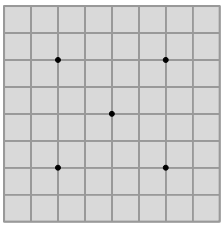


GONNECT

João Pedro Neto (2000)

GONNECT is played on a board with 9×9 intersections and 40 black and white stones. The board is initially empty and Black has the first turn. The game is played with the swap rule. Black and White take turns in placing a stone of their colour and possible subsequent capture.

Placement: The active player places one stone on an empty point; this is mandatory.

Capture: If, after placement, the last liberty of one or more opposing chains has been removed, these chains are captured by removing all their stones from the board.

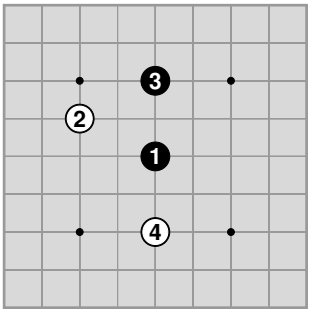
No suicide: After capture, each chain of the active player needs to have at least one liberty.

Super ko: Repetition of any previous board position is prohibited.

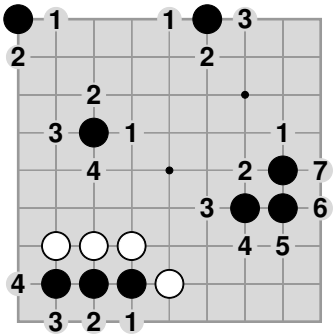
Win: A player has won if

- there is a chain of that player's colour connecting two opposite borders, or
- if the other player has no move.

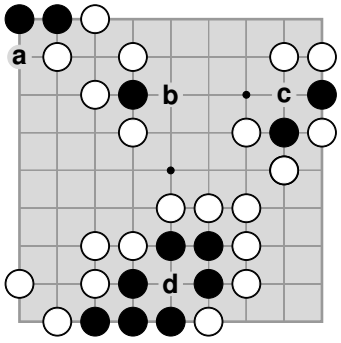
Diagrams explaining the rules



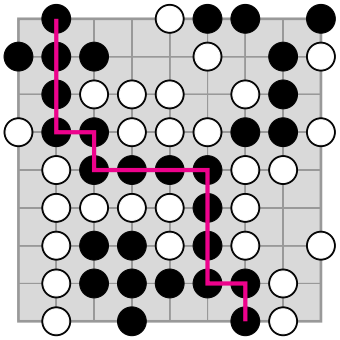
Players take turns **placing** one of their stones on empty points. Placement is compulsory!



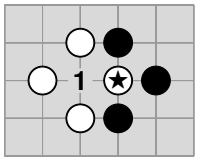
The *liberties* of all black chains, i.e. the adjacent empty points.



White can **capture** black stones with a placement on *a, b, c* or *d*. Black is not allowed to play at *d* (no suicide).



A winning connection for Black.
The connection could also be left–right.

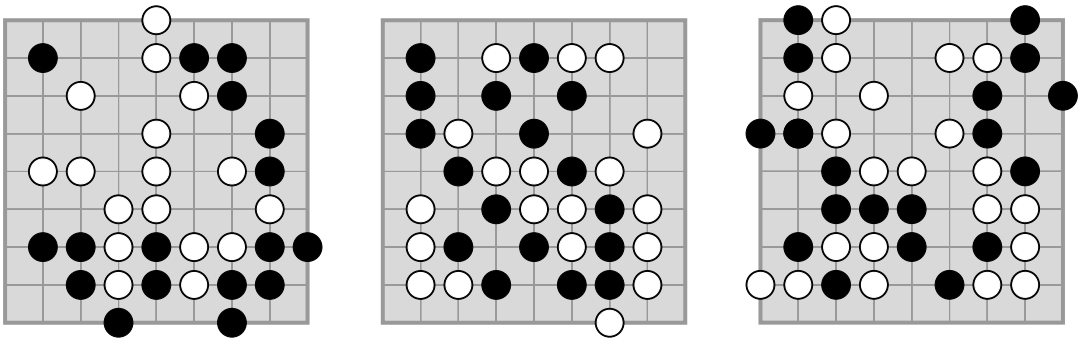


This local position is called *ko*.

If Black captures ⍟ by playing *1*, then White is not allowed to recapture right away because that would lead to a repeated position. So White has to play somewhere else; this is called a *ko threat*.
Through ko situations and the subsequent threats, distant parts of the board can affect each other.

Three introductory problems: *Black to play.*

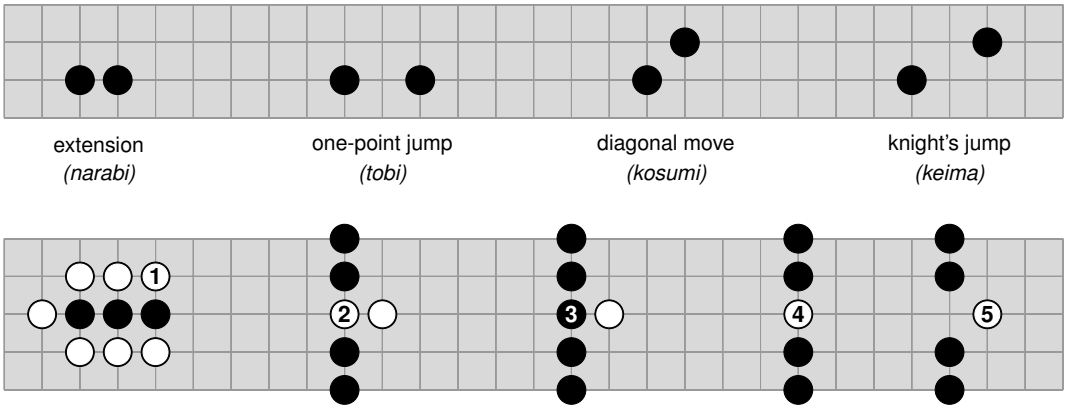
If you find the first move, it's easy!



Problem 1. Problem 2. Problem 3.

Local shapes

Here are basic patterns; in brackets the Japanese terms familiar from GO:



① puts the three black stones into *atari*, i.e. threatens to capture next. ② *cuts* the two black chains. ❸ *connects* against the imminent cut. ④ *wedges* between two black stones. ⑤ is a *peep*, i.e. a threat to cut.

Connection speed

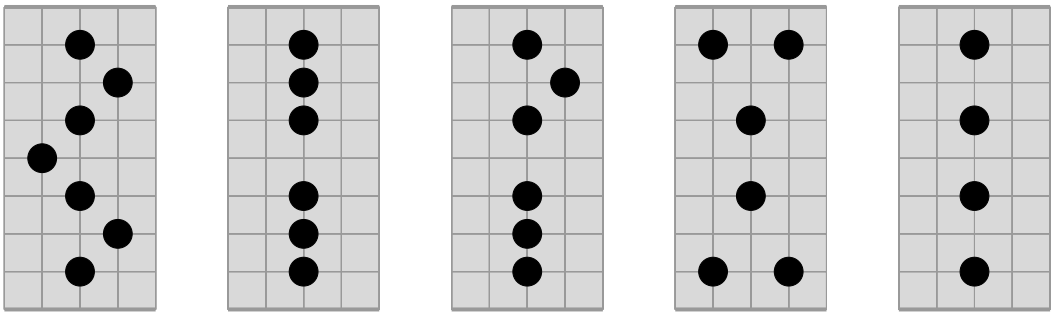
GONNECT allows parallel connections, so that unbreakable, partial connections exist for both colours. In such situations, the number of moves to reach a complete connection is crucial. If the opponent would not interfere, this number is easy to count. However, of more relevance is the case when the opponent obstructs the upcoming link.

The *effective connection count* is the smallest number of placements to finish the link minus the number of stones placed by the opponent in the sequence. For example, if Black plays six moves and White interfered with two moves, then that's an effective connection count of four. The smallest possible difference is the relevant number when evaluating connections.

In practice, both the obstruction moves as well as the replies will have an impact on the global position. In the following set of problems, this question is looked at in isolation.

Five problems about effective connection counts.

In each problem, a partial black top-bottom connection is given. How many effective moves does Black need to connect if going first? What if White starts?



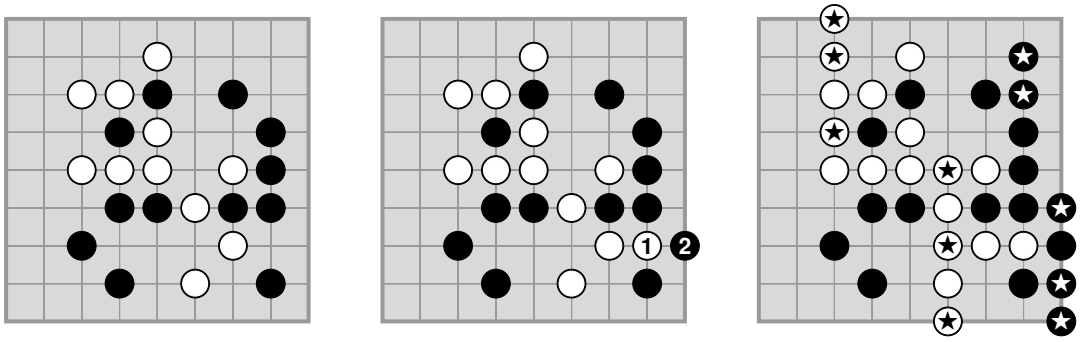
Problem 4a. Problem 4b. Problem 4c. Problem 4d. Problem 4e.

The two main strategies: race and territory

Parallel connections and race. Races are one possible course in GONNECT matches: this means that the two players are threatening connections along the same direction, i.e. both left–right or both top–bottom.

Tactically, this race entails interesting subtleties which are foreign to GO, and which do not appear in other, static connection games either. The reason is that capturing stones takes time. Therefore, well-placed sacrifices can delay the opponent's connection considerably, and such tactics may eke out a win in a close race.

A typical example came up in Problem 1b where the wedge delays the connection by two effective moves. Here is another simple position:



Black's connection is safe and would take five moves, if Black were to start.

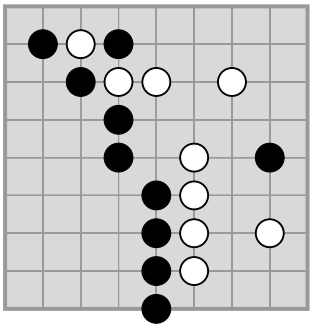
① forces ❷ and delays Black's connection by one move.

So White wins the connection race.

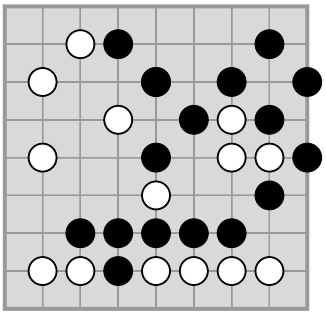
Clearly, such stalling tactics are equally important in many other situations, not just in parallel races. These moves are called 'defensive blocking moves' in [A]. I prefer the term *delaying tesuji*[5]: first, the distinction to 'offensive blocking moves' isn't very clear. And secondly, such delaying moves are similar to the GO tesujis reducing opponent liberties or increasing one's own.

[5] *Tesuji* is Japanese and means 'local good move' when applied to GO.

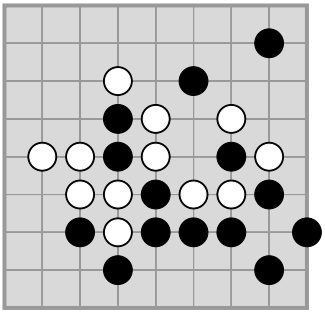
Three connection races: *White to play.*



Problem 5.

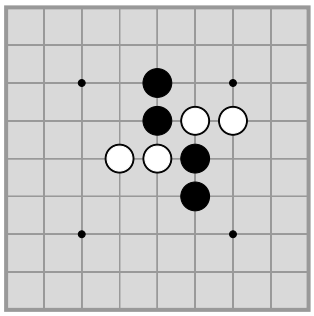


Problem 6.

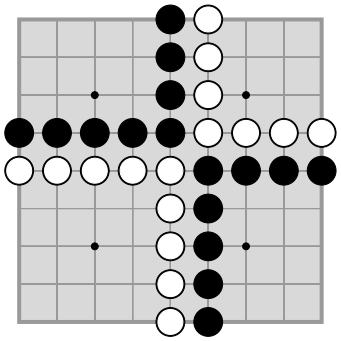


Problem 7.

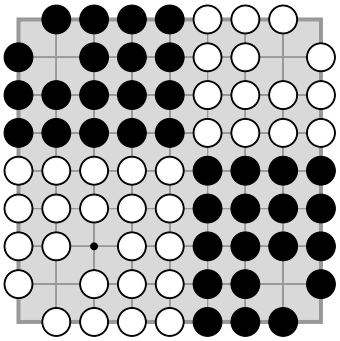
Deadlock and territory. Often, the initial phase of the game does not produce a winner because *cross cuts* prevent connections in all directions. The following three diagrams show such a development schematically:



A cross cut.



Temporarily no connections possible.



Cold phase over.

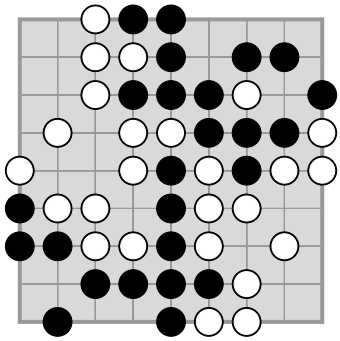
If, as in the middle diagram, both players have traced out territories preventing all connections and forming living groups (in the sense of GO), then the so-called *cold phase* sets in: due to compulsory placement, the players are forced to fill their own territories. The right-hand diagram shows a situation where Black and White have placed 36 pieces each. In his next turn, Black has to fill one of his eyes and then White will be able to capture that Black chain. This will quickly lead to a White connection.

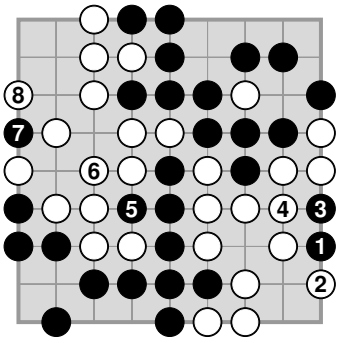
In other words, cold phases during a GONNECT game mean that the bigger territory settles the win. In contrast with GO, territory is only a strategical resource but the analogy is astounding. On a tactical level, there are many differences between the two games although GO players will be able to apply some of their methods in GONNECT, too.

A cold phase

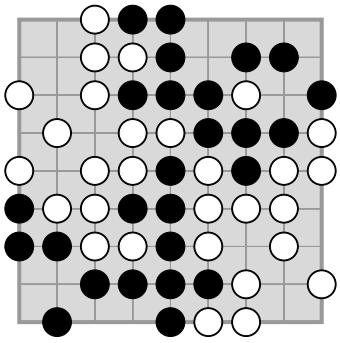
The combinatorial details of cold wars quickly become exhausting. But it will help to have a closer look at one position.

In the adjacent diagram, it is Black's turn. There are four groups, all of which are alive in GO parlance; see page 129. But in GONNECT, even alive groups will eventually perish.
The total areas are: $5+8=13$ points in the black groups (Black can capture the white stone and then has one more empty point) and $10+8=18$ points surrounded by White. If the players simply placed stones in their territories, then Black would run out of eyes first and lose a group, then the game. But that won't happen: it's much better to play into opposing groups,
293 reducing their territory and conserve one's own groups.





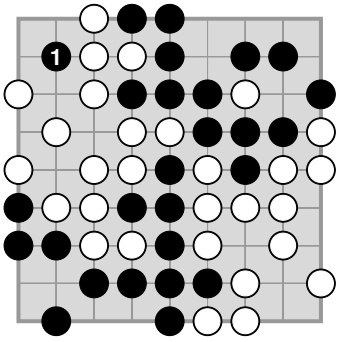
Cold war sequence 1



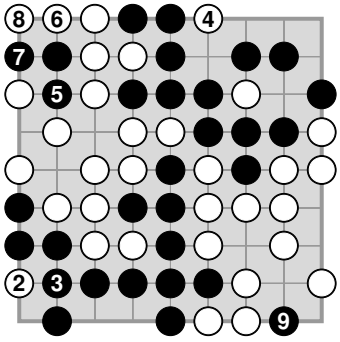
After cold war sequence 1

Black plays forcing moves: ❶ threatens a snapback at ④. While ② is the best reply, Black plays another atari at ❸ (better than 4).
❺ threatens a double atari; no matter where White covers, Black plays a follow-up atari.

295 After this sequence, the black territory still is 13 points but White's area has shrunk to $8+6=14$
296 points! Black has almost established equality, and is about to move again.



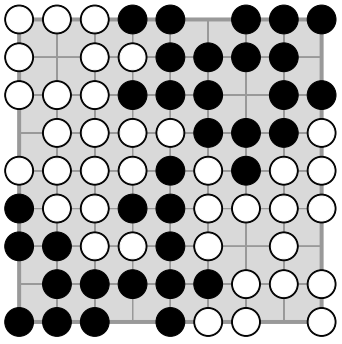
Cold war sequence 2



Cold war sequence 3

The idea is to play inside the opponent's area such as to maximise one's own move count. In this regard, ❶ in the left-hand diagram is excellent: the central point in the largest available space. Of course, White does the same…

…and eventually, all territories are compartmentalised into single-space eyes. This I call a *perforated* board. Now is the time for each player to finally fill up their own areas. One possible continuation from the previous diagram is shown here.
This game is lost for White, whose turn it is. After one placement in the lower right group, the next move puts one of the white groups in self-atari, yielding to capture by Black.
White seemingly comforting territorial lead melted under Black's forcing moves inside the white groups. But the other reason was that Black's areas were less compact than White's
298 and didn't allow as many guerilla moves.



After the cold war

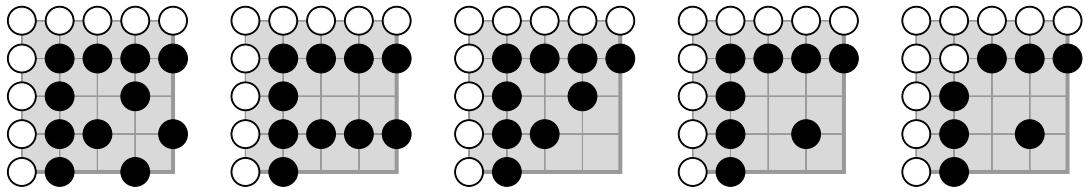
All kinds of trickery can occur during this stage, including squeezing, throw-ins, ko, seki perhaps familiar from GO but also threats genuinely peculiar to GONNECT. In fact, I cannot guarantee that the initial position always ends with a black win, assuming best counterplay by White. But I hope you can get a feeling for the kind of thinking required in a GONNECT cold phase.

Effective area size

Just like the true value of a connection is the effective connection count, taking into account delaying moves by the opponent, what really matters for territories is the *effective area size*. Discussing a white territory, this is the number of moves White can spend there minus the number of moves Black can squeeze into it. (These white moves don't fill up white areas, hence they are subtracted.) The above example indicates that certain shapes are more prone to intrusions than others.

Five problems about effective area sizes.

In each problem, a black corner group is given. How many effective moves does Black have inside this territory? Find the solution depending on whether White or Black goes first.



Problem 8a. Problem 8b. Problem 8c. Problem 8d. Problem 8e.

As a rule of thumb, the intruder is aiming for few, large eyes (so that the eye-stealing techniques from GO help) whereas the defender shoots for many, small eyes.
It is important to remember that group has to store two eyes from its effective size for survival. In particular, in an endgame position where one side has more groups than the other, the side with more groups needs an extra effective area size of two for each surplus group.
Finally, GONNECT endgames involve deliberations like this: sometimes, it is the best move to play into one's own territory because that increases the group's effective size by more than one. Moving a bit earlier in course of a game, it becomes clear that invasions can be staged even though the invading group will not make two eyes — unlike in GO, such a maneuver is already a success if it reduces the effective size. In other words, as soon as it becomes clear that the game will go into the cold phase, invasions and defensive moves against invasions become important. For another discussion of cold wars, with similar properties, see Symple.

Additional comments on tactics and strategy

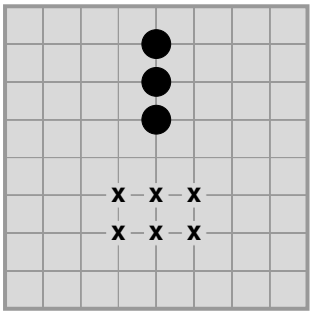
Shapes: Diagonal moves (kosumis) are a two-sided affair in GONNECT. On the one hand, they are absolutely safe links and moreover direction-agnostic, i.e. equally well poised towards horizonal or vertical connections. This makes them solid, strong moves, like in GO. On the other hand, they are slow because yet another stone is needed to create the actual link between two diagonal stones.
One-point jumps (tobi) carry a weakness in that they can be wedged. However, they are a very good way to stake out an initial frame towards a connection. Premature wedges often help to

solidify another connection. It is interesting to see that peeps against tobis are less useful than in GO: not only does the peep prevent a potential wedge, it also fixes the opponent's connection and loses a tempo.

Blocking. In GONNECT, the connection direction is decided as a game goes on. As usual in connection games, blocking an adversial link may help in building one's own link in the transversal direction. But in GONNECT, running along with the opponent can also further a connection.

GONNECT shares a common principle with other connection games: in order to block an opponent's prospective connection, it is best to play in some distance. How far depends on the board size but as a rule of thumb, contact play (i.e. next to the opponent's stones) is rarely useful.

In the adjacent schematic diagram, a White play on the central point makes it easy for Black to dodge around it. Whether to play centrally or on the side depends on the surrounding positions. It is conceivable to play even further to left or right of the x points.

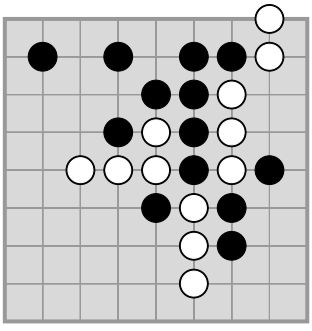


Blocking Black's chain should start on one of the x points.

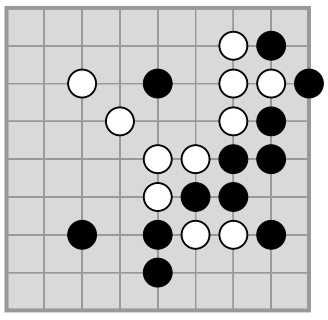
Sacrifice: GO players are used to ataris and similar capture-threatening moves being *sente*, i.e. forcing and to require an immediate reply. This is often an illusion in GONNECT: stones not part of a prospective connection can be discarded with carefree abandon. In fact, it is often useful to enlarge a sacrifice because the opponent then has to spend moves on capturing. This concept also exists in GO, for example with driving tesujis, but is more prominent in GONNECT.

Life and death: The concept of two eyes, and alive groups is important. GONNECT players are well-advised to look at GO problems dealing with shape, connection and cutting tesujis, and life and death. However, it has to be stressed that making life may be wrong in GONNECT: instead, count how many turns the opponent needs to actually remove the stones; this tempo cost may be enough to pursue one's own connection instead.

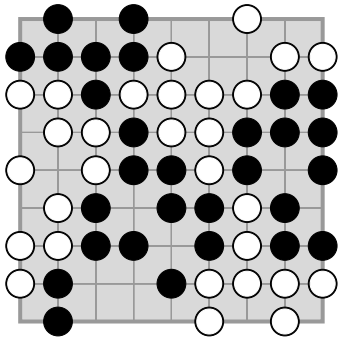
Three advanced problems: *White to play*



Problem 9.



Problem 10.



Problem 11.

Further remarks

GONNECT copies the rules of GO almost verbatim with just two differences:

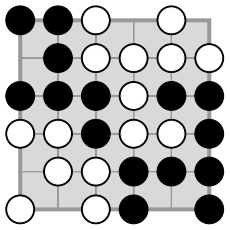
1. Crucially, the goal is changed from territory-scoring to connecting borders.
2. Passing is not allowed, i.e. placement is mandatory.

Regarding suicide (self-capture), GO rules are divided: it is not allowed for the Japanese rules, but the Chinese rules and its derivates allow self-capture (it can come up as ko threat). No familiarity with GO rules is assumed, although your reading ability in GONNECT will improve by looking at typical GO problems, such as about life and death; see Page 131.

GONNECT is, like most games in this book, highly scalable. The original rules specify a 13×13 board. Generally speaking, connection games need space. However, 9×9 is already fit for interesting GONNECT matches and, as elsewhere, this book recommends small board sizes amenable for new players. Once familiar with the game, players are advised to enlarge the board. The swap rule is recommended anyway (except for players of greatly differing skill) but especially important on the 9×9 board.

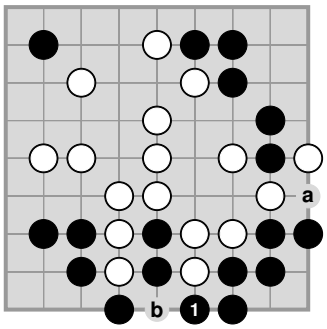
Draws are impossible as repeated positions and self-captures are not allowed. As in GO, triple ko situations can arise. Total prohibition of repeat positions is a heavy-handed way to settle these; most GO rules treat such games as drawn.

Consider the right-hand diagram and assume that no captures occurred so far. Then it is Black's turn but Black has no move. According to the rules, inability to move loses the game. This situation does not come up in actual play because White would have capture one the black chains in a previous turn. But the diagram shows why the rule is formally necessary.

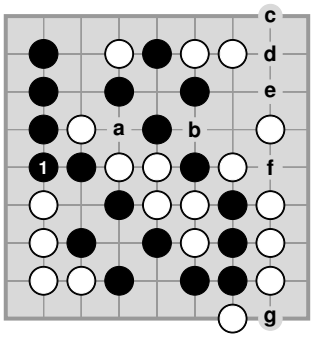


Black has no move and loses the game

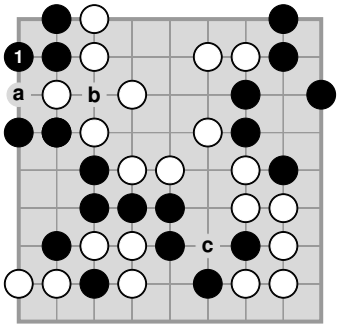
Solutions to the problems



Solution to Problem 1.



Solution to Problem 2.



Solution to Problem 3.

Problem 1: After ❶, Black has a 3-move horizontal connection whereas White needs five turns (if next ⓑ, then White can re-capture). If Black instead plays a, going for a vertical connection then ① is one move faster.

Problem 2: Black has to connect at ❶; this ensures a vertical connection in four moves; one step faster than White's connection on the right side. If Black mistakenly captures five stones with ⓐ, now White's connection along c–g is one step faster. If Black plays somewhere else, then ⓑ threatens to separate the black top and bottom halves.

Problem 3: ❶ secures Black's connection in the top left corner because White a is self-atari. Then Black has a 4-turn vertical connection, one step quicker than White's. Black must not start with ⓐ: after ① Black has to play a ko at b but White has a ko threat at c.

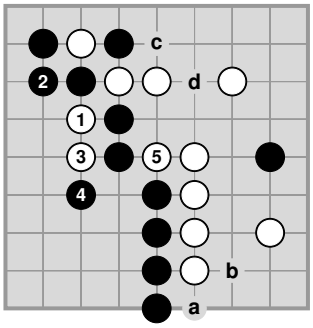
Note that ① would lead to a 4-turn horizontal link for White.

Problem 4a: [5/5]

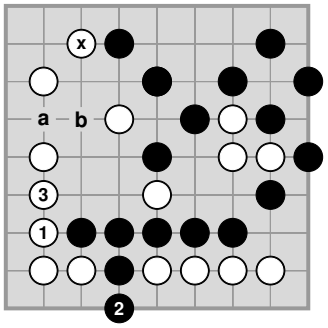
Problem 4b: [3/5]

Problem 4c: [4/5]

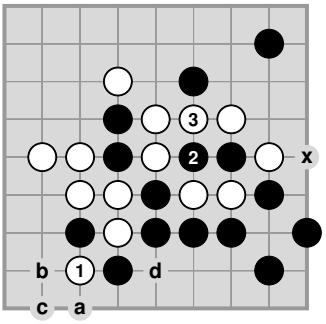
Problem 4d: [7/7] To check.
Problem 4e: [4/7] What do you get?



Solution to Problem 5.



Solution to Problem 6.



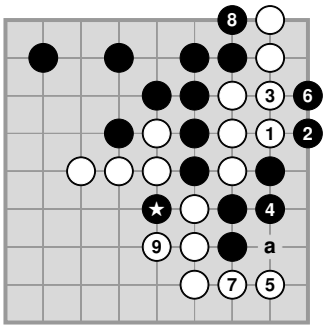
Solution to Problem 7.

Problem 5: Without intervention, White needs five moves to connect but Black only four. Convince yourself that White's atari ① is absolutely forcing. Connecting with ❷ is faster than capturing. The extension ③ is crucial: this move is the delaying tesuji. After ⑤, Black needs five moves to link up but for White this is now possible in four moves! ⓐ is answered by ⓑ and does not change White's connection count. Likewise, ⓒ is addressed by ⓓ.

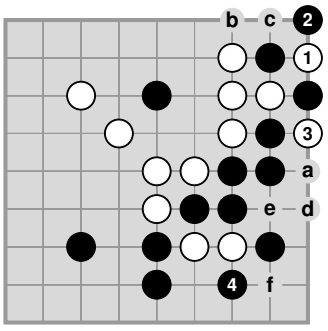
Problem 6: White has to bend around the black chain with ①. Black now needs to prevent White's horizontal connection with ❷; this starts the vertical race. However, White wins the race by one move. Note that ⓐ is does not delay White's connection: replying ⓑ restores the previous connection count thanks to ⓧ.
Naively aiming for a horizontal connection with ② loses the race by one move.

Problem 7: White has to capture the stone in the lower left with ①. The connecting direction is now vertical: Black's stubborn resistance with ⓐ ⓑ ⓒ ⓓ is pointless; White connects the ko regardless of Black's threat. Therefore, Black has to aim for a vertical link with ❷.
If ❷ captures two stones as in the diagram, White is forced to connect with ③. Black's connection is safe but very slow and loses to White's. Playing ❷ at x does not reduce the connection count.
If White starts by ③, saving the two stones, then Black plays on 2-2 point in the lower left corner, and wins the horizontal connection race by one tempo. If, more subtle, White connects at 6-6, then Black cuts at 8-6, restoring the tempo advantage. This is subtle — please check!

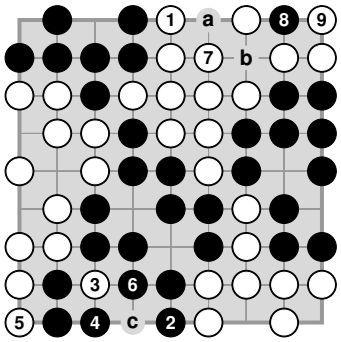
Problem 8a: [5/5] This is already a perforated groupd, so Black has five moves and White can't play there.
Problem 8b: [4/3]
Problem 8c: [4/3]
Problem 8d: [5/4] Black should play on 3-3.
Problem 8e: [1/1]



Solution to Problem 9.



Solution to Problem 10.



Solution to Problem 11.

Problem 9: After this sequence, White needs five more turns to connect whereas Black has to play six moves. This works because White has made the sacrifice as large as possible, forcing Black to waste many turns on capturing. If Black deviates, it doesn't end better. For example, if after ① ❷ ③ Black plays 7 or a, then White 5 works.
All other choices for ① fail. If White starts at 5 or 7, then Black's capture at 3 suffices; this wins the race by one move even without using delaying tesujis or the cutting stone ✪. This also shows that sacrificing only four stones is not enough: ① ❷ ⑤ ❸ is a black win. And if White starts by connecting at 3, then Black descends to 7; the subsequent local fight is easy for Black because of the cutting stone ✪ and the three white stones next to it are short of liberties.

Problem 10: ① and ③ set up a ko. Regardless of Black's ko threat, White connects the ko and wins the horizontal race.

If Black wants to avoid the ko and instead of ❹ captures with ⓐ, the following sequence is essentially forced: ⓑ ❶ ⓒ ❸ ⓓ ⓔ ⓕ and Black loses a dozen stones.

Problem 11: After the sequence, each side has two more moves before self-atari but it is Black's turn, so White wins. If White makes any other move than ①, then Black will seize the opportunity. Now ❶ is absolutely forcing: if White ignores it, then the atari ⓑ kills (if ⓐ then ❽) and Black has a connection is at most three move moves which is quicker than anything White can achieve at the bottom. So White has to reply, and the sequence ❶ ⓐ ⓑ ⑦ ❽ ⑨ leaves White with two bare eyes in that group. No matter how White uses the first move at the bottom, it won't be enough to overcome the squeeze in the top-right corner. For example, ③ ❻ ② ⓒ ⑤ ❹ loses the cold phase by one move.

Bibliography

Literature

[A] Cameron Browne, João Neto: *Gonnect: the best of Go and Hex*, Abstract Games Magazine 6 (Summer 2001).

[B] Cameron Browne: *Connection Games: Variations on a Theme*, A K Peters, Natick, Massachusetts (2005), page 192.

[C] João Neto: *World of Abstract Games: Gonnect*, www.di.fc.ul.pt/~jpn/gv/gonnect.htm (2016).

Connection games after HEX?

With HEX, Piet Hein introduced in 1942 the connection motive into the world of board games. There have been earlier, less elegant connection games but HEX stuck. The rule set is of utmost, minimal elegance and gives rise to a game of great depth. So much that one is compelled to ask:

What could other classic connection games look like?

In fact, there are many good answers to the question, and Cameron Brown wrote an entire volume about this category. This book presents three additional connection games apart from HEX, and here I argue for this particular selection. In a nutshell, it goes like this:

	pure placement?	goal	board
HEX	yes	link specific edges	four-sided hex
HAVANNAH	yes	fork, bridge or ring	six-sided hex
GONNECT	no (capture)	link any two edges	square
SLITHER	no (movement)	link specific edges	square

Clearly, any reasonable record of connection games should start with HEX, the definitive origin of the genre. It is still the best known representative; rules are exceptionally simple; theory-building has begun, with at least three books devoted to HEX. I deviate from reason for pure idiosyncrasy: just so that Part I can start with GONNECT and end with GO. This makes for a beautiful bracket, in my opinion. I could also claim that GONNECT can piggyback on the popularity of GO. Now I explain my particular choice of connection games other than HEX.

GONNECT: Combining the rules of GO with the goal of connection, as discovered by João Neto in 2000, is simple and very effective. GO is extremely well known, allowing its players to try GONNECT at once. Moreover, the one aspect of GO rules which can be confusing to beginners — game end and scoring — is simplified in GONNECT. As a longtime GO player, I think that it can be a good idea to teach GONNECT before GO. In my opinion, that makes for a more interesting entry than Atari Go (the first player to capture wins).
Among connection games, GONNECT stands out for its tactical fights which are induced by captures, sacrifices and related forcing moves. Among the four connection games featured in this book, GONNECT is the one with cold wars. The ability or necessity to adapt the connection direction during play also carries considerable strategic appeal.

SLITHER: Corey Clark's 2010 invention has an obvious similarity to HEX in the win condition, where Black has to connect the top and bottom borders, and White has to connect the left and right borders. On the other hand, SLITHER is played on squares, unlike HEX, requiring a rule to prevent ubiquitious standoffs (this is done by diagonal prohibition).
What makes SLITHER a great game and triggered its inclusion in this book, is the exceptional combination of placement and movement. Most connection games have players take turns placing stones, so that games develop statically. Movement in SLITHER is as slow as possible — like the Chess king — but it does make matches surprisingly dynamic.

HAVANNAH: Designed 1976 by Christian Freeling, this game keeps the hexes of HEX but uses a six-sided board. The innovation of HAVANNAH is the win condition which is built from three simple shapes. Because borders are not associated to colours (unlike HEX), the value and choice of each possible winning link is determined during a match. This is one reason why HAVANNAH is a particularly strategic game.