



# Niel's Chess - How to Play?



# Part 1 - Basic rules

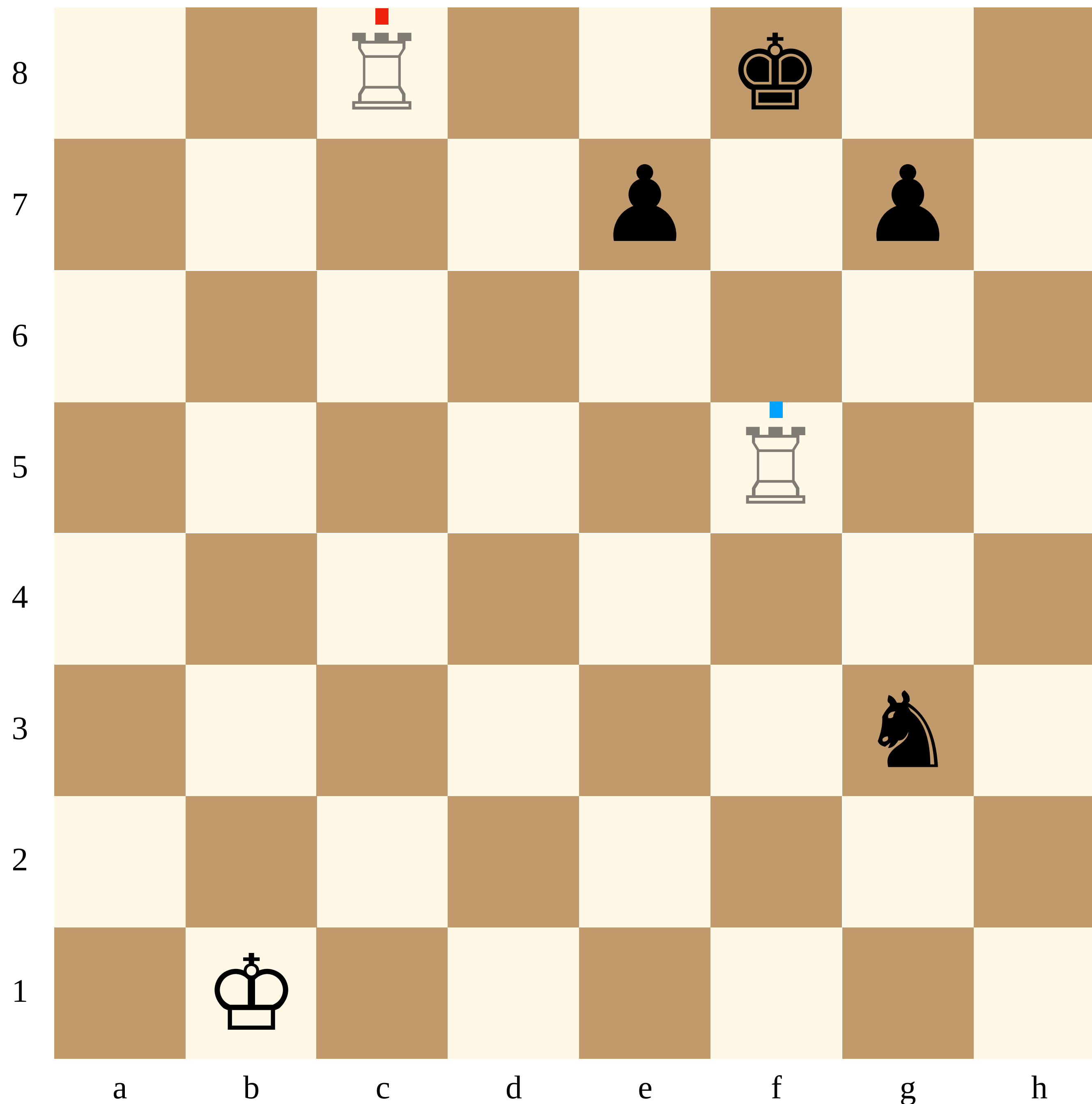
# What is the game about?

In Niel's Chess, the pieces can move according to the laws of quantum mechanics, opening up new and creative ways to win the game.

Quantum mechanics is a theory in physics that explains how the tiniest entities in our universe, like atoms and elementary particles, behave. These entities are invisible to the naked eye and follow some truly bizarre rules. For example, it is not uncommon for an atom to be in two places—or more—at once!

Yet, as we know, larger objects—such as buildings, cars, and even our bodies—are all made up of atoms. So, in theory, the strange laws of quantum mechanics are likely to extend beyond just the sub-microscopic world.

Players of Niel's Chess use quantum effects to create situations on the chessboard that—while unimaginable in everyday life today—could one day become a tangible reality.



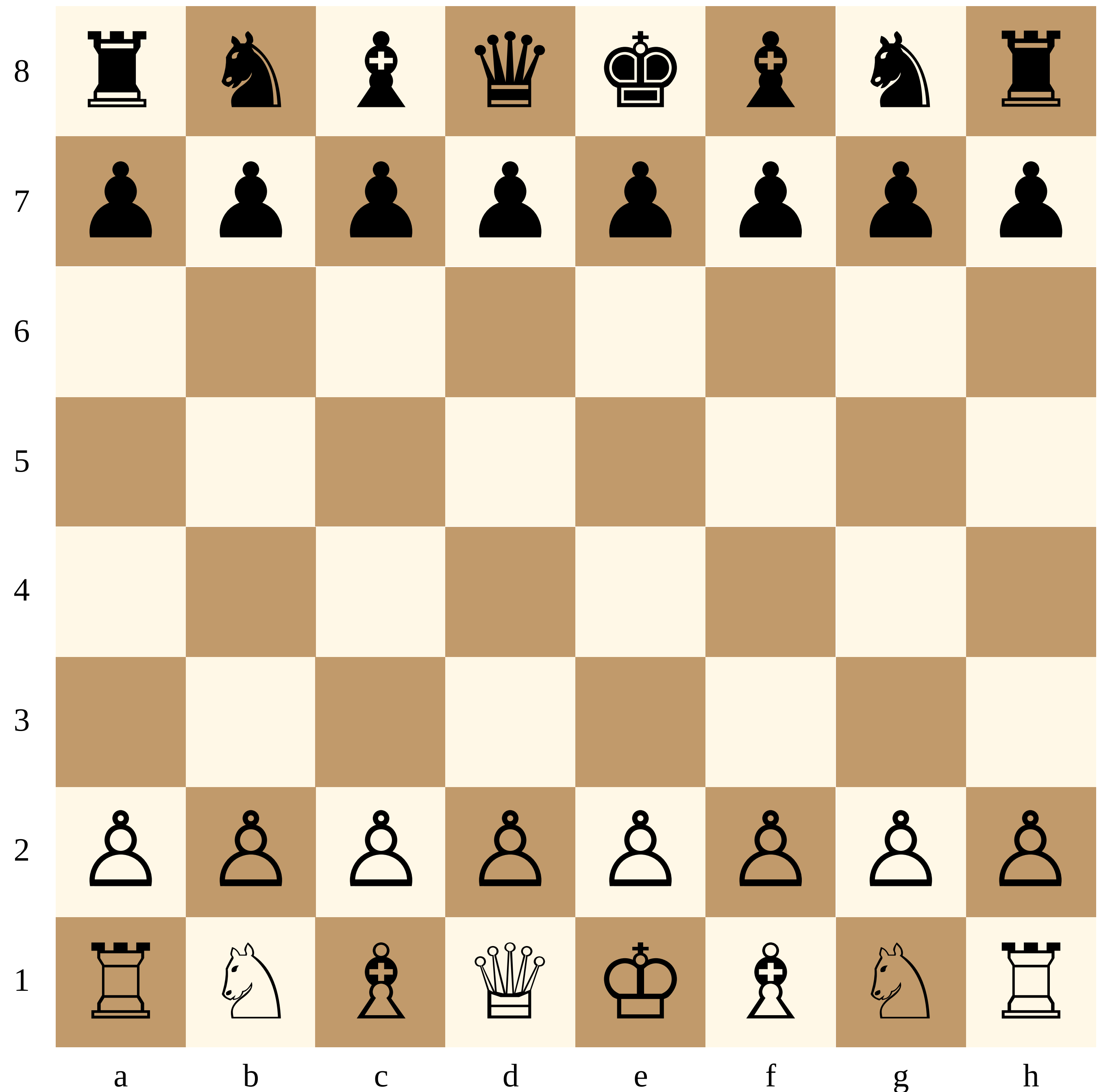
# The chess set

## Initial position

Niel's Chess starts in the same initial position as conventional chess.

**All the moves and rules of conventional chess are valid in Niel's Chess as well.**

E.g. a check in conventional chess is a check in Niel's Chess too.




# Indefinite pieces

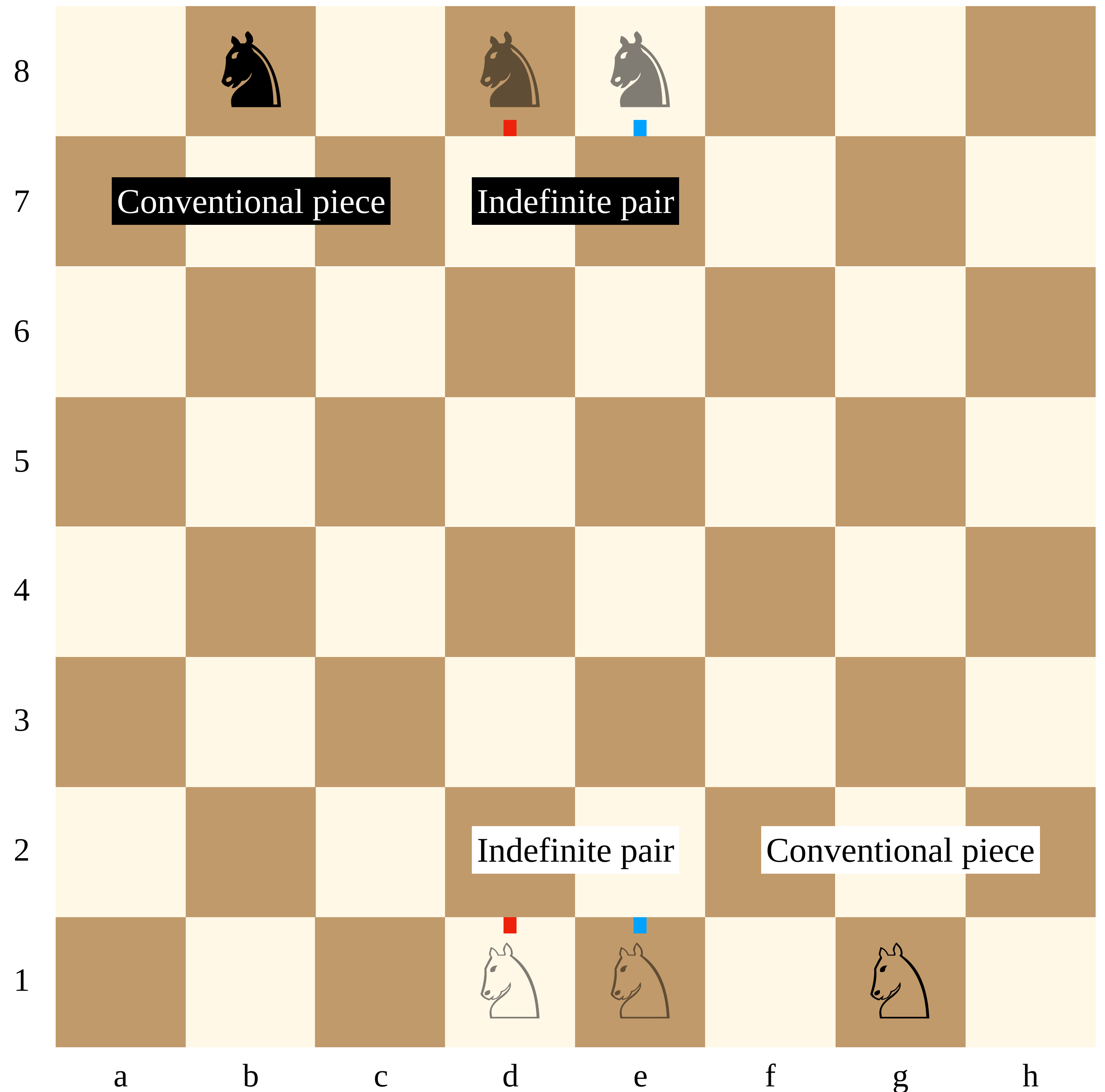
Every conventional piece has a corresponding pair of “indefinite pieces” in the box.

One piece in the **indefinite pair** has a **red** mark, while the other has a **blue** mark. Once on the chessboard, they can make the same moves as the conventional pieces.

You can see two examples on the right: one with Black’s knight (top), and one with White’s knight (bottom).

 *For better visibility, the red and blue marks are shown separated from the pieces.*

The indefinite pieces are used to make quantum moves.



Superposition

## Superposition move

By the rules of conventional chess, White's knight may move to d4 to attack Black's queen.

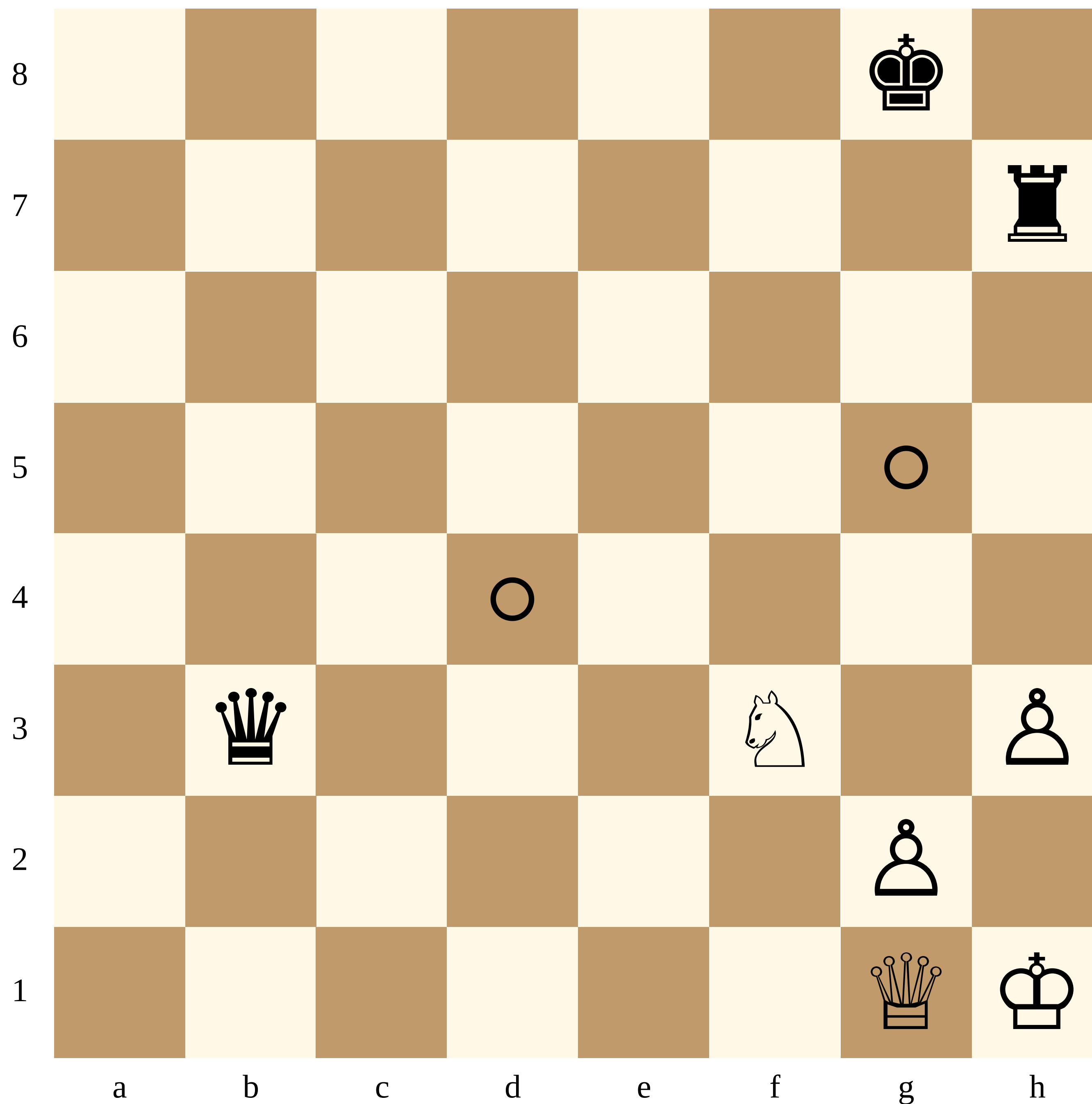
Or, it may move to g5 to attack Black's rook.

Neither of the above ideas seems particularly promising.

However, in Niel's Chess, the knight can move to **both** d4 and g5 simultaneously, attacking the queen and the rook at the same time!

**!** *IMPORTANT: d4 and g5 must be unoccupied for this quantum move.*

Let's see how to make that move...



# Superposition move

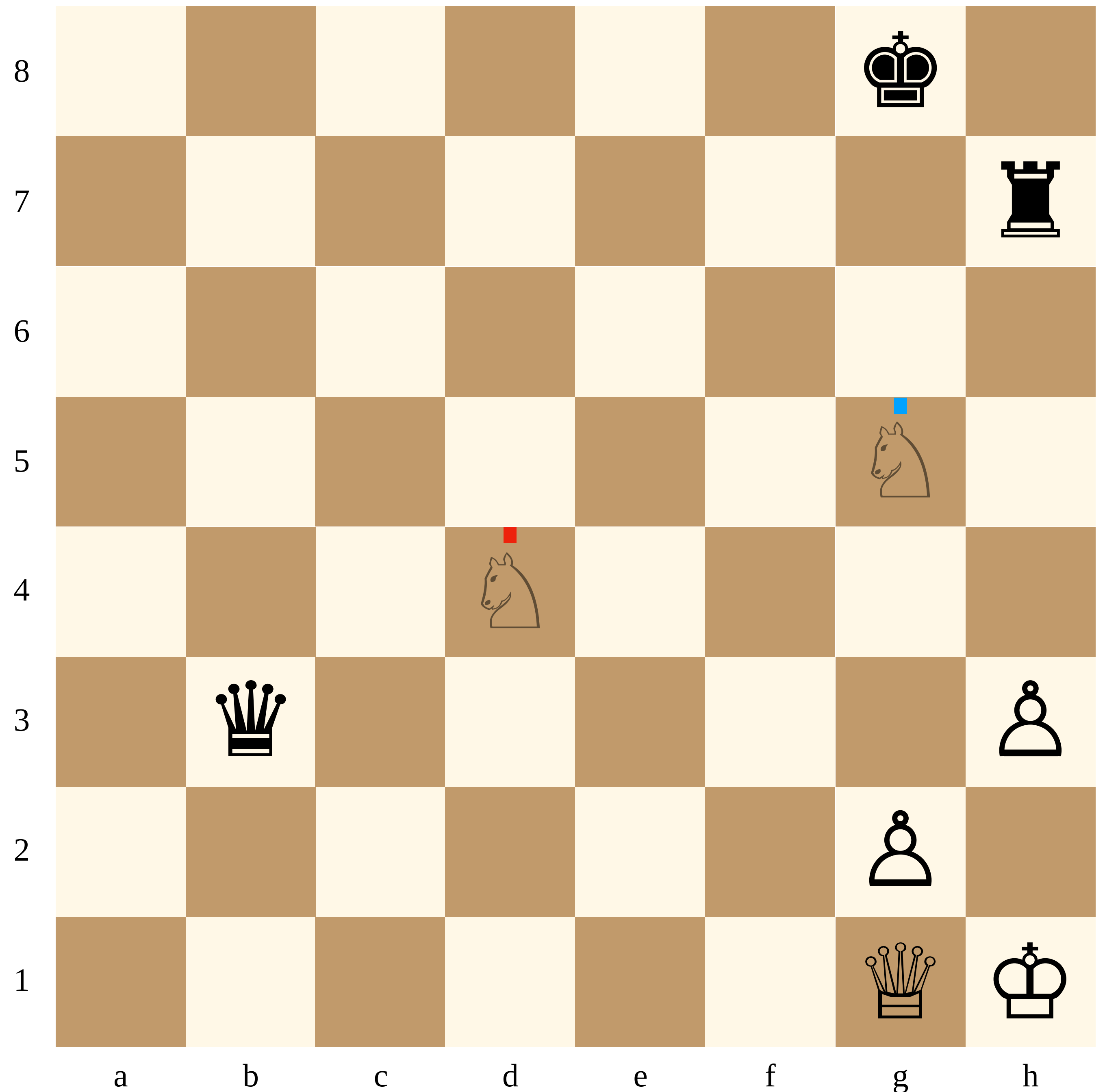
The indefinite pair indicates that the knight is on **both** d4 and g5, in a sense that will be clarified later.

This is called “**spatial superposition**,” a common phenomenon in the sub-microscopic world, but unimaginable in everyday life today.

💡 *In quantum mechanics, superposition is a general concept, meaning that a physical entity is in a state that is a combination of two or more states.*

The knight’s state is a “**combination**” of being on d4 and being on g5. (Keep in mind: it’s 1 knight, represented by 2 indefinite pieces.)

⚠ *Being on three or more squares is not allowed in this game (although theoretically possible, it would require indefinite triplets or more).*





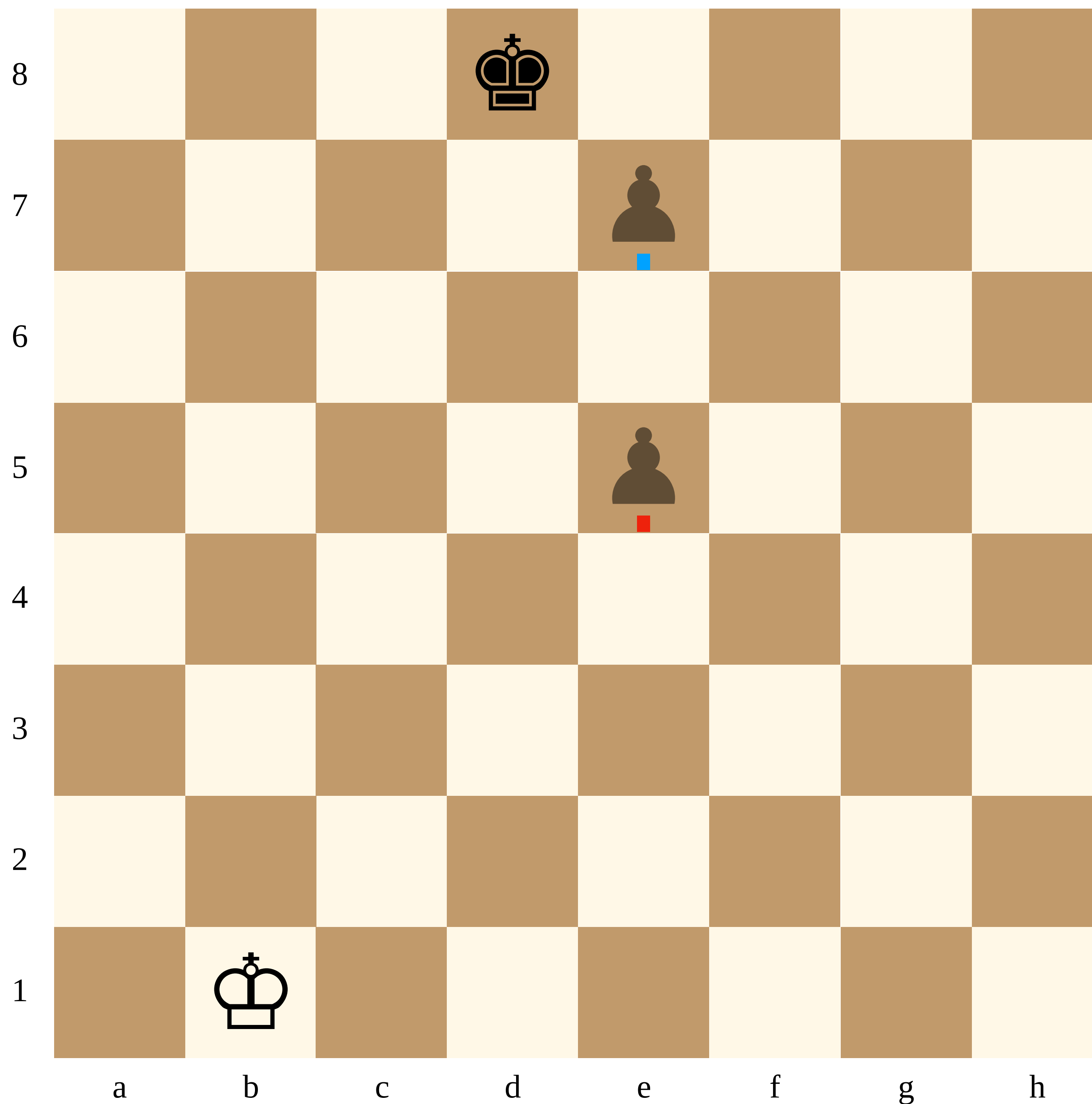
## Move & stay is OK

It's allowed to **move** to an unoccupied square and **stay** simultaneously.

For example, Black's pawn has both moved to **e5** and stayed on **e7**.

**!** *Only for pawn pairs: the indefinite piece with the red mark must be in the front.*

Now, let's continue where we left off before...



Collapse

# Truly random collapse

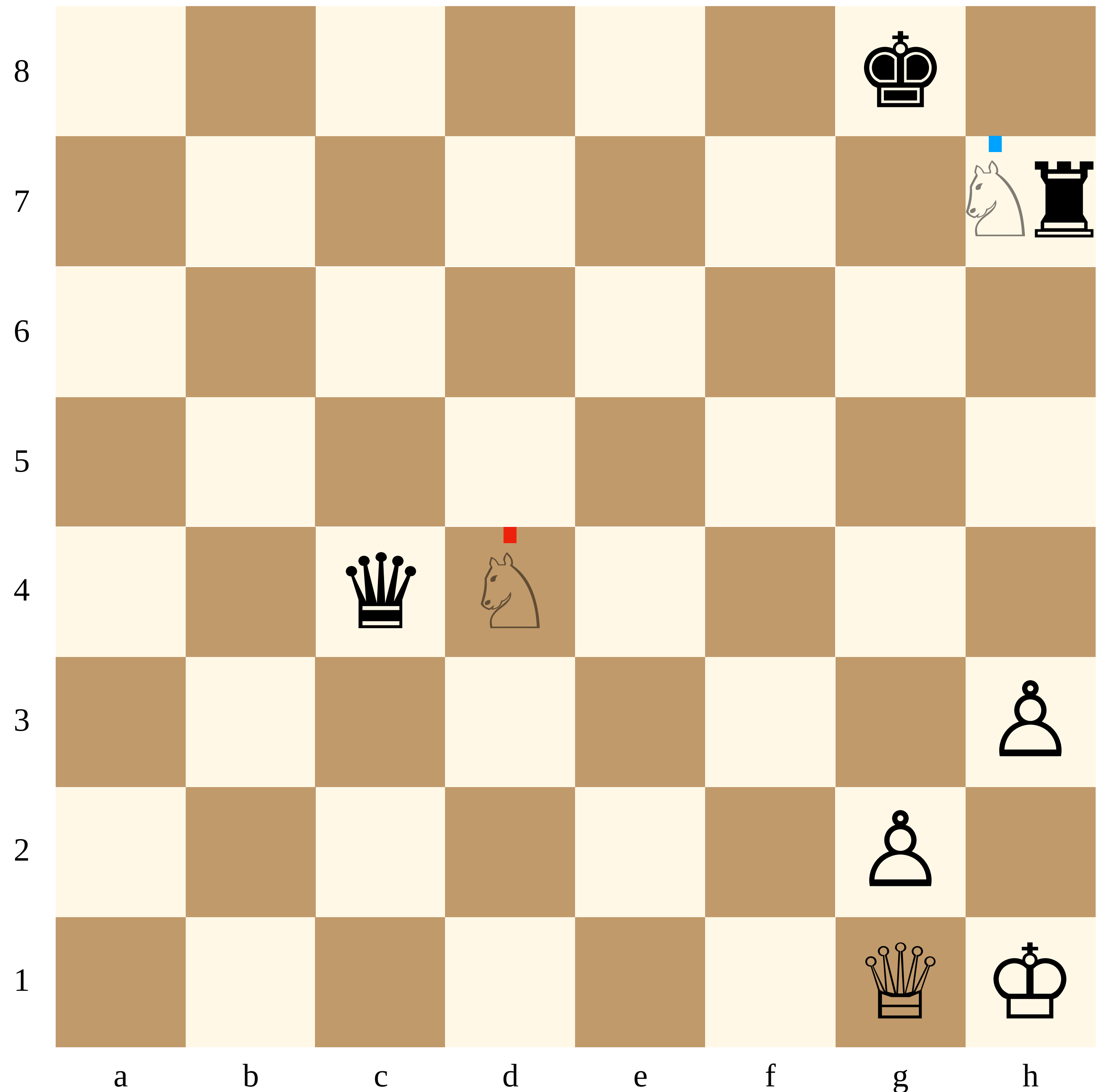
Black's queen moved from b3 to c4.

After that, White's indefinite knight moved from g5 to h7, to try to capture Black's rook.

Physically, we imagine the knight "bumps into" the rook, and the collision will make its superposition randomly "**collapse**" into a conventional state; it will end up either on d4 or h7.

💡 *In reality, a superposition state is extremely fragile. Even the slightest disturbance from outside can cause it to collapse. In this game, we assume every indefinite piece has a protective layer which breaks down on collision; after that, the unwanted contact with the environment causes collapse. According to quantum mechanics, the outcome of the collapse is truly random.*

So, White has to **roll the dice**...





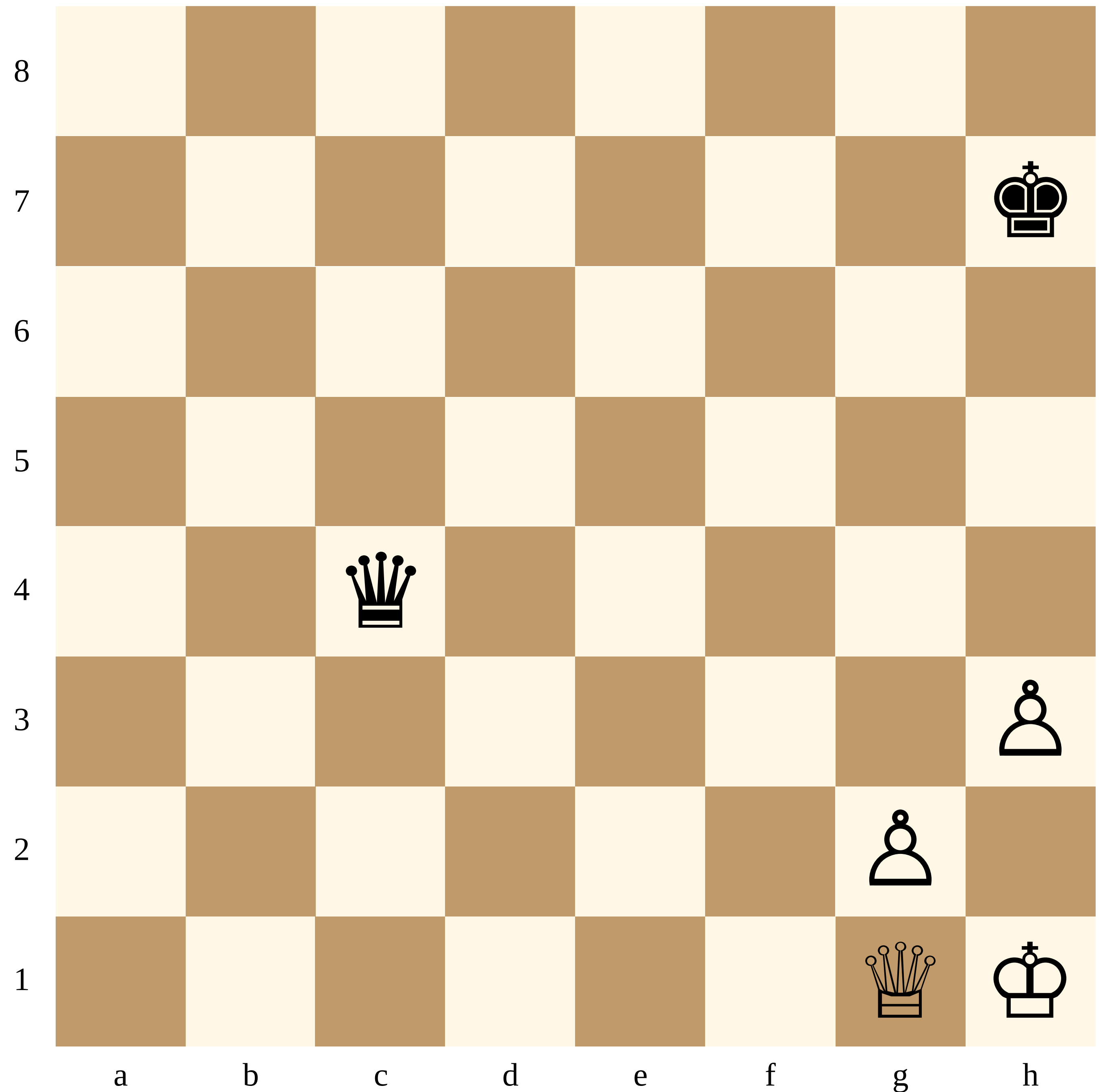
## The next move

As per conventional rules, Black's king has captured the knight.

However, White still seems to have a better chance of winning, thanks to the earlier capture of the rook, which was made possible by the superposition move.

### Note:

If White's knight had collapsed to **d4** instead of **h7**, it would have been protected by the queen on **g1**, making White's attempt to capture the rook safer than a gamble.



## Two indefinite pieces

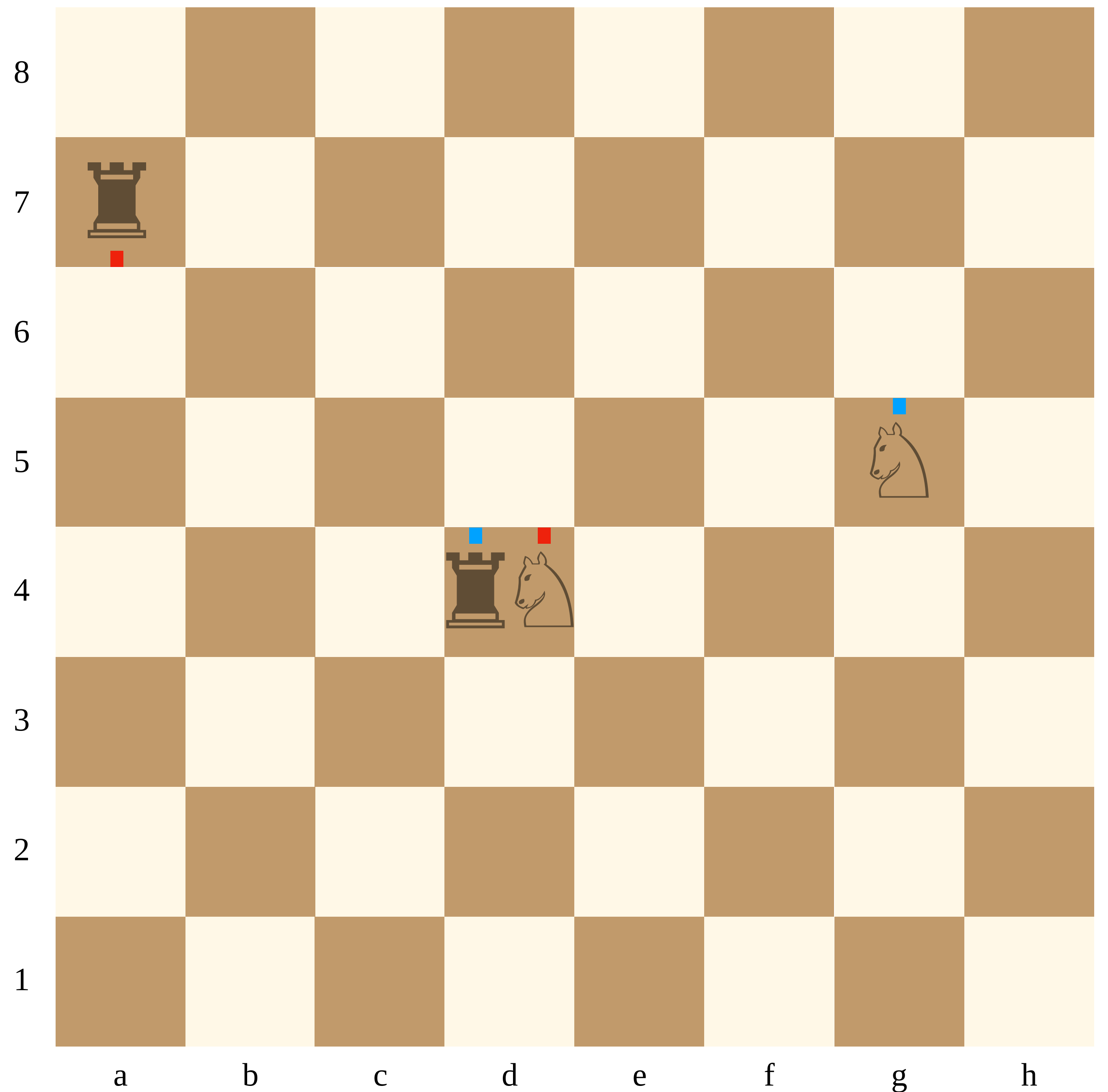
What if Black's rook tries to capture the knight on d4?

Collision breaks the protective layer of the pieces, so **both** Black and White have to roll the dice. The capture will succeed only if both pieces end up on the **same square**, i.e. on d4.

For unequal superposition, 1, 2, 3, or 4 means **red**, while 5 or 6 means **blue**.

Black wishes to roll a 5 or 6 (**blue**), hoping that White rolls an even number (**red**).

Let's see what happens...

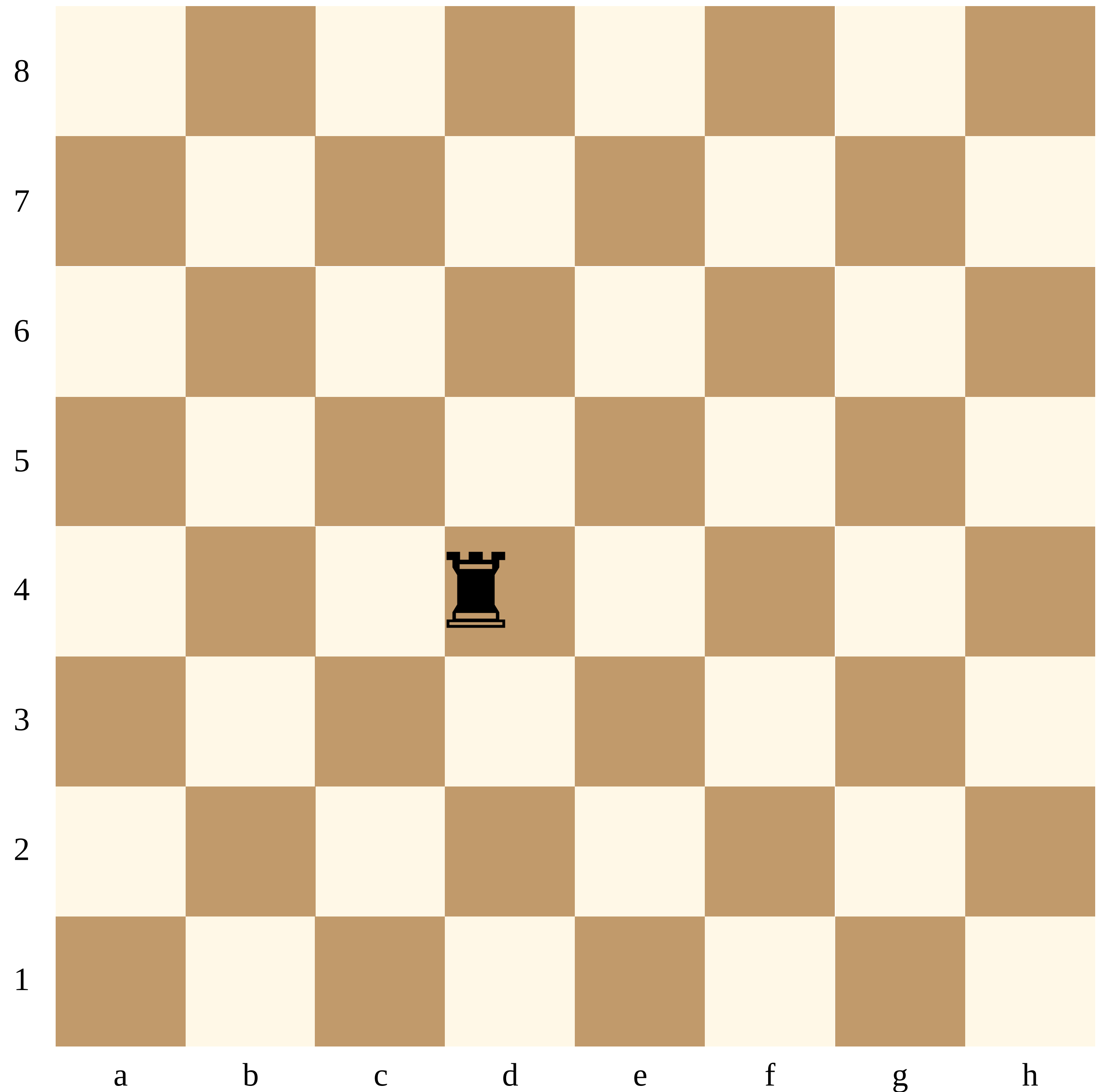


## Two indefinite pieces

Black has rolled a 6 (  ) and White a 2 (  ).

Thus, the rook collapsed to **d4**, and the knight also collapsed to **d4**, exactly as Black had hoped!

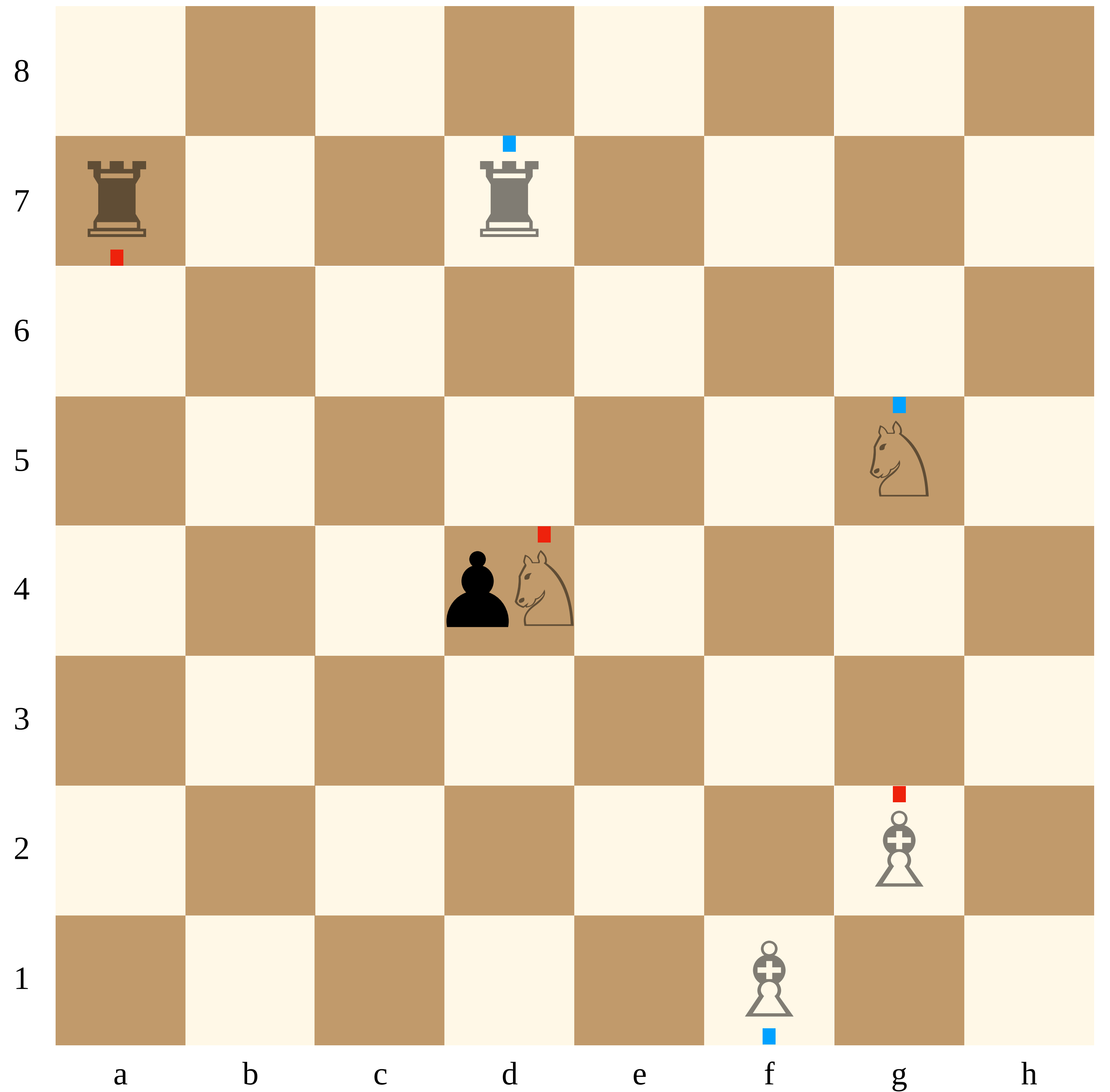
With that, the knight has been **captured**.




## Independent pairs

Black's pawn tries to capture the knight on **d4**.

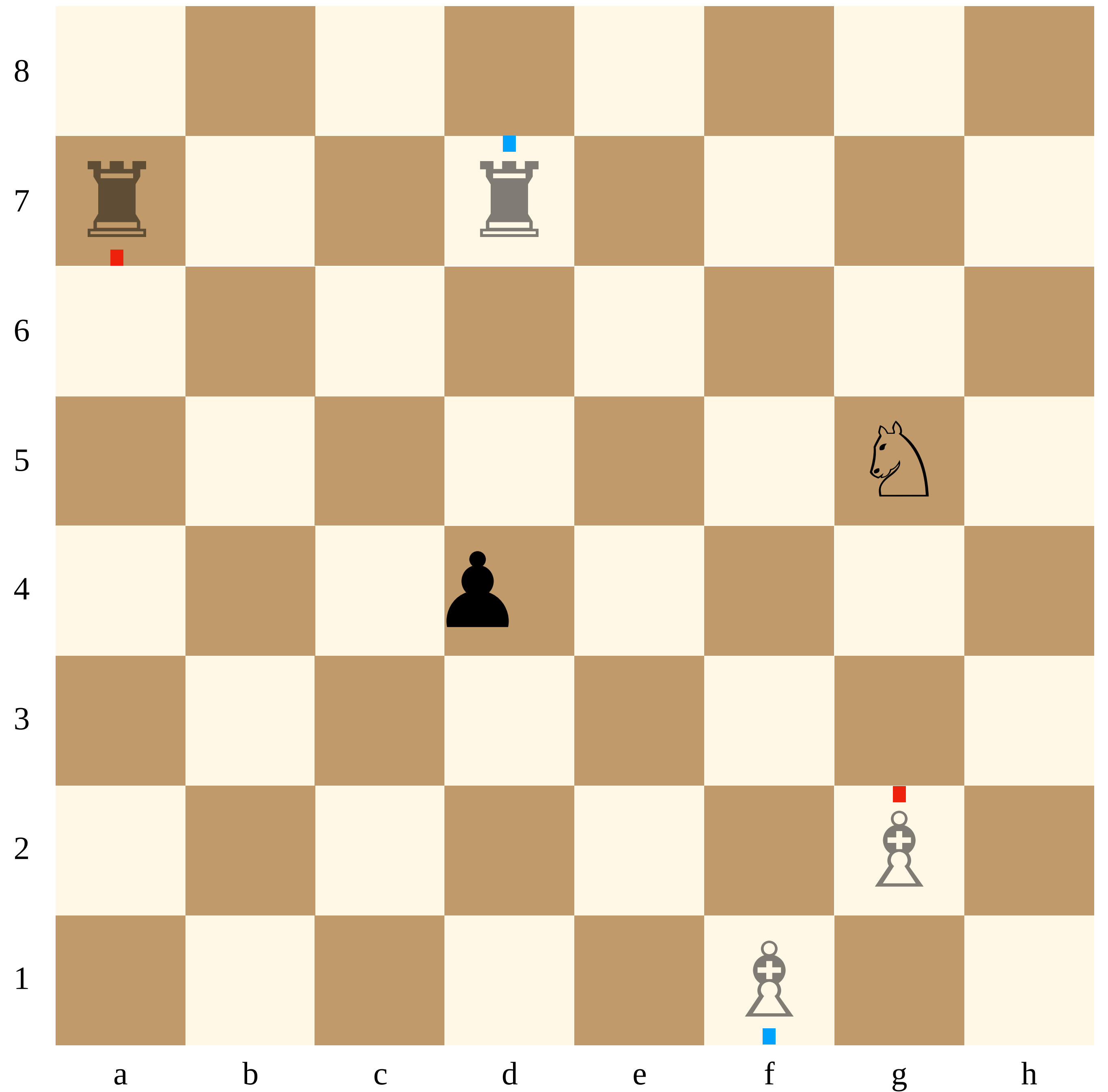
Now, White has to roll the dice to collapse its knight...



## Independent pairs

White has rolled a 3 (  ), so the knight collapsed to **g5** and **escaped**.

**!** *The rook and the bishop were not disturbed by the pawn, so they remained in superposition.*



Check & checkmate

## What is a check?

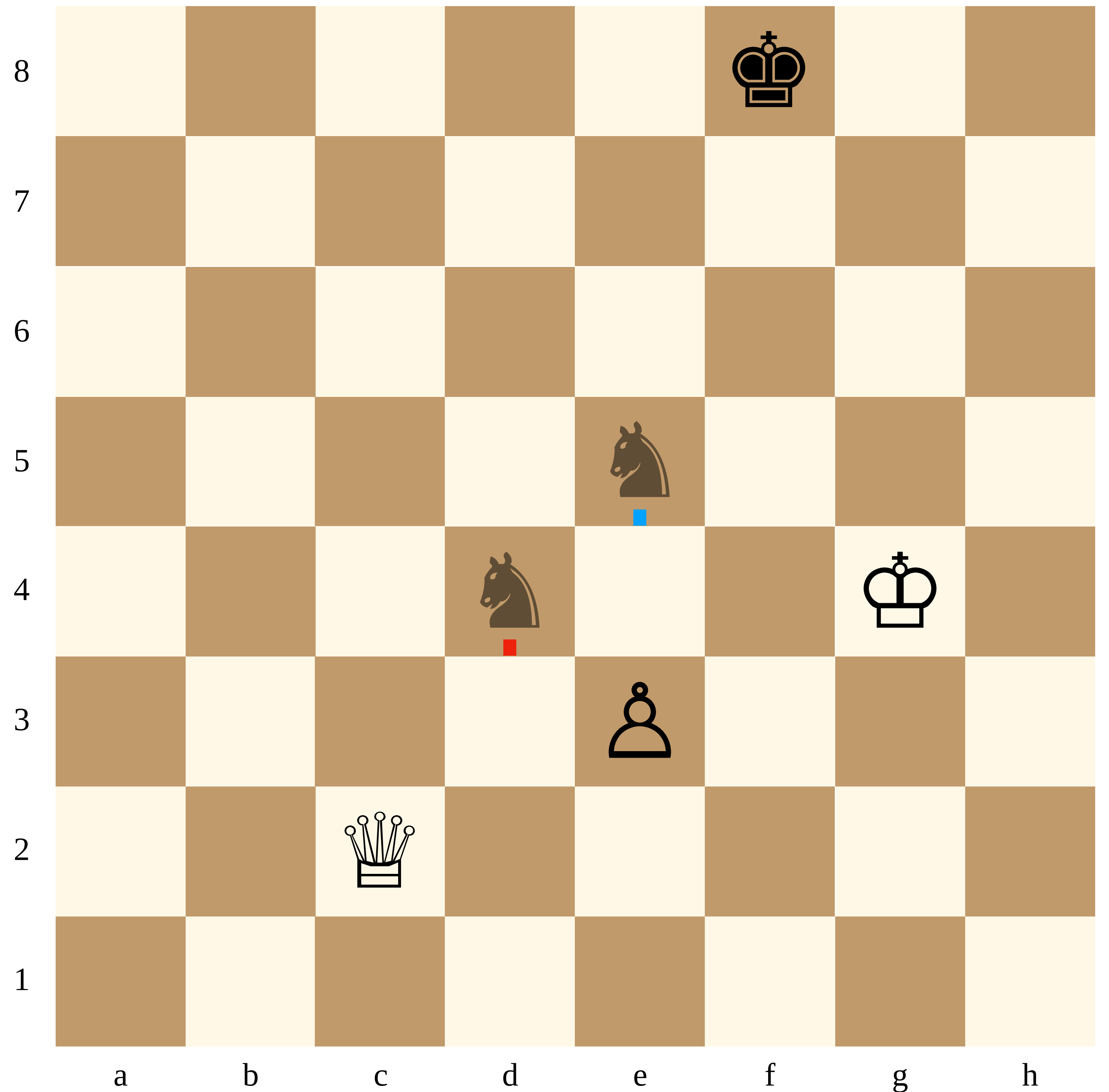
White's king is in danger.

In a **hypothetical** next move, Black would have a 50% chance of capturing it by moving from e5 to g4.

In Niel's Chess, **danger** (of capturing the king) is called "**check.**"

So White's king is in check and must move to get out of it!

But wait, what if...



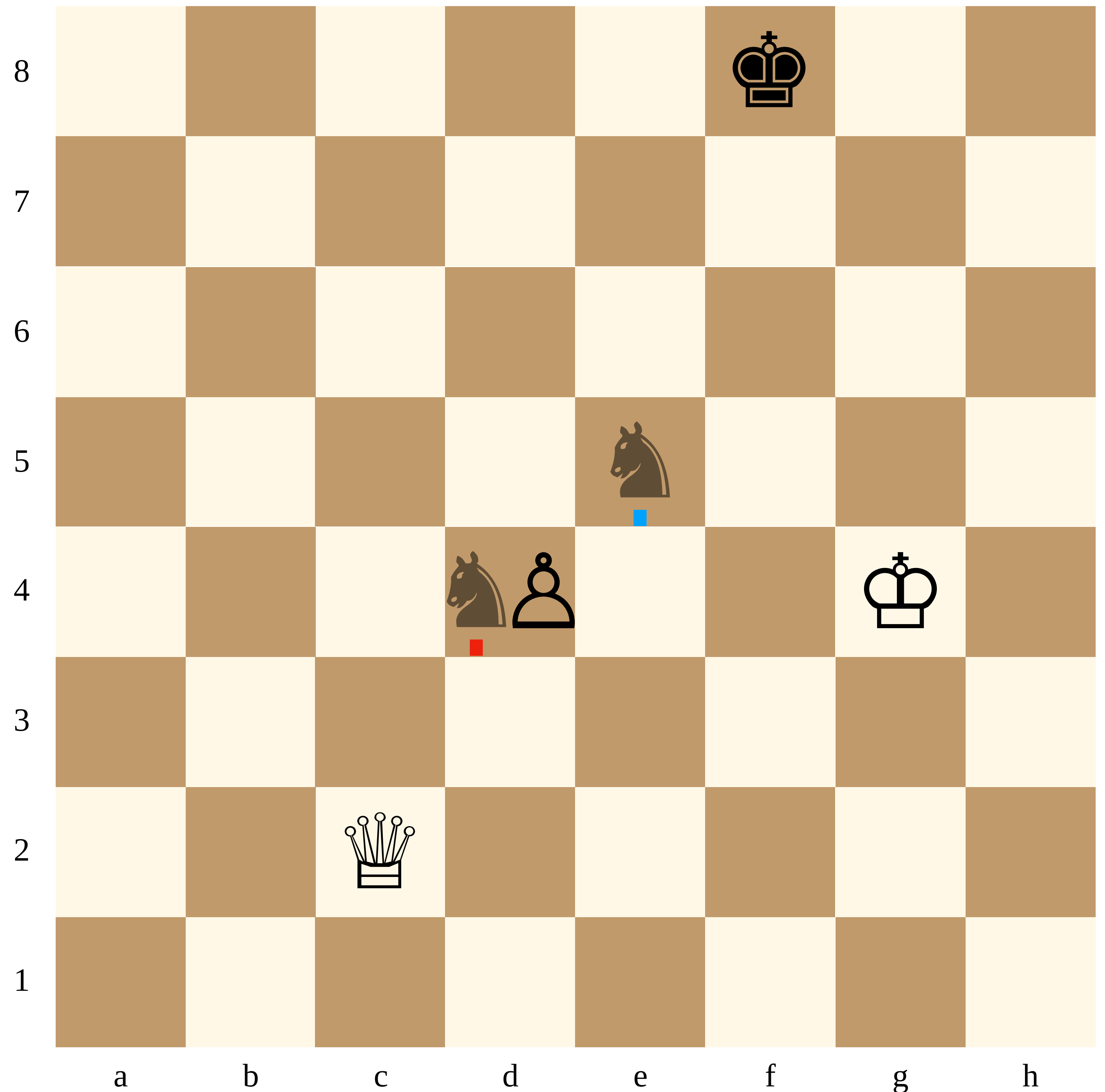
## No way!

White's pawn is **not allowed** to try to capture the knight on d4.

Why? Because doing so would cause Black's knight to collapse, but there is a 50% chance that it would collapse to e5, thereby escaping capture and leaving White's king in check.

**!** *It's not allowed to make a move that could potentially leave your king in check or expose it to check.*

To get out of this check, White has to move its king. (Pawn has to stay on e3.)



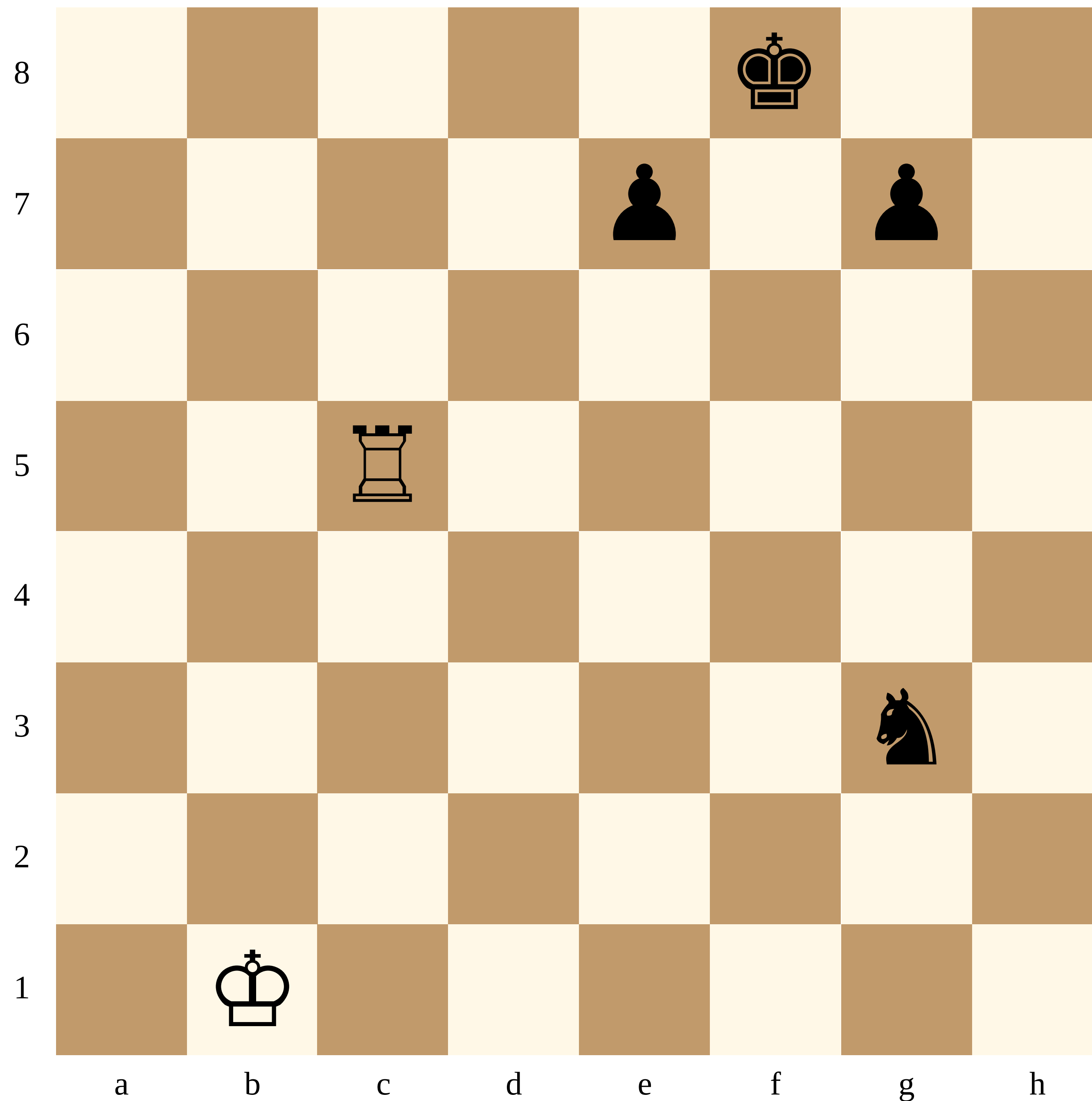
# Checkmate

White has the move.

In conventional chess, it wouldn't be possible to checkmate Black's king in just one move.

But in Niel's Chess, it's possible!

Can you guess how?



# Checkmate

The superposition move...

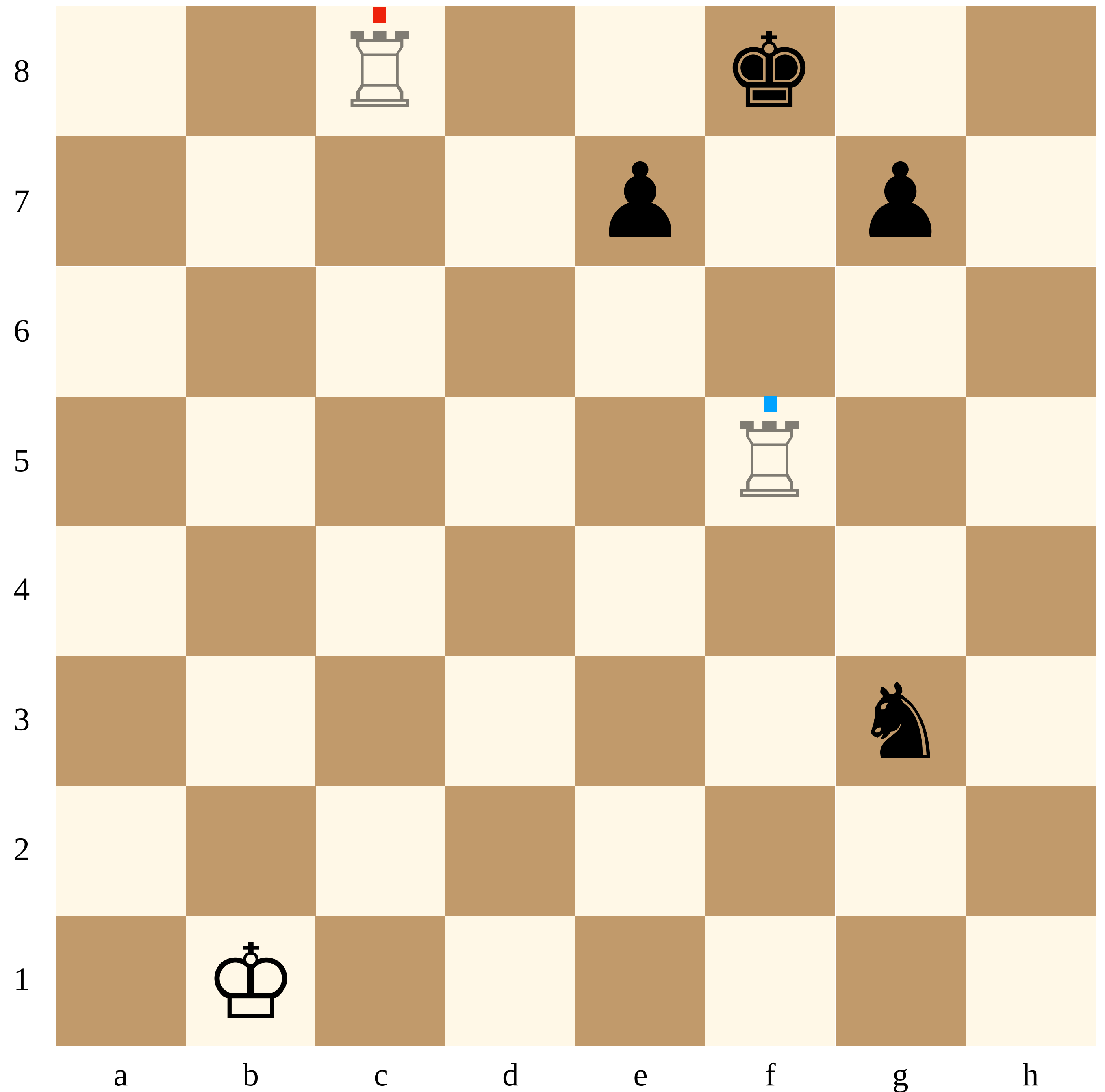
Black cannot get out of this check.

**!** *Moving the knight to f5 is not allowed, as the rook would have a 50% chance of collapsing to c8, leaving Black's king in check.*

So, it's a checkmate.

Note:

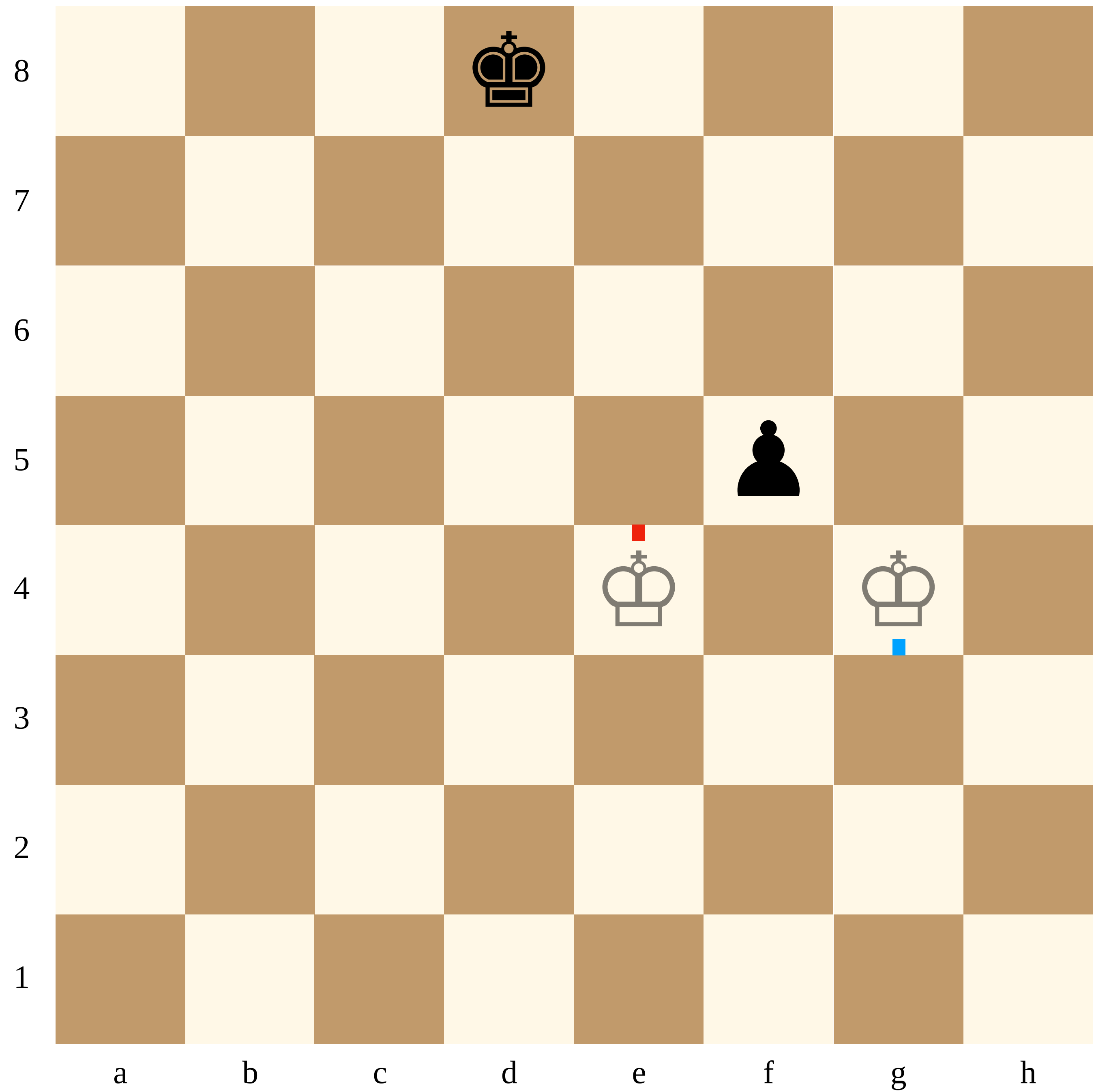
This had nothing to do with luck—we didn't even roll the dice!



## A weird one

This is also a checkmate.

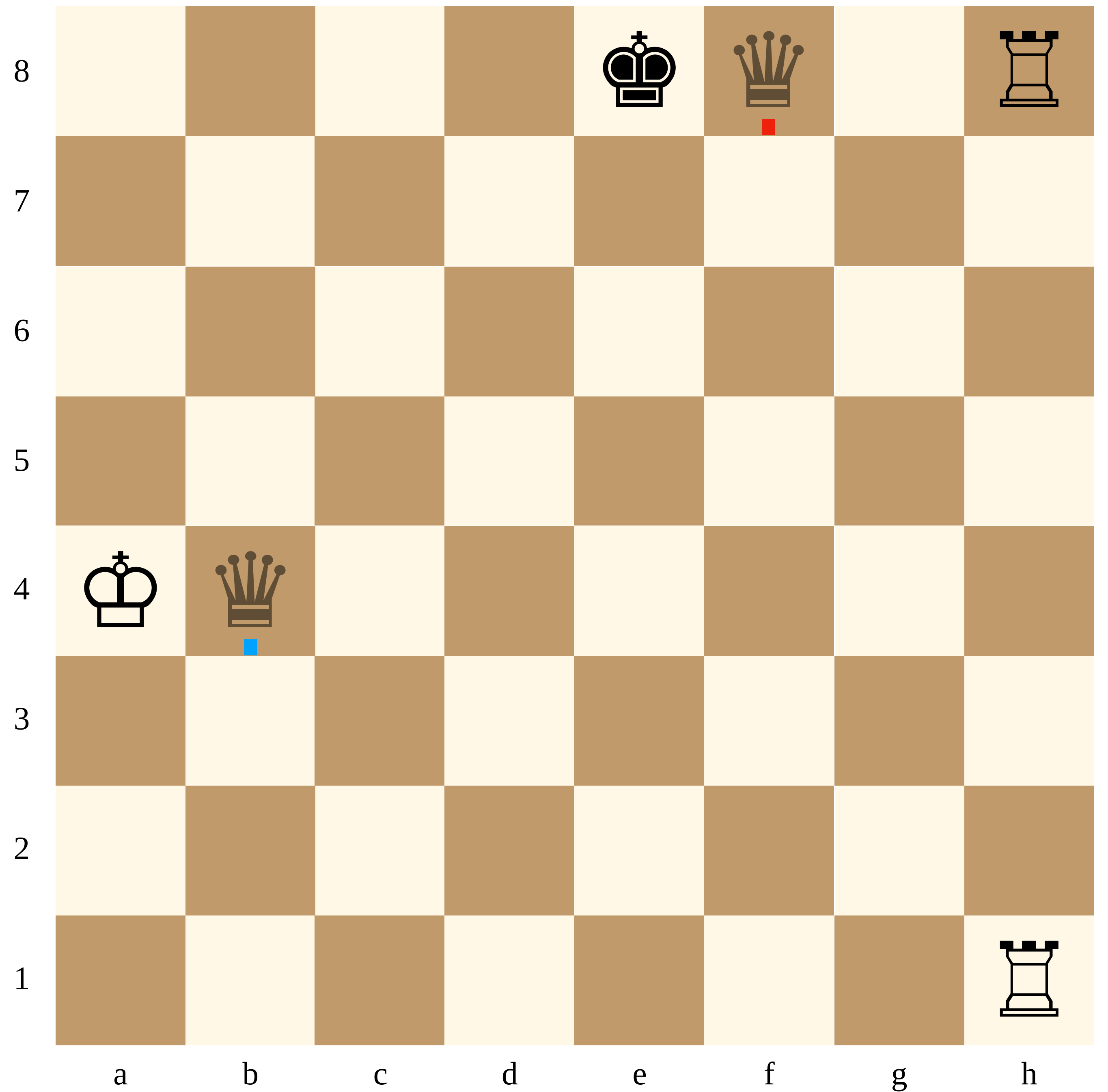
White doesn't have any legal move to get out of check.



## One more

Black's indefinite queen on **f8** prevents check from White's rook on h8...

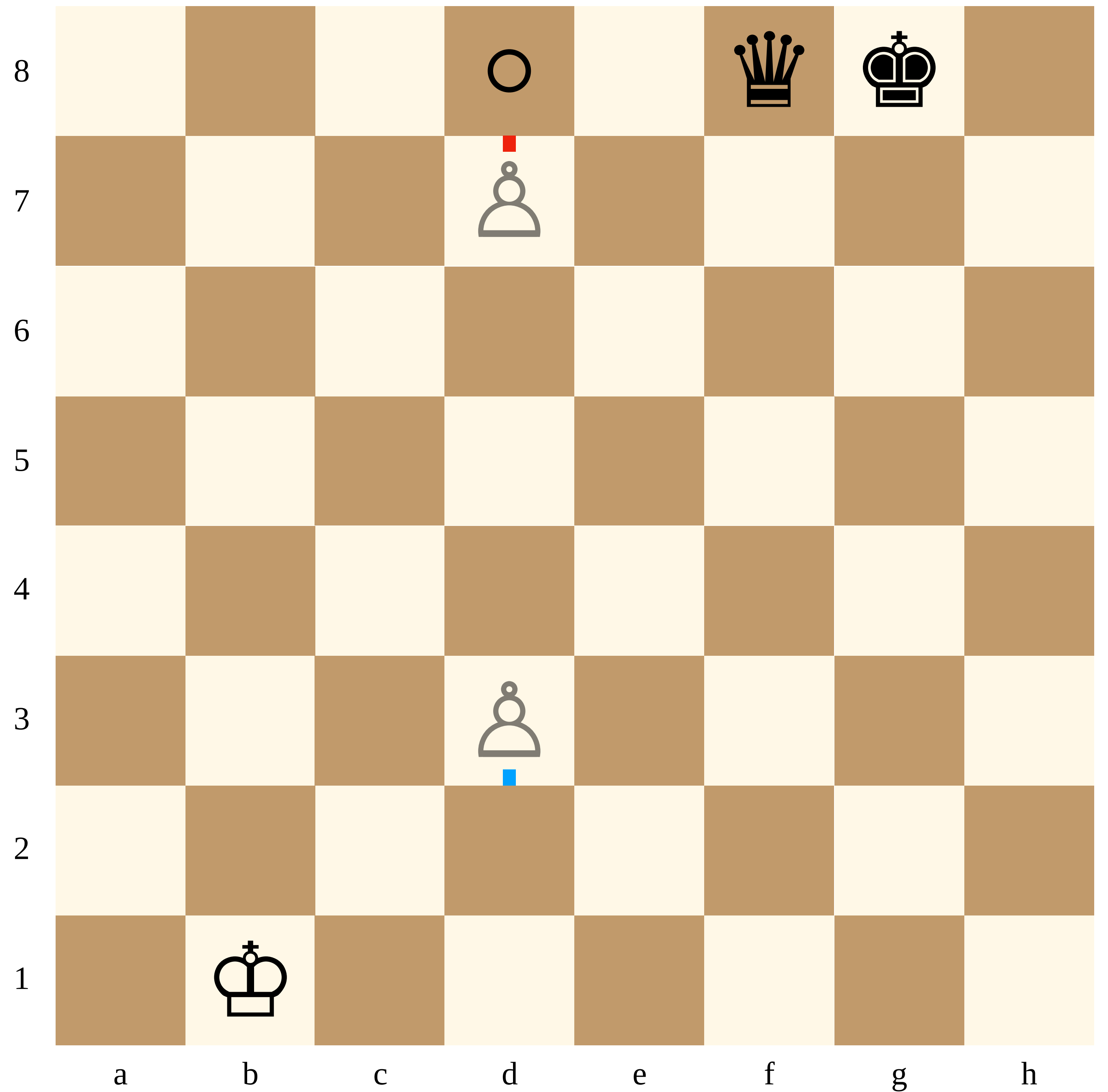
...while its pair piece on **b4** checkmates White's king.



# Special moves I

## Indefinite pawn promotion

If an indefinite pawn reaches the furthest rank, the pair it belongs to **must be exchanged** for a new indefinite queen, rook, bishop, or knight pair with the **same orientation** of the marks...

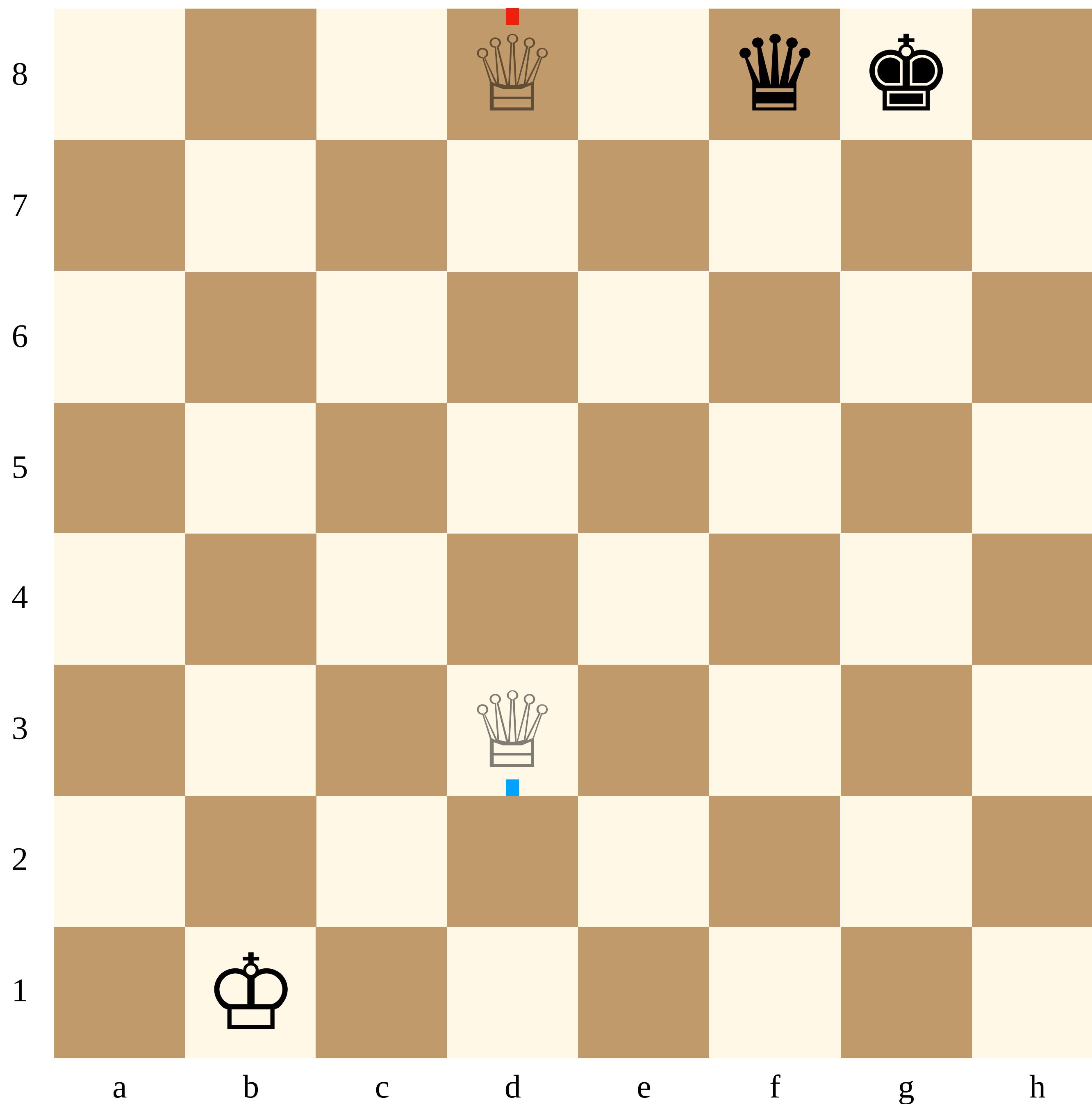


## Indefinite pawn promotion

The indefinite pawn has reached **d8**, and the pair has been promoted to a queen.

Fun fact:

It would have been possible to exchange the pawn pair for a bishop pair!



# Happy playing!

- Now you know enough to give Niel's Chess a try...
- For the **complete** set of rules, including two more **crazy quantum effects**, proceed to Part 2

# Part 2 - More rules

# Entanglement

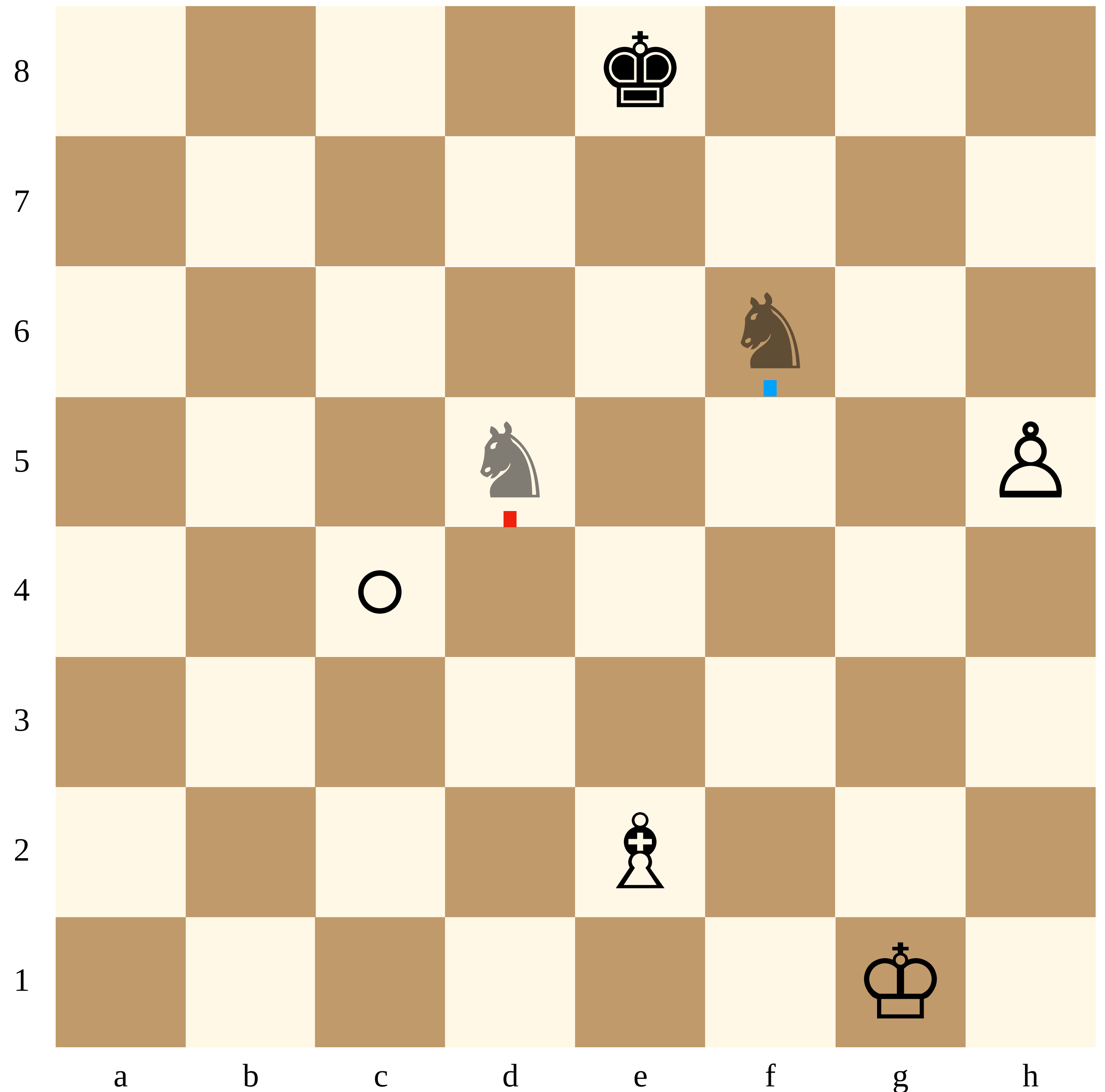
## The move, technically

Below we explain, through an example, how you can make an “entanglement move”:

1. White’s bishop both **moves** (e.g. to c4) and **stays** on e2, ...
2. ...in such a way that it **attacks** Black’s knight (from c4 in this case).
3. All marks must be **oriented** along the same diagonal (cf. next page), and ...
4. ...**aligned** according to the superposition type of the knight.

**!** *IMPORTANT: c4 must be unoccupied for this quantum move, and the two pieces involved must be of different colors.*

Let’s execute the four steps...



## The move, technically

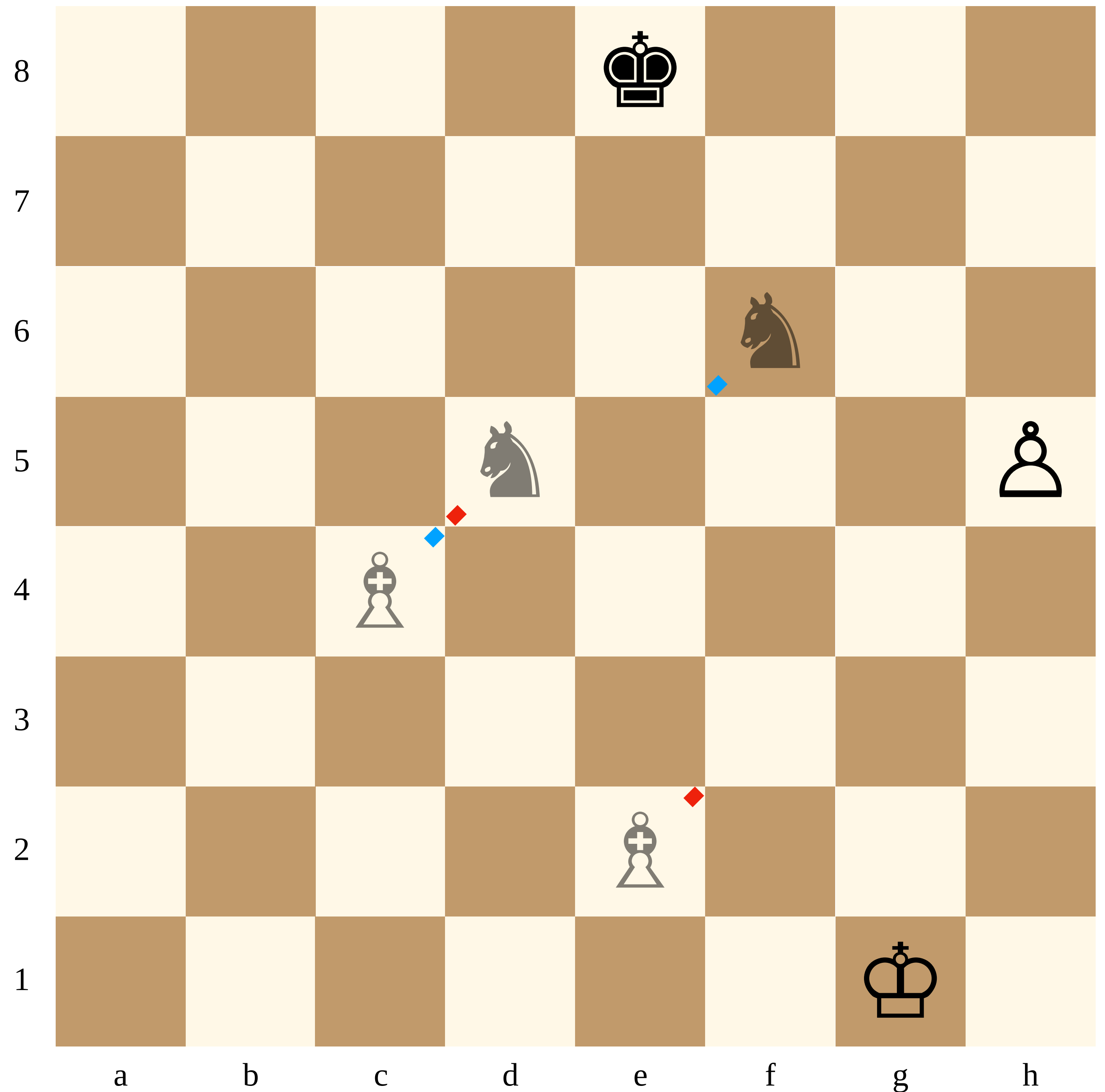
All marks are oriented along the same diagonal /, and since the knight was originally in equal superposition, they all face (diagonally) the opponent.

! *White is free to choose whether the red mark goes to e2 and the blue to c4, or vice versa.*

Now, the marks indicate a “**joint superposition**” state, in which the **knight-bishop pair** is “equally” on **d5-e2** and **f6-c4**. And with that, the knight and the bishop have become “**entangled.**”

💡 *In quantum mechanics, entanglement refers to a situation in which two or more distinct physical entities seem to be connected, despite having no apparent physical link between them.*

We’ll follow the game to see what this actually means...

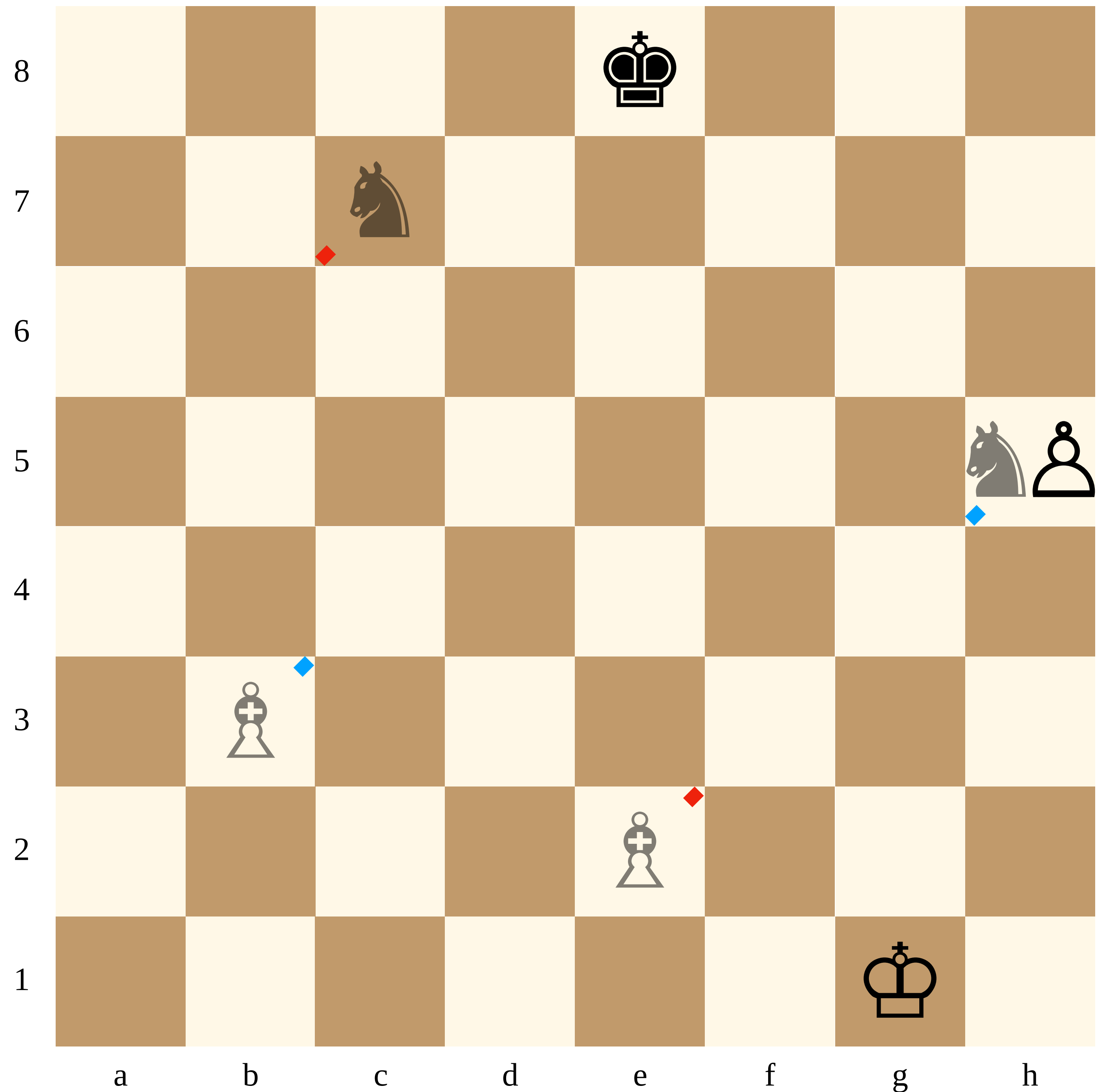


## Collapse in tandem

Two moves later, Black tries to capture White's pawn on h5.

It has to **roll the dice** to collapse its knight...

💡 *Spoiler: The environment asks the knight, “Are you on h5?” If the answer is, “Yes, I’m fully on h5,” then it’s compatible only with h5-b3 in the joint superposition (which includes being on c7-e2 and h5-b3), so the pieces end up on those “blue” squares. However, if the answer is, “No, I’m not on h5 at all,” then the pieces end up on the “red” squares c7-e2, since only that’s left after excluding h5-b3. Thus, the outcome will be either “red-red” or “blue-blue.”*




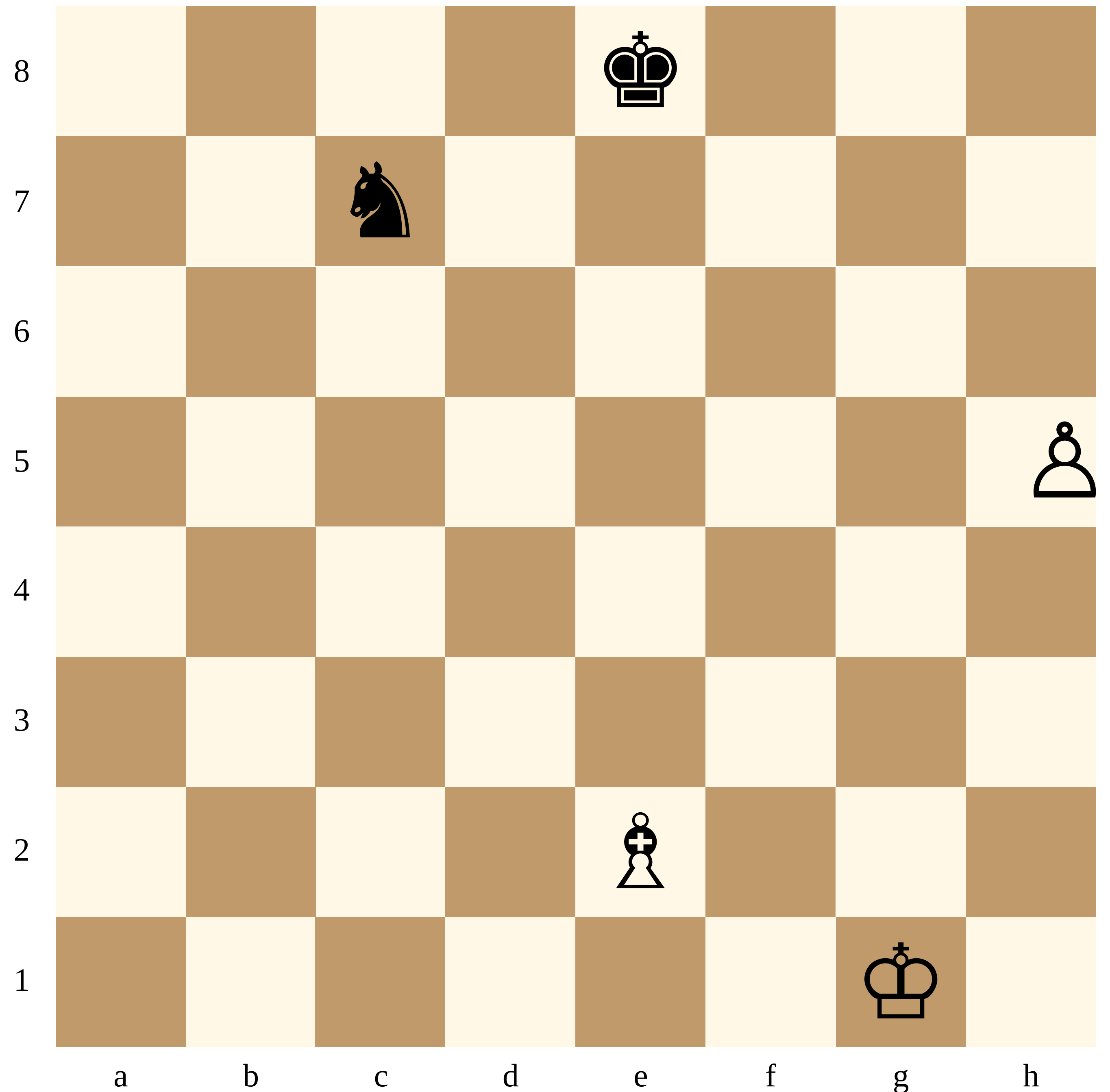
## Collapse in tandem

Black has rolled a 4 (  ).

For equal superposition, even number means **red**, odd number means **blue**.

Thus, the knight-bishop pair ended up on **c7-e2**, and the pawn on h5 escaped. A **single dice roll** collapsed **both** pieces at once.

 *Physically, it seems as though the bishop somehow immediately knew the knight's "answer" to the question, "Are you on h5?" and collapsed accordingly right away. This phenomenon bothered Einstein a lot, and he famously called it "spooky action at a distance."*



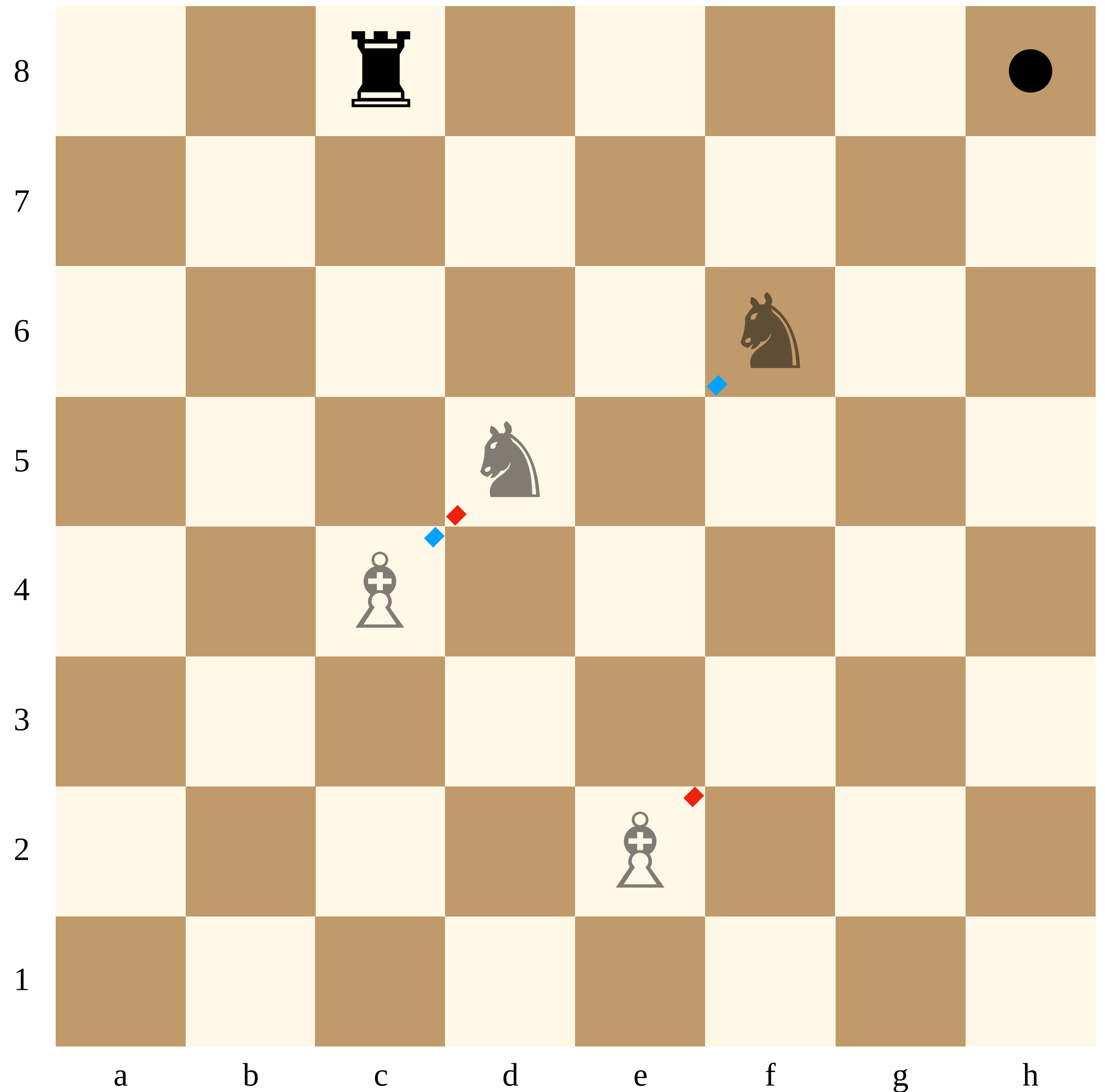
## More may join

The rook on c8 may **join** the entanglement of the knight and the bishop, by making an entanglement move involving the **opponent's** bishop.

**!** *Reminder: Technically, an entanglement move is like an attacking, “stay-and-move” superposition move, followed by the diagonal orientation of the marks.*

As it already attacks the bishop from c8, the rook in this example may move to any unoccupied square it can reach (e.g. h8), while simultaneously staying on c8.

Let's see the move...

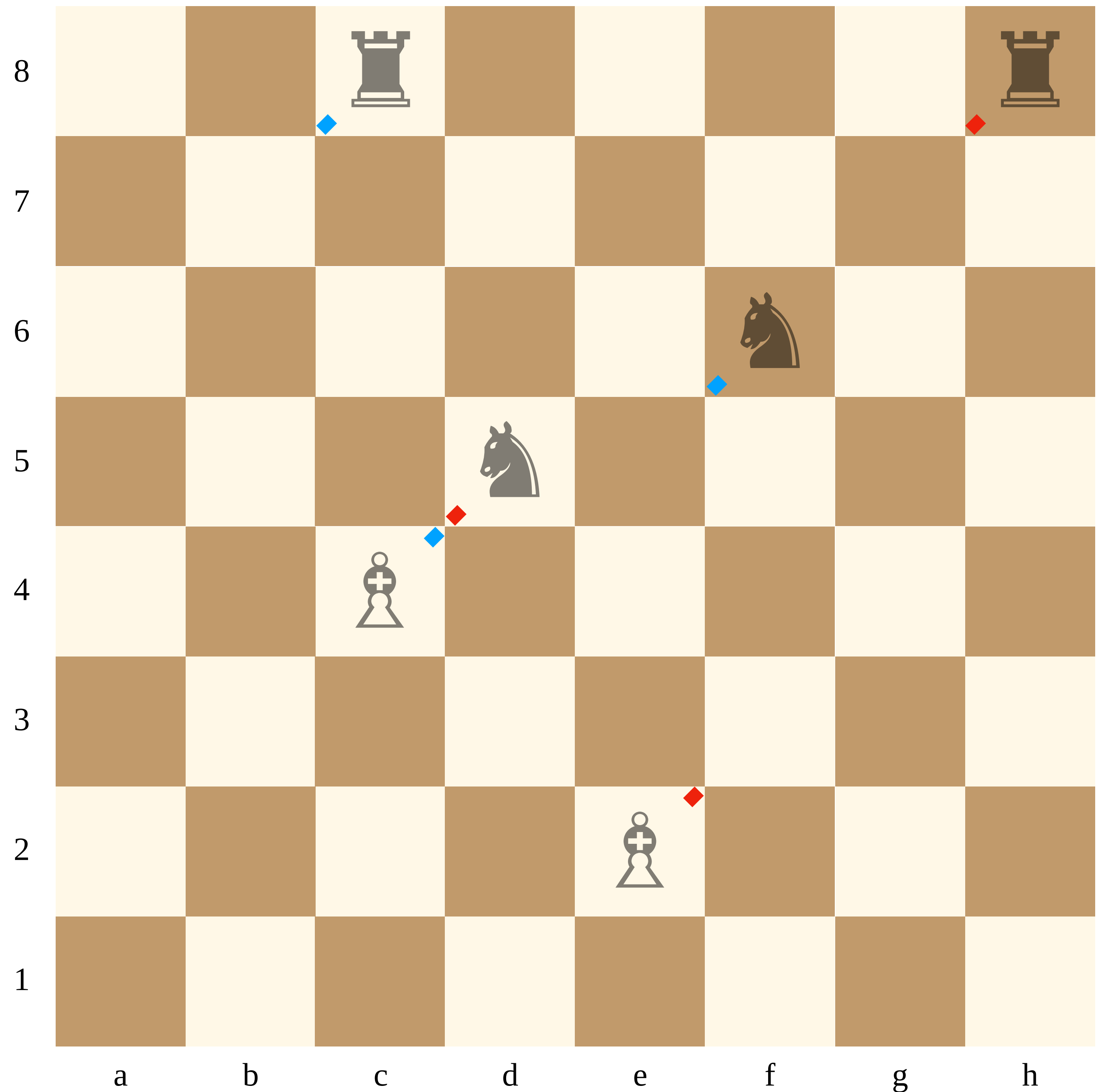


## More may join

Now, all three pieces are entangled, in an equal joint superposition. That is, the knight-bishop-rook triplet is “equally” on  $d5-e2-h8$  and  $f6-c4-c8$ .

Next, if the bishop moves **from c4 to d5** to try to capture the knight, Black would have to roll the dice and the pieces would end up either on  $d5-e2-h8$  or  $f6-d5-c8$ .

However, the bishop would surely not capture the knight, because it's impossible that **both** collapse to d5.

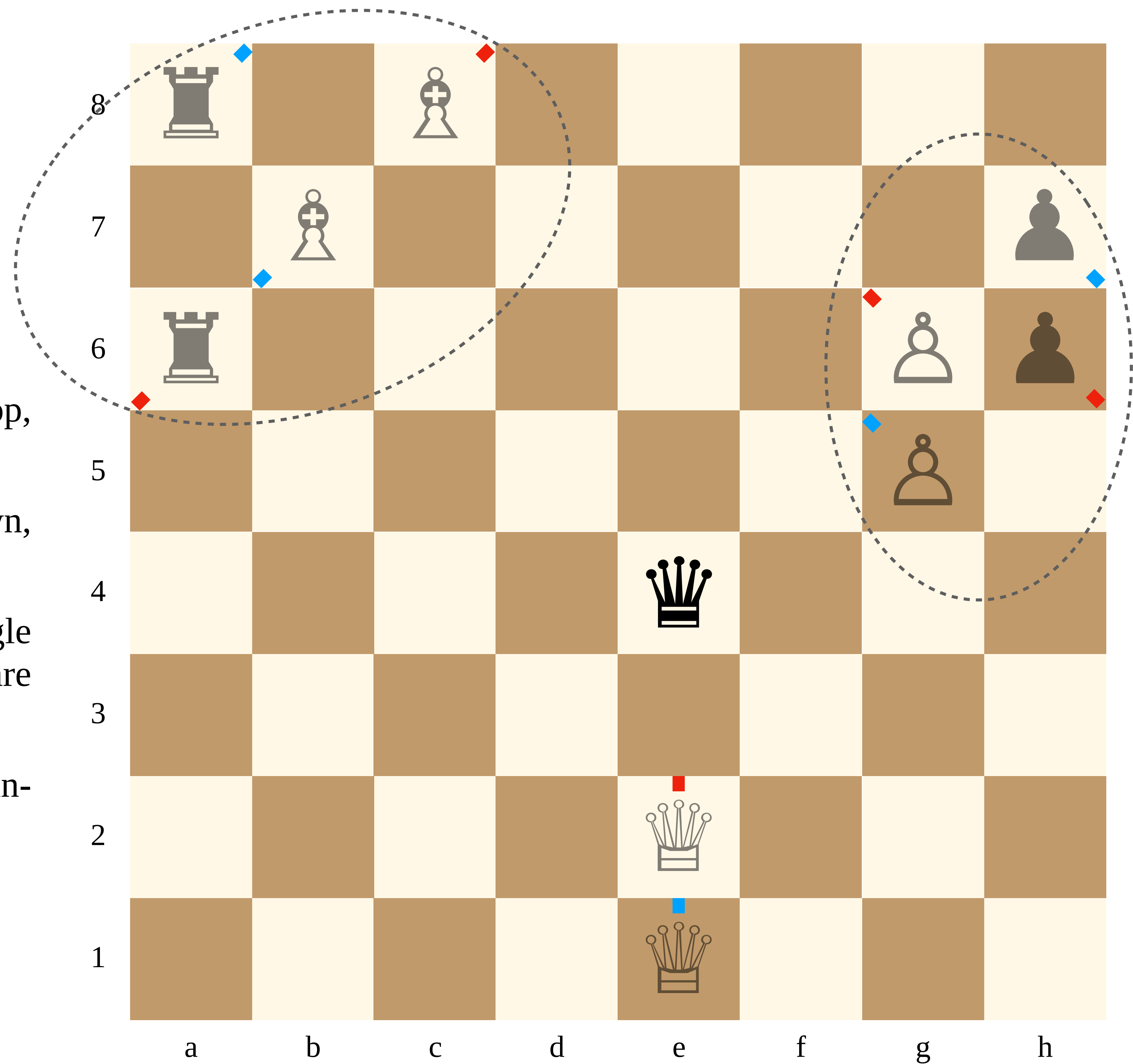


## Two diagonals only

1. Black's rook is entangled with White's bishop, as indicated by their marks aligned along  $/$ .
2. White's pawn is entangled with Black's pawn, as indicated by their marks aligned along  $\backslash$ .

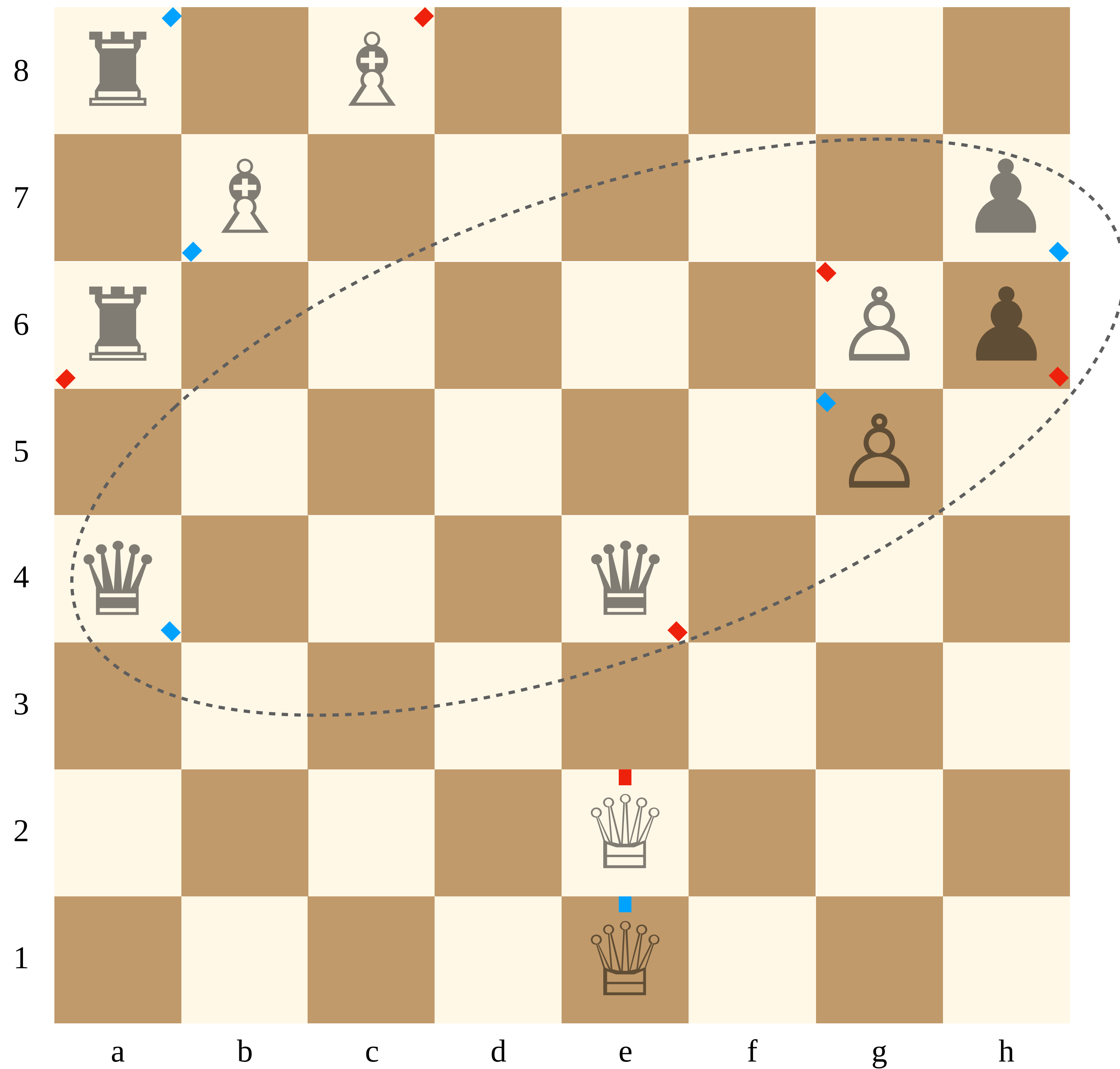
Black's queen is **not allowed** anymore to entangle with White's queen, because both diagonals are already used up...

...but it is allowed to **join** either of the two entangled groups.



## Two diagonals only

Black's queen has joined the entanglement of the pawns.



## Collapse this!

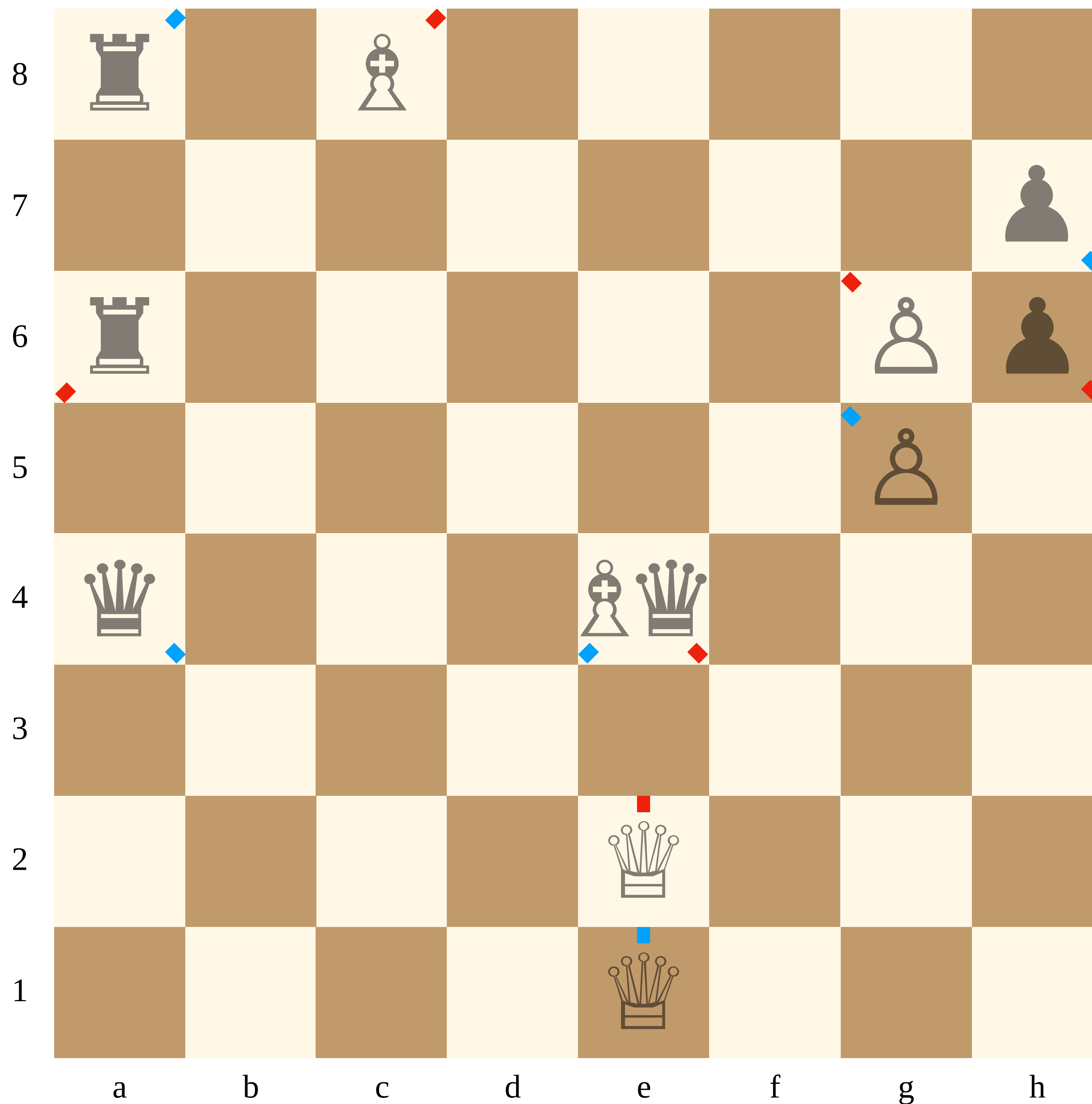
White's bishop tries to capture Black's queen on e4.

Now, Black and White **both** have to roll the dice. **Black's roll** will collapse Black's queen, Black's pawn, and White's pawn (according to the "equal" rule). **White's roll** will collapse White's bishop and Black's rook (according to the "unequal" rule).

The capture will succeed if White rolls either a 5 or a 6 (**blue**), and Black rolls an even number (**red**).

### Note:

White's queen is not disturbed, it will **remain unchanged** in superposition.

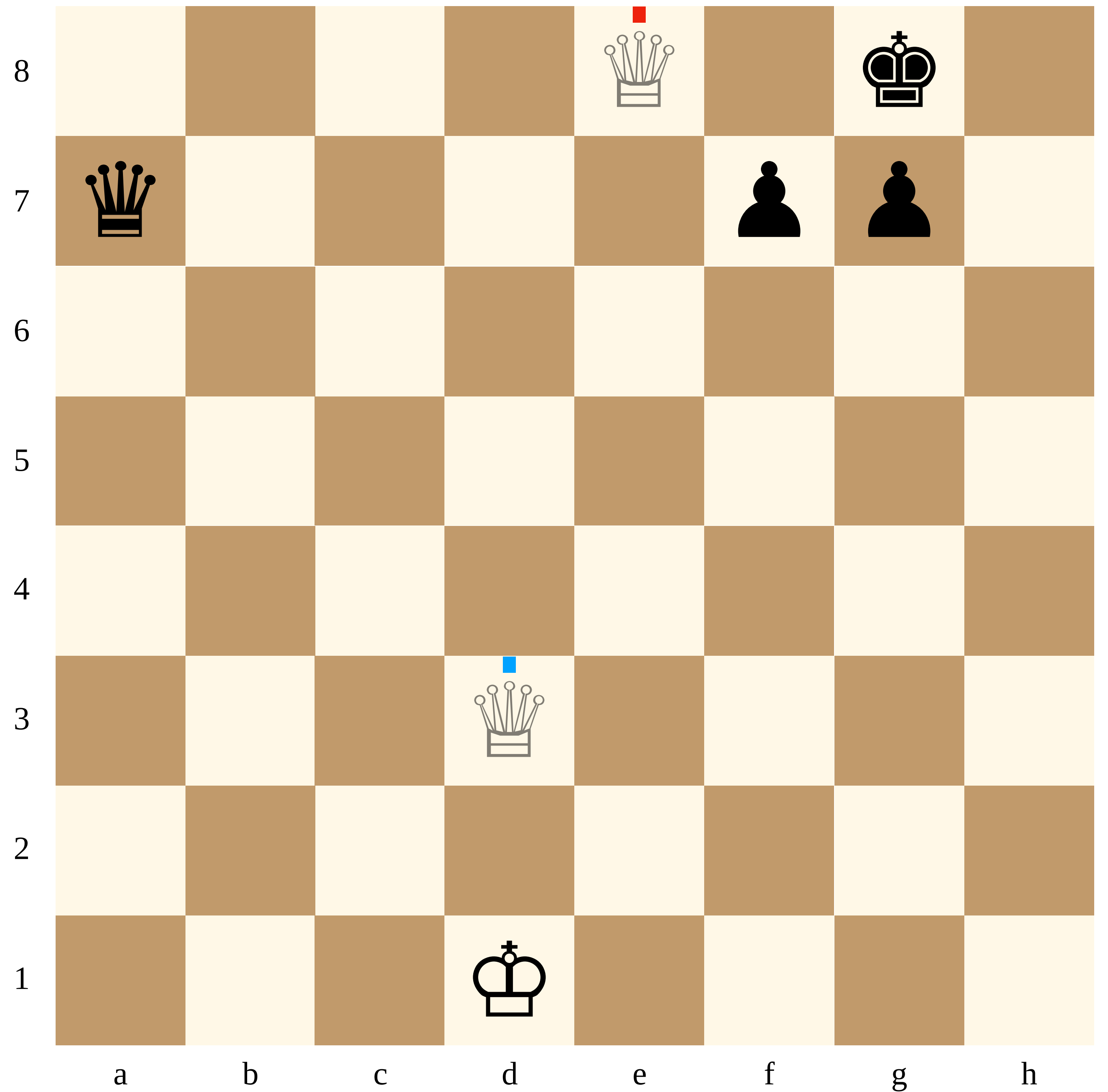


Zero-risk attack

## Checkmate?

Looks like checkmate, doesn't it?

However, White's queen is **close** to Black's king, allowing the king to entangle and escape...

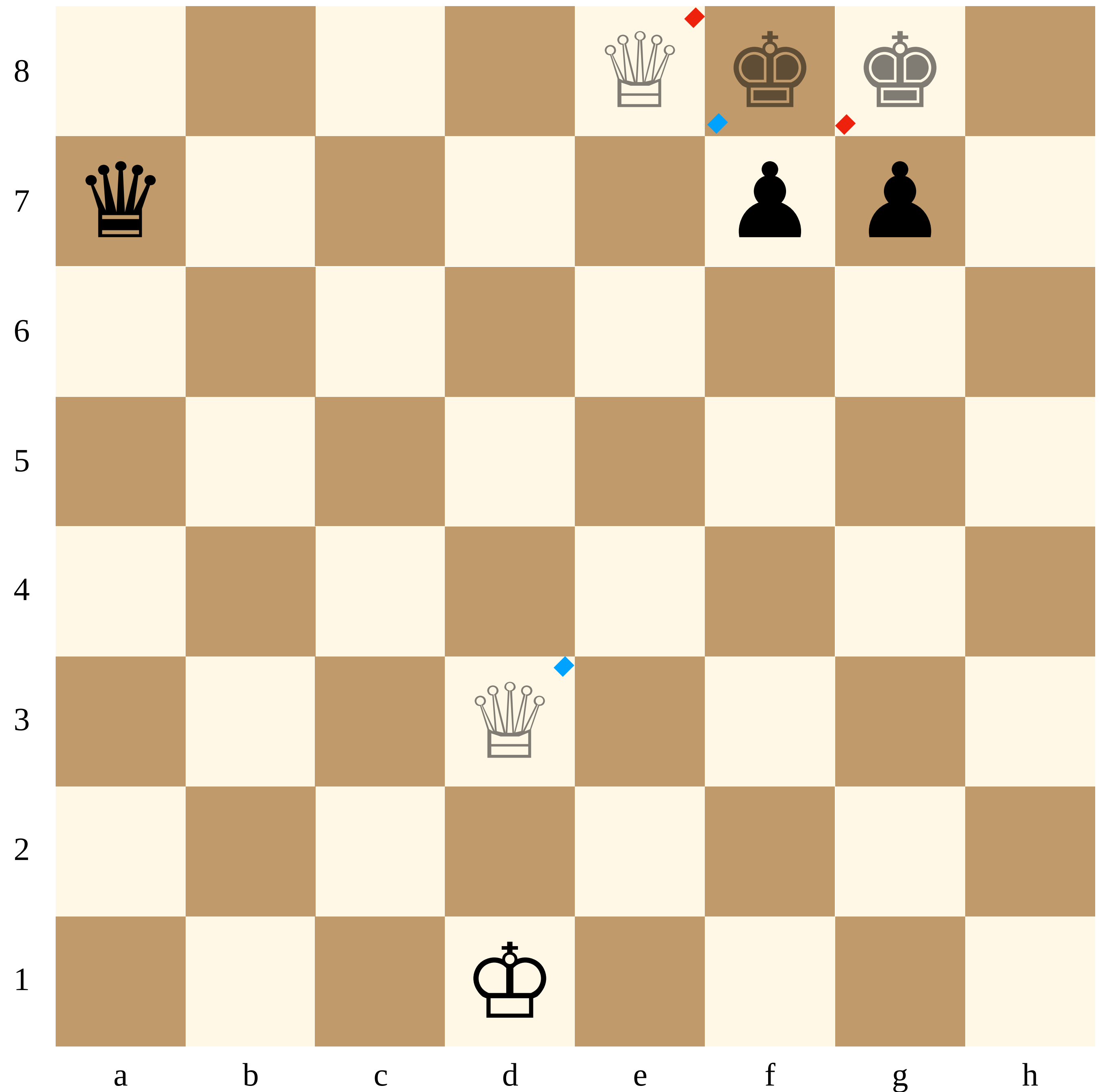


## No check

Black's king is **no longer in danger**, because White's queen has zero chance of capturing it.

Thus, Black's king is out of check. (It does "attack" White's queen, since e8 is within reach of the indefinite piece on f8.)

**!** *Next, it would be a valid move for White's queen to try to capture the king on f8.*



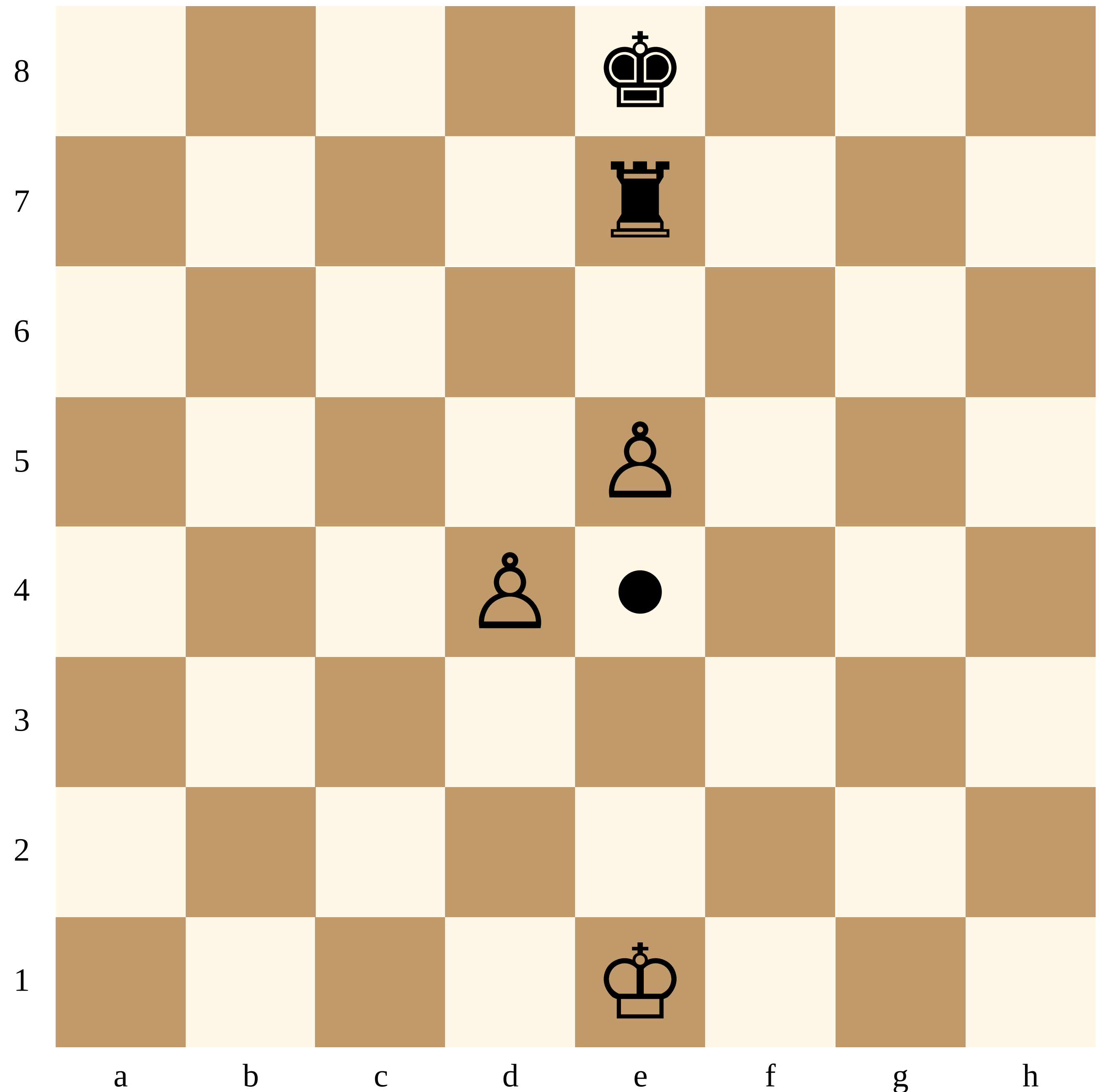
# Tunneling

## Through the barrier

A **conventional piece** may “tunnel” to an unoccupied square **right behind** an **opponent’s** conventional piece.

Here, Black’s rook indicates it wants to tunnel through White’s pawn to e4.

Black has to **roll a 6** to succeed; otherwise, the rook will “bounce back” and remain on e7.

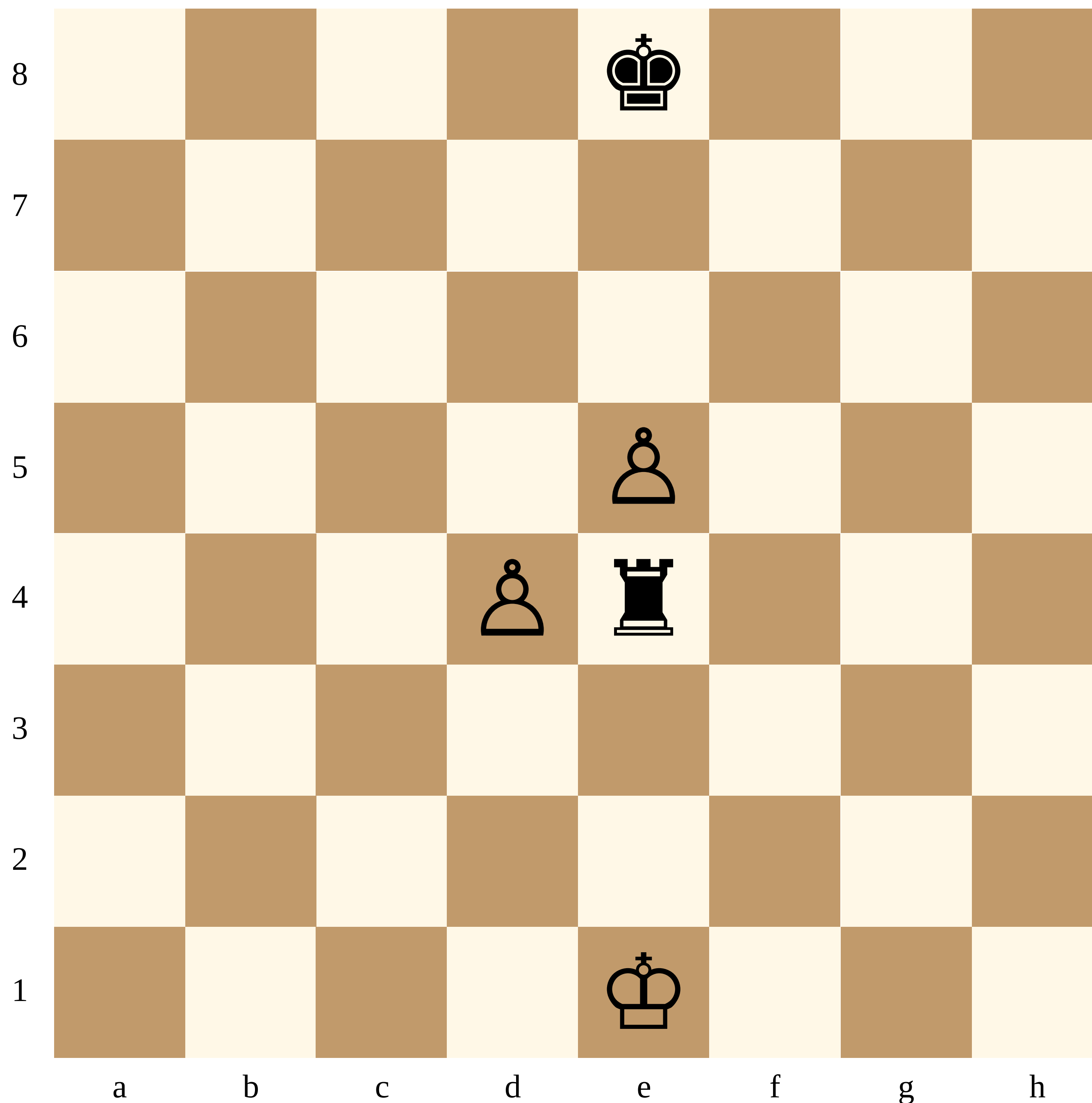


## Through the barrier

Black has rolled a 6 ( 🎲 ).

Tunneling was successful, and now White's king is in check.

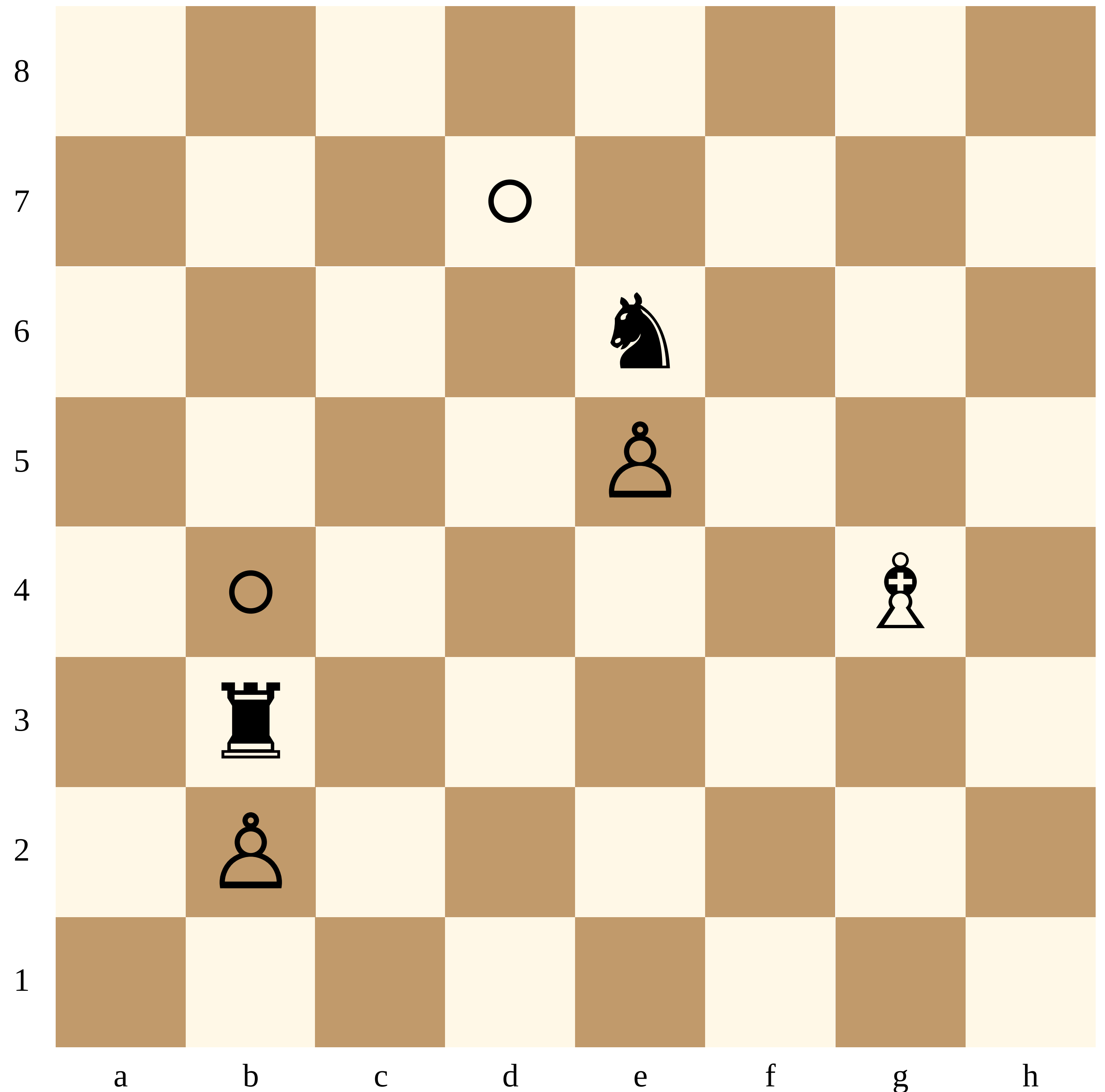
💡 *Tunneling is a phenomenon that occurs in the sub-microscopic world, but typically succeeds only with a low probability.*



## More examples

- The pawn on b2 may try to tunnel to b4. (A pawn may move two squares forward on its first move.)
- The bishop may try to tunnel to d7. (But not to c8, since c8 is not right behind the knight.)
- The pawn on e5 isn't allowed to tunnel to e7. (A pawn may no longer move two squares forward after its first move.)

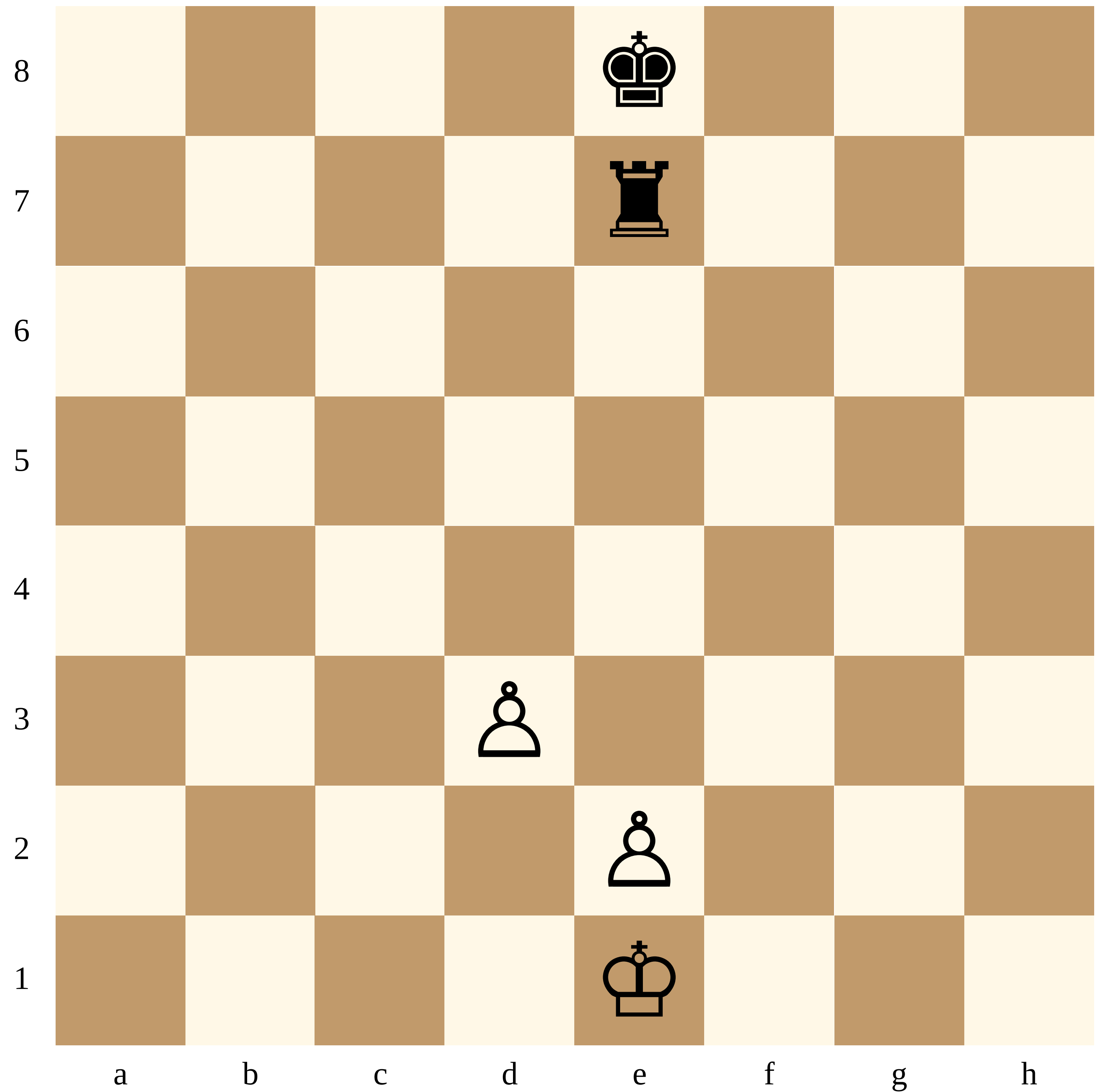
**!** *In this game, only conventional pieces are involved in a tunneling move.*



## No check

White's king is not in check.

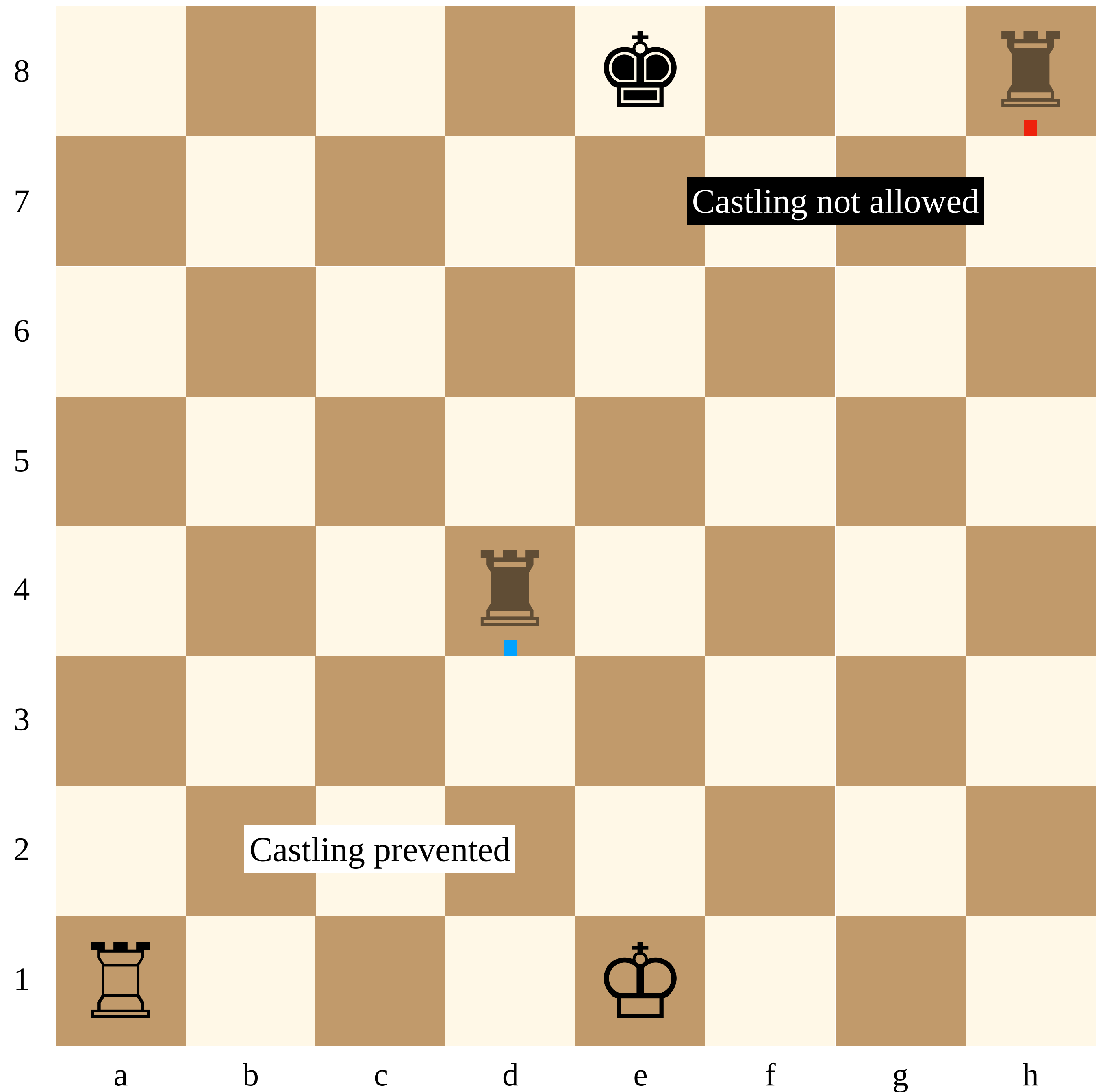
Black's rook **isn't allowed** to tunnel to e1, as that square is occupied.



# Special moves II

# Castling

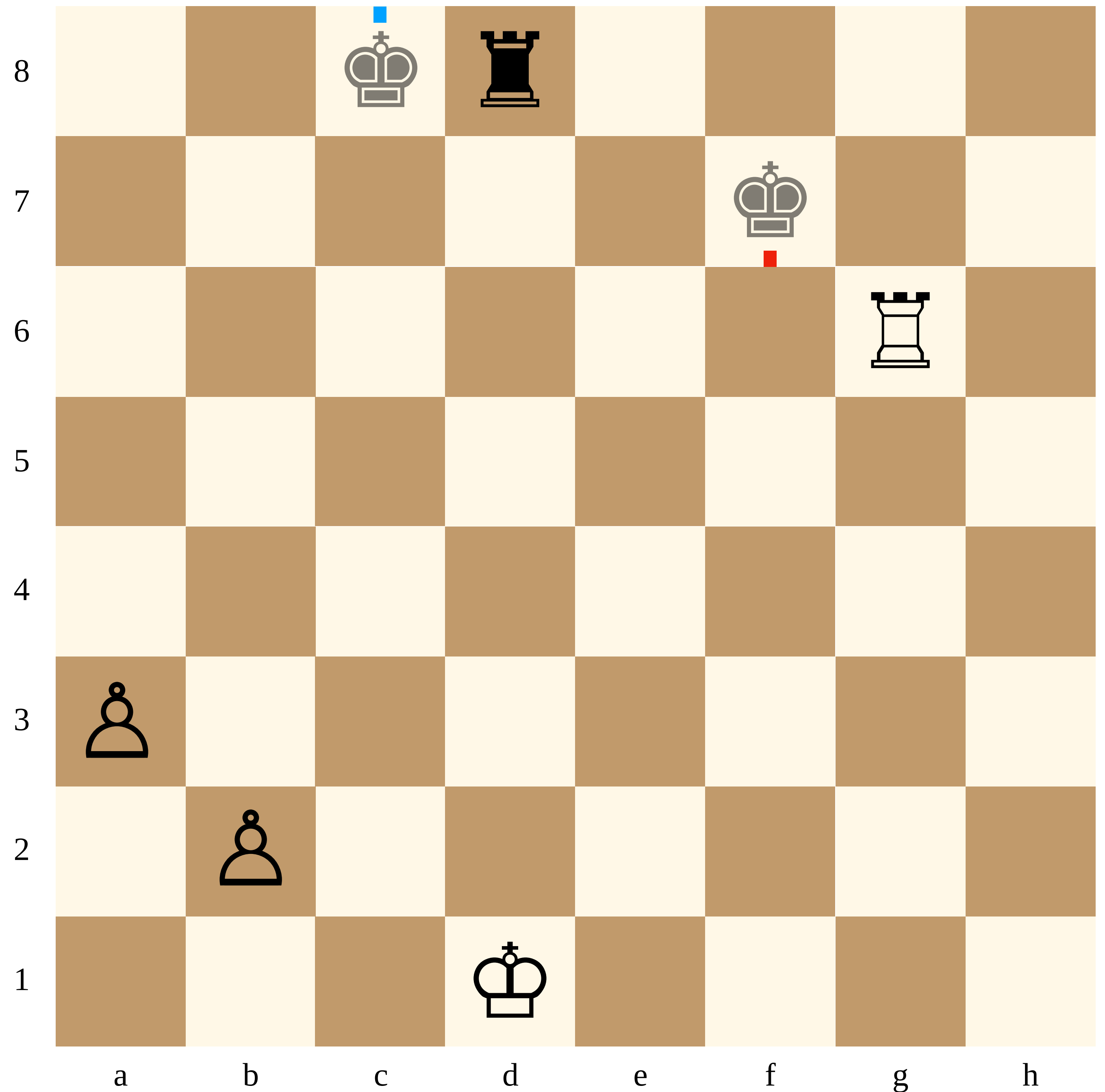
- Castling is **not allowed** with an indefinite king or rook.
- An opponent's indefinite piece prevents castling **in the same way** as a conventional piece does.



# Castling

Castling is a move of the king. The king may make a **superposition move** or an **entanglement move** by castling.

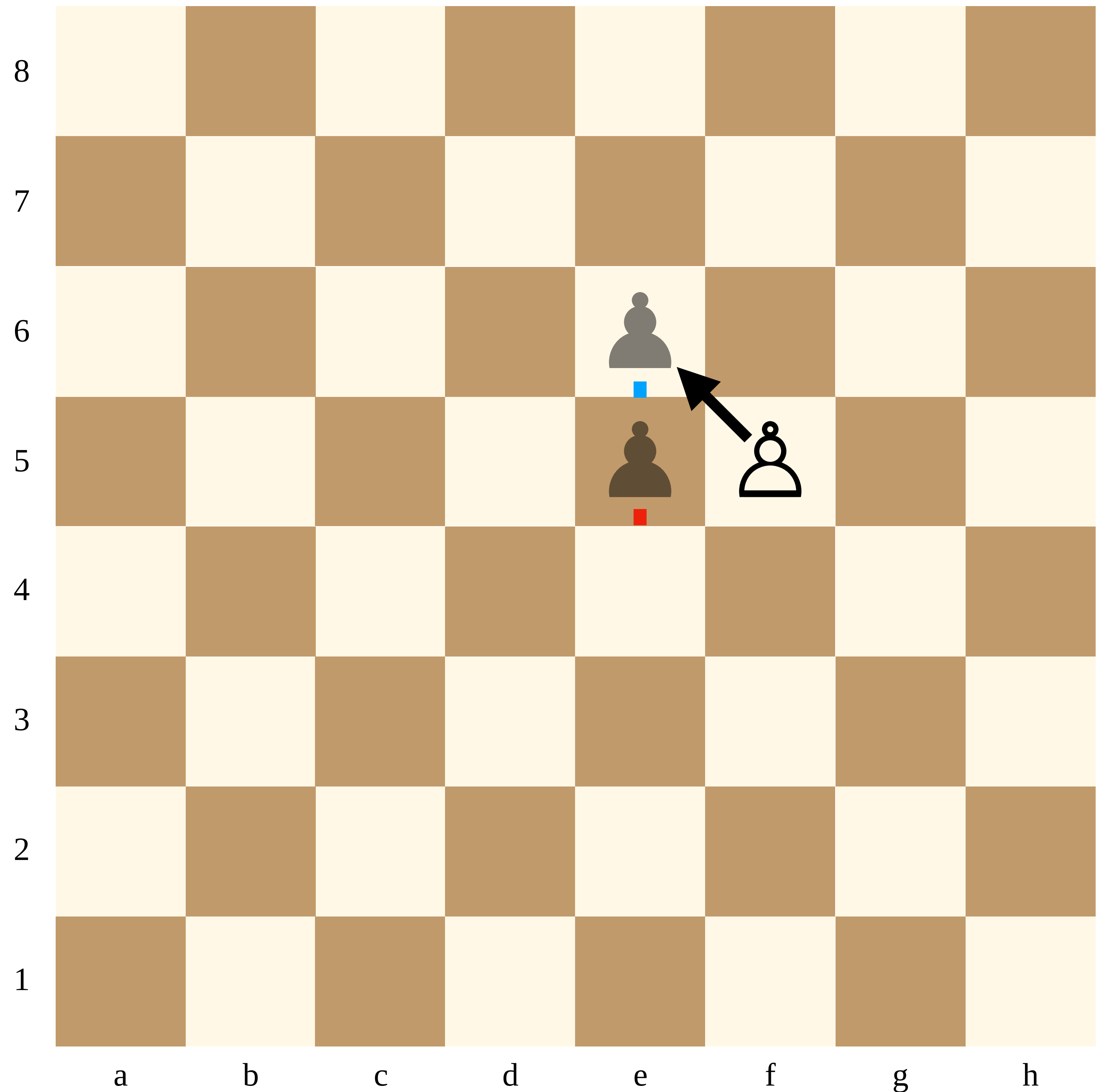
Here, Black's king made a superposition move from e8, by simultaneously castling to c8 and moving to f7.



## En passant

The “en passant” capture against an indefinite pawn must be made as if the pawn had previously both stayed in its **starting position** and moved only **one square forward**.

Let White’s pawn attempt an en passant capture against Black’s indefinite pawn on **e5**, which has just moved from e7 to **e5** (and **e6**) in a super-position move...

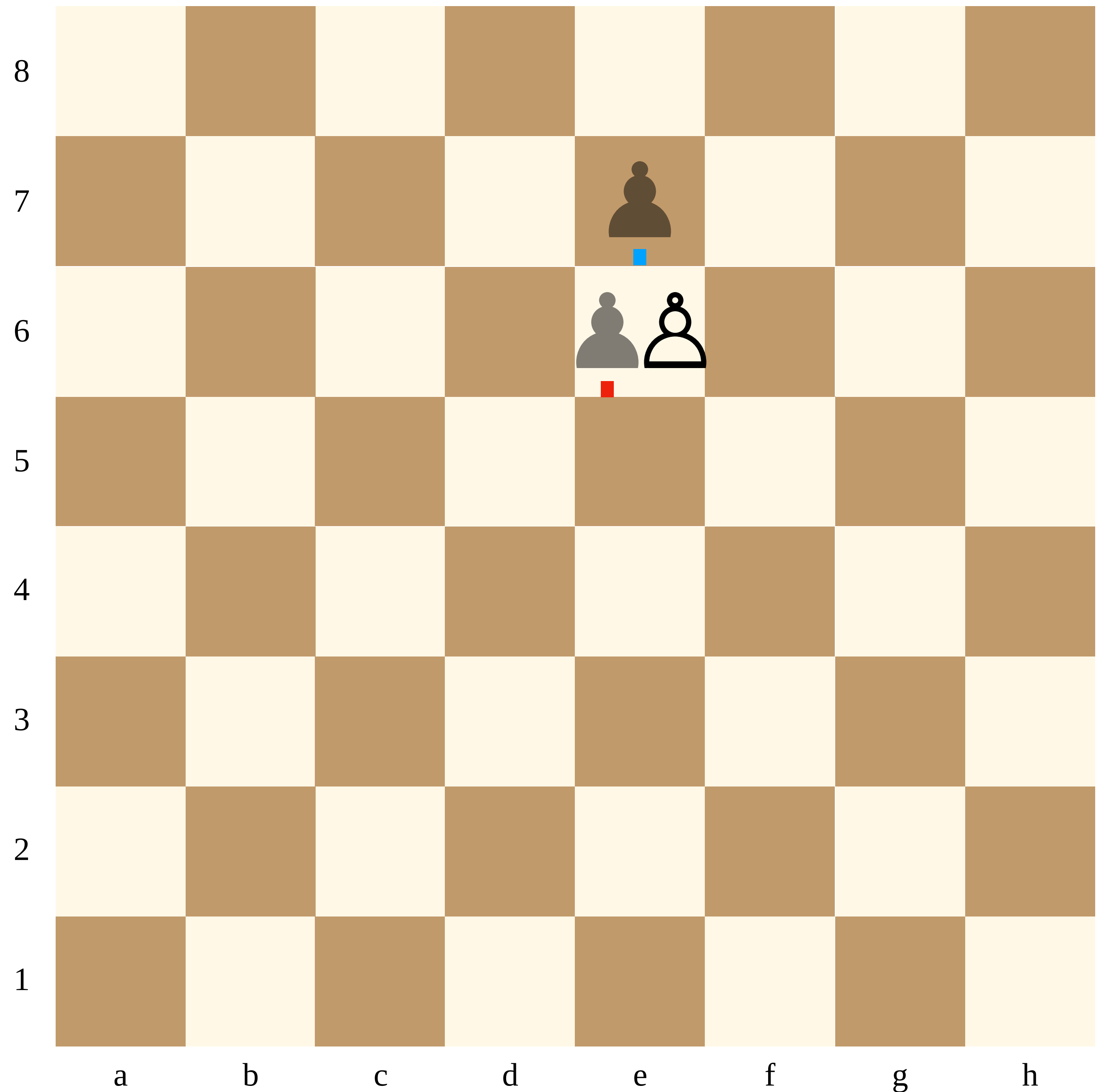


## En passant

Black's indefinite pawn had to be shifted backward, as if its previous move had been to **stay** on **e7** and **move** to **e6** simultaneously.

Note:

The backward shift must be done, without changing the orientation of the marks, even if the pawn had previously made an entanglement move.



Closing remarks

## Our suggestions

- If you're a beginner, start the game as if it were a conventional chess game, but also keep an eye out for opportunities where you can benefit from a quantum move.

In the game shown here, the first four moves were those of Carlsen vs. Ernst, 2004. Then, in the 5th move, the opportunity arose for White to suddenly checkmate Black's king, by making a superposition move from e4 to both d6 and f6.

- Visit <https://nielschess.com> to play online and learn about other Niel's Chess variants, such as the *Hadamard-style game* and the *Poker-style game*.

**We wish you much fun playing Niel's Chess!**

