5.6 Method of Comparing Two Sequences

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We can use the method of comparing counts or the method of comparing net profits described in the previous sections. For the purpose of only deciding the first move, either method can be refined and combined with the following method of comparing two sequences. Combining the method of comparing *counts* with the method of comparing two sequences is equivalent to combining the method of comparing *net profits* with the method of comparing two sequences.

The method of comparing two sequences is not generally applicable. Its application requires mathematical proofs of applicability. Such proofs exist for the following kinds of positions, to which we may therefore apply the method. The local endgame must have one or two simple follow-ups. An environment consists of simple gotes without follow-ups.

The method of comparing two sequences applies to these positions:

- **One local endgame with one follow-up in an environment.**
- **One local gote with follow-ups of both players in an environment.***

One local endgame with gote and sente options uses a related method described in *13 Late Endgame with Gote and Sente Options* (p. 212). We would like to also apply the method of comparing two sequences to positions with several local endgames with follow-ups. This, however, is not possible, or currently not verified by proofs to be possible. The method is a shorthand but theory must support it so that the method does not give wrong answers. Future research might expand the scope of application to further kinds of positions.

The method of comparing two sequences greatly accelerates decision-making. Instead of considering several sequences and comparing their net profits or resulting counts, we only need to consider two sequences. If currently we only want to determine the correct start, it is a great advantage of the method of comparing two sequences that it ignores all sequences starting with two moves in the environment.

Compare these two kinds of sequences:

1) The player starts locally.

2) The player starts in the environment. The opponent replies locally.

Ignore the third kind of sequences starting with two moves in the environment.*

According to the method of decreasing values, each sequence is continued alternately with the remaining moves, which occur in simple gotes, in order of decreasing move values including any local follow-up. The player starts a sequence with the favourable resulting count (or net profit), where we mean 'favourable for the player'. Black maximises counts (or net profits) and prefers the larger resulting count (or net profit); White minimises counts (or net profits) and prefers the smaller resulting count (or net profit). If both sequences result in equal counts (or net profits), the player starts either sequence.

Consideration of the third kind of sequences starting with two moves in the environment is postponed until the second moving player's turn when we decide afresh. If currently we only need to decide whether the starting player's correct first move is played locally or in the environment, we do not need to consider the third kind of sequences starting with two moves in the environment.

For the method of comparing two sequences and determining the correct locations of move 1, it is sufficient to compare sequences 1 and 2. We ignore all other sequences, including such starting with two moves in the environment. The method only determines move 1 of the current position. At this moment, the method does not decide correct replies or later moves, but it can be applied to follow-up positions *iteratively.* In every follow-up position, apply the method afresh. Thereby, correct sequences can be identified. Another important application of the method is determining the *first moment for playing locally.*

In an inequation, the player prefers his optimal value and this indicates the sequence with the correct start. Black prefers the maximum value; White prefers the minimum value. Although this can be applied to the method of comparing two sequences, a warning is necessary as to limited applicability. A single value comparison is not in general correct if two or more local endgames with follow-ups are involved. Such positions can require decision-making at several branches of variations.

In a local endgame with one follow-up, if the preventer makes the first local move, he starts the sequence to his follower and makes the follow-up unavailable. If the creator makes the first local move, a local follow-up move is available among the remaining moves. For the starting creator, we might also need to compare the temperature **T** with the follow-up move value **F.** See also *11 Late Endgame with One Player's Follow-up* (p. 110).

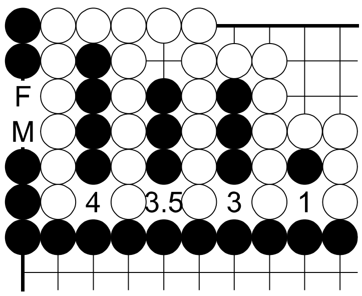
In a local gote with follow-ups of both players, if the starting player makes the first local move, he makes the follow-up move value **E** available. If the opponent makes the first local move, he makes the follow-up move value **F** available. For more details, see also *12 Late Gote Endgame with Follow-ups of Both Players* (p. 165).

We apply the method of comparing two sequences to counts (see *11.2.1 Available Follow-up*) or net profits (see *11.3.1 Available Follow-up*). The method and its restriction to sequences 1 and 2 are mathematically proved in general, for all positions of our discussed kind and all possible move values.

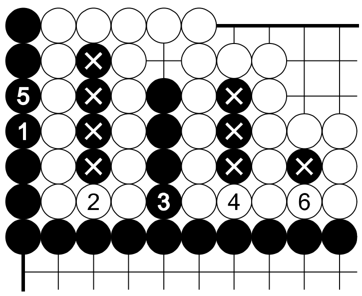
All examples when applying the method of comparing two sequences: To apply the method of comparing two sequences, we compare two sequences to determine whether the correct start and place for move 1 is local or in the environment. Sequence 1 starts locally, results in the count C_1 and has the net profit P_1. Sequence 2 starts in the environment, has a local move 2, results in the count C_2 and has the net profit P_2. **Sequences 1 and 2 are only used for determining correct starts but need not show correct subsequent moves. We ignore other sequences starting with two moves in the environment, even if they are correct for all their moves.**[*]

We combine the method of comparing two sequences with either the method of comparing counts or the method of comparing net profits. It is sufficient to combine with one of them. We need not apply both the method of comparing counts and the method of comparing net profits. For better learning, the same examples can occur for application of both methods or their comparison.

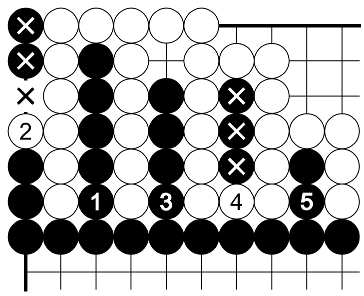
Examples 1 - 3: The local endgame has one player's follow-up.



Example 1: Black to move, local sente



Dia. 1.1: sequence 1, local start, C_1 = -16



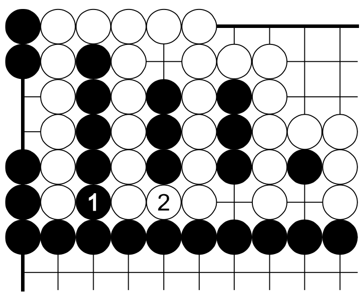
Dia. 1.2: sequence 2, start in the environment, C_2 = -11

Example 1: We have the sente move value M_{SENTE} = 1 and move value F = 2. The environment consists of simple gotes without follow-ups and the gote move values 4, 3.5, 3, 1 in decreasing order.

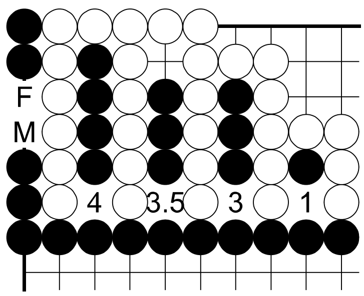
The method of comparing two sequences considers sequence 1 with the local move 1 and resulting local count C_1 = -16 in *Dia. 1.1,* and sequence 2 with move 1 in the environment, the local move 2 and resulting local count C_2 = -11 in *Dia. 1.2.* Black maximises counts by choosing the largest available count. If he chooses only among sequences 1 and 2, he selects the larger count C_2 and therefore prefers to start with move 1 in sequence 2.

There is, however, another relevant decision. After Black 1 in *Dia. 1.2,* on move 2, White chooses between playing locally in *Dia. 1.2* or in the environment in *Dia. 1.3.* How do we know that the count C_2 = -11 is meaningful for Black's decision on move 1?

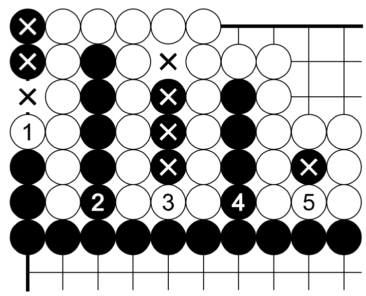
Before the sequence in *Dia. 1.3,* it is Black's choice to play locally or in the environment. After the two moves in *Dia. 1.3,* again it is Black's choice to play locally or in the environment. He has the same kind of choice. There is only one difference: the moves 1 and 2 in *Dia. 1.3* are made before he makes the choice again. What is their impact? As we see by the values of the gains in *Example 1,* Black gains 4 points by move 1 and White lets Black lose 3.5 points by move 2. The net profit of the sequence of the two moves is 4 - 3.5 = 0.5. As this is a positive number, Black gains during the exchange of two initial moves in the environment. In general, since moves in the environment are played in decreasing order of their move values, Black never loses during such an exchange. He gains at least as much as White. For Black, the worst case is a 0 net profit from the exchange. For Black, the resulting count of sequence 2 is at least as good as any count resulting from *Dia. 1.3.* This explains why, for the method of comparing two sequences, Black's decision for determining his possible correct locations for move 1 is meaningful despite only considering sequences 1 and 2.



Dia. 1.3: ignored, two moves in the environment



Example 2: White to move, local sente

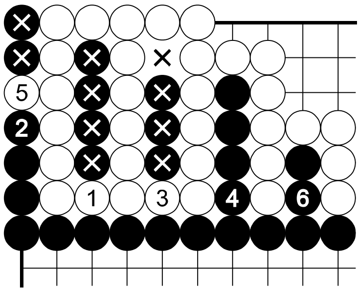


Dia. 2.1: sequence 1, local start, C_1 = -14

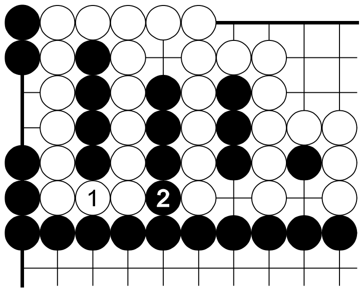
Example 2: This is *Example 1* with White to move. In *Example 1,* the creator Black starts; in *Example 2,* the preventer White starts. We discuss why the method of comparing two sequences also applies to the case of a starting preventer. The reasoning is alike, except that we emphasise White's perspective.

The method of comparing two sequences considers sequence 1 with the local move 1 and resulting local count C_1 = -14 in *Dia. 2.1,* and sequence 2 with move 1 in the environment, the local move 2 and resulting local count C_2 = -19 in *Dia. 2.2.* White minimises counts by choosing the smallest available count. In his choice only among sequences 1 and 2, he selects the smaller count C_2 and so prefers to start with move 1 in sequence 2.

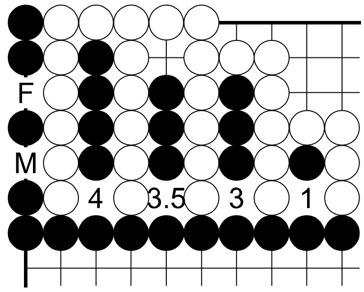
We must, however, consider another relevant decision. After White 1 in *Dia. 2.2,* on move 2, Black chooses between playing locally in *Dia. 2.2* or in the environment in *Dia. 2.3.* Why is the count C_2 = -19 meaningful for White's decision on move 1? Before the sequence in *Dia. 2.3,* it is White's choice to play locally or in the environment. After the two moves in *Dia. 2.3,* he has the same kind of choice, except for one difference: the moves 1 and 2 in *Dia. 2.3* are made before he makes the choice again. Let us study their impact. White lets Black lose 4 points by move 1 and Black gains 3.5 points by move 2. The net profit of the sequence of the two moves, viewed from Black's perspective, is -4 + 3.5 = -0.5. Since this is a negative number, White gains during the exchange of two initial moves in the environment. In general, because moves in the environment are played in decreasing order of their move values, White never loses during such an exchange. He gains at least as much as Black. For White, the worst case is a 0 net profit from the exchange. For White, the resulting count of sequence 2 is at least as good as any count resulting from *Dia. 2.3.* In conclusion, White's decision for determining his possible correct locations for move 1 is meaningful despite only considering sequences 1 and 2.



Dia. 2.2: sequence 2, start in the environment, C_2 *= -19*

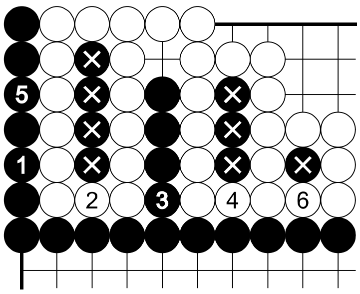


Dia. 2.3: ignored, two moves in the environment

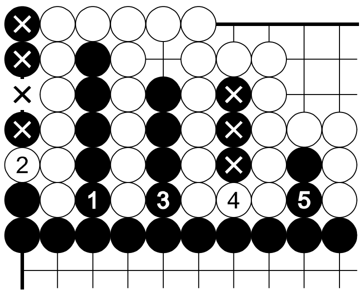


Example 3: Black to move, local gote

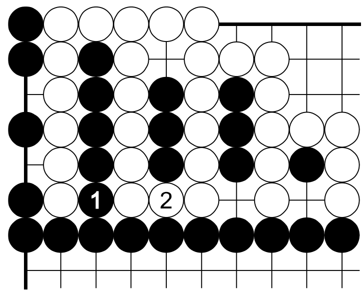
Example 3: As we learn in *11 Late Endgame with One Player's Follow-up* (p. 110), despite having a local gote, we use the tentative sente move value M_{SENTE} = 3 and follow-up move value F = 2. The method of comparing two sequences considers sequence 1 with the local move 1 and resulting local count C_1 = -16 in *Dia. 3.1,* and sequence 2 with move 1 in the environment, the local move 2 and resulting local count C_2 = -13 in *Dia. 3.2.* Black maximises counts by choosing the larger count C_2. He starts with move 1 in sequence 2.



Dia. 3.1: sequence 1, local start, C_1 *= -16*



Dia. 3.2: sequence 2, start in the environment, C_2 *= -13*



Dia. 3.3: ignored, two moves in the environment

This chapter discusses a local gote endgame with one player's follow-up using the methods of comparing counts or net profits during the late endgame. The section *11.4 Principles* (p. 130) continues discussion using the method of applying a principle.

We presume a simple local endgame with sente move value $\mathbf{M_{SENTE}}$, follow-up move value **F,** without other follow-ups, in an environment of simple gotes without follow-ups with non-negative, decreasing move values $\mathbf{T \geq T_1 \geq T_2 \geq ... \geq 0}$. The largest move value T of the environment is also called the temperature. $\mathbf{T_1}$ is the second-largest value (although it may be equal to T). In this and the following chapters, we can ignore passes with move value 0 unless needed as next moves in the environment when there are no more plays.

We can ignore additional variations due to equal options because each player gets one move per pair of equal move values in the environment. Equal options enable superfluous, additional variations with equal results, which we need not denote explicitly in the principles. Compare the microendgame in *Volume 2.*

The local endgame can be a local sente, 'ambiguous' or a local gote. However, in this chapter, we need not distinguish these types because their behaviour is independent of them, as we will see for the examples.

The method of applying a principle uses the sente move value M_{SENTE} while the other methods do not need it. If we use M_{SENTE} at all, we do so to study each type, even if it is a local gote.

Strictly speaking, some move values or gains are *tentative.* While *Volumes 3* and *5* distinguish tentative from eventually confirmed correct values, we simplify discussion in this chapter and always consider the sente move value M_{SENTE}. We do so even for a local gote, for which this value or the first taken follow-up move value F of a sente sequence are tentative; we ignore its gote move value, which is the correct move value if we consider only the local gote without an environment. In this chapter, however, we have a particular kind of environment and need the sente move value regardless of its tentative nature.

In fights, we can assign the roles 'attacker' and 'defender' to the players. Similarly, traditional terminology assigns roles for a local sente by distinguishing the *sente player*, who can start a sente sequence, and the *reverse sente player,* who can start a reverse sente sequence. These terms are not used for a local gote. Since we need terms applicable to local sentes and local gotes, we advance go theory by inventing the following names for two consistently used roles.

The **creator** is the player whose local start makes the follow-up available. The **preventer** is the player whose local start makes the follow-up unavailable.

Black or White can assume either role. If Black is the creator, White is the preventer - or vice versa. In a local sente, the creator is the sente player and the preventer is the reverse sente player. The reader can recall the aforementioned identities for every example of a local sente.

M_{SENTE} is the move value and gain of the preventer's local starting move or action making the follow-up unavailable. M_{SENTE} is the move value and F is the gain of the creator's local starting move or action making the follow-up available. F is the move value and gain of the follow-up move or action by either player, that is, either the creator's local continuation after the preventer's play elsewhere or the preventer's local answer.

If the position has an environment consisting of simple gotes without follow-ups, the theory studied in this chapter is exact. If the position has a more complicated environment with follow-ups, other local sente endgames and so on, the conditions in principles should be understood as approximations so that the sente player prefers not to play locally at the last suggested moment.

A *local sente* endgame is not necessarily a *global sente.* In a local endgame of one of the types local sente, ambiguous or local gote, a local sente sequence can be played 'in sente' only for a limited period of time. We need to know when to start in the local endgame. This depends on local move values and move values in the environment. We cannot solve the general case but can study move orders under slightly simplifying standard conditions.

Consider a simple local sente. The reverse sente player can start a sequence to the settled reverse sente follower and the sente player can start a sequence to a position, from which he can start a continuation to a settled follower or the reverse sente player can start a continuation to the settled sente follower. Net profit is viewed from the sente player's perspective: his gain is added while the opponent's gain is subtracted. Now consider the generalised case of a simple local endgame with the creator's follow-up. The preventer can start a sequence to the settled 'preventer follower' and the creator can start a sequence to a position, from which he can start a continuation to a settled follower or the preventer can start a continuation to the settled 'creator follower'. Net profit is viewed from the creator's perspective: his gain is added while the preventer's gain is subtracted.

Counts (which can be negative) are expressed from Black's perspective. Alternatively we can use white-counts, which presume White's perspective. Refer to *2 Basics* (p. 10) for definitions of move values, counts, local gote, ambiguous and local sente.

Application of theory in this chapter to more complication positions, such as having several local endgames each with one follow-up, may often be possible. However, we have to be careful with generalisation. More complicated positions demand modifications of the theory.

For a local endgame with one follow-up in an environment, the major task is to determine correct timings for the players' local play. Correct move orders depend on the sente move value M_{SENTE}, the follow-up move value F and the move values T, T_1, T_2,... of the environment.

When the temperature is high, usually both players play in the environment. When the temperature drops to an intermediate level, the creator can play in the environment or locally. When the temperature drops even further, eventually both players play locally.

***All examples** in this chapter:* The same examples use the same Arabic example numbers. Reference examples have Latin numbers. The captions of diagrams of initial positions denote the types local sente ($F > M_{SENTE}$), ambiguous ($F = M_{SENTE}$) or local gote ($F < M_{SENTE}$) for the only purpose of faster learning of the same behaviour regardless of the types. The examples show, or we demonstrate that the theory applies to, local gotes, 'ambiguous' and local sentes. We have one local endgame with one follow-up in an ordinary environment of simple gotes without follow-ups. We use the following variables with these meanings: 'sente move value' **M_{SENTE},** 'follow-up move value' **F,** 'temperature' **T.** Note that F is a gote move value. We state the equation or inequation comparing F to T so we know which condition in a principle applies. In the initial diagrams, numbers on empty intersections are the *<u>gote</u> move values of moves in the environment.* Each such move value is calculated as the difference value of the black and white followers in a particular simple gote divided by 2, according to *2 Basics* (p. 10). See *Volume 3 chapter 3.* The locale consists of the intersections of the local endgame and the simple gotes of the environment. We calculate counts in the locale.

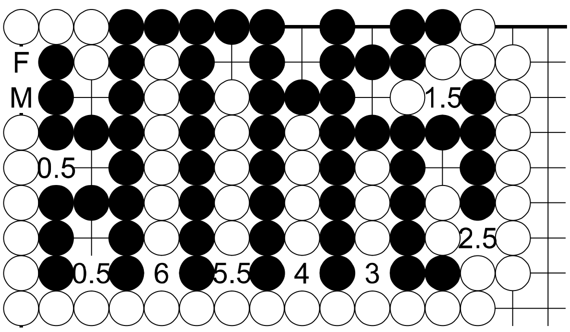
For a local sente, informal guidelines have suggested that T > F indicates a high, F > T > M (the temperature is between the follow-up move value and the move value) an intermediate and M > T a low temperature.

However, these approximative guidelines are *sometimes wrong!* If there are no excitements besides one local endgame with one follow-up and its environment, at least we have the following valid advice when the follow-up move value is larger than the temperature and the creator can play locally *in sente:*

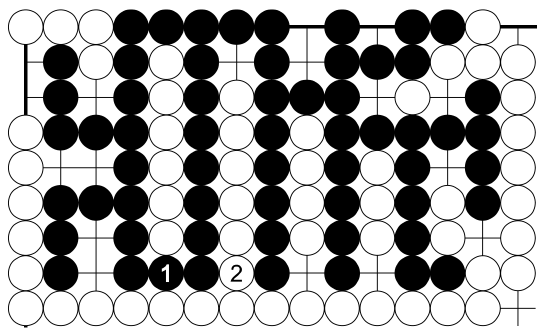
If F > T and the creator has started local play, the preventer replies locally.*

The creator wants to play the local endgame 'in sente'. In other words, when the creator plays the first local move, he wants his opponent, the preventer, to reply locally immediately. This is possible if it is the creator's turn and the temperature T has fallen below the follow-up move value F. Principles in this chapter for playing locally *in sente* presume the convention to play the follow-up move F before any moves of the environment with equal move values. We do not repeat this convention every time.

Discussion in this chapter studies correct move orders for playing locally or in the environment. One important purpose is that the player having a local sente applies the good long-term strategy of enabling himself to play the local endgame 'in sente'. However, we do not recur the obvious. The following reference example shall be enough reminder of the strategy and the often correct case of an immediately locally replying opponent. The subsequent meticulous discussion of move orders must also be seen in the light of pursing the strategy and minimising mistakes enabling the preventer to make the follow-up unavailable before the creator uses his chance of making the follow-up available and playing the local endgame 'in sente' in the global positional context.

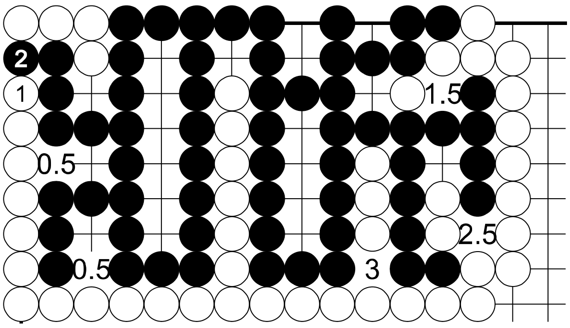


Reference example I: Black to move

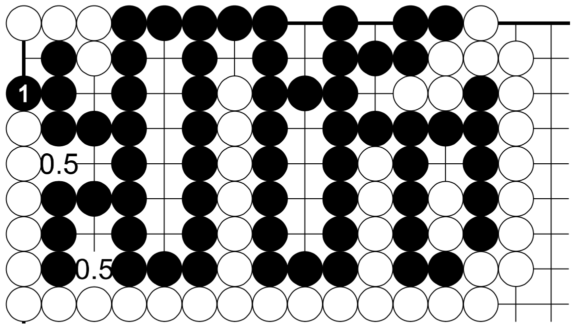


Dia. I.1: moves in the environment

Reference example I: From *Example 2* in *2 Basics* (p. 10), we know the move value $M_{SENTE} = 1$ and the follow-up move value F = 4.5. The environment consists of moves with the values T = 6, $T_1 = 5.5$, $T_2 = 4$, $T_3 = 3$, $T_4 = 2.5$, $T_5 = 1.5$, $T_6 = 0.5$, $T_7 = 0.5$. - *Dia. I.1:* Before move 1, the temperature is T = 6 because this is the move value of the largest move in the environment. A guideline for T > F <=> 6 > 4.5 recommends play in the environment. If Black started locally, White would reply at 1 and the resulting count would be worse for Black.



Dia. I.2: White's choice



Dia. I.3: Black to continue, local start

Dia. I.2: Later, the temperature has dropped to T = 3. We are in the phase of intermediate temperature with F > T > M_{SENTE}, during which White can play in the environment or locally. The local move 1 is one possibility. Black replies locally because, before move 2, the follow-up is the simple gote with the largest move value. Instead of move 1, White has the alternative possibility of taking the move of value 3 in the environment, Black takes 2.5 and White continues locally in sente. Both move orders result in the same count.

Dia. I.3: Regardless of any earlier mistake by White of not playing locally in time, Black having the turn plays locally and makes the follow-up unavailable. The temperature has dropped to T = 0.5. It would be wrong to play in the environment and let White have the first move in the local endgame.

If the difference of F and M_{SENTE} is small, so is the temperature range when the creator can play locally in sente before the preventer can make the follow-up unavailable. In case of doubt, the creator does not wait until the last moment of playing locally but should consider playing locally a bit earlier, provided the move value of the follow-up is larger than the temperature: F > T. Later, we learn exact conditions for the creator playing locally and in sente. Such conditions apply to a position with one local endgame with one follow-up in an environment of simple gotes. The conditions indicate a) when the creator's starting move or action is answered locally by the preventer and b) whether the local sente, 'ambiguous' or local gote endgame is a global sente.

A high temperature T > F allows a refinement and *acceleration* of the methods: except for T, we may ignore the intermediate part of all moves in the environment with moves values larger than F.

Every principle in the sections *11.2, 11.3, 11.4* determines only the correct first move in an example. For each subsequent move, a new decision must be made using the then applicable conditions.

11.2 Comparing Counts

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11.2.1 Available Follow-up

We combine the method of comparing two sequences (see *5.6 Method of Comparing Two Sequences* (p. 40)) with the method of comparing counts. This combination of methods does not need M_{SENTE}. See *5.4 Method of Comparing Counts* (p. 34) also for the definition of sequences 1 and 2 and their resulting counts $\mathbf{C_1}$ and $\mathbf{C_2}$.

If the method of comparing two sequences is combined with the method of comparing *counts,* the *black creator* starts

- **in the environment if $T > F$ and $C_1 \leq C_2$,**
- **in the environment or locally if $T \leq F$ and $C_1 \leq C_2$,**
- **locally if $C_1 \geq C_2$.**

Compare *white-counts* if the *white creator* starts.*

Described informally, we compare sequence 1, in which the creator starts locally, to sequence 2, in which he starts in the environment and the opponent replies locally on move 2. The creator starts a) in the environment if the temperature T is larger than the follow-up move value F and the local count of sequence 1 is at most the local count of sequence 2, b) in the environment or locally if the temperature T is at most the follow-up move value F and the local count of sequence 1 is at most the local count of sequence 2, c) locally if the local count of sequence 1 is at least the local count of sequence 2.

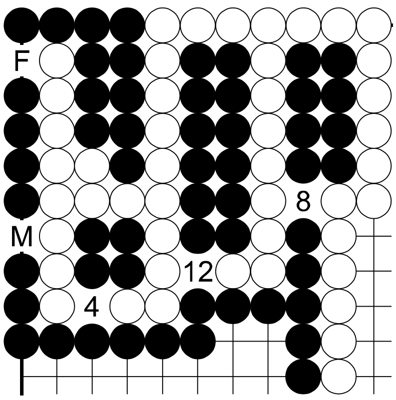
Counts are calculated from the starting player's perspective. Accordingly, if White starts, we calculate white-counts, they are added for him (and subtracted for Black) and we substitute them for the counts in the principle. See also *2 Basics* (p. 10). In *Example 2,* we use white-counts.

Example 3 demonstrates the alternative calculation from Black's perspective using counts. Accordingly, they are subtracted for the starting White (and added for Black) and we invert the conditions for counts in the principle.

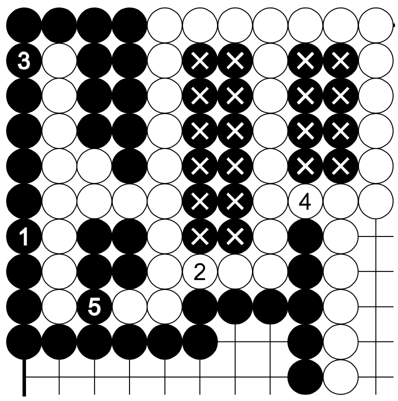
For $T \leq F$ with $C_1 < C_2$, the creator can start in the environment or locally. Although the larger count C_2 refers to sequence 2 with its start in the environment, the creator has the alternative of starting locally. We get first hints from the principle *"If F > T and the creator has started local* *play, the preventer replies locally."* in *11.1 Introduction* (p. 110) and a related observation that the preventer can reply locally if F = T. See *Volume 5* for the complete theoretical justification, and proofs of the method and principles of this and the following section.

A high temperature T > F allows an <u>acceleration</u> of the method of comparing counts: except for T, we may ignore the intermediate part of all moves in the environment with moves values larger than F.

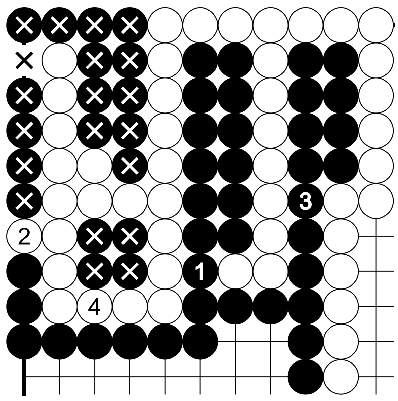
All examples *when applying the method of comparing counts:* We combine the method of comparing two sequences with the method of comparing counts to determine the correct first move. Except for the temperature, we only need the environment's other move values, which are denoted in the diagram of the initial position, for applying the method of decreasing values.



Example 1: Black to move, local sente

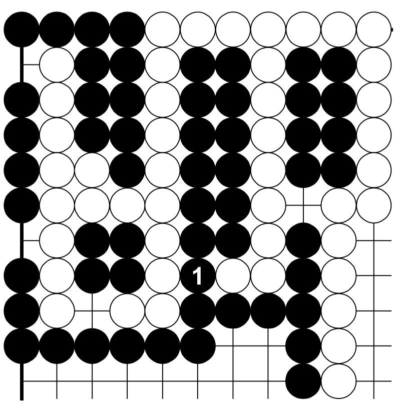


Dia. 1.1: sequence 1, $C_1 = -40$

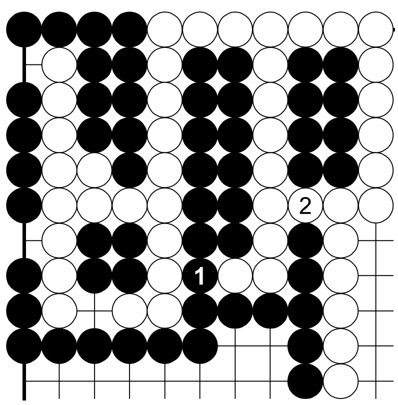


Dia. 1.2: sequence 2, $C_2 = -39$

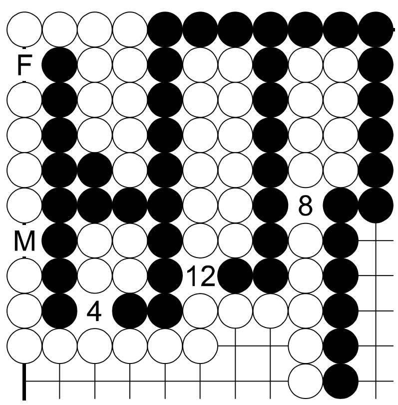
Example 1: We have the follow-up move value F = 11 and temperature T = 12. In *Dia. 1.1,* the count is $C_1 = -40$. In *Dia. 1.2,* the count is $C_2 = -39$. According to the conditions T > F <=> 12 > 11 (high temperature) and $\mathbf{C_1 \leq C_2}$ <=> -40 ≤ -39 of the principle for a starting black creator, his only correct start is in the *environment* in *Dia. 1.3.*



Dia. 1.3: correct start in the environment



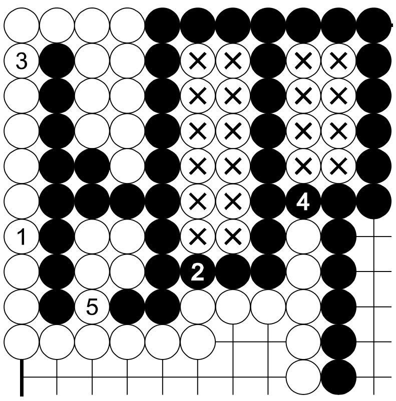
Dia. 1.4: ignored kind of sequences



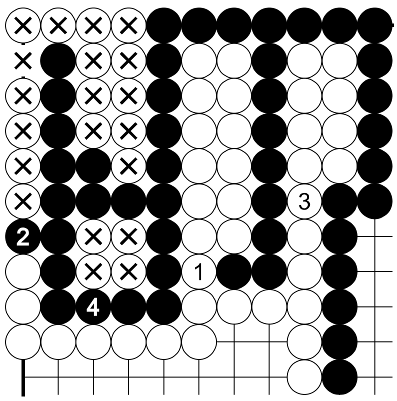
Example 2: White to move, local sente

Dia. 1.4: The method of comparing two sequences ignores this kind of sequences, in which the first two moves are played in the environment. For one local sente in an environment, we need not consider this kind of sequences at all if we only want to determine the correct first move. In all examples, we ignore this kind of sequences.

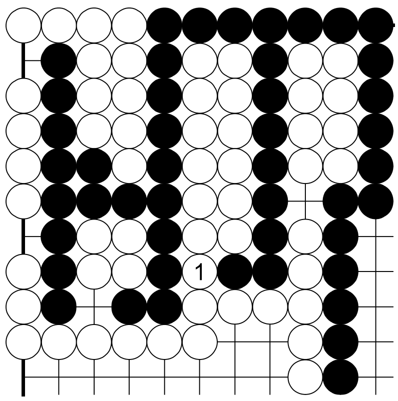
Example 2: This is *Example 1* with reversed colours. As White is the starting player, we use <u>white-counts.</u> Accordingly, we substitute variables in the principles. White is the creator. We have the follow-up move value F = 11 and temperature T = 12. In *Dia. 2.1,* the white-count is $\overline{C}_1 = -40$. In *Dia. 2.2,* the white-count is $\overline{C}_2 = -39$. According to the conditions T > F <=> 12 > 11 (high temperature) and $\mathbf{\overline{C}_1 \leq \overline{C}_2}$ <=> $-40 \leq -39$ of the principle for a starting white creator, his only correct start is in the *environment* in *Dia. 2.3.*



Dia. 2.1: sequence 1, *$\overline{C}_1 = -40$*



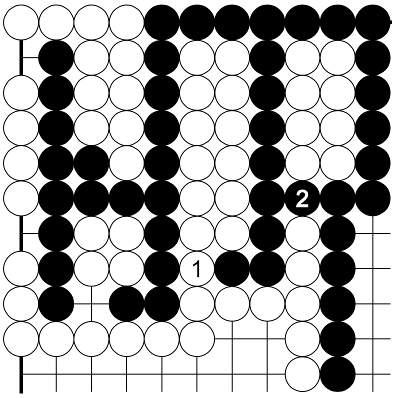
Dia. 2.2: sequence 2, *$\overline{C}_2 = -39$*



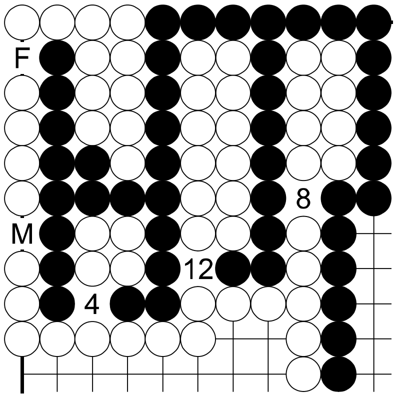
Dia. 2.3: correct start in the environment

Using white-counts for White's start allows us to do exactly the same kinds of calculations as when using counts for Black's start. We just have to recall from which player's perspective we calculate and annotate variables with overlining. If we did not use white-counts, we would need twice the number of principles because their inequations for counts would be inverted for White's start. Nevertheless, the reader might prefer to use counts calculated from Black's perspective. In this case, the inequations of the principles above and below must be reinterpreted if White starts. While Black maximises net profits and counts, White minimises them. (In the following section, the same general remarks apply to net profits instead of counts.)

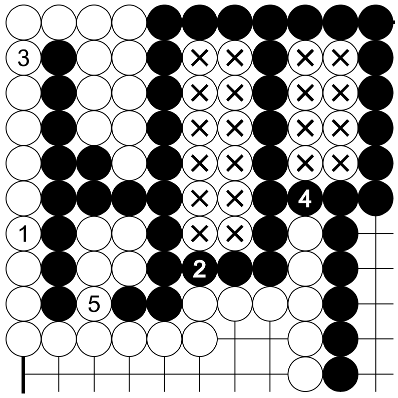
Example 3: This is *Example 2* redone using counts calculated from <u>Black's perspective.</u> We have to be careful because the starting creator is <u>White.</u> We have the follow-up move value F = 11 and temperature T = 12. In *Dia. 3.1,* the count is $C_1 = 40$. In *Dia. 3.2,* the count is $C_2 = 39$. The principle states the conditions T > F and $C_1 \leq C_2$ but, due to White's start and Black's value perspective, we have to <u>invert</u> the inequation for the counts and get the conditions T > F <=> 12 > 11 (high temperature) and $\mathbf{C_1 \geq C_2}$ <=> $40 \geq 39$ so White's only correct start is in the *environment* in *Dia. 3.3*. This is his only correct start because we do not have $C_1 = C_2$.



Dia. 2.4: ignored kind of sequences

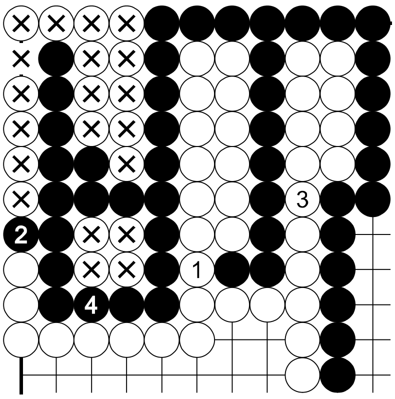


Example 3: White to move, local sente

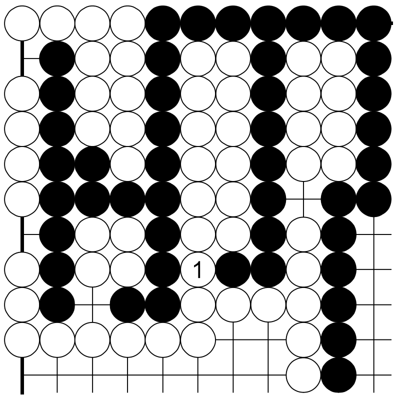


Dia. 3.1: sequence 1, $C_1 = 40$

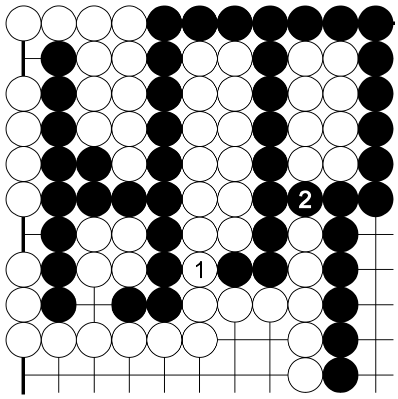
Remarks: If inverting an inequation confuses us and we cannot recall whether it has already been inverted, we can find out by thinking afresh. In general, we can say that the starting player optimises for himself. White starts. Using Black's value perspective means that the optimising White minimises values and so prefers the smaller values. Here, White chooses the smaller count. The preferred, chosen, smaller value belongs to one of the two sequences, whose first move indicates the starting player's correct start. In this example, the smaller value belongs to sequence 2, whose first move is in the environment. Hence White's correct start is in the environment. (The analogue remarks apply to net profits.)



Dia. 3.2: sequence 2, $C_2 = 39$



Dia. 3.3: correct start in the environment



Dia. 3.4: ignored kind of sequences

Example 4: We have the follow-up move value F = 11 and temperature T = 12. In *Dia. 4.1,* the count is $C_1 = -40$. In *Dia. 4.2,* the count is $C_2 = -40$. For a black creator starting in the environment, the principle states the conditions T > F <=> 12 > 11 (high temperature) and $C_1 \leq C_2$. Since we have $\mathbf{C_1 = C_2}$ <=> -40 = -40, the second condition is also fulfilled so Black's start in the *environment* at A in *Dia. 4.3* is correct. For starting locally, the principle states the condition $C_1 \geq$

calculate values of one local endgame with iterative follow-ups. However, moves are not always played in order of decreasing move values. Local endgames with iterative follow-ups do not share the simple behaviour of an environment of simple gotes without follow-ups. The following simplifying theory is available.

Apply known theory about extreme difference values, equal options or global sente when a suitable position is created.

See also chapters *4 - 6* and *11 - 14,* and 'Microendgame' in *Volume 2.* We learn the *principle of extreme difference values,* which compares two local endgames. We compare the minimum difference value of one local endgame to the maximum difference value of the other local endgame.

In a local endgame, the **minimum difference value** is the difference value of the settled locale created by the player's one move and the opponent's reply, and the settled locale created by the opponent's one move.

In a local endgame, the **maximum difference value** is the difference value of the settled locale created by the player's successive local moves and the settled locale created by the opponent's successive local moves.

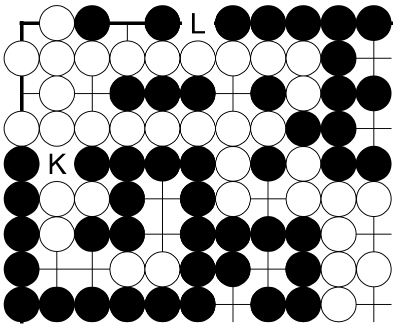
Prefer play in a local endgame whose minimum difference value is at least the maximum difference value of another local endgame.[**]

We use the player's value perspective. We calculate a difference value conveniently as the count of the player's follower minus the count of the opponent's follower. When determining the minimum difference value and considering the sequence with the opponent's reply, it is a pass if the player has already settled the local endgame so that the opponent cannot answer with an endgame play in it. If a local endgame is a simple gote without follow-up, its maximum difference value equals its difference value. If a local endgame has possibly iterative follow-ups, the values can differ. The principle applies if, for the one local endgame, the minimum difference value exists and can be calculated because the player's one move and the opponent's reply settle the local endgame and, if instead the opponent starts, his one move also settles it. It is immaterial whether the local endgames are local gotes, local sentes or 'ambiguous'.

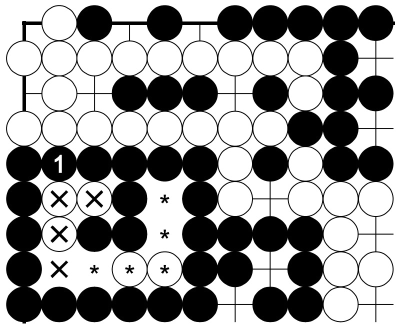
For the pair of two compared local endgames, judgement can depend on which local endgame is assessed by the minimum difference value and which by the maximum difference value. If a judgement is unsuccessful, a second judgement and application of the principle might be successful for swapped roles of the two local endgames. The unsuccessful judgement would consider the minimum difference value for one local endgame and the maximum difference value for the other local endgame - the successful judgement would consider the minimum difference value for the other local endgame and the maximum difference value for the one local endgame.

Furthermore, application of the principle aims at pruning the reading volume as much as possible. Therefore, we welcome a sometimes occurring side effect of the principle if it identifies a player's preferred start in a local endgame so that follow-up moves become unavailable at all, or the greater number of follow-up moves become unavailable.

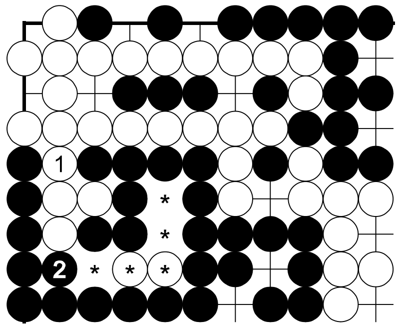
All examples: We apply the principle of extreme difference values. In the local endgame labelled K, we calculate the minimum difference value K. In another local endgame labelled L, we calculate the maximum difference value L. Crosses denote relevant counting intersections. Asterisks mark counting intersections that cancel each other. We prepare simplification of the method of reading and counting in *Examples 1 - 9* and apply the gathered information to *Example 10.*



Example 1: Black to move



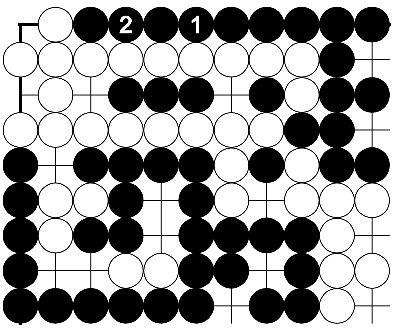
Dia. 1.1: minimum difference value, black follower, K_B = 14



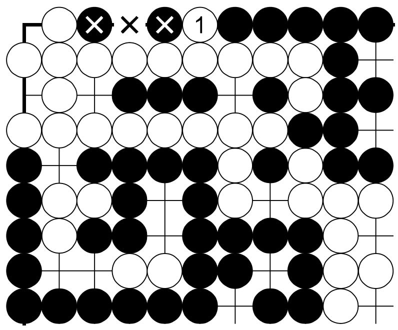
Dia. 1.2: minimum difference value, white follower, K_W = 7

Example 1: In the local endgame K, the crosses let us quickly identify the tentative sente move value K = 7. We can ignore the intersections marked with asterisks, which cancel each other when being added for one and subtracted for the other sequence. We might also calculate the minimum difference value carefully from the black follower's count $K_B = 14$ in *Dia. 1.1* and the white follower's count $K_W = 7$ in *Dia. 1.2* as $K = K_B - K_W = 14 - 7 = 7$. - *Dias. 1.3 + 1.4:* In the local endgame L, the maximum difference value is $L = L_B - L_W = 0 - (-5) = 5$.

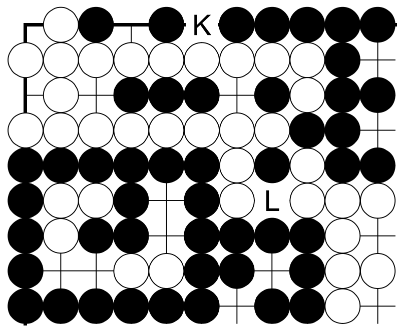
Conclusion: The minimum difference value K is larger than the maximum difference value L: we have K > L <=> 7 > 5. Therefore, according to the principle of extreme difference values, playing at 'K' is better than playing at 'L'. For the method of reading and counting, we must read Black's first move at K but need not read his first move at L.



Dia. 1.3: maximum difference value, black follower, $L_B = 0$

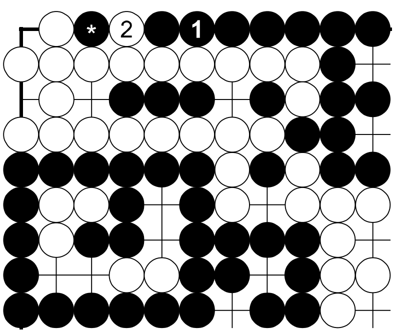


Dia. 1.4: maximum difference value, white follower, $L_W = -5$

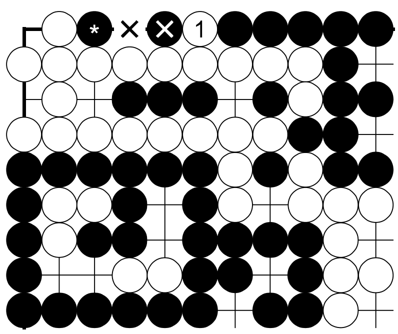


Example 2

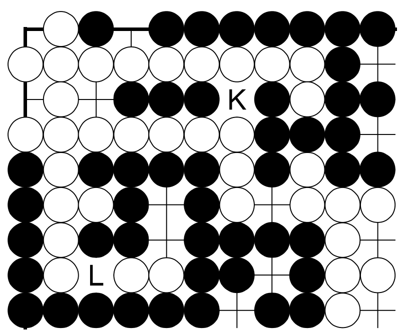
Example 2: We study the local endgame K in *Dias. 2.1* and *2.2.* The crosses in *Dia. 2.2* indicate the minimum difference value K = 3. In the local endgame L, the maximum difference value is L = 2. As the minimum difference value of the local endgame K is larger than the maximum difference value of the local endgame L, i. e., K > L <=> 3 > 2, we discard the starting player's start at 'L'. Note that *Example 2* does not specify whether Black or White is the starting player. Either player can be the starting player. We use examples without specified starting player to determine Black's or White's start in applications in *Example 10.*



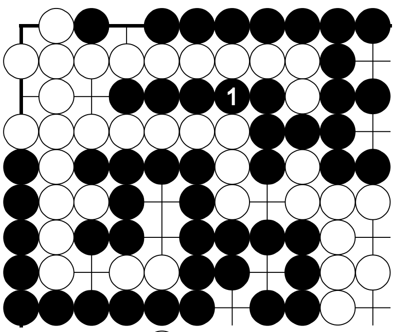
Dia. 2.1: minimum difference value, black follower



Dia. 2.2: minimum difference value, white follower

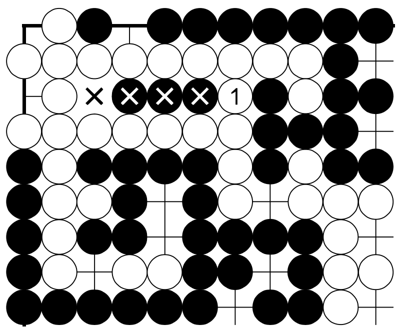


Example 3

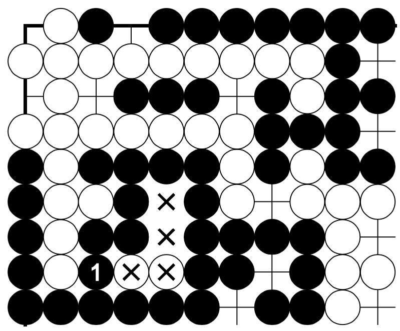


② pass.

Dia. 3.1: minimum difference value, black follower



Dia. 3.2: minimum difference value, white follower



Dia. 3.3: maximum difference value, black follower

Example 3: In the local endgame K studied in *Dias. 3.1* and *3.2,* the minimum difference value is K = 7, as indicated by the crosses in *Dia. 3.2*. Note that Black 1 in *Dia. 3.1* already settles the local endgame K so White's local reply is