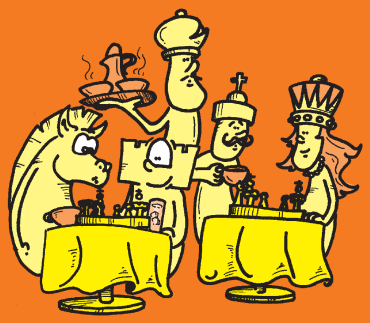


THE PUZZLING SIDE OF CHESS

Jeff Coakley

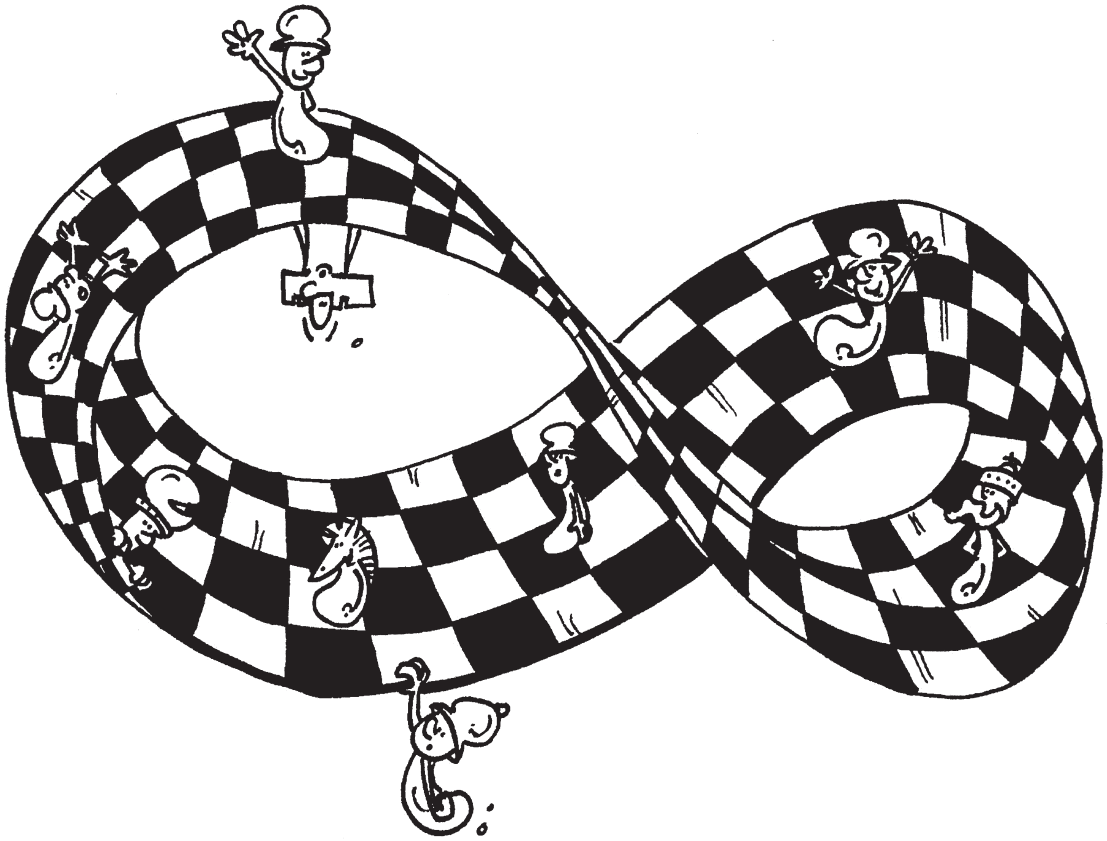
LOOPOLOGY X

Ultimate Loops

number 172 October 13, 2018

All good things come to an end. Even loops. This column, the conclusion to our ten-part series, features defensive loops in which there is no requirement for an equal number of each piece. By using different numbers of pieces, several new records can be set.

Computer analysis and optimal solutions courtesy of François Labelle. Merci beaucoup!



Where do we start?

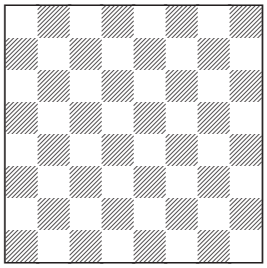
Complete tables showing the maximum piece count for loops with an equal number of each piece are given on the final page.

DOUBLE LOOPS

In a double loop, the pieces form a continuous chain of defence in which every piece reciprocally guards the two pieces it is linked to.

The maximum length for a double loop is 32 pieces, using 32 knights. See columns 140, 155. No multi-piece loop can break this record, with or without an equal number of each piece.

The second longest double loop is 31 pieces, using 31 kings. See column 151. But 31 pieces is also possible with other piece groups if we eliminate the “equal number of each” restriction.



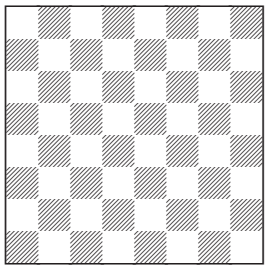
Double KB Loop

The maximum pieces in a double KB loop with an equal number of each piece is 20 (column 156). Make a double KB loop with 31 pieces, using any number of each piece. What is the maximum number of bishops?

Corkscrew Loops *Malaysia*

It is impossible for pawns to be part of a two-piece double loop in which there are equal numbers of each piece. But KP and BP loops are possible with unequal numbers.

In all loop tasks, pawns may not be placed on the 1st rank.



Double KP Loop

Make a double KP loop with 31 pieces, using any number of each piece. What is the maximum number of pawns?

Double KBP Loop

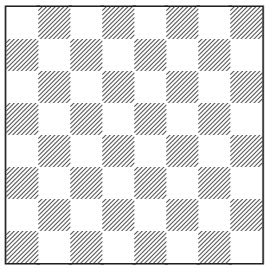
The maximum pieces in a double KBP loop with an equal number of each piece is 21 (column 158). Make a double KBP loop with 31 pieces, using any number of each piece. What is the maximum number of bishops and pawns?

Double BP Loop

Make a double BP loop with the maximum number of pieces, using any number of each piece. The matchable record for bishops alone is 12 pieces (column 82). What is the maximum number of pawns in a 12-piece BP loop?

What is the maximum number of bishops in a double BP loop that includes 3 pawns?

Smiler *Staffordshire, England*

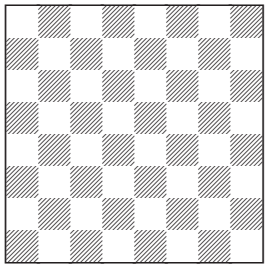


Double QR Loop

The most pieces in a double QR loop with an equal number of each piece is 16 (column 156). This record cannot be broken with an unequal number of pieces, but it can be tied. Make a double QR loop with 16 pieces, using as many queens as possible.

Magic Mountain *Los Angeles*

Our next puzzle is the most interesting of the new double loops.



Double QB Loop

The maximum pieces in a double QB loop with an equal number of each piece is 14 (column 158). With unequal pieces, the record is greatly increased. Make a double QB loop with the maximum number of pieces, using any number of each piece.

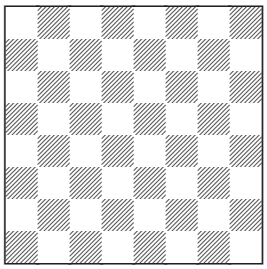
Double QBP Loop

A double QBP loop with an equal number of each piece is impossible. Make a double QBP loop with the maximum number of pieces, using any number of each piece. How many pawns are possible?

SINGLE LOOPS

In a single loop, the pieces form a continuous chain of defence in which every piece guards exactly one other piece.

Two-piece single loops without pawns necessarily have an equal number of each piece. However, by using unequal numbers, the length of loops with three or more pieces can be extended.



Single KRB Loop

Make a single KRB loop with the maximum number of pieces, using any number of each piece. At least one piece of each type must be used. The record for equal numbers of each piece is 15 (column 164).

Single KRN Loop

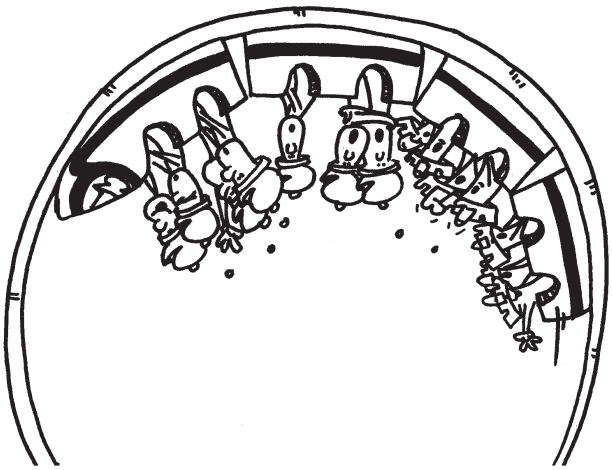
Make a single KRN loop with the maximum number of pieces, using any number of each piece. At least one piece of each type must be used. The record for equal numbers of each piece is 15 (column 164).

Single KBN Loop

Make a single KBN loop with the maximum number of pieces, using any number of each piece. At least one piece of each type must be used. The record for equal numbers of each piece is 21 (column 164).

Single RBN Loop

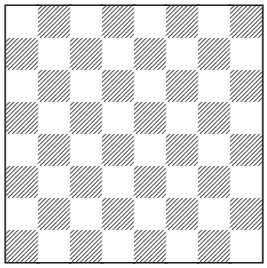
Make a single RBN loop with the maximum number of pieces, using any number of each piece. At least one piece of each type must be used. The record for equal numbers of each piece is 18 (column 147).



At long last, it's now time for the ultimate achievements in loopology!

The maximum pieces in a single loop with an equal number of each piece is 24. This can be accomplished with two different groups: BNP and KBNP (columns 166, 170).

But what is the maximum pieces in a single loop with any number of any type of piece?



Ultimate Single Loop

Make a single loop with the maximum number of pieces, using any number of any piece. It is not necessary to use every type of piece.

a. Pawns are not allowed.

b. Pawns are allowed.

Keep a clear mind.

All good things linger on. And so it is with loops. There are still numerous tasks with unequal numbers of pieces that were not covered in this column. Stay tuned for more brain twisters next year when the *Puzzling Side of Chess* returns for season 5.

SOLUTIONS

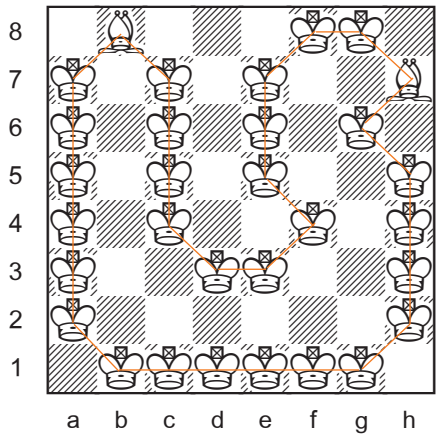
PDF hyperlinks. You can advance to the solution of any puzzle by clicking on the underlined title above the diagram. To return to the puzzle, click on the title above the solution diagram.

Archives. Past columns and a detailed index of problem-types and composers are available in the *Puzzling Side of Chess* archives.

Double KB Loop

François Labelle 2018

Puzzling Side of Chess



31 pieces

(29 kings, 2 bishops)

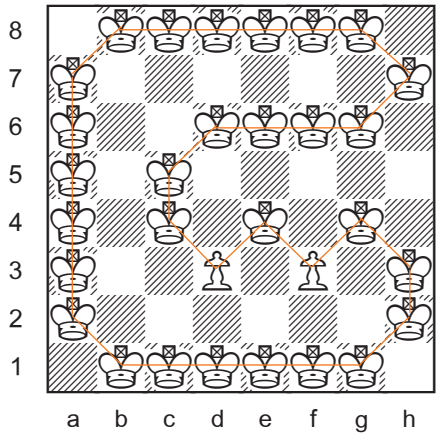
A unique solution!

Two is the maximum number of bishops in a 31-piece double KB loop. The solution is unique, disregarding reflections and rotations of the same pattern, a convention used for all problems.

Double KP Loop

François Labelle 2018

Puzzling Side of Chess



31 pieces

(29 kings, 2 pawns)

Two is the maximum number of pawns in a 31-piece double KP loop. There are three solutions.

Kb1 Ka2 Ka3 Ka4 Ka5 Ka6 Ka7 Kb8 Kc8 Kd8 Ke8 Kf8 Kg8 Kh7 Kg6 Kf6 Ke6 Kd6 Kc5 Kc4 Pd3 Ke4 Pf3 Kg4 Kh3 Kh2 Kg1 Kf1 Ke1 Kd1 Kc1 (diagram)

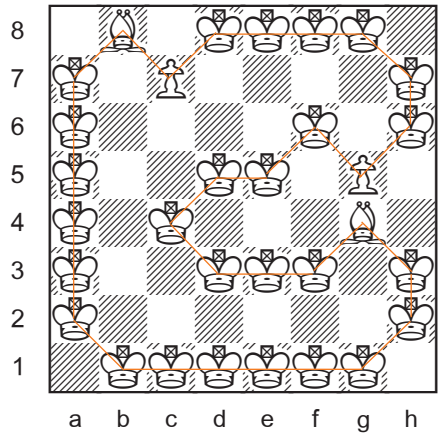
Kb1 Ka2 Kb3 Kc3 Kd3 Ke3 Kf4 Kf5 Ke6 Pd5 Kc6 Pb5 Ka6 Ka7 Kb8 Kc8 Kd8 Ke8 Kf8 Kg8 Kh7 Kh6 Kh5 Kh4 Kh3 Kh2 Kg1 Kf1 Ke1 Kd1 Kc1

Kb1 Ka2 Kb3 Kc3 Kd4 Pe3 Kf4 Kf5 Ke6 Kd6 Kc6 Pb5 Ka6 Ka7 Kb8 Kc8 Kd8 Ke8 Kf8 Kg8 Kh7 Kh6 Kh5 Kh4 Kh3 Kh2 Kg1 Kf1 Ke1 Kd1 Kc1

Double KBP Loop

François Labelle 2018

Puzzling Side of Chess



31 pieces

(27 kings, 2 bishops, 2 pawns)

A unique solution!

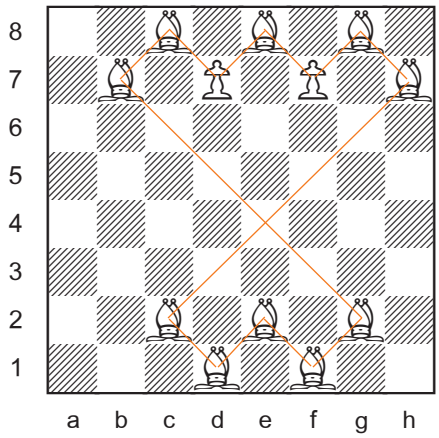
Four is the maximum number of non-kings in a 31-piece double KBP loop. It is only possible with two bishops and two pawns.

Ten more pieces than a KBP double loop with an equal number of each piece (column 158).

Double BP Loop

François Labelle 2018

Puzzling Side of Chess

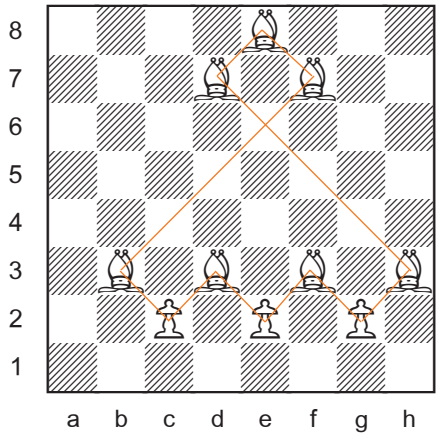


12 pieces

The maximum number of pieces in a BP loop is 12, matching the record with bishops alone (column 82). It can only be achieved with one or two pawns. There are four solutions with two pawns.

Bd1 Bc2 Bh7 Bg8 Pf7 Be8 Pd7 Bc8 Bb7 Bg2 Bf1 Be2 (diagram)
Bd1 Bc2 Bh7 Bg8 Pf7 Be8 Pd7 Bc8 Ba6 Bf1 Bg2 Bf3
Bd1 Bf3 Pg2 Bh3 Bc8 Ba6 Bb5 Be8 Pf7 Bg8 Bh7 Bc2
Bd1 Bf3 Pg2 Bh3 Bc8 Ba6 Bd3 Bh7 Bg8 Pf7 Be8 Ba4

The maximum number of pieces in a BP loop that includes three pawns is 10, shown below. Four pawns is impossible.



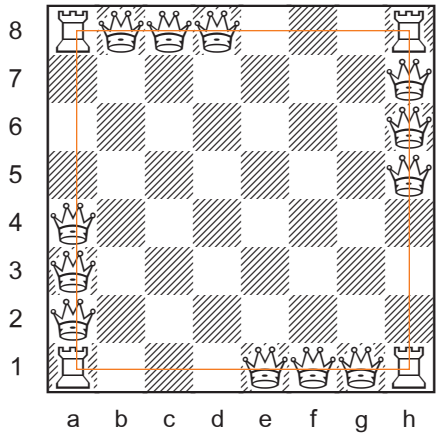
There are four solutions for a 7B-3P double loop.

Pc2 Bb3 Bf7 Be8 Bd7 Bh3 Pg2 Bf3 Pe2 Bd3 (diagram)
Pe2 Bf3 Bb7 Bc8 Pd7 Be8 Bf7 Bb3 Pc2 Bd3
Pe2 Bd3 Bh7 Bg8 Pf7 Be8 Bd7 Bh3 Pg2 Bf3
Pe2 Bd3 Bh7 Bg8 Pf7 Be8 Pd7 Bc8 Bb7 Bf3

Double QR Loop

François Labelle 2018

Puzzling Side of Chess



16 pieces

(12 queens, 4 rooks)

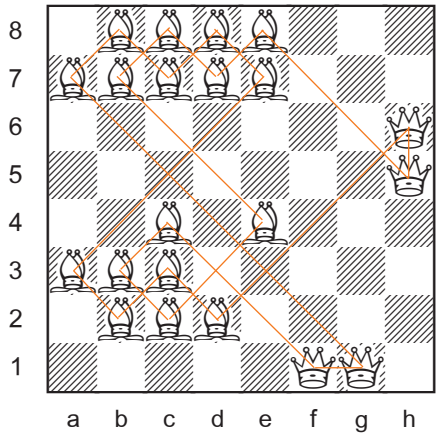
Twelve is the maximum number of queens in a 16-piece QR loop. There are four solutions, all symmetrical. The first is shown in the diagram.

Ra1 Qa2 Qa3 Qa4 Ra8 Qb8 Qc8 Qd8 Rh8 Qh7 Qh6 Qh5 Rh1 Qg1 Qf1 Qe1
Ra1 Qa2 Qa3 Qa5 Ra8 Qb8 Qc8 Qe8 Rh8 Qh7 Qh6 Qh4 Rh1 Qg1 Qf1 Qd1
Ra1 Qa2 Qa4 Qa6 Ra8 Qb8 Qd8 Qf8 Rh8 Qh7 Qh5 Qh3 Rh1 Qg1 Qe1 Qc1
Ra1 Qa2 Qa5 Qa6 Ra8 Qb8 Qe8 Qf8 Rh8 Qh7 Qh4 Qh3 Rh1 Qg1 Qd1 Qc1

Double QB Loop

François Labelle 2018

Puzzling Side of Chess



21 pieces

(17 bishops, 4 queens)

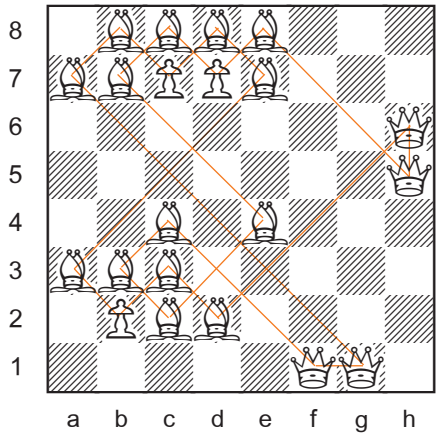
Unique solution!

Seven more pieces than a QB loop with an equal number of each piece (column 158).

Double QBP Loop

François Labelle 2018

Puzzling Side of Chess



21 pieces

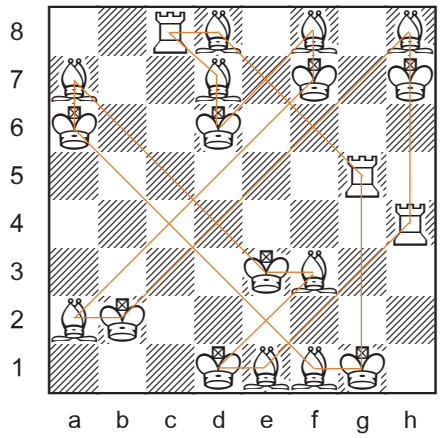
(14 bishops, 4 queens, 3 pawns)

There are nine solutions, all using the same pattern as the QB loop above, substituting pawns for various bishops. The diagram shows the only position with the maximum three pawns.

Single KRB Loop

François Labelle 2018

Puzzling Side of Chess



20 pieces

5 solutions, none symmetrical.

Kd1 Be1 Rh4 Kh7 Bh8 Kb2 Ba2 Kf7 Bf8 Kd6 Bd7 Rc8 Bd8 Rg5 Kg1 Bf1 Ka6 Ba7 Ke3 Bf3 (diagram) 8K+3R+9B

Kd1 Be1 Rh4 Kh7 Bh8 Rb2 Ba2 Kf7 Bf8 Kd6 Bd7 Rc8 Bd8 Rg5 Kg1 Bf1 Ka6 Ba7 Ke3 Bf3 7K+4R+9B

Rd1 Kg1 Bh1 Ka8 Bb8 Kg3 Bh3 Kf5 Bg5 Rh6 Bh5 Re2 Ka2 Ba3 Kf8 Bg8 Kc4 Bc3 Ka5 Ba4 8K+3R+9B

Be1 Kh4 Bh5 Kf7 Rg8 Kd8 Bd7 Ka4 Ba3 Rc5 Be5 Kh2 Bh1 Ka8 Ba7 Rb6 Bh6 Ke3 Bd3 Kf1 8K+3R+9B

Rg1 Bh1 Kb7 Ba7 Kc5 Bb5 Ra4 Ba5 Rd8 Kh8 Bh7 Kc2 Bb2 Kf6 Bf7 Kh5 Bh6 Re3 Kh3 Bh2 7K+4R+9B

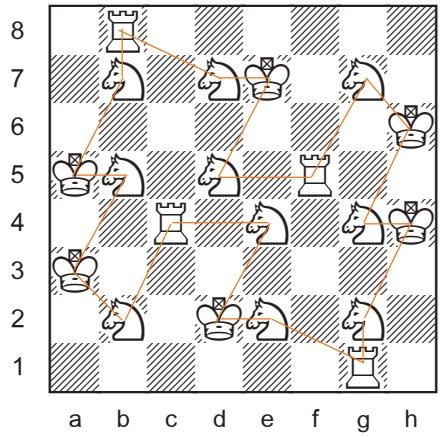
Five more pieces than a single KRB loop with an equal number of each piece (column 164).

The same maximum as a two-piece loop with only king and bishop (column 151).

Single KRN Loop

François Labelle 2018

Puzzling Side of Chess



20 pieces

15 solutions

The diagram shows one of the two symmetrical solutions. It is the only pattern that includes a maximum of four rooks. The other symmetrical solution replaces the rooks on b8 and g1 with kings.

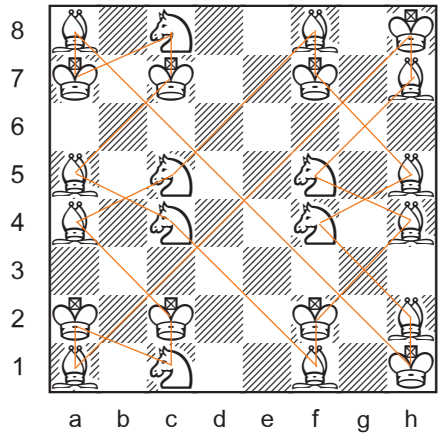
Five more pieces than a single KRN loop with an equal number of each piece (column 164). The same maximum as a two-piece loop with only king and knight (column 151).

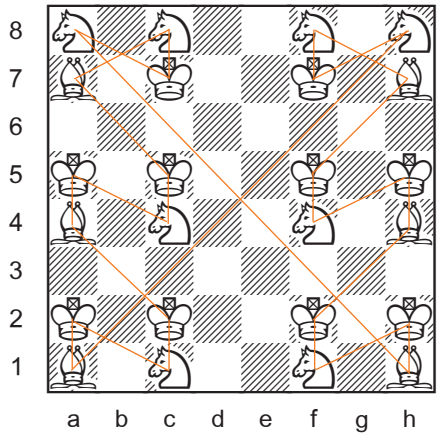
Olympic Looping

Single KBN Loop

François Labelle 2018

Puzzling Side of Chess





24 pieces

3 solutions, two symmetrical.

Three more pieces than a single KBN loop with an equal number of each piece (column 164).

Ba1 Kh8 Bh7 Nf5 Bh4 Kf2 Bf1 Nc4 Ba5 Kc7 Nc8 Ka7 Ba8 Kh1 Bh2 Nf4 Bh5 Kf7 Bf8 Nc5 Ba4 Kc2 Nc1 Ka2 (left diagram) 8K+10B+6N

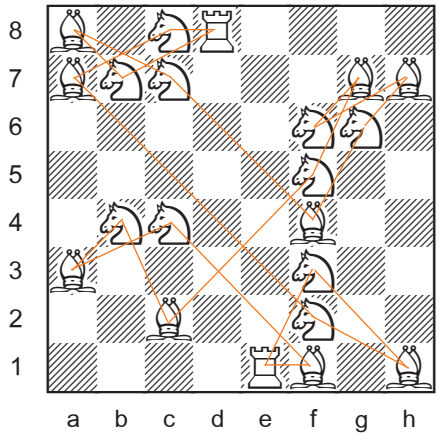
Ba1 Nh8 Kf7 Nf8 Bh7 Kf5 Nf4 Kh5 Bh4 Kf2 Nf1 Kh2 Bh1 Na8 Kc7 Nc8 Ba7 Kc5 Nc4 Ka5 Ba4 Kc2 Nc1 Ka2 (right diagram) 10K+6B+8N

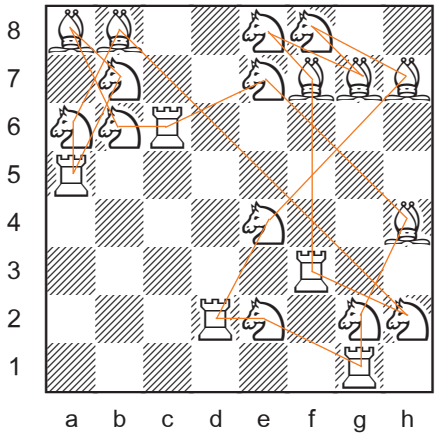
Ba1 Nh8 Kf7 Nf8 Bh7 Kf5 Nf4 Kh5 Bh4 Ke1 Nf1 Kh2 Bh1 Na8 Kc7 Nc8 Ba7 Kc5 Nc4 Ka5 Ba4 Kc2 Nc1 Ka2 (not shown, asymmetrical) 10K+6B+8N

Single RBN Loop

François Labelle 2018

Puzzling Side of Chess





21 pieces

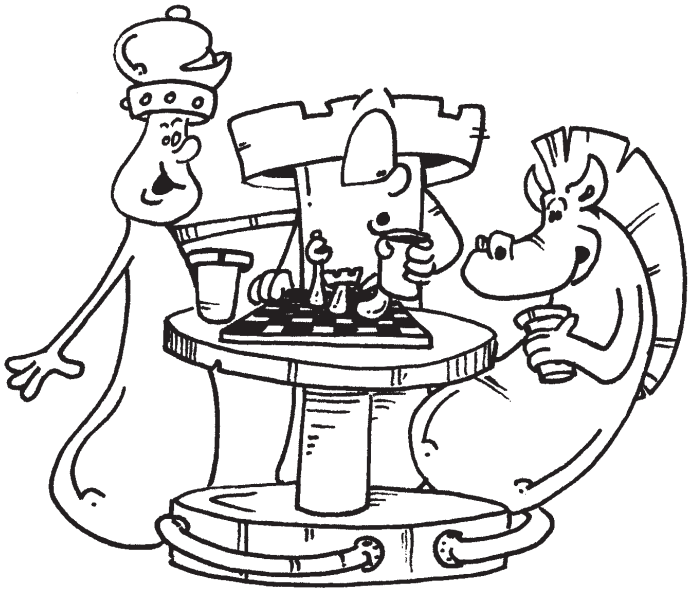
3 solutions, none symmetrical.

Three more pieces than a single RBN loop with an equal number of each piece (column 147).

Re1 Bf1 Nc4 Ba3 Nb4 Bc2 Nf5 Bg7 Nf6 Bh7 Ng6 Bf4 Nc7 Ba8 Nb7 Rd8 Nc8 Ba7 Nf2 Bh1 Nf3 (left diagram) 2R + 9B + 10N

Re1 Bf1 Nc4 Rd2 Bh2 Nf4 Bh5 Nf7 Bh8 Nc3 Ba4 Nc6 Bb8 Nc7 Ba8 Nb7 Bc5 Nf8 Bh7 Nf5 Bh4 (not shown) 2R + 10B + 9N

Rg1 Ng2 Bh4 Ne7 Rc6 Nb6 Ba8 Nb7 Ra5 Na6 Bb8 Nh2 Rf3 Bf7 Ne8 Bg7 Nf8 Bh7 Ne4 Rd2 Ne2 (right diagram) 5R + 6B + 10N



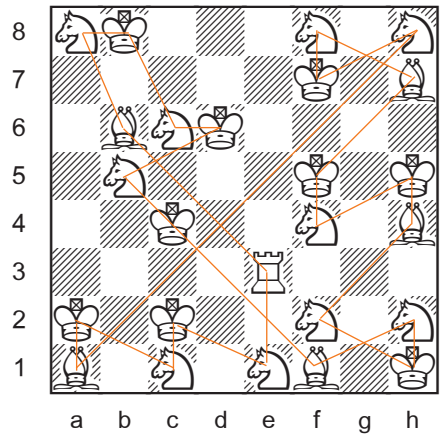
Another round?

Ultimate Single Loop

a. pawns not allowed

François Labelle 2018

Puzzling Side of Chess



25 pieces

Only 2 solutions, neither symmetrical.

Five more pieces than a KRBN loop with an equal number of each piece (column 168).

The diagrammed position has 9K + 1R + 5B + 10N . The second solution is almost identical. The only difference is placing a rook on d6 instead of a king.

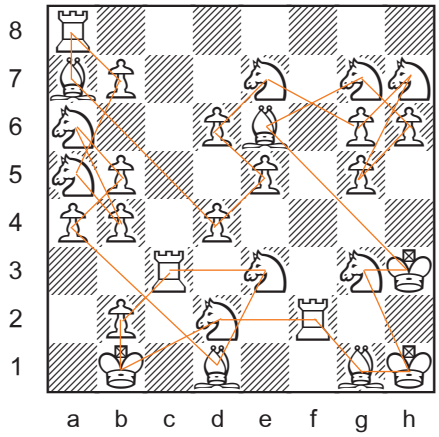
As would be expected, no queens are employed.

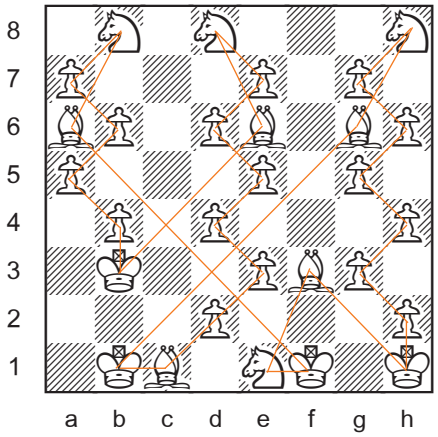
Ultimate Single Loop

b. pawns allowed

François Labelle 2018

Puzzling Side of Chess





29 pieces

5 solutions, none symmetrical.

Three solutions use five pieces (KRBNP). The first is shown in the diagram on the left. The other two differ by just one piece (Ba1 or Bb2 instead of Pb2).

Nine more pieces than a KRBNP loop with an equal number of each piece (column 170).

Two solutions use four pieces (KBNP), with no rooks. The only difference is the piece on h2 (B or P). See diagram on right.

Five more pieces than a KBNP loop with an equal number of each piece (column 170).

So, folks, the maximum number of pieces in a single loop is an astounding 29. Nearly half the board!

Maximum Pieces in Single Loop

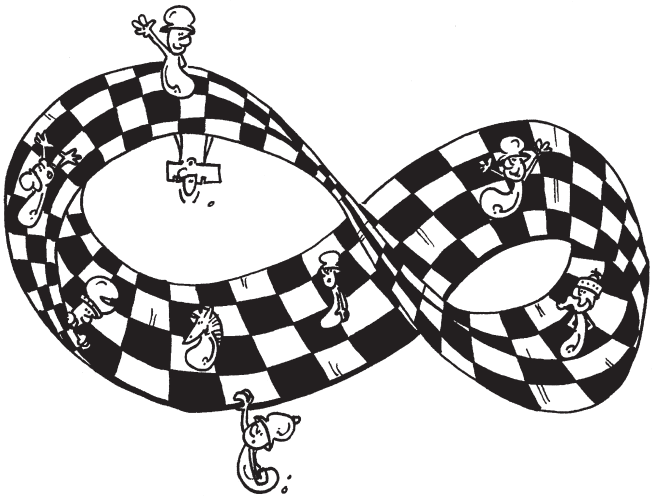
Equal Number of Each Piece

BN	20	KBN	21	BNP	24	KRBN	20	KQRBN	15
KB	20	RBN	18	KNP	21	QRBN	12		
KN	20	KRB	15	RNP	18	KQRN	12	KRBNP	20
RN	16	KRN	15	QNP	15	KQBN	12	KQRNP	15
RB	14	KQN	12	RBP	15			KQBNP	15
QN	12	QBN	12	KRP	12	KBNP	24	QRBNP	15
KR	12	QRN	9			KRBP	20		
						RBNP	20	KQRBNP	12
RP	10					KRNP	16		
NP	8					KQNP	12		
						QRNP	12		
						QBNP	12		

Maximum Pieces in Double Loop

Equal Number of Each Piece

N	32	KB	26	KBP	21	KQRB	16
K	31	KR	22	KQR	18	KQBP	16
R	16	KQ	16	KQB	18	KRBP	16
Q	14	QR	16	KRB	18		
B	12	QB	14	QRB	12	KQRBP	15



Until the next time around!