Margo
Basics

Cameron Browne

Cameron Browne
Computational Creativity Group
Imperial College London
South Kensington
London, UK
http://www.cameronius.com

Margo Basics

ISBN: 978-1-300-09515-6
Lulu.com

Margo game licensed to **nestorgames**
Available from: http://www.nestorgames.com
Cover photo of Margo Samurai set

Contents

Thanks To

Richard Reilly for his continued interest in Margo, and the many games over the years. Much of the following analysis is due to him.

Néstor Romeral Andrés for publishing Margo so exquisitely.

The **gamerz.net** members who've tried Margo.

Sandra Snan for detailed proofreading and analysis, and excellent editorial suggestions.

Helen Gilbert for proofreading.

Margo

The roots seek freedom,
but a handful of soil is
not enough for all.

CHAPTER 1

Introduction

Margo is an abstract board game in which balls stack upwards to surround and capture enemy groups. It was inspired by the famous territorial game Go, but involves a number of subtleties that make it distinct. For example, balls pinned down by enemy balls survive capture, to remain alive in the game as zombies.

Margo is played on a relatively small board, so competition is fierce for the available area and groups must grow upwards to survive. It combines life-and-death analysis with 3D spatial planning to produce a truly complex game.

Margo is the deepest game that I've invented, and I believe the best. Sparring partner Richard Reilly and I have played it hundreds of times since its creation in 2006, and feel that we're still only scratching its strategic surface. Most matches continue to produce surprises, indicating that there's still a lot to learn.

This book is intended to introduce Margo to new players, gently but without hiding its depth. The discussion is limited to what we know for certain about the game so far, and puts names to

common plays and patterns that we've seen emerge; deeper strategic and positional analysis will take more years to develop properly. I hope that *Margo Basics* will encourage new players to take up the game, and help explore its mysteries.

Structure

The book is structured as follows:

I Tactics describes useful tactical plays.

II Strategy provides some strategic advice for the various stages of a game.

III Games & Puzzles presents annotated sample games and puzzles, at various board sizes.

IV Appendices include supplemental material and technical detail behind the game.

Tips

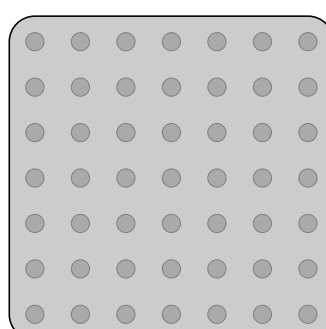
Key tips are highlighted in text boxes such as this one.

Rules

This chapter describes the standard rules of Margo. There are quite a few rules for an abstract board game, but they are relatively simple and should become second nature after a few plays.

Equipment

The standard board is a 7×7 square grid of holes.



Standard board (7×7).

Each player, White and Black, has at least 49 balls of their colour, or enough to cover the board.

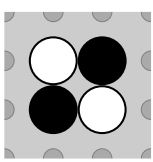
Play

The board starts empty. White plays first.

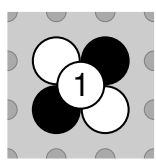
Players take turns placing a ball of their colour, on either:

1) an empty board hole, or
2) a square 2×2 *platform* of balls.

Balls can stack on platforms of any colour, as shown below.



Platform.



Stacking move.

Groups

Balls of the same colour that touch, either directly adjacent to each other or resting upon each other, are *connected*.

A *group* is a connected set of same-coloured balls. Single balls count as singleton groups.

Freedom

The ball being placed must have *freedom* after the move. That is, it must be either:

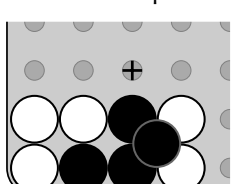
1) adjacent to at least one empty board hole, or
2) visibly connected to at least one empty board hole by a chain of touching friendly balls.

Freedoms are adjacent empty board holes.

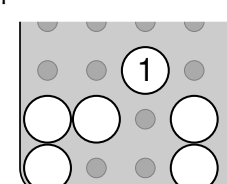
Capture

After each ball is placed, groups without freedom are captured and removed.[1]

For example, the black group below has a single freedom (marked +). White move 1 removes that freedom to capture the group.



Black group.



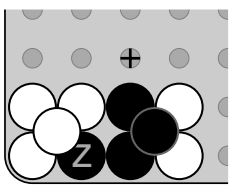
Capture by White 1.

A group with a single freedom, under immediate threat of capture, is said to be *in atari*. This is a traditional term from Go.

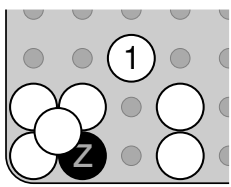
[1] Appendix A describes the rare case of *revealed captures*.

Zombies

Balls that are *pinned* in place by one or more enemy balls, directly or indirectly above, survive capture and remain active in the game as *zombies*. For example, the black ball (z) pinned by a white ball in the following position is a zombie, and survives capture following move 1.



Black group in *atari*.



Zombie z survives.

A ball is *buried* if there's another ball straight above it, hiding it from view.

Scoring

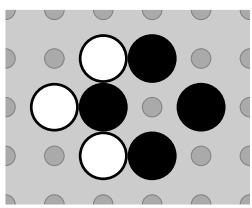
Counting captured balls can be easier than counting balls in play.

Constraints

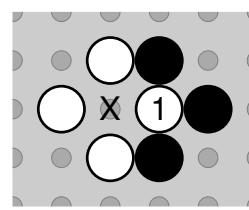
No Passing: Players may not pass.

No Repetition: Players may not make a move that would repeat any previous board position with the same player to move.[1]

For example, White captures a black ball with move 1 in the following position, but Black can't immediately recapture at point X, as that would repeat the previous board position.

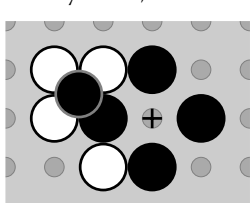


White to play.

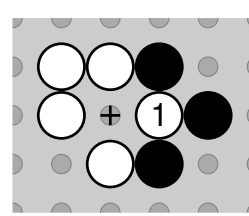


Black can't recapture.

No Suicide: The ball played on a move must have freedom at the end of that move. Note that balls can create their own freedom by capturing enemy balls, such as White move 1 below.



White to play.

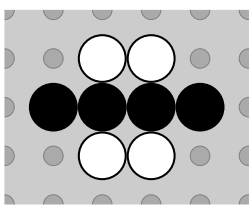


1 creates freedom.

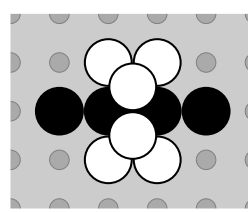
[1] Go players might recognise this rule as *situational superko*.

Overpasses Cut Underpasses

Only visible connections count (viewed from above), hence higher-level connections cut lower-level connections that they cross over. For example, the black group below (left) is cut into two separate groups by a white *bridge* (right).



One black group.



Two black groups.

Note that bridges may themselves be cut by even higher level bridges crossing over them.

Aim

The game ends when the current mover has no legal moves. It is won by the player with the most balls in play (including zombies).

If both players have an equal number of balls in play, then the game is a draw.

Beginner's Game

Beginners wishing a shorter game may instead win by making the first capture.

Resigning

Players may resign at any point.
This is how most games are decided.

Swap Rule

The game may optionally be played with the following *swap rule*:

> *In reply to the opening move, the second player may elect to swap colours in lieu of moving.*

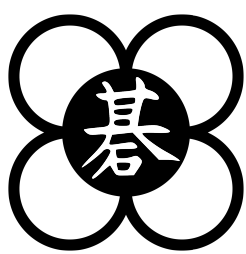
This effectively steals the opening move, and discourages the first player from making too strong an opening move. It's recommended that evenly matched opponents use the swap rule, especially experienced players.

Rules in a Nutshell

Place a ball at any playable point.
Capture freedom-less enemy groups.
Pinned balls (zombies) survive capture.
No passing. No repetition. No suicide.
Only board holes give freedom!

PART I

Tactics



Groups

Margo is all about groups, or connected sets of same-coloured balls. This chapter discusses topics related to group formation and group safety.

Points

A *point* is anywhere that a ball can potentially be placed, which includes board holes and higher level stacking points. Points can have the following properties, depending on the situation:

Playable: A point is *playable* if a player can legally move there. Points can be playable to one player but not the other.

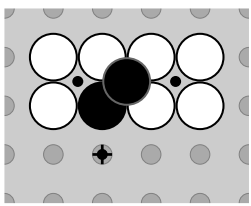
Dead: A point is *dead* if neither player can legally move there.

Safe: A point is *safe* if a player can move there without putting a friendly group in *atari* (threat of immediate capture).

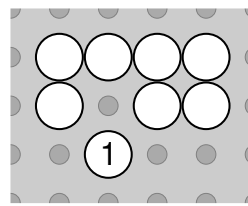
Owned: A point is *owned* by a player if it is safe for them and unplayable to the enemy.

Groups Grow from the Board

Some players have trouble remembering that *only board holes are freedoms*. Consider the following.



Three growth points...



...one freedom.

The black group has three *growth points* (•), but only one of these (+) is a freedom. White move 1 removes this freedom to kill the group (right). The other two growth points aren't freedoms as they're higher level stacking points and not board holes.

It helps some players to visualise each group as a tree with roots on the board. If the roots can't grow then the tree dies (thanks to Daniel Schulz for this analogy).

Another way to remember this rule is to think of Go. In both games, Margo and Go, freedoms only exist in the 2D plane on the board level.

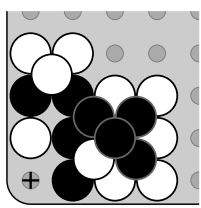
Every group must start on the board level, and grow from there.

Freedoms only exist on the board level.

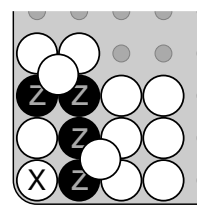
Group Safety

A group is *safe* if it has at least one freedom that is not playable to the enemy. This will typically happen if zombies protect that freedom.

For example, the following position (left) shows a safe black group with a single freedom (+). This point is not playable to White, as a white move there (X) would have no freedom after the move, due to the surviving zombies (z).



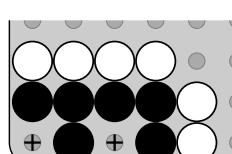
Safe black group.



White can't play X.

> One unplayable freedom makes a group safe.

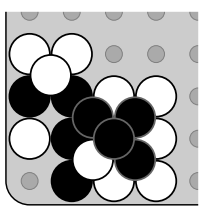
Groups don't need zombies to be safe. The following black group is also safe, as White can't legally play at either of its freedoms (+).



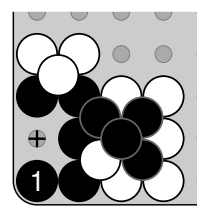
Safe black group.

Safety is Relative

The black group below (left) is safe as a White move in the corner would be an illegal suicide move, as shown above. Black *could* play there with move 1 (below) to capture the white ball, but this would reduce the black group to a single playable freedom (+) and place it in *atari*.

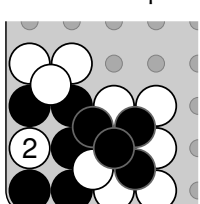


Safe black group.

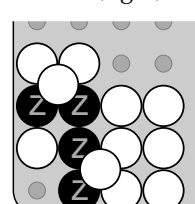


Unsafe black group.

White could then play move 2 (left) to remove this freedom and capture five black balls (right).



White move 2...



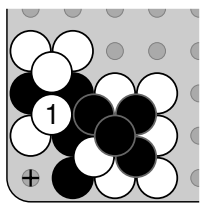
...captures 5 balls.

It may seem absurd for Black to make such a move. However, they may be forced to do so as the board fills up and they run out of safe options.

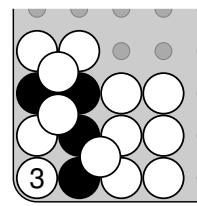
Safety is not absolute.

Group Invasion

Another reason that safety is not absolute is that groups can be *invaded*. Returning to the previous example, White move 1 (below) invades the black group to make it decidedly unsafe. White can capture this group next turn with move 3 (right).



Unsafe black group.



White captures.

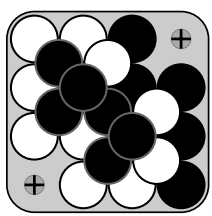
Note that the two-freedom group shown at the bottom of page 19 is safe from invasion. White can't play in any of the enclosed single-point freedoms to establish a foothold.

Smaller internal territories are harder to invade.

Dead Safe

Group safety can be more permanent if at least one adjacent freedom is a dead point that neither player can move at. This can occur if enemy groups overlap to mutually support each other.

For example, both the white and black groups in the following 4×4 position are safe, as each is adjacent to a dead freedom (+). This game has ended as there are no legal moves for either player.



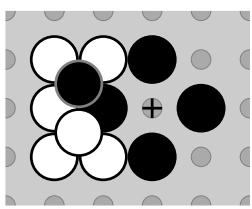
Dead points give safety.

Note that such cases of permanent safety are rare, as dead points can usually be made playable again later in the game.

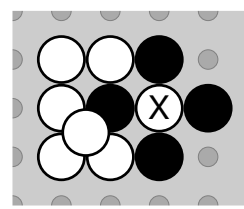
An adjacent dead freedom makes a group safer.

Virtual Groups

A *virtual group* is a set of groups that share at least one common freedom and are safe from immediate capture. For example, the following position shows a virtual black group (left). White can't make capturing move X (right) as that ball would have no freedom after the move

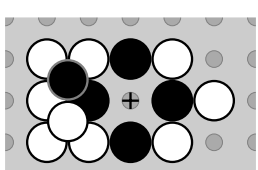


Virtual group.

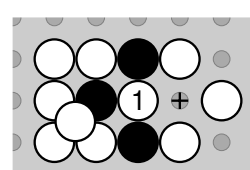


White can't capture.

White can break this virtual group by making one (or more) of its constituent members unsafe, as shown below (left). White can now play capturing move 1 (right).



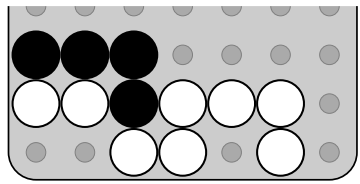
Not a virtual group.



White can capture.

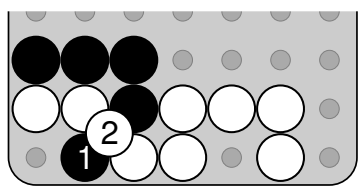
Virtual groups share at least one freedom.

The following example shows another type of virtual group.



Virtual white group.

Black can play in the freedom shared by the two white sub-groups with cutting move 1 (below). However, White can then bridge over to complete the connection with move 2, to join the two sub-groups into a single safe group.



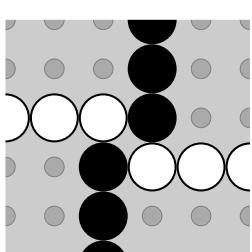
Black can't cut.

Bridges

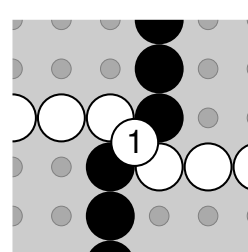
Bridges are fundamental to Margo and make up much of its unique 3D character. They allow groups to escape capture and allow players to cut enemy connections. This chapter describes the key bridge plays.

Bridges

A *bridge* is any connection built on existing balls. For example, White plays bridge move 1 in the following example, to connect the two white groups.



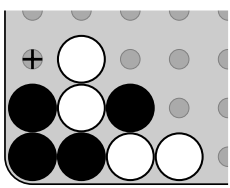
White to play.



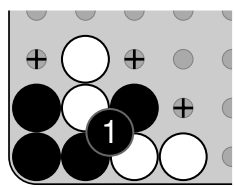
Bridge move 1.

Jumping the Wall

Bridges allow groups to *jump the wall* over surrounding enemy groups. For example, the main black group below (left) has one remaining freedom and is in *atari*.



Black group in *atari*.



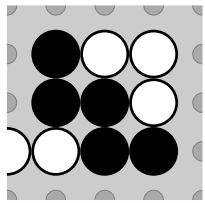
Black escapes.

Bridging move 1 jumps the wall to create a combined black group with three freedoms, that is now safe from immediate capture.

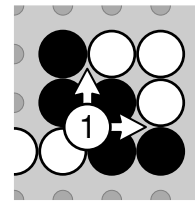
Jump the wall to escape capture.

Bridge Fork

A *bridge fork* guarantees connection between two groups by establishing two bridge threats with a single move. For example, White move 1 in the following position threatens two possible connections, and Black can only respond to one next turn.

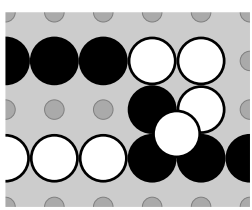


White to play.

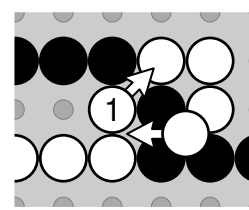


Bridge fork.

The following figure shows a variation, in which White move 1 establishes two disjoint bridge threats that guarantee the connection of the two white groups (right).

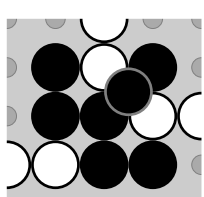


White to play.

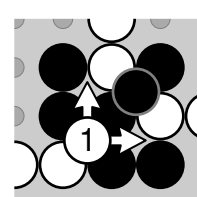


Bridge fork.

The following example shows a different type of bridge fork, in which one white group threatens to connect to two separate white groups.



White to play.



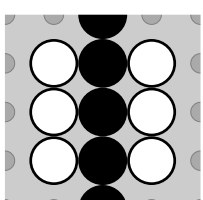
Bridge fork.

Black must again decide which connection to block. However, the decision is more critical in this case, as Black must decide *which* two white groups get connected, rather than simply *how* they get connected.

Bridge forks guarantee a connection.

Cross-Bridge

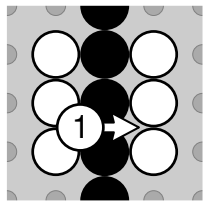
The *cross-bridge* is a move sequence that allows a player to force a connection across an intervening wall of enemy balls. For example, consider the following situation, with White to play.



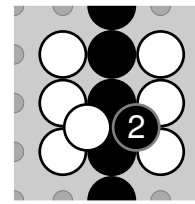
White to play.

Cross-bridges connect two groups.

White threatens to bridge across with move 1, forcing Black to block with move 2.

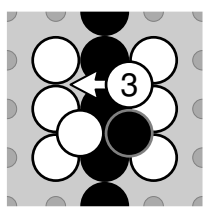


Threat to the right.

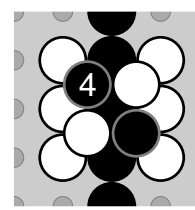


Block.

White then threatens to bridge across in the opposite direction with move 3, forcing Black to block with move 4, thus creating a 2×2 platform.

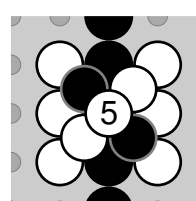


Threat to the left.



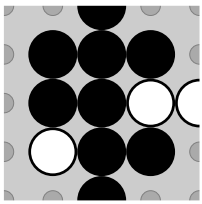
Block.

White can now play on this platform, to complete the connection with crowning move 5.

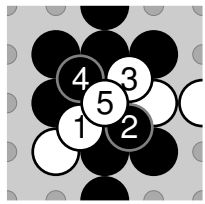


Crowning move.

Cross-bridges can be forced from a single ball, as shown in the following example with moves 1–5.



Single ball on left.



Success.

Note that the initial move 1 was made from the ball with the fewest stacking points. The destination ball must have two stacking points or the connection can be blocked; this cross-bridge would not have worked going in the other direction.

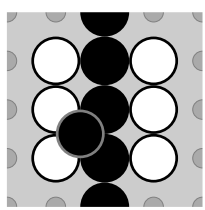
Also note that even though Black played the cross-bridge sequence to completion in these examples, they would not normally do so in actual play. If Black knows that move 2 will not succeed in blocking White's connection, they should abandon this battle and play move 2 somewhere more useful. Even better, players should prevent such positions from occurring in the first place.

Abandon lost cross-bridges.

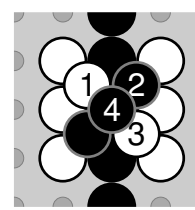
Move Order is Critical

The following example shows a similar position, but with an additional black ball in play (left). This additional ball puts Black ahead in the cross-bridge sequence, even though it's White's turn to move.

White must attack from the left side with move 1, as the white ball on that side only has a single stacking point.



White to play.



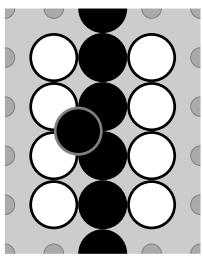
Black defends.

Black wins this cross-bridge (right) as the extra ball puts them one move ahead in the bridge-building race, allowing them to place the crowning ball 4 instead of White.

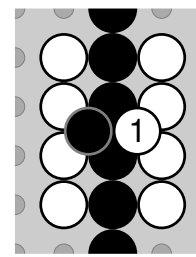
Cross-bridges are lost if the opponent is ahead.

Cross-Bridge Fork

The situation is different if the attacker has an additional avenue of attack, as shown below. White move 1 to establishes a *cross-bridge fork*.

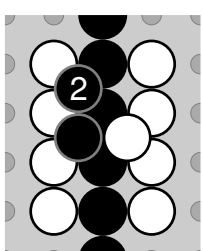


White to play.

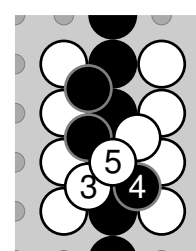


Cross-bridge fork.

If Black defends one avenue with move 2 (left), then White can use the other avenue to secure the connection (right), and vice versa.



Black defends.

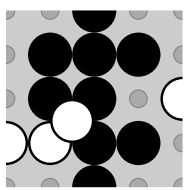


White takes other side.

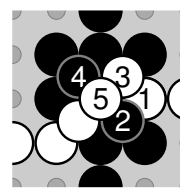
Fork around defenders.

Revealed Cross-Bridge

The following example shows a *revealed cross-bridge*. The rightmost white group hasn't reached the wall yet, but the leftmost white group has a stacked ball that will put White ahead in the cross-bridge race. White can play move 1 to force the cross-bridge as shown.

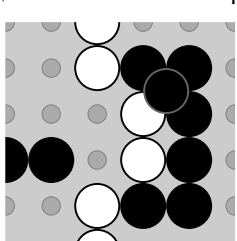


White to play.

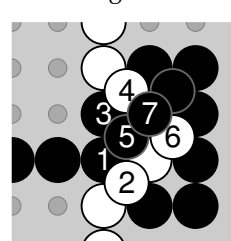


Revealed cross-bridge.

The following example shows a more complex case. Moves 1 and 3 force blocking replies 2 and 4, then move 5 sets up the cross-bridge for Black.



Black to move.

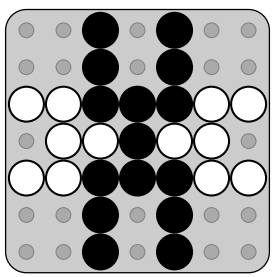


Success.

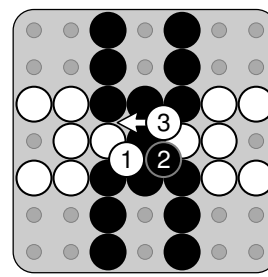
Revealed attacks have the element of surprise.

Counter-Cross-Bridge

The following situation shows an apparently safe black group and two vulnerable white groups (left). White can threaten to join their groups, and cut the black group, with a cross-bridge (right).

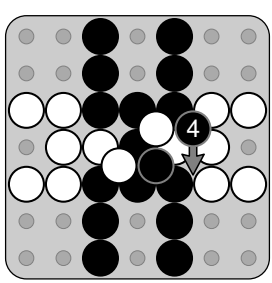


White to play.

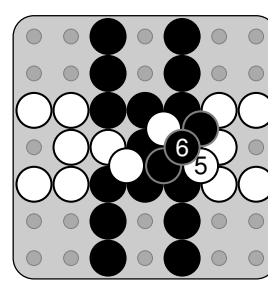


White cross-bridge.

However, Black can respond with a *counter-cross-bridge* perpendicular to it, as shown below.



Black counter-cross-bridge.

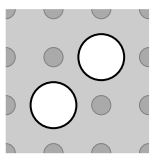


Black prevails.

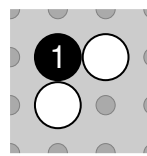
When crossing, beware of counter-crossings.

Virtual Bridges

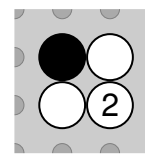
A *virtual connection* is an implied connection that doesn't yet exist but can't be blocked, regardless of who moves next. For example, the following position shows two white balls that White can connect even if Black intrudes with move 1.



Not connected.

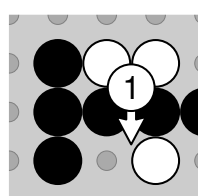


Black intrudes.



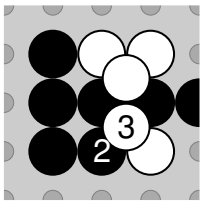
Connected.

Similarly, a *virtual bridge* is an implied bridge connection that doesn't yet exist but can't be blocked, regardless of who moves next. For example, the following white ball 1 has an implied bridge to the single white ball below it.

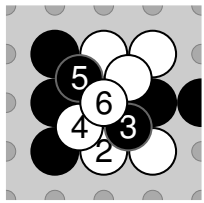


Virtual bridge.

If Black makes move 2 (left), then White can complete the connection with bridge move 3. Alternatively, White can make move 2 (right) then force a cross-bridge to connect. The connection is guaranteed, regardless of who plays next.

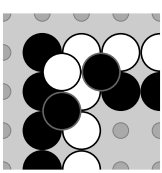


Bridge if Black 2.

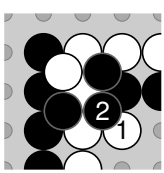


Cross-bridge if White 2.

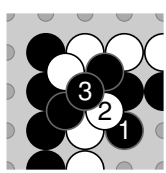
The following example (left) shows another virtual bridge connection. Black can connect their two groups, regardless of who makes move 1.



Virtual bridge.



Black connects.



Black connects.

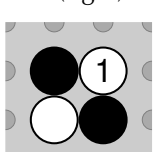
Virtual bridges guarantee connection.

Zombies

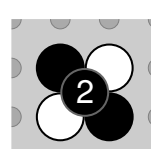
Zombies (balls pinned by enemy balls) can strongly influence play and often decide games. It is generally best to create as few zombies as possible, and to have more zombies than your opponent. This chapter describes some of the key plays for creating and exploiting zombies.

Making Zombies

The classic move for creating a zombie is the *cross-cut* move 1, shown below. This invites the opponent to connect their balls with bridging move 2, at the expense of creating two enemy zombies (right). This is called a *zombie invitation*.



Invitation to stack.



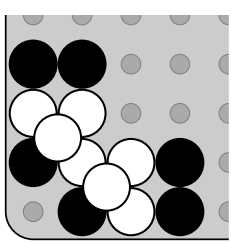
Two new zombies.

Stacking usually creates zombies.

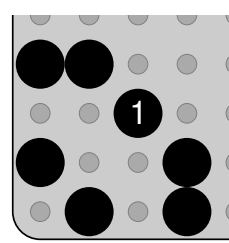
Balls at higher levels are generally more powerful, but the easiest way to build upwards is usually over enemy balls. The conflicting urges to build upwards, but not create zombies, mean that most stacking moves are something of a double-edge sword that require careful thought.

Releasing Zombies

It is possible to release zombies by capturing the balls that pin them. For example, the two black zombies in the following example are released when the pinning white group is captured with move 1 (below). The freed zombies are now just regular balls again.



Two black zombies...



...released by capture.

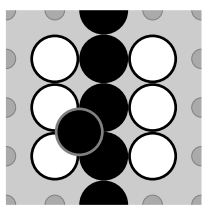
Several balls (at least three) must be captured to release zombies, and such releases typically require mass captures to occur.

> Most zombies do not get released.

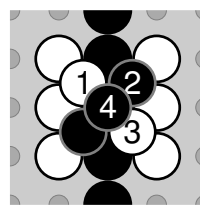
Zombie Piles

Connection threats can be used to make the enemy create zombies. Sometimes they can be used to make the enemy create *lots* of zombies.

Consider the following example, with White to play. White move 1 initiates a cross-bridge that is doomed to fail.

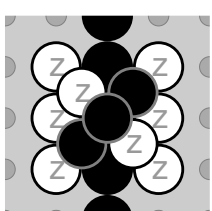


White to move.



Black wins the battle.

Black wins this battle with crowning move 4, but in the process creates an additional six white zombies (below). White now has two strong bases from which to attack, one on each side of the black wall, and an almost certain 8 points added to their score. Black may have won the battle, but White has possibly come out ahead here.

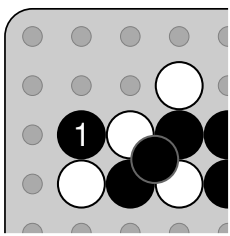


Lots of zombies.

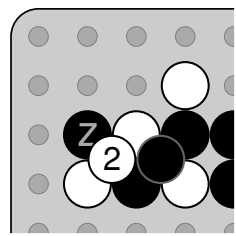
The battle may not be worth the zombies it creates.

Avoiding Zombies

Black move 1 (below) intrudes into white territory. Move 2 (right) is the obvious response, but that would create a threatening zombie (z) in home territory.

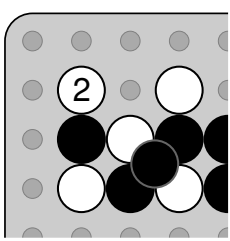


Black 1 intrudes.

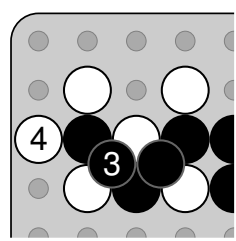


2 creates zombies.

Instead, a better defense is to attack the intruding ball with move 2 (below). If Black bridges across with move 3 (right), then White can play 4 to establish a strong defensive position.



A better defense.

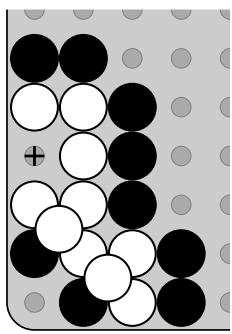


White dominates.

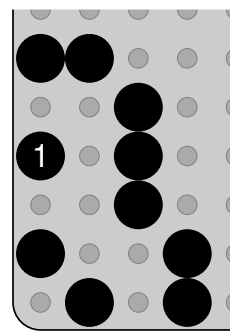
Avoid making zombies in home territory.

Zombie Foundations

Enemy zombies are dangerous to create and dangerous to build on. For example, the white group below (left) may appear to enclose two board holes, but only one of these is a freedom as the two black zombies cut the corner point off. Black can capture this group with move 1 (right).

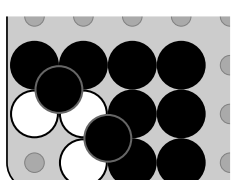


One white freedom.

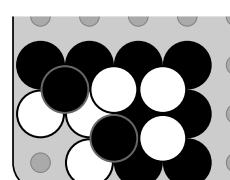


1 kills the group.

On the other hand, friendly zombies can be good to build on, as they offer a relatively permanent base. Consider the following example.



One white freedom.



Safe white group.

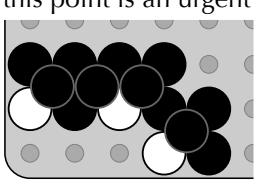
The white group (left) is firmly pinned in place and safe from capture. White can use this base to safely extend the group (right).

> Enemy zombies make bad foundations.
> Friendly zombies make good foundations.

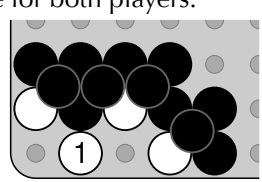
Zombie Support Groups

Most zombies, once created, remain fixed for the remainder of the game. This can make them more reliable support bases than unpinned balls, which are subject to capture.

For example, the position below shows a black group apparently dominating the corner (left). However, White can intrude with move 1 to establish a safe virtual group and steal the corner; this point is an urgent move for both players.



Black corner?

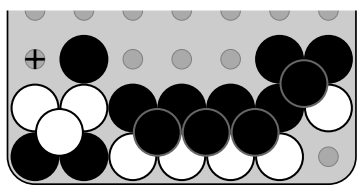


White steals it.

> Friendly zombies offer support.

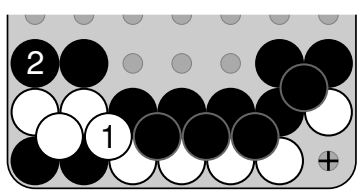
Zombies on the Edge

In addition to being relatively permanent, zombies along the board edge can't be cut. For example, the following position shows a white group in *atari* (left), with White to play.



White, in *atari*, to move.

White move 1 bridges to the nearby line of zombies, which act as a *conduit* to freedom (+).



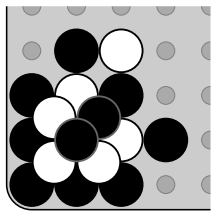
Safe white group.

Even if Black plays move 2 to contain the group, this unplayable freedom makes the group safe. Black can't cut this freedom from the group, as the connecting zombies are along the board edge.

> Connections along the board edge can't be cut.

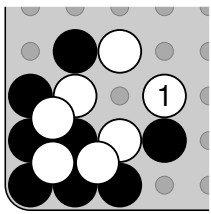
Zombie Sandwich

Zombies may be interleaved in multiple layers, as shown below. Such cases require both players to perform captures to release the most deeply pinned zombies.

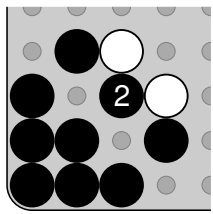


Zombie sandwich.

White move 1 captures the top layer of black zombies, freeing five white balls (left). Black move 2 then captures these five white balls to release the black zombies underneath.



Black layer removed.



White layer removed.

Note that such cases are rare, and that both players would have to cooperate to achieve such a zombie release. The even rarer case of *revealed captures* is discussed in Appendix A.

CHAPTER 6

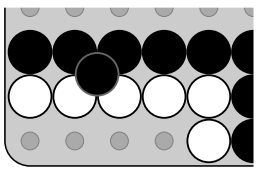
Territory

Territory is a scarce and valuable resource in Margo, as the only freedoms are board holes and the board is relatively small. While territory may seem a secondary consideration in the early game, it's importance becomes increasingly obvious as a game progresses, and it's ultimately the deciding factor of almost every game. This chapter describes some of the key ways to maximise your territory and minimise your opponent's.

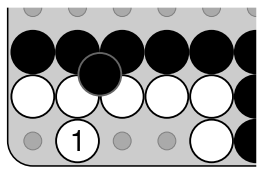
Invasion

The relatively small size of the Margo board means that players' territories tend to be small, and typically contain no more than a few board points each. This means that invading groups usually do not have enough room to make themselves safe, so must rely on support from nearby friendly groups.

Consider the situation shown below. White can make their group safe with move 1 or the point to the right of it.

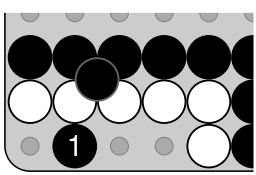


White dominates.

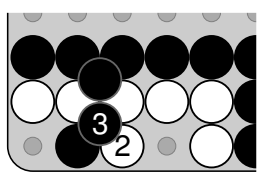


1 makes the group safe.

However, Black can invade if they have the move instead (below, left). White doesn't want to make the obvious reply 2 (right), otherwise Black can bridge over with 3 to cut the white group in two.



Black 1 invades.



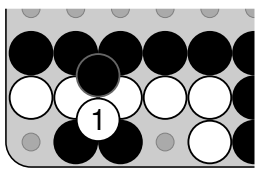
White can't defend.

Nor does White want to play to the left of the black invader, as that would allow Black to put the white group in *atari* and ultimately capture it. White has no good immediate defense against this invasion.

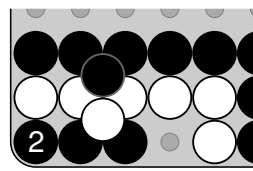
Use bridge threats to invade.

Bridgeheads

A *bridgehead* is an advance group established in enemy territory, usually made up of zombies. For example, White move 1 (below) creates a strong black bridgehead. Black can then play sacrificial move 2 to put the white group in *atari* (right).

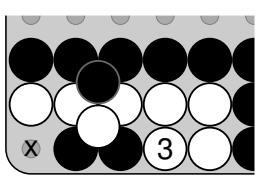


3 forces two zombies.

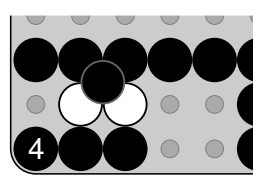


5 is a sacrifice.

White can capture one invader with move 3, but the bridgehead remains and Black can then kill the white group with move 4. Such a capture leading to a bigger capture is called a *snapback*.



White captures...

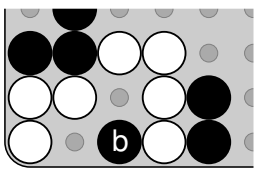


...but Black snaps back.

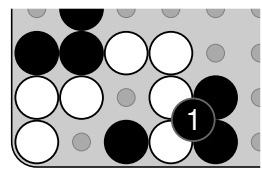
Make the enemy create zombies in their territory.
Don't create zombies in your territory.

Escalades

An *escalade* is a ball that scales an enemy wall to overlook the other side.[1] For example, the invading black ball b (left) is overlooked and supported by escalade move 1 (right).

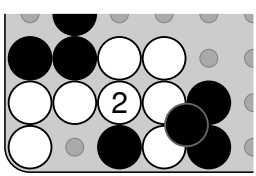


Invading ball b.

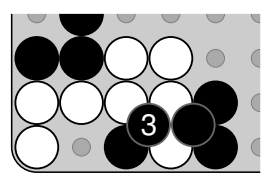


Escalade move 1.

White's obvious defensive move 2 (below) fails, as that would allow Black to bridge across with move 3 (right) to consolidate the invasion.



White 2 attacks...



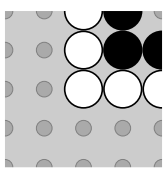
...but Black 3 defends.

Escalades support isolated balls.
Escalades create bridgeheads.
Escalades deter enemy placements.
Use escalades to invade!

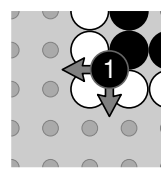
[1] The term *escalade* was suggested by Richard Reilly.

Double Escalade

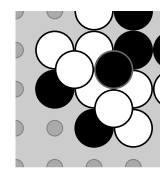
A *double escalade* occurs when a ball climbs an enemy wall to overlook two sides at once, such as move 1 (below). The continuation shown on the right demonstrates the power of the double escalade, where Black has engineered a double bridgehead on the other side of the wall to invade white territory.



Black to play.

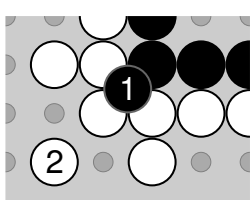


Double escalade.

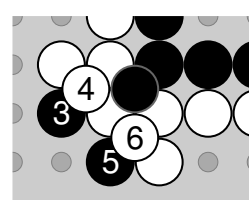


Continuation.

The following example shows a variation on this position. White would be wise to reply to double escalade 1 with defensive move 2 (left), otherwise Black can engineer an invading zombie pair.



White should defend...

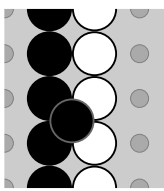


...or Black can invade.

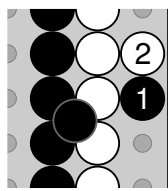
Double escalades can be strong moves.

Escalade Fronts

Escalade *fronts* of more than one ball are generally more powerful than single balls. The following position shows an escalade with a single-ball front, with Black to play. White can defend against intruding move 1 (right).

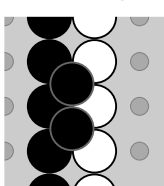


Single front.

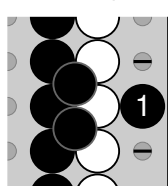


Black 1 fails.

However, if the escalade has a two-ball front (below), then intruding move 1 is safe from capture (right). White does not want to play at either adjacent point – for fear of a bridge.



Double front.



Black 1 is safe.

Broader escalade fronts are stronger.
Impede single fronts to prevent double fronts.

CHAPTER 7

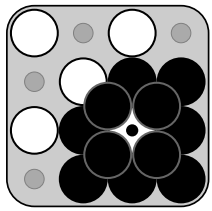
Cycles

Cycles, although rare, can legitimately occur in Margo, and can be devastating if one player can cycle a local position while the opponent is forced to fill in territory. This chapter involves more advanced concepts, and is best read only if you are familiar with the rules of the game and the concept of point ownership.

Differential Cycles

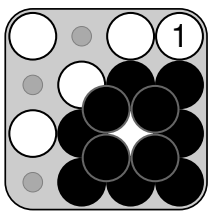
A *differential cycle* occurs when both players repeat a local cycle, but one player is forced to play a move elsewhere – outside the cycle – per iteration. The cycle is described as "local" since the global board state changes each turn, due to the "elsewhere" ball played per iteration.

Consider the following position, with White to play. A 4×4 example is used for simplicity. This position was taken from an actual game, annotated in full in Chapter 11 *4×4 Game*. Note that Black owns one point (●).

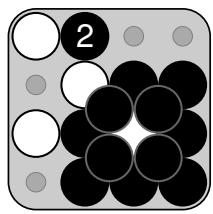


White to play.

Move 1 (below) puts the black group in *atari*, forcing Black to capture with reply 2 (right).

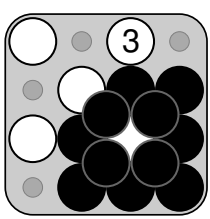


1 creates *atari*.

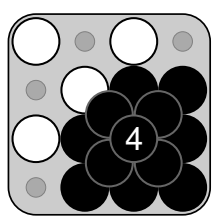


Forced reply 2.

White recaptures with move 3 (below) to complete the local cycle. Black is then obliged to play the "elsewhere" move 4 at their only remaining safe point (right).

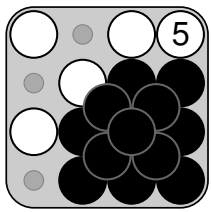


3 completes the cycle.

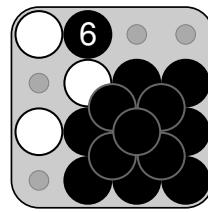


"Elsewhere" move 4.

Move 5 (below) again puts the black group in *atari,* forcing Black to capture with reply 6 (right).

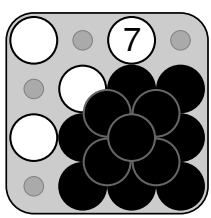


5 creates *atari*.

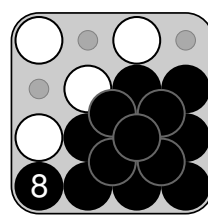


Forced reply 6.

White again recaptures with move 7 (below) to complete the local cycle. Black doesn't own any more safe points, so must play the "elsewhere" move at an unsafe point (right).



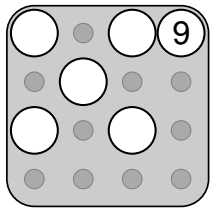
7 completes the cycle.



"Elsewhere" move 8.

Move 9 (following) performs a mass capture that clears the board of black balls. Captures don't get much more decisive than this.

This cycle has a differential ratio of 2:1, as White loses two balls per iteration while Black loses one. Such cycles can be devastating in the territory-filling stage of the end game, where every ball added is another step towards defeat.



Mass capture.

The fact that the cycle is local means that the No Repetition rule is not violated, as the global board state changes with each move.

The differential cycle sequence is summarised below.

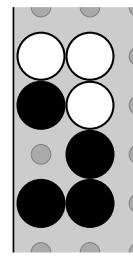
Differential Cycle

1. A puts B in *atari*.
2. B captures two balls (including ball 1).
3. A captures ball 2.
4. B must play play elsewhere.

Don't perpetuate a local cycle if the opponent's "elsewhere" moves hurt you.

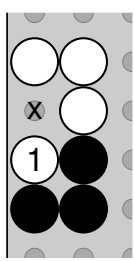
Blocking Cycles

The following example shows a similar cycle about to be initiated by White.

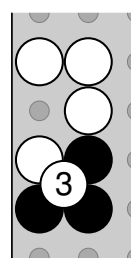


White to play.

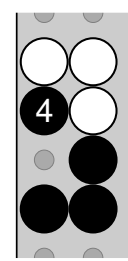
White move 1 captures the black ball in *atari,* forcing Black to play move 2 elsewhere due to the No Repetition rule. White plays 3, then Black captures both with move 4 to complete the cycle.



1 captures.

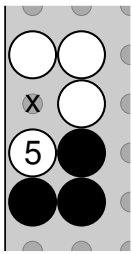


3 delays.

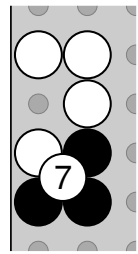


4 captures.

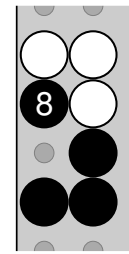
The cycle is repeated with moves 5–8. This is another local cycle with a differential ratio of 2:1, in which Black plays a ball elsewhere per iteration.



5 captures.

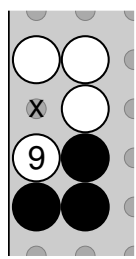


7 delays.

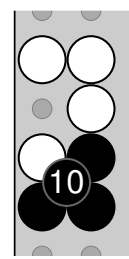


8 captures.

White move 9 threatens to continue the cycle (below). However, Black has a straightforward reply in this case, and can shut the cycle down by occupying White's buffer point with move 10 (right).



9 captures.



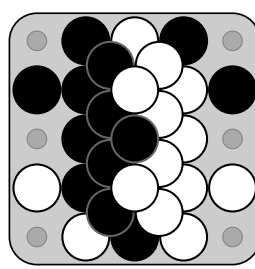
10 blocks.

White can't continue the cycle now.

> Block harmful cycles, if possible.

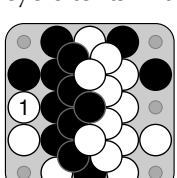
Mutual Cycles

It's possible for two differential cycles to mutually feed each other, if the "elsewhere" move for each iteration is used to initiate the other cycle, with colours reversed, on another part of the board. However, the No Repetition rule will stop such cycles continuing indefinitely. Consider the following situation with White to play.

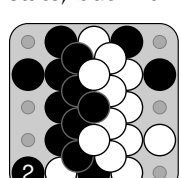


White to play.

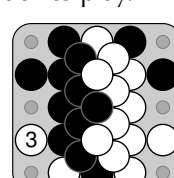
White move 1 (below) initiates a differential cycle by putting the main black group in *atari*. Move 2 captures, then move 3 recaptures to return the cycle to its initial state, but with Black to play.



1 creates *atari*.

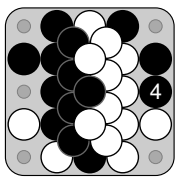


2 captures.

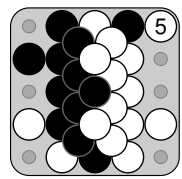


3 recaptures.

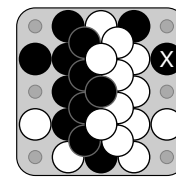
Black's "elsewhere" move 4 (below) then initiates a separate cycle by putting the main white group in *atari*, and White is obliged to capture the threatening balls with move 5 (middle).



4 creates *atari*.



5 captures.



X is illegal.

Black would now like to play move X, but this is forbidden by the No Repetition rule. This move would repeat the same board state from six moves ago with the same player (White) to move.

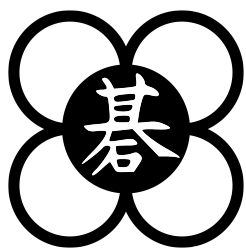
Occurrence

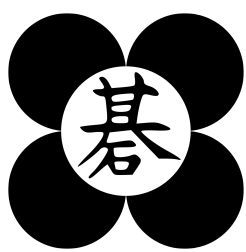
Players should not be too concerned about mutual cycles. They will be extremely rare, and no cases have been seen in actual play to date.

It's not necessary to remember every previous move of every game to enforce the No Repetition rule, and for most cases it will be sufficient to remember the board position of the previous turn only. If players notice that a mutual cycle has developed, then it's relatively straightforward to work out which move initiated the cycle, and stop the cycle before that position is repeated on the next iteration.

PART II

Strategy





CHAPTER 8

Stages

Games of Margo, like many board games, can be divided into distinct stages. Each stage has its own character, which can require players to adjust their play accordingly. This section describes the stages of play, and briefly introduces tactics and strategies specific to each, which are discussed in more detail in the following chapters.

Stages of Play

Games played on the standard 7×7 board tend to last between 50 and 100 moves before the game ends, typically with a player resigning. Most games can be divided into three broad stages, as follows:

1. Opening

First ten or so moves.

The opening stage of a game generally occurs on the board level, as players fight for key control points, and loosely stake out as much territory as possible as quickly as possible. Play tends to be

subtle and developmental, although the confined space means that engagement is never far away.

Opening

Secure control points (discussed next chapter).
Stake out territory.

2. Middle Game

Approximately first half of game (after opening).

The game then enters a more aggressive middle stage, in which territorial boundaries push against each other and players probe enemy defenses for weakness. Players endeavour to secure their own groups and wreak havoc on the enemy's. The middle game is typically characterised by upper level bridge play in disputed regions and full-scale invasions into enemy territory. Players should seek to maximise their territory and potential for point ownership.

Middle Game

Invade enemy territory!
Join your groups and cut your enemy's.
Expand your borders, contract your enemy's.
Prepare territory and own points.

3. End Game

Approximately last half of game.

The end game is all about the management of territory and owned points. Players' territories are established by now, and invasions are aimed at eating away enemy territory rather than necessarily overrunning it. Players focus on reinforcing their borders, maximising their territory, and owning as many points as possible.

Most games eventually enter a *cold war*, in which the only moves available are those that fill in the mover's own territory. These are *cold* moves that players don't want to make, but are forced to as they can't pass. The key to such *territory-filling races* is to pack your territory efficiently, and maintain ownership of as many points as possible.

Once a player's safe points run out, they are forced to make unsafe moves that place their own groups in *atari*. This usually spells disaster for the first player to do so. Generally, the aim in the end game is to make your opponent fill their territory more quickly than you fill your own.

End Game

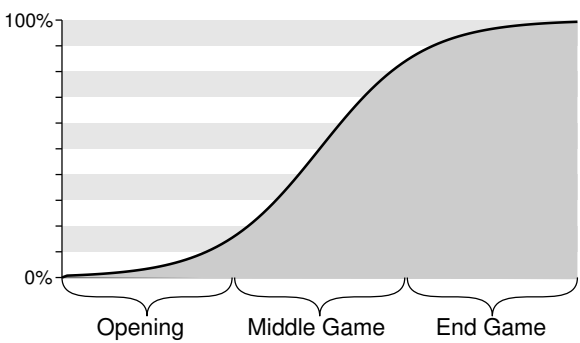
Invade enemy territory!
Connect to your invaders if possible.
Otherwise do not be afraid to sacrifice them.
Consume more enemy territory than your own.

Territory

Any game of Margo ultimately comes down to territory; how much players are able to claim, and how well they manage it through the end game. Even though territory may seem a secondary concern in the early stages of play, players should always bear it in mind when planning any move, and should plan to secure as much territory as possible from the start. If two moves are otherwise equal, choose the one with the best potential to gain territory.

Sacrifice

The following graph shows how willing players should be to sacrifice balls, over the course of a game.



Willingness to sacrifice.

Players should generally be reluctant to sacrifice balls in the early stages, as every ball is initially vital in staking out territory. Sacrifice becomes more worthwhile in the middle game, when minor skirmishes can be lost for positional gain. Players should not be scared to sacrifice balls in the end game, especially if this makes the enemy consume their own territory.

Every ball sacrificed is one less ball to fill the player's own territory in any upcoming cold war. However, this is balanced by the fact that every ball sacrificed is one less point for the owner's score.

Several small sacrifices may be worthwhile if they ultimately lead to a mass enemy capture. In addition, harassing the enemy with sacrificial incursions can force them to play in their own territory and whittle away at the points that they own, pushing them towards a fatal unsafe move. However, the value of any sacrifice must be gauged on a case-by-case basis.

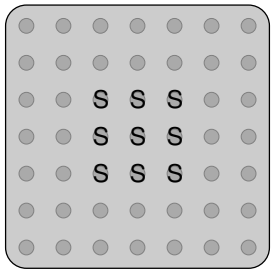
Opening

The opening stage covers the early moves of a game, in which players vie for position and stake out potential territory. Any direct threats at this stage are generally intended to push territorial boundaries, force weak replies or invite zombies.

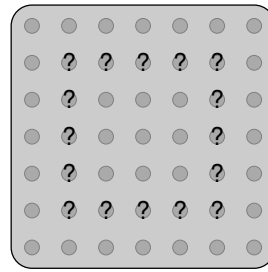
To Swap or Not to Swap

If the swap rule is used, then Black has the option of swapping colours on the second move, effectively stealing the opening move. White should therefore attempt to make the strongest opening move that Black will not swap.

Points marked S in following figure are strong moves that Black is likely to swap (central points are generally stronger). Points marked ? are borderline moves that are reasonably safe to open with. Points on the outer edge are too weak to make good openings.

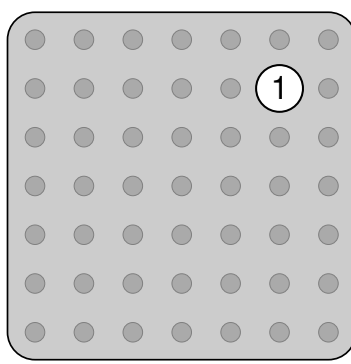


Strong openings to swap.



Borderline openings.

It is therefore recommended that White opens with a borderline move, such as move 1 (below). Black is less likely to swap such a move.



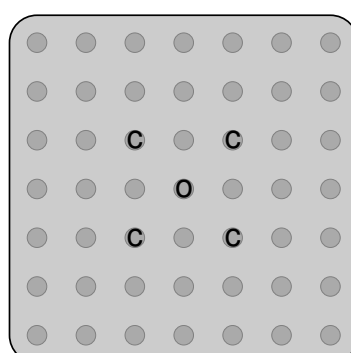
Feasible opening move 1.

Make the strongest opening that the opponent won't swap.

Control Points

Following the opening, the next few moves of a game typically involve a grab for the board's main control points, as these most strongly influence the most territory.

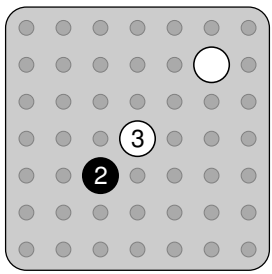
The *corner control points*[1] (c) give the owner a strong advantage in controlling the nearby corner. The *central point*[2] (o) offers maximum connective potential to all sides of the board, and can allow a player to dominate the board from a strong central position.



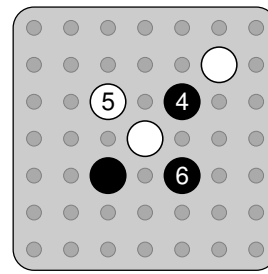
Key control points.

The following example shows a typical opening sequence. Black takes the far corner control point with move 2 and White takes the central point with move 3 (left).

[1] Called *san-san* in Go.
[2] Called *tengen* in Go.



Moves 2 and 3.



Control points taken.

Black move 4 splits the white balls and claims another corner control point (right). Moves 5 and 6 take the remaining corner control points.

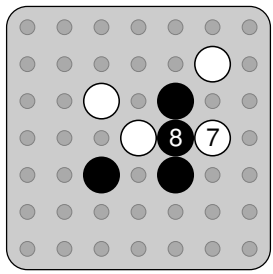
Grab the control points.

Stake Your Claim

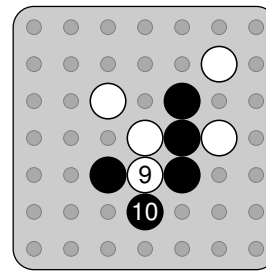
Black now owns three corner control points and dominates the lower part of the board. White must now attempt to stake out their own loosely defined territory, before Black consolidates control over most of the board.

The following White move 7 encroaches into the vertical corridor down the right side of the board, and Black keeps this ball separated from White's central force with reply 8 (left). White move 9 threatens to push through Black's line towards the

bottom part of the board, and Black defends again with reply 10 (right).



White probes right.



White probes down.

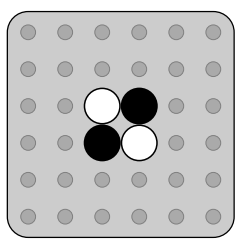
White now dominates the two upper corners while Black dominates the two lower corners. The territorial boundaries of each player are taking shape, and the positional framework for the rest of the game has been laid.

Note the friction at the boundaries where the players' forces push against each other; the battle for territory has already begun. Freedoms are scarce on the relatively small Margo board, and players must fight for them right from the start.

> Stake out your territory quickly.

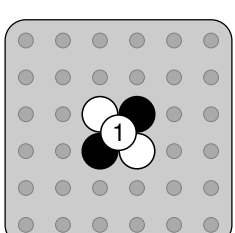
Even Boards

Even-sized boards, such as the 6×6 board shown in the following example, do not have a single central point. In these cases, the following pattern will often occur in the opening stage as players vie for control of the centre. Note that the four occupied points are the four corner control points.

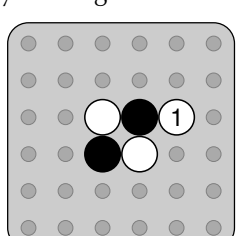


Opening cluster (6×6).

White might stack as shown in the following continuation 1 (left), to connect their two balls into a single central group, but this would create two black zombies very early in the game.

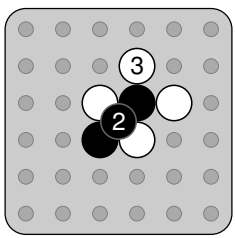


1 makes zombies.

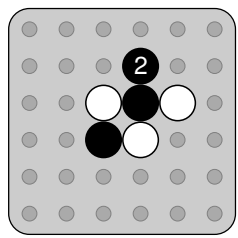


1 attacks.

Alternatively, White can directly threaten one of the black balls with move 1 (right), to expand their territory and force an immediate reply. Black may choose to stack themselves with move 2 (left), although this would create two white zombies and allow White to continue the attack with move 3.



2 makes zombies.



2 defends.

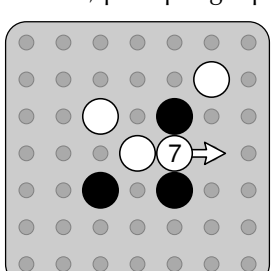
A better option for Black is probably to simply defend their threatened group with move 2 (right). Note how much more intimate and aggressive the game can be from the very first moves on even a slightly smaller board.

Middle Game

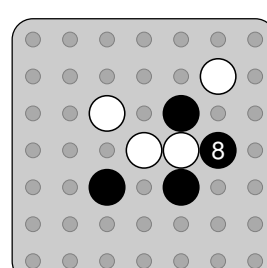
The middle game is characterised by players defending their borders and probing the enemy's for weakness, as the loose territorial boundaries staked out in the opening stage are solidified. This chapter describes some relevant points of strategy.

Inner and Outer Games

The following example shows a different continuation of the opening sequence presented in the previous chapter. White pushes right with move 7, prompting reply 8 from Black (below).

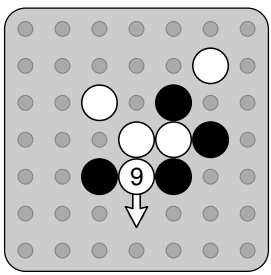


White pushes right...

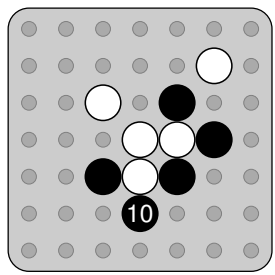


...Black responds.

White then pushes down with move 9, prompting reply 10 from Black (below).



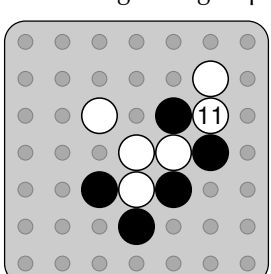
White pushes down...



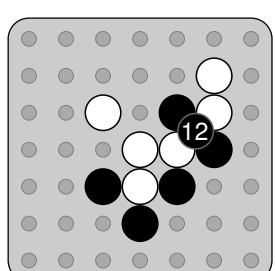
...Black responds.

Black has opted for an *outer game*, in which a player controls the corners and establishes territory around the edges. White is playing an *inner game*, in which a player seeks to control the board from a strong central group.

White move 11 threatens an escape, and Black makes the obvious bridge block 12 to stop White connecting their groups.

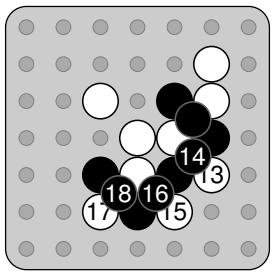


White threatens...

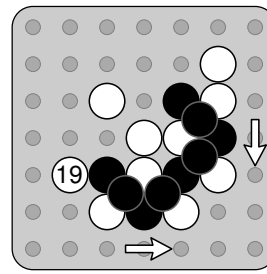


...Black blocks.

White makes similar threats with 13–17, and if Black makes similar blocking replies 14–18, then the following situation develops.



White controls the outer.



Strong attacks to corner.

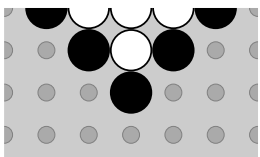
This game is now delicately poised. The large group of black balls (which form an alternating up/down sequence called an *inchworm*) provides a strong base for Black to build from, but the surrounding white balls constrain it and control the outer game; the two arrows show strong dual white attacks into the corner region.

Not every game will develop this way. This example demonstrates the inner and outer games and how zombies can quickly change things. Richard Reilly points out that the outer game can also be seen as a natural consequence of blocking a strong central group from reaching the edges.

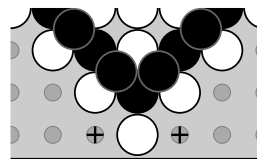
> Don't let the opponent contain you.

Ramps

The following figure (left) shows diagonal lines of non-touching black balls holding back a central white group. These lines constitute diagonal *ramps*.



Black ramps.



White ramps.

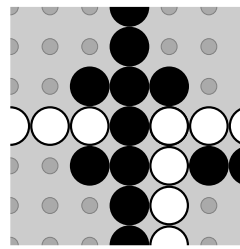
The black ramps (left) are exposed and really quite weak. If White is able to engineer a surrounding wall of zombies, then the black balls are now the ones being contained (right). This would be a bad play for Black.

White's ramps would be stronger than Black's ramps were. Firstly, the white ramps would meet the edge to form two acute corner points (+) called *mouths*, which Black cannot attack without some preparation. Secondly, the white ramps would be made up of zombies and hence more resistant to attack.

> Ramp from the board edge to form mouths.

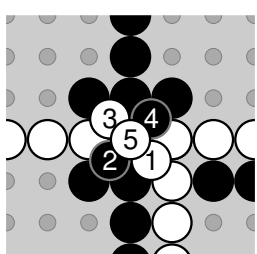
Play to the Context

Consider the following example (White to play).

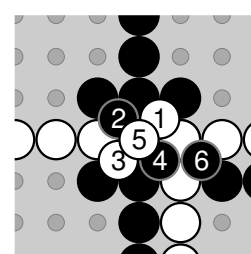


White to play.

White has two ways to force a cross-bridge here, as shown below. However, note that the second option (right) provides a *conduit* 4 through which Black can connect two groups with move 6. White should play the first option to prevent this.



Good choice.

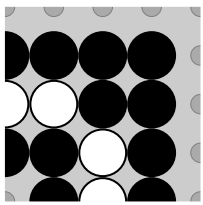


Bad choice.

> Play to suit the surrounding context.

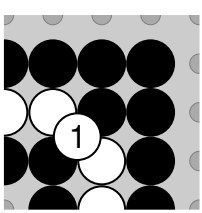
Make Moves Matter

Try to make moves achieve more that one goal. For example, the following position shows two white groups that White wants to connect.

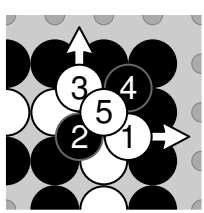


White to play.

White could play the obvious bridging move 1 (left). However, alternative move 1 (right) still connects the two groups by forcing a cross-bridge, but also results in a double escalade.



Connection.



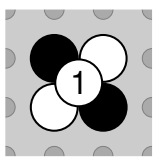
Connection + attacks.

Black should have given this battle up and played move 2 elsewhere.

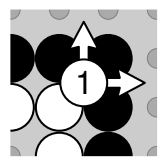
> Make moves achieve more than one goal.

To Build or Not to Build?

The fact that bridges cut the connections they cross over means that balls are generally more powerful the higher they are. For example, the elevated white ball 1 on the left facilitates connection, and the elevated white ball 1 on the right facilitates invasion.



Bridge.



Escalade.

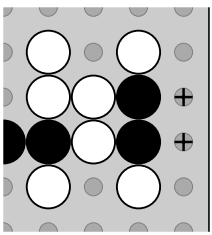
On the other hand, stacking a ball usually creates zombies, as the easiest way to build upwards is usually on enemy balls. These conflicting urges to build upwards but not create zombies add balance and tension to the game, and the decision to pin or not can be a difficult one that depends on the:

- benefit of stacking that ball,
- likelihood and importance of capturing rather than pinning any enemy support balls, and
- danger that those balls will pose as zombies.

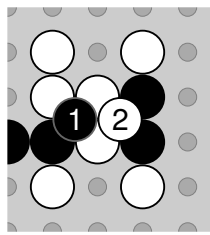
> Higher is better, but zombies are dangerous.

Save or Pin

If you can't save stranded balls, then engineer to have them pinned. The following example (left) shows a stranded black group with two freedoms (+). This pair can't be saved, even if Black moves next. However, Black move 1 invites reply 2 from White, which pins the stranded balls in place to zombify them.



Black to move.



White must pin.

There are several advantages to forcing the enemy to pin isolated balls. For example, the two black zombies shown above:

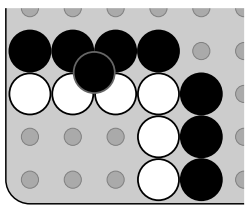
- intrude into potential white territory,
- occupy two potential white freedoms,
- reduce White's potential to own points,
- count 2 points towards Black's score, and
- provide a bridgehead for future invasion.

> What you can't save, get pinned.
> Eat away at enemy territory.

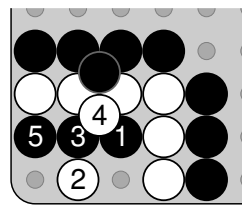
Smaller Can Be Safer

The ability to build over walls means that there are many ways to invade enemy territory, even if that territory appears to be safe. Escalades can interfere fatally with the defense of a group.

For example, the following white group (left) might appear defendable, but is in fact not safe.



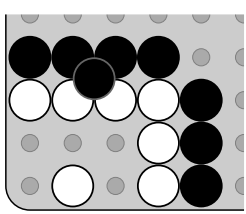
Black to play.



White group is dead.

Move 1 invades, 2 defends, then 3 forces pinning move 4 to establish a strong black bridgehead. White can't save this group after move 5.

However, if the white group enclosed fewer board holes then it would be easier to defend. For example, an additional white ball (below) would make this group safe.

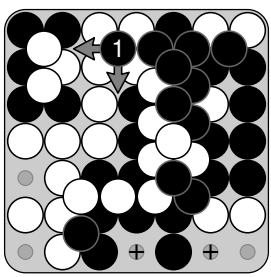


Safe white group.

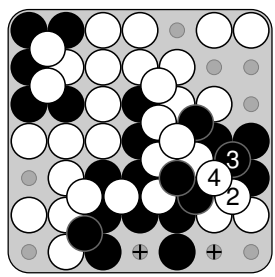
Smaller territories are more defendable.

Cut Attacks Off at the Source

When defending against an attack, consider the entire situation and not just the sharp end. For example, Black move 1 (below) intrudes into White's territory, and threatens to gain traction there through a bridge fork. Note that the attacking black group has two freedoms at the bottom of the board (+).



Black 1 invades.



White kills the attack.

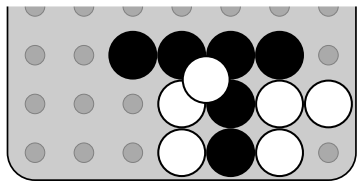
White can't block both branches of the fork, but can go one better and kill the entire attack with moves 2–4 (right). This cross-bridge cuts the majority of black balls off from their only freedom (+) to capture them. White is now in a winning position.

Consider the whole situation.

Cut attacks off at the source.

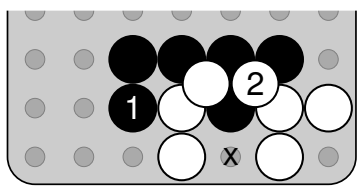
Time Your Attacks

The timing of attacks can be critical. For example, consider the situation below, with Black to move.



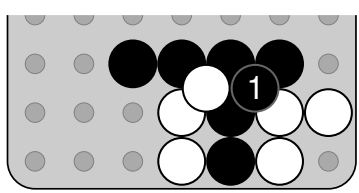
Black to play.

If Black attacks the group prematurely with move 1 (below), then White can bridge across with 2 to capture a ball and make their group safe.



Premature attack 1 fails.

However, if Black delays the attack and plays blocking move 1 (below), then White is doomed.



Delaying move 1 succeeds.

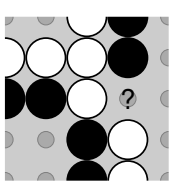
Black move 1 stops White from capturing a ball to create a freedom, and even forcing a cross-bridge to connect the two white groups will not help White now. Black can attack these groups at their leisure to capture them.

> Prepare before attacking.

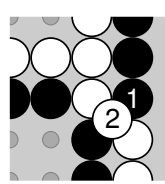
Cold Points

A *cold point* is a point at which a player can legally move but doesn't want to. For example, point ? in the following situation is available to both players, but neither wants to play there.

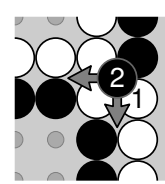
If Black plays move 1 there (middle), then White can bridge over it to complete their connection. If White plays there (right), then Black can build on that ball to mount a strong forking attack.



Cold point.

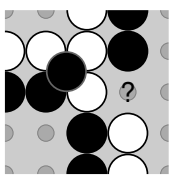


Black 1 is bad.

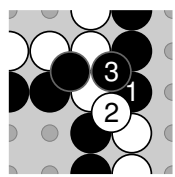


White 1 is bad.

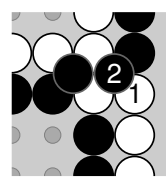
However, the situation is different if Black has an extra ball in play, as shown below (left). In this case, the point ? is only cold for White, as a Black move there would be good for Black (middle), while a White move there would still be bad for White (right).



Cold for White.



Black 1 is good.



White 1 is bad.

Points can be cold for either or both players.

CHAPTER 11

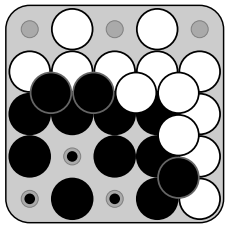
End Game

The end game occurs when players' territories are well established, and they are forced to start filling them in. The emphasis is on efficient use of the available space and the management of point ownership, and players should strive to ensure that more balls are played in enemy territory than are played in their own. This chapter contains relevant points of strategy.

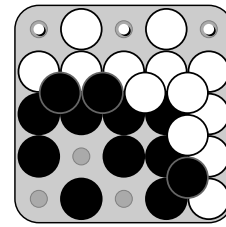
Point Ownership

Recall that a player *owns* those points that are playable and safe to them but not playable to the opponent. The following example shows the points owned by each player in a 5×5 game at the territory-filling stage, with Black to move.

Both players appear to own three points (●), but each only really owns one. This is because playing at any of these points would reduce its group to two freedoms, neither of which would then be safe to play in.

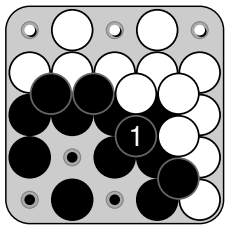


Owned by Black.

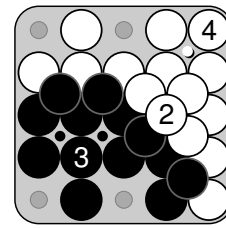


Owned by White.

Move 1 (below) is the best move for Black here. This move stops White intruding into Black's territory and does not lose ownership of any points. After moves 2–4 (right), Black now owns two points to White's one, which is a good position to be in.

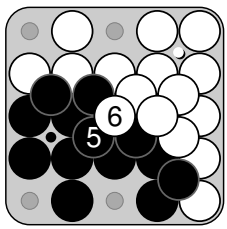


1 blocks intrusion.

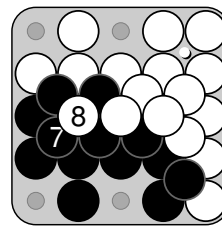


3 creates safe points.

However, Black must still be careful, as the following move 5 would allow White to bridge over with move 6, forcing reply 7, to leave Black owning no points and facing defeat.

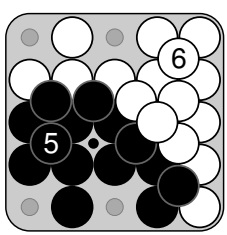


Wrong move 5.

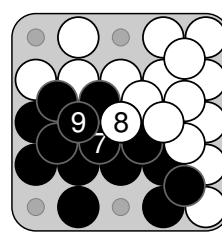


White succeeds.

Instead, Black should play move 5 (below), which forces White to consume their last remaining owned point with move 6 (left). Black can then dictate play with moves 7 and 9 (right), leaving White to play but with no safe points to play at.



Correct move 5.



White fails.

White is now forced to fill one of their own freedoms to put themselves in *atari*, and Black can capture this group to set up a win. This example shows how careful management of point ownership can decide a game.

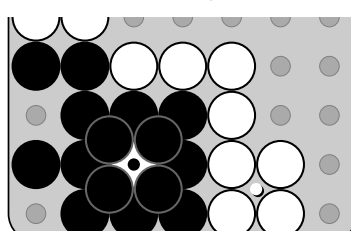
Point ownership become increasingly important as the game approaches its conclusion. Each owned point is like an extra life that delays the fatal freedom-filling move by one more turn. Most

games between players of similar skill will be decided by one or two owned points either way.

> Point ownership decides games.
>
> Placement order is critical.

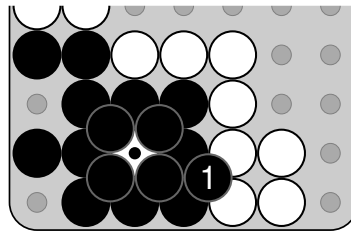
Platform Ownership

Creating 2×2 platforms of your colour can be an efficient way to own points. The following example shows two such platforms: a black platform that owns a point for Black (left) and a white platform that owns a point for White (right).



Black and White each own a point.

Black can encroach into White's platform with move 1 as shown, to compromise the ownership of that point.



Black 1 encroaches.

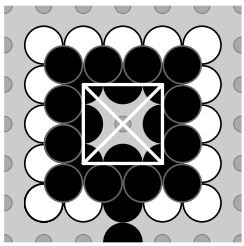
However, White can't encroach into Black's platform without considerable effort, despite the fact that it's largely surrounded by white balls. This is because the black platform is elevated above the white balls, and will require White to build upwards to invade it.

> Higher is generally better.

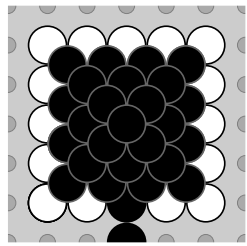
Freedoms Constrain Stacking

Freedoms, being board holes, limit the capacity for balls to stack in their vicinity. Each board hole can be visualised as the tip of an inverted pyramid that defines a "can't stack" volume.

The following example shows the "can't stack" volume created by a black freedom (left). Black can stack an additional 19 balls in this volume, if they are willing to fill this freedom (right).



"Can't stack" volume.

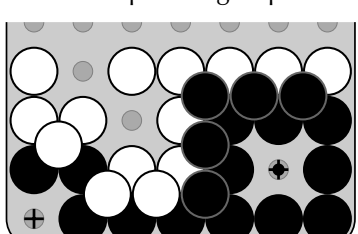


Stacked.

> Fill freedoms according to their potential for point ownership.

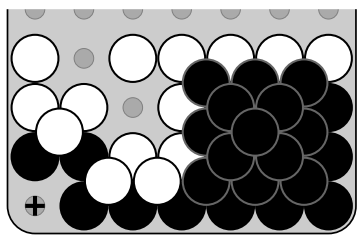
Critical/Superfluous Freedoms

The following example demonstrates how freedoms can be a useful resource. The black group has two freedoms (+) but only owns one of them (●). Black doesn't own the corner point, as playing there would put the group in *atari*.



Critical and superfluous freedoms.

The freedom in the left corner is *critical* as the group needs this freedom to survive, while the freedom on the right is *superfluous*, as Black can safely play there without putting the group in danger. In fact, doing so would let them pack another 10 black balls in their own territory, as shown below.



Black safely adds 10 more balls.

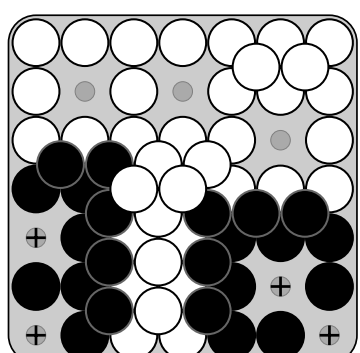
Because the black zombies that guard the corner are pinned by white balls, Black has control over whether these zombies are ever released or not. Black is therefore quite safe to reduce this group to a single unplayable eye (unless they plan to capture the pinning white balls later). Filling the volume previously constrained by the superfluous freedom adds another 10 points to Black's score.

Don't be afraid to fill superfluous freedoms.
Beware of creating safe freedoms for the enemy.

Group Tax

The previous example leads to the notion of *group tax*, as suggested by Sandra Snan. This is the idea that players are penalised for having more groups, as each group requires freedoms to survive, and each critical freedom represents space that the player can't fill in safely.

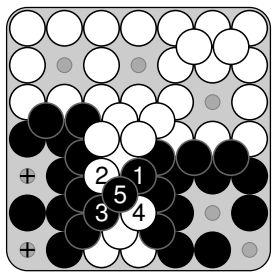
An extreme case is demonstrated below, with Black to play. Note that Black has two groups, each with two freedoms, and that Black requires all four freedoms to remain safe.



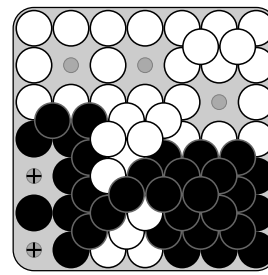
Black needs all four freedoms.

However, if Black consolidates their two groups into a single group with cross-bridge moves 1–5 (left), then two of these freedoms are made superfluous. Black can now safely fill them, and the volume constrained by them, to add an additional 12 balls and therefore 12 points to

their score (right). This additional volume would also allow Black to outlast White in a territory-filling race, to eventually win the game outright by a considerable margin.



Two freedoms needed...



...12 balls added.

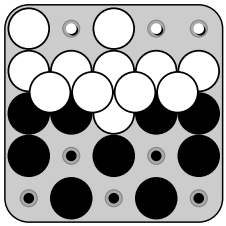
The point is that the extra number of freedoms required to maintain a larger number of groups restricts a player's ability to pack their own territory efficiently. Note that White could have won this game if it was their turn to play, by blocking the potential cross-bridge and keeping Black's two groups separated.

Group tax is a side-effect of Margo's ball count scoring system. This is in direct contrast to Go, where empty points within a territory reward rather than punish their owner.

Consolidate groups to minimise group tax.

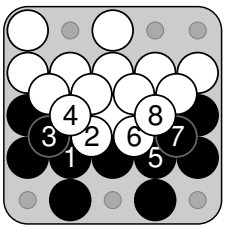
Don't Feed the Enemy

Consider the following situation. This game is now a territory-filling race, in which Black owns five points to White's three and should win.

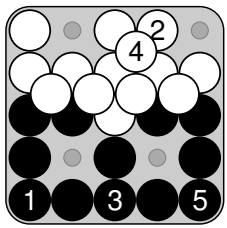


Black should win.

However, Black can still lose by starting to fill those freedoms closest to the white balls (left).



Black loses from here.



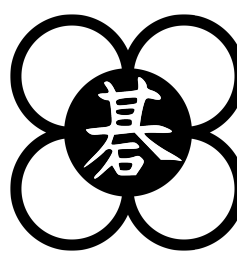
Black wins from here.

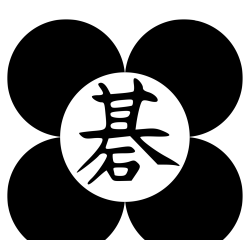
Instead, Black should start filling freedoms as far as possible from any white balls (right), to avoid giving White safe points that they can expand to.

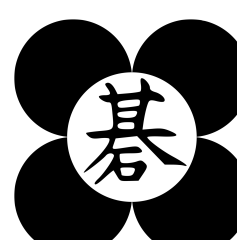
> Fill as far as practical from enemy groups.

PART III

Games & Puzzles



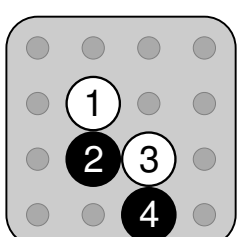




4×4 Game

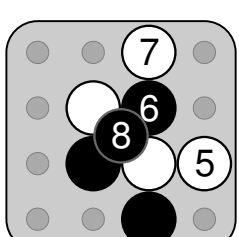
The following annotated sample game was played on the gamerz.net server in 2011. It shows the deadly nature of the game on the small 4×4 board, and includes a differential cycle.

Game #254 ○ S. Tavener ● C. Browne

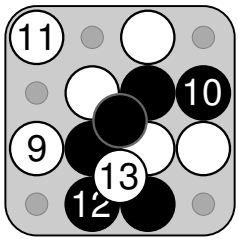


Opening

Moves 1–3 are typical opening moves, occupying corner control points. Move 4 does not claim the fourth one, for fear of a White bridge.

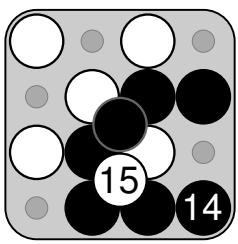


Move 5 stakes out territory, move 6 intrudes, move 7 threatens, and move 8 bridges over to defend. This concludes the opening stage.

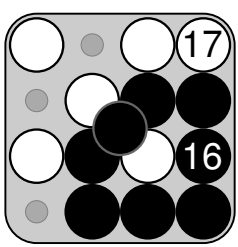


Middle Game

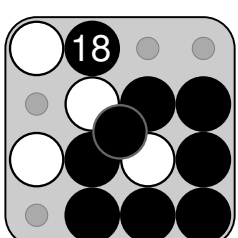
Moves 9–12 consolidate the borders of each player's territory. Move 13 is the first cold move; White has run out of safe options.



Move 14 captures and move 15 repeats the cold move. White is using the cold moves to waste balls while Black fills their own territory.

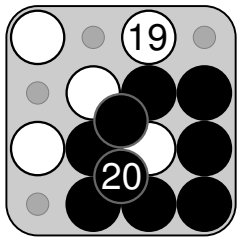


Move 16 is the turning point of the game. Black fails to notice what is about to happen and recaptures. Black could have had an easy win by playing 16 at 17 instead.

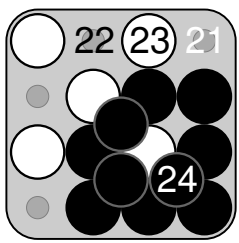


End Game

Move 17 puts the Black group in *atari*, so Black is obliged to capture with move 18.

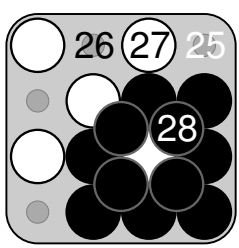


White captures ball 18 with move 19. Black is forced to fill in a safe point with move 20.



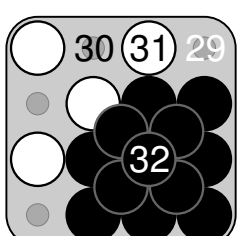
White repeats the differential cycle with moves 21–24...

Black resigns at this point.

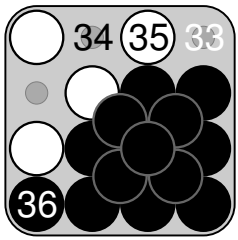


The game would have played out as follows.

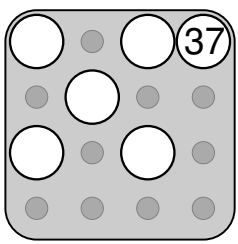
White would repeat the cycle with moves 25–28...



...and repeat the cycle again with moves 29–32. Move 32 would be Black's last safe point.



White would repeat the cycle a final time with moves 33–35, and Black would be forced to make unsafe move 36 to put their own group in *atari*.



White 37 would then perform a mass capture to clear the board of black balls, a position that Black would not recover from.

Black resigned at 24.

Summary

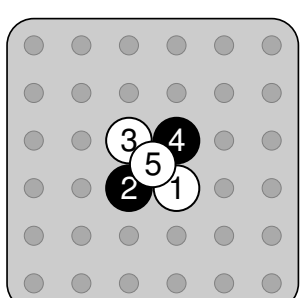
This example highlights the rather tactical and brutal nature of the game at this small size. The opening and middle stages are short, as the few available freedoms are quickly consumed and there is little room to grow, and capture is always imminent. However, games can be surprisingly complex and last longer than the 4×4 grid might suggest, due to capture and recapture.

This example also demonstrates the danger of differential cycles, and the importance of closing out games when you get the chance.

6×6 Game

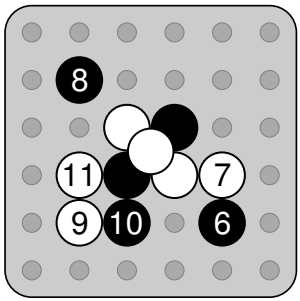
The following annotated 6×6 sample game was played on the gamerz.net server in 2011. This game involves a long end game full of sacrifices made for positional gain, and shows the danger of resigning prematurely.

Game #274 ○ C. Browne ● R. Reilly

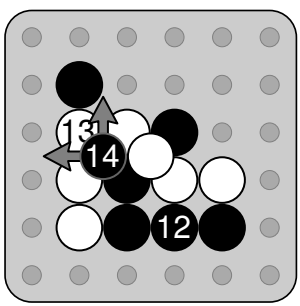


Opening

White move 1 is a strong opening and it's a surprise that Black did not swap. Perhaps Black was anticipating move 5, which creates two black zombies.

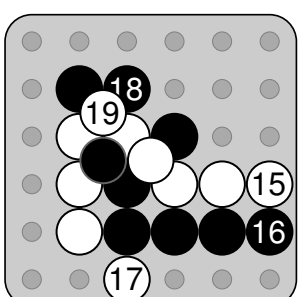


Players loosely stake out their territory with moves 6–11.

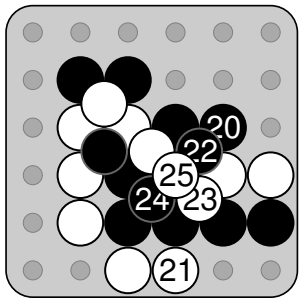


Middle Game

White 13 is a poor move that allows Black to play double escalade 14, which threatens to support invasions to the left and above.

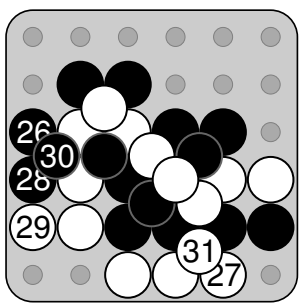


Move 18 launches an invasion into the top left corner, supported by the central black zombie. White is forced to pin the invading balls with move 19, resulting in a strong Black bridgehead (8 + 18).

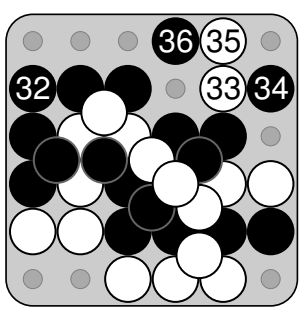


Black consolidates the invasion by forcing a cross-bridge, crowned by White move 25.

White now controls the centre while Black controls the upper board.

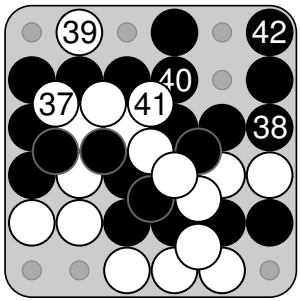


Black slips down the left side to connect to their threatened central group with move 30, while White cuts the tail off the rescued group with move 31.



Black moves 32–36 are consolidating moves that defend Black territory.

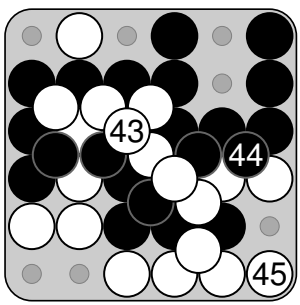
White moves 33–35 are a suicidal invasion force, which fill key points that Black would want.



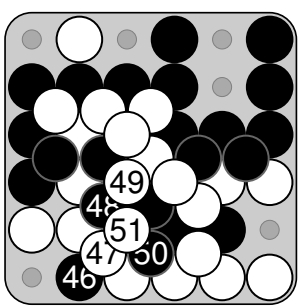
White moves 37 and 39 are an escalade/invasion pair, which Black cannot safely reply to. Black move 42 performs the first capture, to clear the two white invaders.

Black leads by 2.

End Game

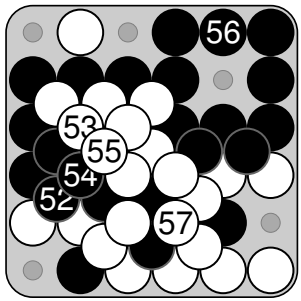


Moves 43–45 are consolidating moves that push territorial borders and threaten to intrude. The end game has been reached.

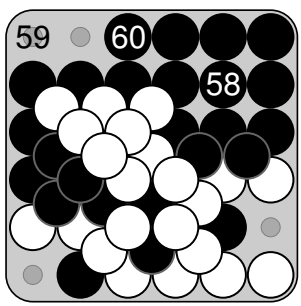


Black move 46 constitutes a minor invasion which forces White to pin it with moves 47 and ultimately 51.

Black is eating away at White's territory.

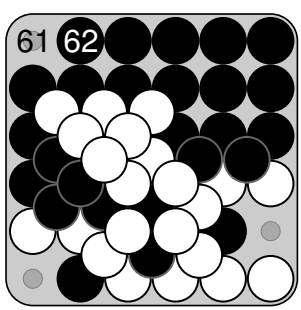


The game has now entered the territory-filling stage. Both players seek to squeeze the enemy and establish owned points with moves 52-57. Platform 57 is owned by White.

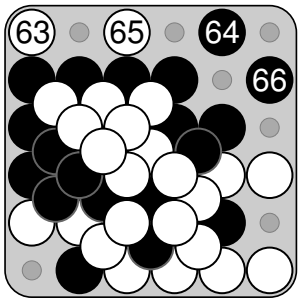


Black fills a freedom with move 58, White puts the group in *atari* with 59, and Black defends with capturing move 60.

Black now leads by 3 balls (29 to 26).

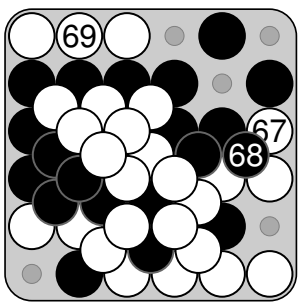


White move 61 puts the main black group in *atari* again, and Black move 62 defends it again. However, the defending move 62 now puts the group in *atari* itself.



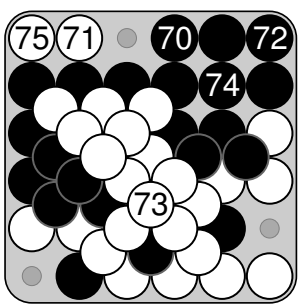
White performs a mass capture with move 63, clearing the upper board.

Players stake a claim in the newly cleared region with Moves 64–66.

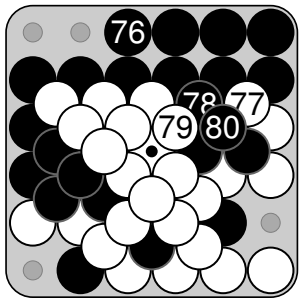


Moves 67 and 68 probe enemy borders.

White move 69 invites another suicide for positional gain, this time sacrificing three balls.

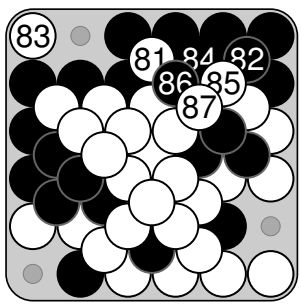


Black move 70 kills the sacrificial group, then the players populate the cleared region again...

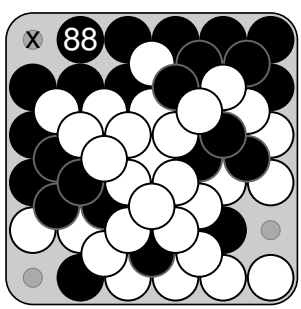


Black move 76 again kills the sacrificial group. White moves 77–79 intrude into Black's territory, and own a point (•).

Scores are now tied.



White pins the remaining black balls, culminating in a cross-bridge crowned with 87.



Move 88 puts Black one ball ahead and can't be retaken due to repetition, but Black is facing imminent defeat.

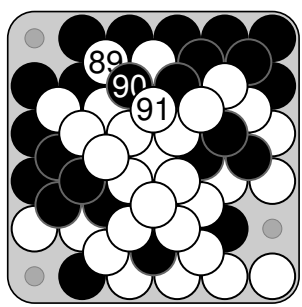
Black resigns.[1]

[1] *Disclaimer:* White actually played an illegal move 89 in this position to recapture ball 88, but this did not affect the result.

Summary

This game involved a long filling-in phase. Note White's willingness to sacrifice balls for positional gain, with repeated suicide invasions that ate away at Black's territory.

Eventually, White lost patience with this and just pinned the remaining black balls to end the game, which could have proven costly. Black was actually ahead on score 34 to 33 when they resigned, and could have stolen a draw by playing on if White was not careful. White has several non-winning lines here, such as the continuation shown below.



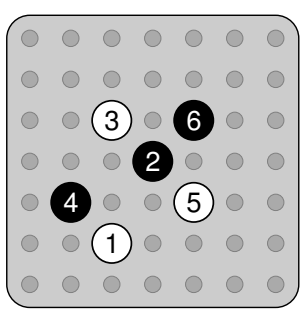
Black steals a draw.

Don't resign prematurely.

7×7 Game

The following annotated 7×7 sample game was played on the gamerz.net server in 2012. It highlights the importance of defending territorial boundaries and maximising point ownership for the end game, and the fact that players should not pursue minor victories at the cost of overall failure.

Game #311 ○ C. Browne ● R. Reilly

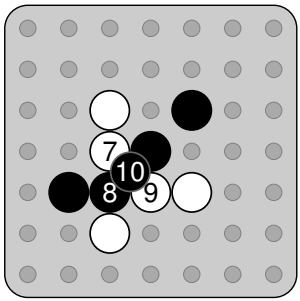


Opening

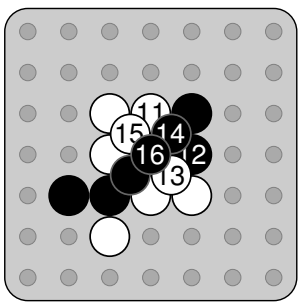
White opens with borderline move 1.

Black declines the swap.

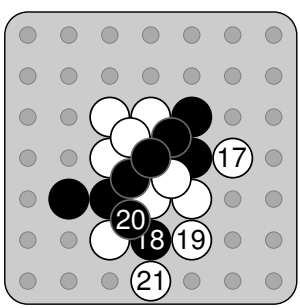
Players grab the main control points with moves 2–6.



White pushes to connect through the centre with moves 7 and 9, forcing Black to block with move 10 and create two white zombies.

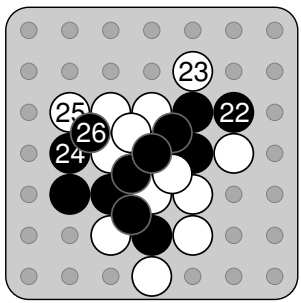


White initiates a cross-bridge, but ball 10 puts Black one ahead in the stacking race and Black crowns the pile with move 16. This creates even more white zombies; not a bad result for White.

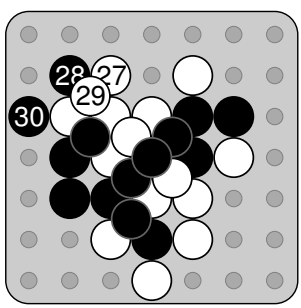


Middle Game

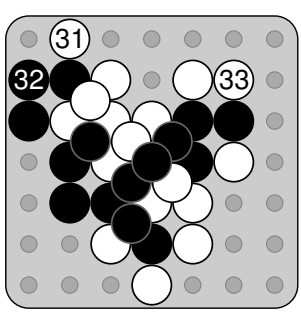
Black intrudes gently into White's territory with move 18 and is able to connect it safely with 20, but move 21 establishes strong white ramps.



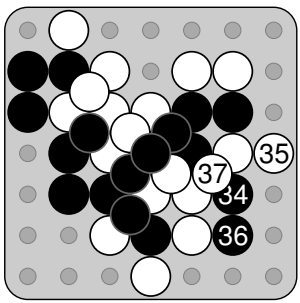
Players solidify their territorial boundaries with moves 22–25. Move 26 is an escalade that hints at an invasion into the corner area above it.



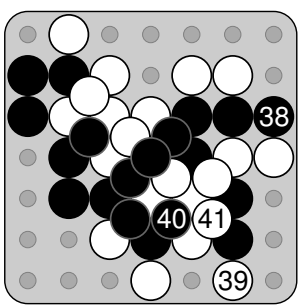
Move 27 is a poor response that allows Black to force a pin with move 28 and secure a bridgehead. Move 30 dominates the left side, giving Black secure passage into the top left corner.



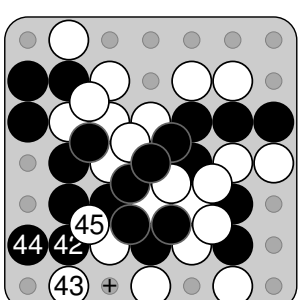
Moves 31–33 are positional moves that defend weak points on the players' territorial boundaries.



Black launches another invasion with moves 34 and 36, forcing White to pin with move 37.

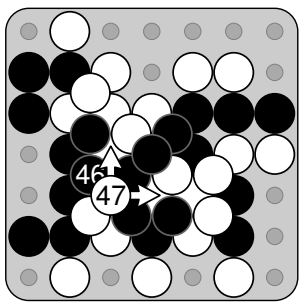


Move 39 threatens the pair of intruding balls. However, escalade move 40 forces White to pin both with move 41, creating a strong black bridgehead in that corner.

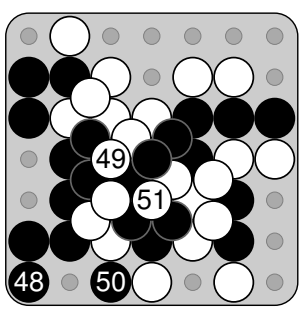


Black pressures White with move 42. Move 43 may seem inconsequential, but sets up a devastating play. Black ignores the danger and defends with 44, allowing White to play killer move 45.

Black should have played 44 at 45 to prevent this.

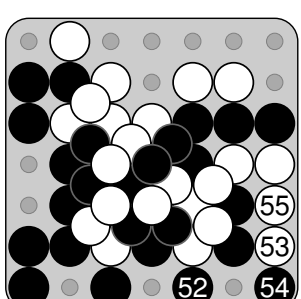


Black can't capture 45 due to the No Suicide rule, so blocks the immediate threat with move 46 instead. This allows White to play the strong bridge fork 47.

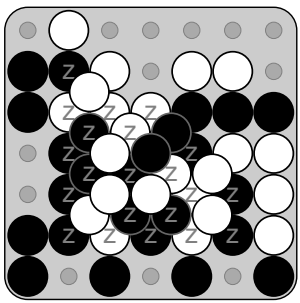


Black ignores the threat and continues to pursue White with moves 48 and 50, allowing White to connect almost all of their balls into a single strong group.

End Game



Black succeeds in their pursuit of the white balls along the bottom edge with moves 52 and 54, but by then it's too late. White now dominates the board.



White controls much more territory than Black, and the abundance of zombies (z) means that Black is not likely to capture any more balls.

Black resigns.

Summary

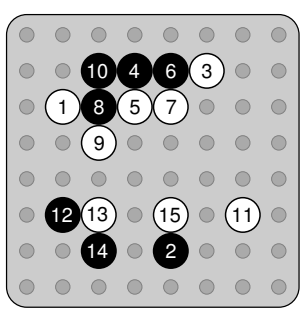
This game is unusual in that White won without making a single capture, and was in fact two balls behind (25 to 27) when Black resigned. The first capture did not occur until move 50, and the game ended before reaching the usual filling-in stage, as White was so far ahead on territory.

Black made two fatal mistakes in this game. Firstly, move 44 should have been played at point 45 to block White's killer play. Secondly, even after the bridge fork 47 had been played, Black still had a chance to salvage the game by playing move 48 at point 49, and creating their own dominant group across the board. However, Black's pursuit of the vulnerable balls along the bottom edge allowed White to consolidate their forces into a strong group to dominate the game. Black won the skirmish but lost the campaign.

8×8 Game

The following annotated 8×8 sample game was played on the gamerz.net server in 2011.

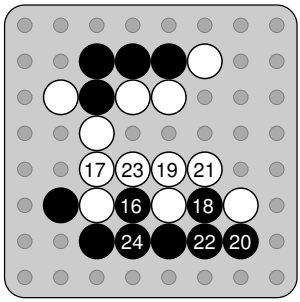
Game #248 ○ C. Browne ● R. Reilly



Opening

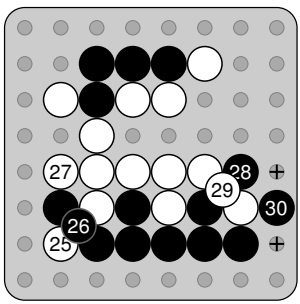
White opens with borderline move 1, then Black responds with a rather non-standard follow-up sequence with moves 4-10. These attack White directly and require an immediate response.

Note that even though the first few moves were not a standard opening sequence, the position soon developed along familiar lines, with players either occupying or dominating the four corner control points. Neither player has taken a central point yet, but White already controls the centre.



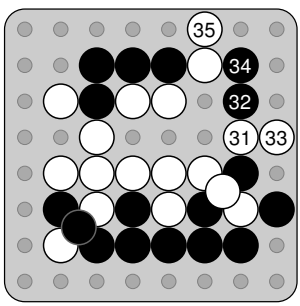
Middle Game

Players consolidate their boundaries along the bottom third of the board. Black has opted for an outer game, ceding the centre to White.

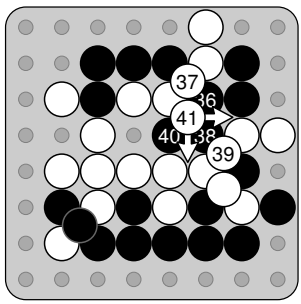


White intrudes with move 25, inviting a zombie, then Black does the same with move 28.

Black move 30 establishes ramps with two mouths on the right hand edge.

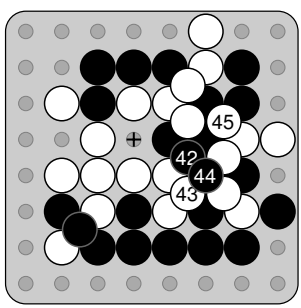


Black launches an invasion force with moves 32 and 34, while White cuts these off from nearby support groups with moves 33 and 35.



Black moves 36 and 38 continue the invasion, forcing White to pin them, but then Black over-extends with move 40 and allows White to play a bridge fork.

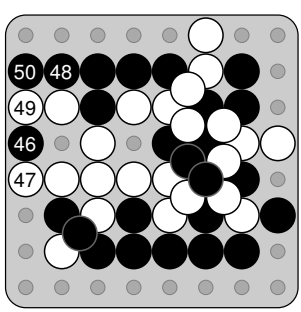
Don't over-extend.

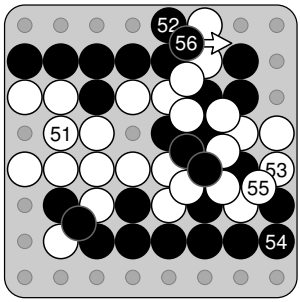


The black invaders, about to be cut off, try to escape with move 42, but are easily blocked. White move 45 cuts these balls of to put them in *atari*.

Black attacks from the other side with move 46, forcing White to strengthen their borders with moves 47 and 49.

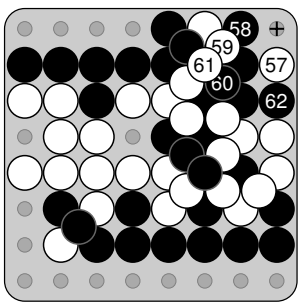
Note that White doesn't kill black balls 42 and 44 yet, as filling the critical freedom would allow Black to invade.



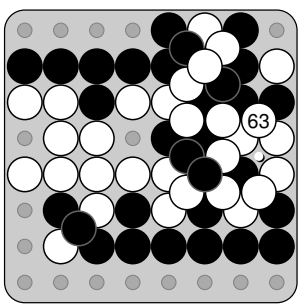


White move 51 captures the isolated black ball 46, then both players continue to strengthen their borders.

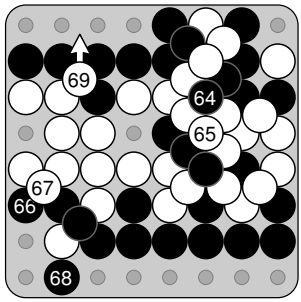
Black escalade 56 threatens to support their isolated invasion force.



White defends the corner, culminating in crowning move 61, which pins many black balls. This is as good a result as Black could hope for. Move 62 then sets up the conditions for a cycle in the top right corner.



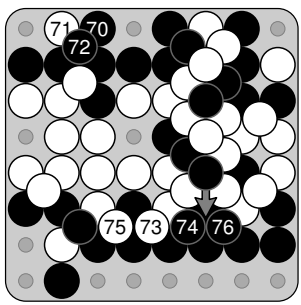
White might benefit from such a cycle, although Black would be unlikely to perpetuate it in the absence of any serious threat. White blocks the cycle with 63 to own point •.



Both players continue to reinforce their boundaries with moves 64–68.

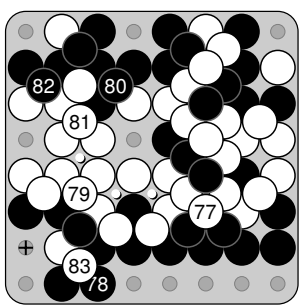
White escalade 69 threatens to invade the upper black territory.

End Game

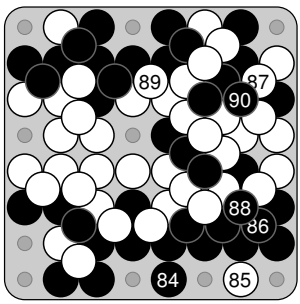


Territorial boundaries are well established now, and the players start picking away at each others' territory.

White establishes a bridgehead with 71, while Black 74+76 threaten to save their isolated group.

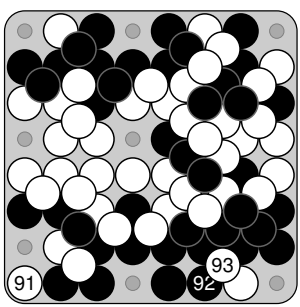


White blocks with 77, Black encroaches with escalades 80 and 82, then White moves 79 and 81 own three more points (•). Move 83 is a sacrifice aimed to make Black fill their territory.

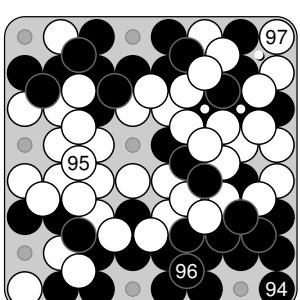


The players continue to consume mutual boundary points playable to both.

Moves 88, 89 and 90 are escalades that overlook points owned by the enemy.

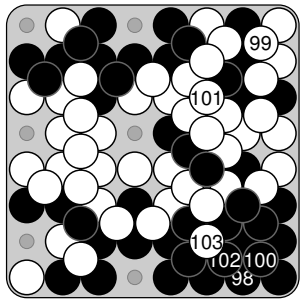


White moves 91 and 93 are sacrifices aimed at getting Black to fill in their own territory.

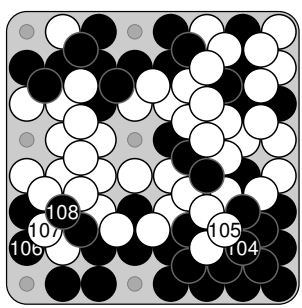


Black obliges with move 94.

White move 97 finalises the battle for the top right corner, owning three more points for White in the process (●).

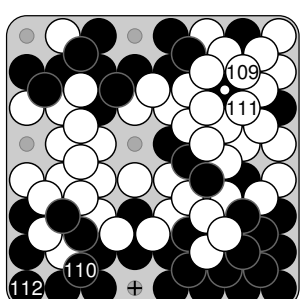


Black is now running out of options, and is forced to fill their own territory in the lower right corner with moves 98, 100 and 102. These are the only safe moves available to Black.



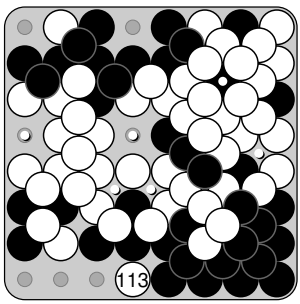
White crown 105 ends any further Black development in that corner.

Black is forced to capture with move 106, allowing White to pin and invade with move 107.



White consumes two owned points with 109 and 111, but in the process generates another one (●).

Black is forced to fill a critical freedom with 112 and put their group in *atari*.



White captures with move 113 to lead 53 to 47. White owns six points to Black's zero, and Black faces imminent defeat.

Black resigns.

Summary

This game emphasises positional development over attacking play, as White established a strong central base and slowly expanded it across the board to simply overrun Black. Black attacked from the very first moves, and continued attacking with various incursions into the central area, but allowed White too strong an advantage by ceding the board centre so easily at the start.

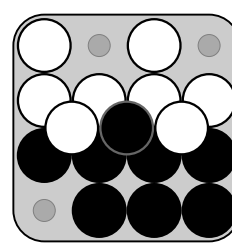
This game hints at the less *immediate* feel of Margo at larger board sizes. There is more scope for positional play, less need to attack constantly, and less urgency to respond to every attack. There is more room for players to experiment – for example, the non-standard opening and various sacrificial incursions – and to recover from miscalculations.

Puzzles

This chapter contains a number of puzzles that demonstrate the principles described in this book. Many are based on positions from actual games. The puzzles range in size from 4×4 to larger boards, but even the smaller ones can be surprisingly tricky.

Puzzle #1

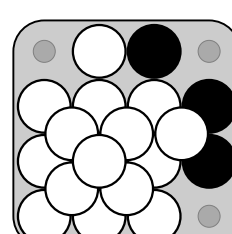
Where should White play?



Puzzle #2

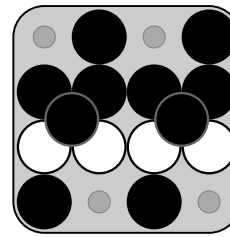
Who will win this game?

The buried ball is White.



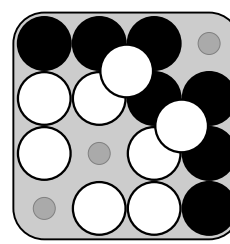
Puzzle #3

What is White's best play?



Puzzle #4

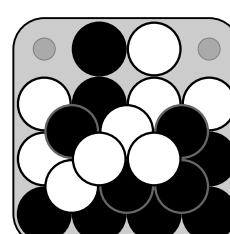
Who will win this game?



Puzzle #5

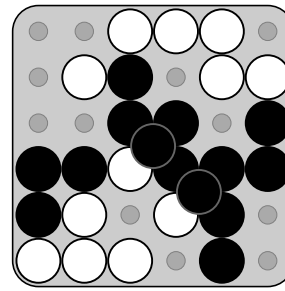
White to play.

Who will win?



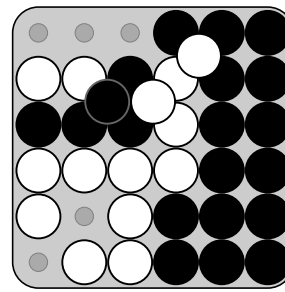
Puzzle #6

What is White's killer move?



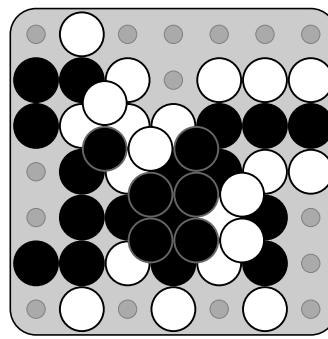
Puzzle #7

What is Black's best move?



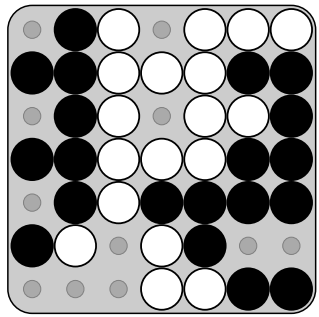
Puzzle #8

What is White's best move?



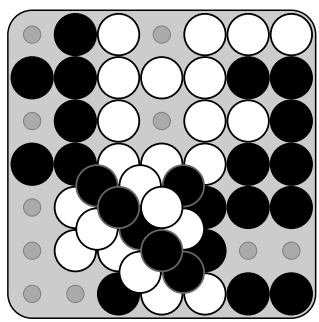
Puzzle #9

What is Black's best move?



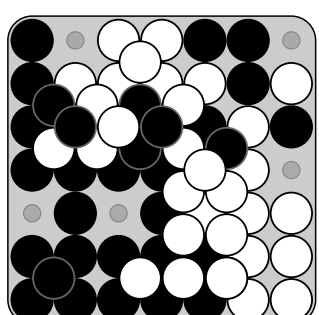
Puzzle #10

What is White's best move?



Puzzle #11

What is Black's best move?

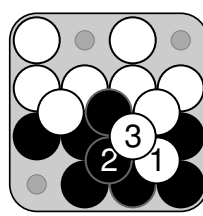


Solutions

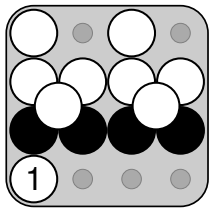
This chapter contains solutions to the puzzles presented in Chapter 14.

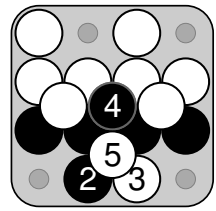
Solution #1

White should make move 1 shown below, and pin the black balls rather than capturing them. Black will have no legal moves after move 3, hence the game will end, and White will win by 9 balls to 8.

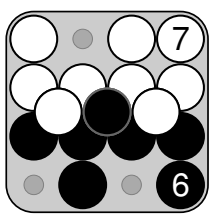


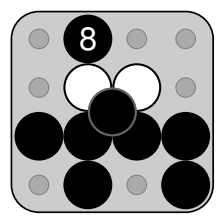
If White instead captures the black balls with move 1 (left), then Black can recapture to establish a safe two-freedom group, and defend it until White runs out of safe moves. A typical extension of play is shown in moves 2–5 (right).





White would be eventually forced to fill one of their own freedoms (7), allowing Black to perform a mass capture with 8 and establish a winning position.





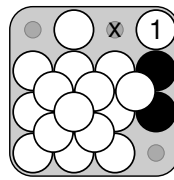
Note that Black's capture with 8 would be more devastating White's capture with 1, because it would clear more balls and only leave two zombies rather than four.

Solution #2

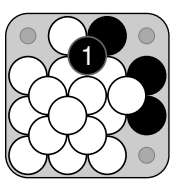
The player whose turn it is to play will win this game. The possible options are considered below.

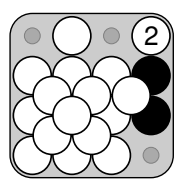
White to Move: White move 1 wins the game immediately. Black can't reply at the point marked x due to repetition, so has no legal

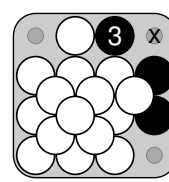
moves. The game ends with White winning by 17 balls to 2.



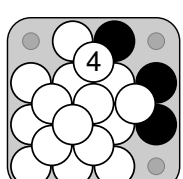
Black to Move: Black move 1 (below) is a sacrifice that forces reply 2, allowing Black to play at 3. White cannot now play in the corner marked x due to repetition. This is the first iteration of a differential cycle.

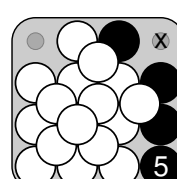




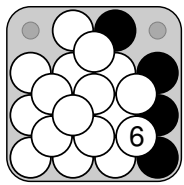


White move 4 (below) allows reply 5, which makes the corner marked x a dead point that neither player can occupy, due to the two zombies.

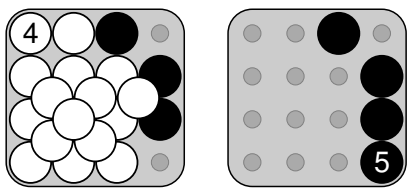




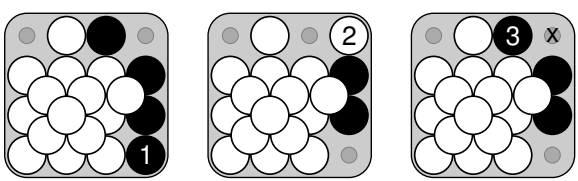
White must move at 6, allowing Black to make a mass capture with 7 to set up a winning position.



Alternatively, White move 4 (below) allows Black to perform another mass capture as shown.



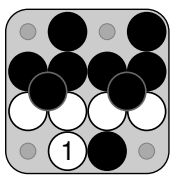
Black also has another winning play for this puzzle, using a similar approach. Move 1 (below) is a sacrifice that forces reply 2, allowing Black to play move 3. The board is now in the same state as shown above and Black can force a victory.

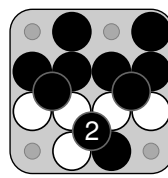


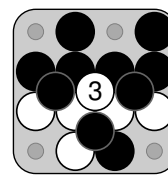
In both cases, Black exploits the No Repetition rule to stop White playing at the only point that would save them.

Solution #3

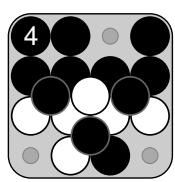
White can force a win from this position with move 1. Black's best reply is 2, then move 3 leaves Black to play with no safe points.

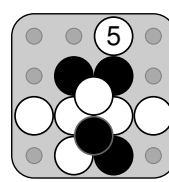






Black is forced to fill in one of their own freedoms with move 4, allowing White to make a mass capture with 5.





White should win from this position, although it may involve several more iterations of capture and recapture.

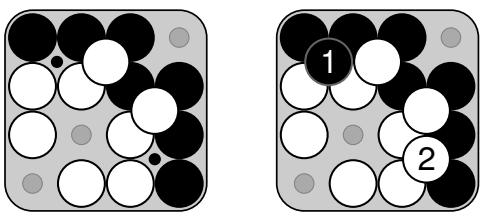
For a more thorough proof of this solution, see:

http://www.cameronius.com/games/spargo/puzzle_1/

Solution #4

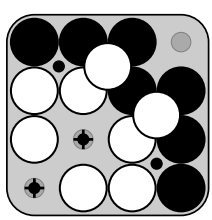
The player whose turn it is to play will *lose* this game (assuming optimal play). The possible options for each player are shown below.

Black to Move: Black has two playable points (left). Playing at either of these points allows White to play in the other (right), which ends the game as Black then has no legal moves.

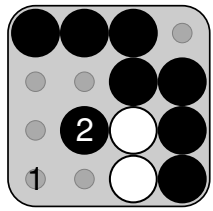


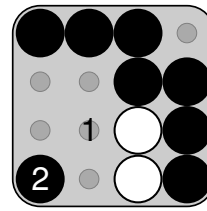
White would win such a game by 9 balls to 8.

White to Move: White has four playable points, tow of which are freedoms.

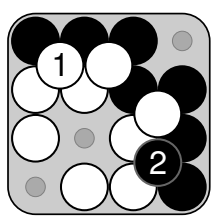


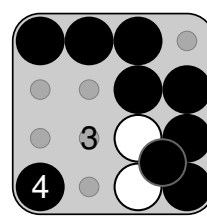
White will not play in either freedom as such a move would be disastrous, as shown in the following figure.





White must play move 1 at one of the other two playable, forcing Black to take the other with move 2 (left). White is then forced to fill one of their own freedoms with move 3, allowing Black to make a mass capture with move 4 (right).





White can still fight from this position using their two surviving zombies, but Black should win from here with careful play.

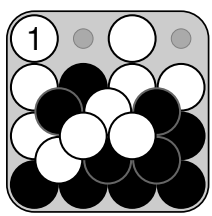
For a more thorough analysis of this puzzle, see:

http://www.cameronius.com/games/spargo/puzzle_2/

Solution #5

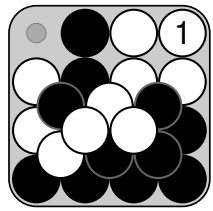
The answer is: it depends on the colour of the two buried balls.

White + White: If both buried balls are white, then White can win with move 1 (below). Black would then have no legal moves, so the game would end with 10 visible balls of each colour, giving White a 12 to 10 victory when the buried balls are counted.

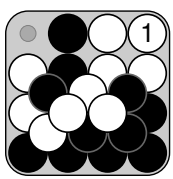


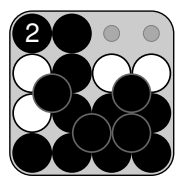
White + Black: If the buried balls are one of each colour, then White can use the same move 1 (above) to force an 11 to 11 draw.

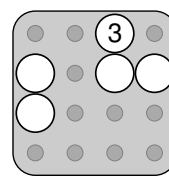
Black + Black: If both buried balls are black, then White faces a losing proposition. In this case, White's best option is to play alternative move 1 which at first looks suicidal, but actually hides a dangerous trap.



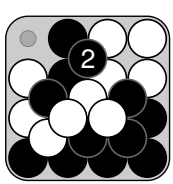
If Black falls for the trap and captures the offered sacrifice with move 2 (below), then White can play move 3 to perform a *snapback* mass capture and clear the board of black balls.

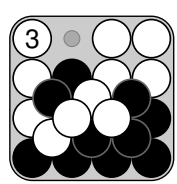


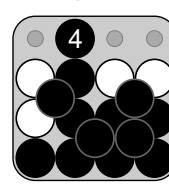




Instead, Black should play move 2 (below) to guarantee victory. Even if White captures with move 3, then Black can play a *snapback* capture with move 4 to decimate White and set up a win.

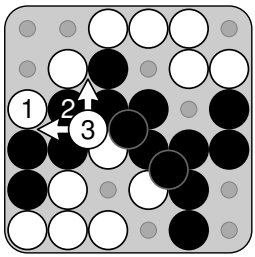


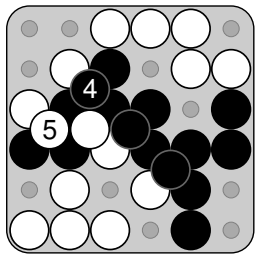




Solution #6

White's killer play is move 1 (left). This forces reply 2, allowing bridge fork move 3.

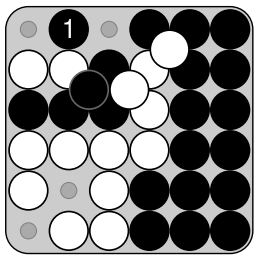


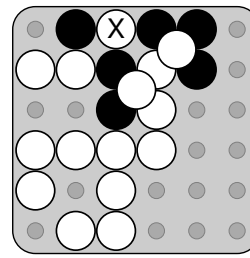


Black's best option is to block with move 4 (right). However, this still allows White to cut the black group with move 5, to capture a ball and establish an unassailable position.

Solution #7

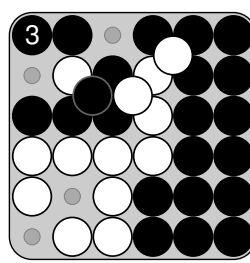
Black can save this game with move 1 (below).





This move saves the threatened black groups, by creating an unplayable freedom guarded by two zombies. White reply X (right) is illegal, as that ball would have no freedom after the move.

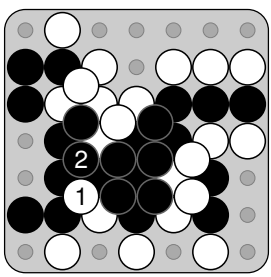
Black can then capture the vulnerable white ball next turn to establish a winning position (move 3).

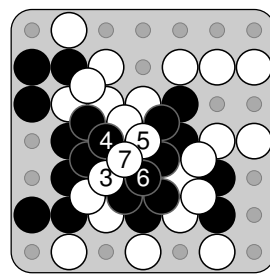


This puzzle is based on game 176 played on the gamerz.net server.

Solution #8

White can engineer a win from this position, with key move 1 shown below (left). Black can't capture this ball as its freedom is guarded by a zombie.



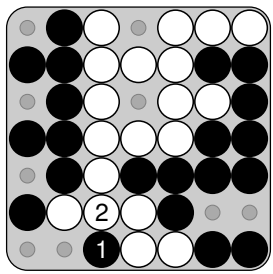


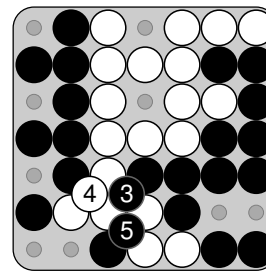
Instead, Black must defend with move 2 to avoid immediate capture, setting up a cross-bridge which White crowns with move 7.

This puzzle is based on game 311 played on the gamerz.net server.

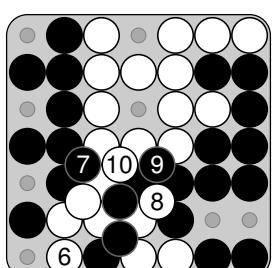
Solution #9

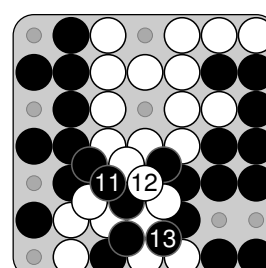
Black's best play from this position is as follows. Move 1 puts the white group in *atari* to force reply 2 (left), which allows a make bridge fork attack with move 3 (right). White's best move is to block to the left with 4 allowing Black to connect downwards with move 5.





Even if White tries to contain the black group with move 6 (below), then Black can threaten a cross-bridge with move 7, forcing White to complete a counter cross-bridge with moves 8–10. Black eventually wins this exchange with moves 11–13.



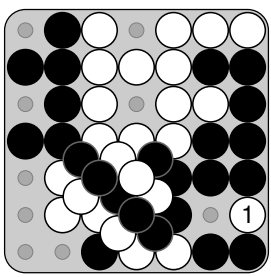


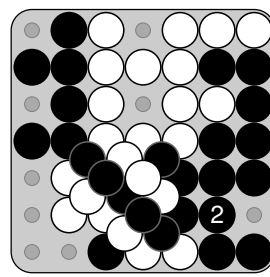
This gives Black a strong position, with a commanding group spanning most of the board.

This puzzle was derived from game 157 played on the gamerz.net server. This game was unusual in that no stacking had occurred until this point.

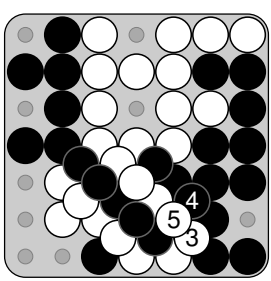
Solution #10

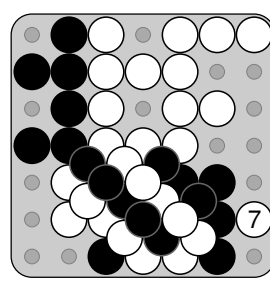
White's best play is move 1 (left), which threatens to capture the two black balls in the lower right corner. Black's obvious reply is capturing move 2, which removes this threat (right).





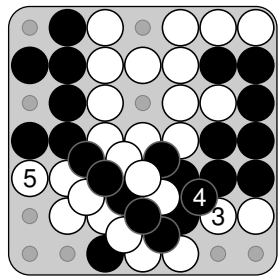
However, this allows White to play a cross-bridge with moves 3–5 (left). The black group has now been cut in two, and White can perform a mass capture on their next move 7 (right).





If Black plays move 2 elsewhere, then White can capture the two threatened black stones with move 3, forcing pin 4, as shown in the following

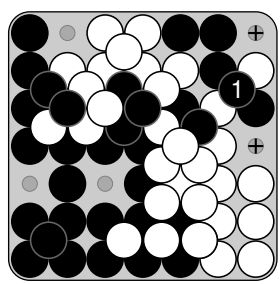
figure. White move 5 then makes the white subgroups containing balls 3 and 5 a safe virtual group that is easily defended.



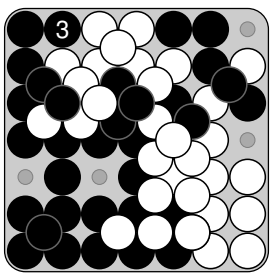
White is now in a dominant position.

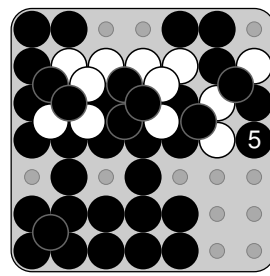
Solution #11

Black's killer move 1 is shown below. This move merges the two threatened black groups into a single group with two freedoms (+). White can't play in the corner point, and taking the other freedom would put the main white group in *atari*. White must move elsewhere.



However, wherever White moves, Black is able to put the main white group in *atari* with move 3 next turn, then make a mass capture with move 5 on the following turn, as shown below.





This puzzle was based on a position that arose in game 312 played on the gamerz.net server.

CHAPTER 18

Conclusion

I hope that this book has explained Margo clearly enough to give you an appreciation of its subtlety and depth. The combination of Go-like play with 3D stacking can be daunting for new players, but the rules are actually quite simple once learnt, and normally click into place after a few games. I believe that the effort is well worth it.

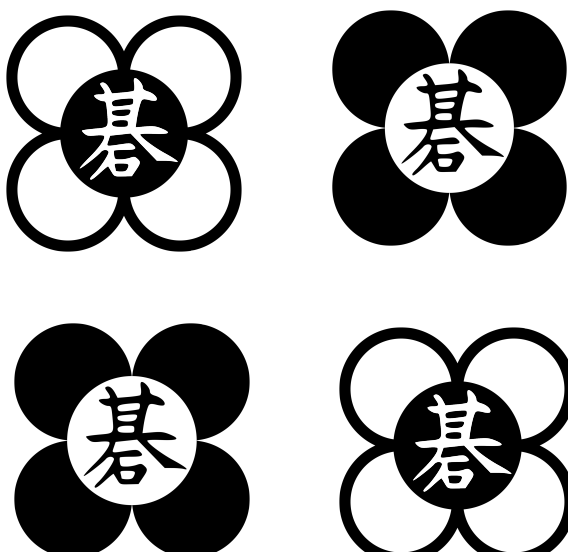
Margo Basics is the first step in documenting what we know about the game, and formalising the key concepts involved. For a book on "basics" it contains some reasonably advanced material, but that's just the nature of this intriguing game.

Margo continues to fascinate me after years of play, and I hope that this book conveys my enthusiasm for the game. I look forward to exploring Margo further and hope to play many of you soon.

Cameron Browne
London, UK
September 2012

PART IV

Appendices



Revealed Captures

This appendix describes the unusual case of *revealed captures*, which are freedom-less groups revealed when a group of the opposing colour is captured and removed. This is extremely rare – no cases have yet been observed in actual play – but is discussed here so that cases can be handled unambiguously, should they occur.

Revealed Captures

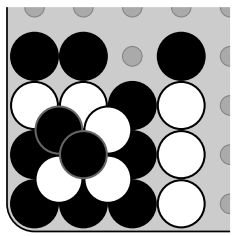
The capture rule states that:

> *After each ball is placed, groups without freedom are captured and removed.*

This generally refers to enemy groups without freedom. However, it's possible that removing captured enemy groups can reveal freedom-less friendly groups. These should also be captured and removed, which might reveal further enemy groups without freedom, and so on. Note that the colour being removed alternates with each iteration of this process.

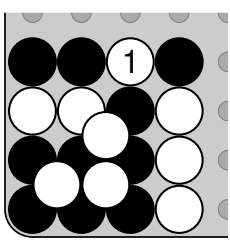
Example

Consider the following position, with White to play.

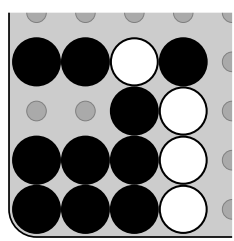


White to move.

White move 1 (below) captures two black balls, to reveal a freedom-less white group (left). This group is also captured as part of the move (right).



Two black captured.

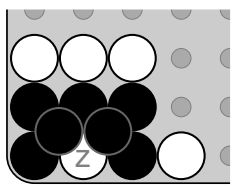


Five white captured.

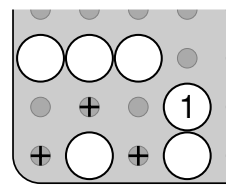
The move is now complete, after having captured both a black group *and* a white group. The remaining black balls are not captured and removed, as removing the white group created freedom for them *during the move*.

Revealed Freedom

The freedom of each group is recalculated after each iteration of the revealed capture process. For example, move 1 (below) captures the black group to reveal freedom (+) for the surrounded white zombie (z) to release it.



White to play.



Revealed freedom.

Captures will always start with enemy groups, then alternate colour with each level of revealed capture: *enemy*, *friend*, *enemy*, *friend*, ...

Occurrence

Revealed captures are unlikely to occur in actual play, but are described here just in case. If you see a revealed capture during standard play, in an actual game, please let me know.

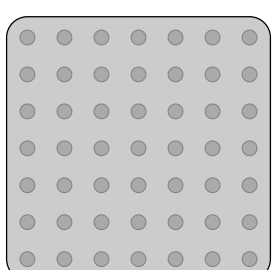
> For most practical purposes, only enemy groups will be captured and removed.

Board Geometry

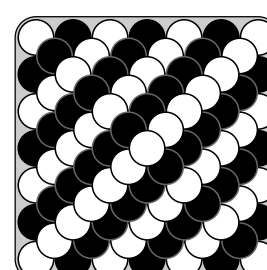
This appendix contains information related to the geometry behind the game, and some notes on the recommended board sizes.

Square Pyramidal Stacking

The Margo board produces a *square pyramidal stacking* when fully packed. The following figure shows a 7×7 board packed to form a pyramid of 140 balls.



7×7 board.



Fully packed.

The *square pyramidal number* P_n of an $n \times n$ board is given by: $P_n = n(n + 1)(2n + 1)/6$.

Such complete stackings will not occur in actual games, as no group would have any freedom. Instead, games typically end with the board one half to two thirds full. Each player should have at least n^2 balls for an $n \times n$ game, enough to cover the board level, which should be enough for most games.

The following table shows the number of balls required for complete stackings for a range of board sizes, and a rough indication of how many balls are actually needed for a game at each size.

Table A-1. *Ball counts for various board sizes.*

Board	Freedoms	P_n	Needed
4×4	16	30	~15–20
5×5	25	55	~25–40
6×6	36	91	~45–70
7×7	49	140	~70–100
8×8	64	204	~100–140
9×9	81	285	~140–190
10×10	100	385	~190–250
11×11	121	506	~250–325
12×12	144	650	~325–400
13×13	169	819	~400–500
14×14	196	1,015	~500–600
15×15	225	1,240	~600–750
16×16	256	1,496	~750–900
17×17	289	1,785	~900–1,050
18×18	324	2,109	~1,050–1,250
19×19	361	2,470	~1,250–1,650

Note that capture is a large part of Margo, hence the number of moves in a game can be much greater than the required number of balls.

Board Size

Margo scales well to different board sizes, and the nature of the game changes noticeably between smaller and larger boards. The choice of size comes down to a balance between strategic depth and game length.

Larger boards offer greater scope for strategy, but can also be subject to long cold wars, in which neither player wants to make any of the available moves. This can reduce the tension and is usually the least interesting part of the game. Games below 7×7 tend to build to a crisis then reach a resolution, while 7×7 and above allow games of greater complexity with multiple crisis points.

Margo was originally devised on the 9×9 board, but this size was revised downwards with experience, as games played on such larger boards tend to involve long passages of cold filling-in play.

The game actually works surprisingly well on small boards. For example, the miniature 4×4 game is so interesting and distinct that it's been given its own name: Spargo.

Table A-2 lists the recommended board sizes. All sizes are available from **nestorgames**, on request.

Table A-2. *Recommended board sizes.*

Size	Name	Characteristics
4×4	**Spargo**	Games are more tactical and less forgiving, and capture is always imminent. Games can be surprisingly tricky.
6×6	**Beginner**	The easiest size to learn on, and the default sold by **nestorgames**. Allows sufficiently deep games.
7×7	**Standard**	Recommended for most games. Offers a good balance of strategic depth and game length.
8×8	**Large**	For longer games with deeper strategy.
9×9	**Huge**	For serious games between serious players. Allows very deep games, but can involve long filling-in phases.
10×10+	**Extreme**	Very deep but less practical. Games can take a *very* long time and a lot of balls.

Tournament Play

This appendix provides recommended guidelines for tournament play and other official games.

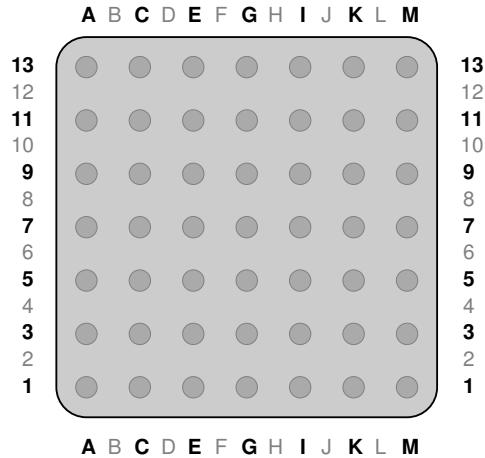
Rules

The standard rules described in Chapter 2 should be used, including the swap rule. In the unlikely event of revealed captures, these should be handled as described in Appendix A.

Players are not allowed to unpack balls to see what's buried underneath. It should be possible to at least glimpse the colour of most buried balls from different angles.

Board Size

The standard 7×7 board is suitable for tournament play, but the board size to be used is left to the discretion of the organisers. Board coordinates should be labelled as shown in the following figure.



Board coordinates.

Scoring

The recommended tournament scoring is:

- 3 points for a win.
- 1 point for a draw.
- 0 points for a loss.

Alternative scoring methods based on ball count (e.g. a player's score is their final ball count minus the opponent's final ball count, totalled over all games) are not recommended. These could have the undesirable effect of encouraging players to play defensively and minimise sacrifices, which would change the nature of the game.

Game Records

Game records should show the board size, the coordinates for each move, and the final ball count for each player. White is listed on the left.

An asterisk after the opening move denotes that the second player elected to swap.

The following listing shows a typical game record for a short (imaginary) game.

Listing D-1. *Typical game record.*

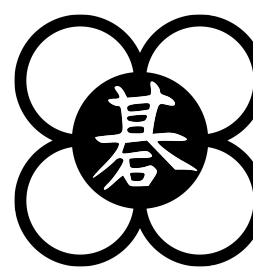
Game #7 (7×7)
Stockholm Invitational, 5/8/1432

○ **A. Block**	● **G. Reaper**
1 C5*	2 E5
3 G7	4 I9
5 E7	6 I5
7 I7	8 K7
9 K5	10 J6
11 G5	12 E3
13 G3	14 H6
15 F6	16 E9
17 G9	18 F8
19 K9	20 J8
21 C9	22 E11
23 C11	24 A7
25 E13	26 C7
27 G11	28 D6
29 H4	30 G1
31 J4	32 Resign
= 14	**= 13**

History

Margo was invented in 2006, based on my earlier ball-stacking game Akron. The name *Margo* is a contraction of *marbles* + *Go*.

The Margo logo (right) shows the Japanese kanji for *Go* superimposed on a 2×2 pyramid of balls.



I'd wanted to devise a workable 3D Go variant for years. The biggest challenge was to find a way to reduce 3D freedom (so that groups can't perpetually escape capture) without stifling ball placement. Limiting freedoms to the board level suddenly solved this problem.

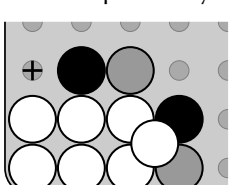
The pinned capture rule that creates zombies was originally added to avoid ambiguities with revealed connections and falling balls, but was soon found to add an interesting tension and balance to the game. The constant urge to build upwards is tempered by the fact that zombies are

dangerous, and players must think carefully before stacking on top of enemy balls.

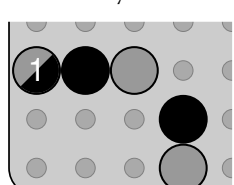
Margo scoring is simpler than Go scoring. Complex Go positions can require considerable analysis and confuse even expert players, whereas Margo positions can be scored by anyone who can count a pile of balls (counting captured balls is even easier). Ball-count scoring encourages upward play, as players must stack efficiently to make optimal use of the limited space, giving an implied 3D territory count. It also introduces the notion of group tax, which encourages players to form fewer and larger groups.

Three Players

Margo can also be played by three players (White, Black and Grey) using the standard rules and another set of balls. The following example shows a white group with a single freedom (+), which can be captured by either Black or Grey.



White group in *atari*.



Captured by Black/Grey.

Additional balls in different colours are available separately from **nestorgames**.

Online Play

Margo can be played online at Richard Rognlie's gamerz.net server. This is an excellent service that provides an archive of previously played games, with a graphical interface that lets players step through the moves of each game:

http://www.gamerz.net/pbmserv/List.php?Margo

Challenge me (*camb*) to a game there any time.

Physical Sets

Margo was first published by Pancerola in 2010, then by **nestorgames** in 2012, who provides two editions:

Ninja: Foam board and plastic balls.
Smaller, cheaper and more portable.
http://www.nestorgames.com/#margoninja_detail

Samurai: Strong acrylic board in "ice" finish.
1" phenolic resin (i.e. snooker) balls.
More expensive but exquisite.
http://www.nestorgames.com/#margosamurai_detail

nestorgames provides the Beginner's 6×6 board by default, but can provide the Standard 7×7 board and other sizes on request. The Samurai set provides an unparalleled playing experience; this is how the game was meant to be played.

Glossary

Atari Group with a single playable freedom, under threat of capture.

Bridge Higher-level connection built on existing balls.

Bridge fork Forking move that threatens two bridge connections at once.

Bridgehead Advance group established in enemy territory, usually made of zombies.

Buried ball Ball with another ball straight above it, hiding it from view.

Cold move Move a player doesn't want to make.

Cold war Sequence of cold moves.

Conduit Intermediate balls through which a connection flows.

Corner control point Board point that dominates a corner.

Counter-cross-bridge Cross-bridge formed perpendicular to an existing cross-bridge.

Critical freedom Freedom of a group that will put it in *atari* if the owner plays there.

Cross-bridge Connection formed by two bridges crossing in opposite directions.

Crown Apex move that "tops off" a pile to complete a bridge.

Dead point Point at which neither player can legally play.

Differential cycle Local capture cycle in which one player loses more balls than the other player per iteration.

Enemy Ball(s) of the opponent's colour.

Escalade Ball that climbs an enemy wall to overlook the other side.

Foundation Board level balls on which a group is built.

Freedom Empty board hole adjacent to a group.

Freedom-filling race An extremely cold war in which players are forced to fill in their own freedoms.

Friend Ball(s) of the player's colour.

Group Ball or connected set of same-coloured balls.

Inner game Game based on establishing a strong central group.

Invasion Playing in the opponent's territory.

Mouth Acute corner where a ramp meets a board edge.

Outer game Game based on controlling the corners and edges.

Overpass Connection passing perpendicularly over a connection directly below.

Owned point Safe point that the opponent can't play at.

Pinned ball Ball that supports any enemy balls above it, directly or indirectly.

Platform 2×2 square of balls.

Playable point Point at which a ball can legally be played.

Point Location that supports a ball, i.e. a board hole or 2×2 platform.

Ramp Non-touching diagonal line of balls.

Revealed capture Freedom-less group revealed by removing a group of the other colour.

Sacrifice To give up a ball (or balls) for positional gain.

Safe group Group with at least one freedom unplayable to the opponent.

Safe point Point a player can move at without putting a friendly group in *atari*.

Snapback Large capture that results from a smaller capture.

Suicide Illegal move that would have no freedom after its placement.

Superfluous freedom Freedom of a group that its owner can play at safely.

Swap The second player may swap colours to steal the opening move.

Tension Importance of each move.

Territory Playable points under a player's control.

Territory-filling race Cold war in which players must fill in their own territory.

Virtual bridge Implied bridge connection, guaranteed to succeed if threatened.

Virtual group Set of balls that aren't all connected, but which are collectively safe from capture.

Zombie Ball pinned by one or more enemy balls.

Index