculate X's predicted odds of winnings:  $\text{odds} = 10^{N/400}$
- Calculate X's predicted winning probability:  $p = \text{odds} / (\text{odds} + 1)$
- Take  $16p$  Elo points from X.
- If X wins, give 16 Elo points to X.
- For a draw, give 8 Elo points to X.