LOOPOLOGY XI
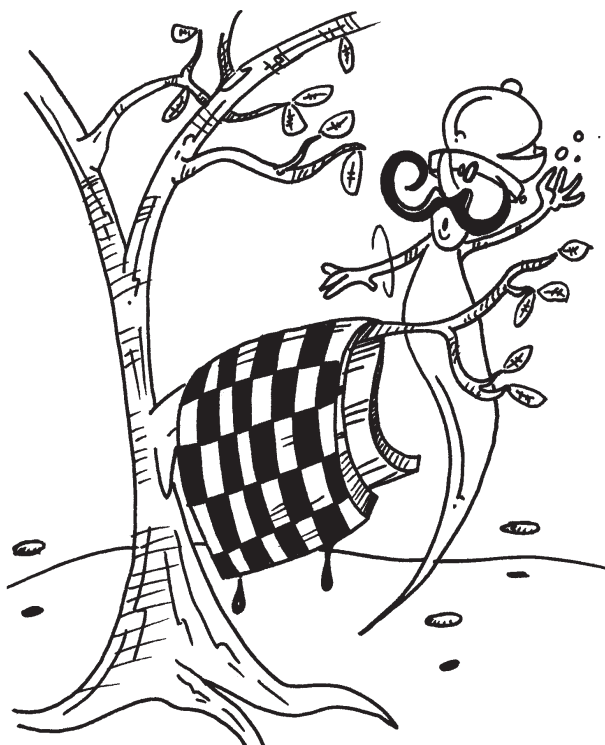### Single Loops with Unequal Pieces
number 179   June 28, 2019

The loops go round and round and the end is never found. But our survey of defensive loop problems may reach its end someday.

This column features single loops in which there is no requirement for an equal number of each piece. By using different numbers of pieces, records for maximum length can be extended. In all tasks, at least one piece of each designated type must be used. For example, a position with only bishops and knights is not a solution for QBN.

Computer analysis and optimal solutions kindly provided by François Labelle. An updated table of records is given on the final page.

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. But loops with unequal numbers are possible for NP and RP.

Single NP Loop
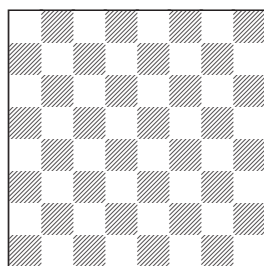
Make a single NP loop with the maximum number of pieces, using any number of each piece.
Pawns may not be placed on the 1st or 8th ranks.
The record for equal numbers of each piece is 8.

Single RP Loop

Make a single RP loop with the maximum number of pieces, using any number of each piece. The record for equal numbers of each piece is 10.
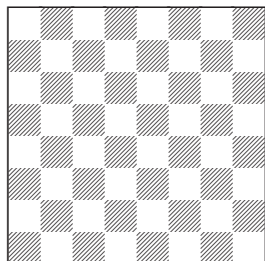

proposed loop bridge
Amsterdam Iconic Pedestrian Bridge Contest 2012

Three-piece single loops with unequal numbers of pieces were given in column 172 for groups KRB, KRN, KBN, RBN. Here are the other three-piece groups without pawns. The record positions for QBN and KQN are unique. Always a pleasant find.

Single QRN Loop

Make a single QRN loop with the maximum number of pieces, using any number of each piece. The record for equal numbers of each piece is 9.

Single QBN Loop

Make a single QBN loop with the maximum number of pieces, using any number of each piece. The record for equal numbers of each piece is 12.
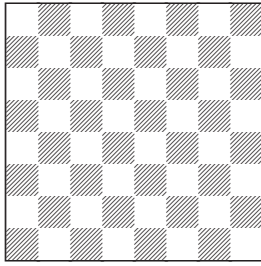
Single KQN Loop

Make a single KQN loop with the maximum number of pieces, using any number of each piece. The record for equal numbers of each piece is 12.

BREAKING NEWS   *Loopology Precedents Discovered!*

We have a new page in the history of chess loops. I recently learned that mathematics professor Erich Friedman from Stetson University in Florida presented numerous defensive loop problems on his website in 2007. Optimal solutions were given for the following single loops, all with an equal number of each piece: KR KB KN QN RB RN BN RP NP KQN KRB KRN KRP QBN QRN KQBN QRBN QBNP. Past columns will be edited to acknowledge his trailblazing contribution to loopological studies.

The single loop KRBN with unequal numbers of pieces was given in column 172. There are three more four-piece groups without pawns.

Single QRBN Loop

Make a single QRBN loop with the maximum number of pieces, using any number of each piece. The record for equal numbers of each piece is 12.

Single KQRN Loop

Make a single KQRN loop with the maximum number of pieces, using any number of each piece. The record for equal numbers of each piece is 12.

Single KQBN Loop

Make a single KQBN loop with the maximum number of pieces, using any number of each piece. The record for equal numbers of each piece is 12.
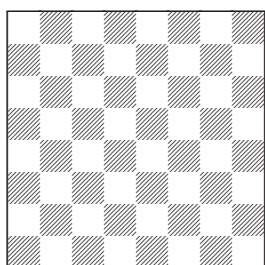
For the sake of completeness, record positions for single loops with pawns and an unequal number of pieces are included in the solution section for all 3, 4, and 5 piece groups. See .

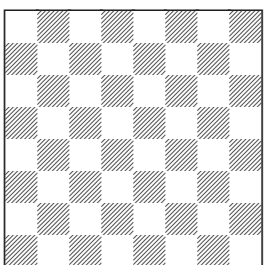*Aqualoop*   *Calypso Park, Ontario*

Of course, there is only one five-piece group without pawns.

Single KQRBN Loop

Make a single KQRBN loop with the maximum number of pieces, using any number of each piece. The record for equal numbers of each piece is 15.

Six pieces are always fun. The length of possible loops is greatly increased with an unequal number of each type.

Single KQRBNP Loop

Make a single KQRBNP loop with the maximum number of pieces, using any number of each piece. The record for equal numbers of each piece is 12.

Coming soon, *Loopology XII: Double Loops with Unequal Pieces*.

When plans go wrong.   *Loop of Doom, South Africa 2016*
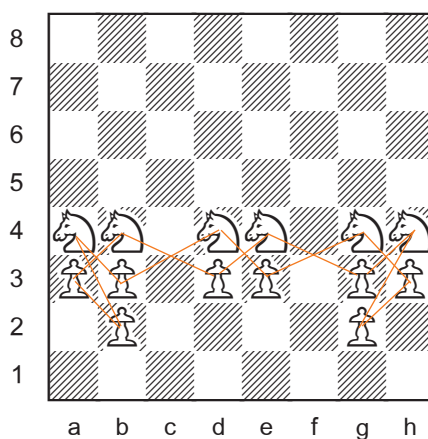
SOLUTIONS

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.

Single NP Loop
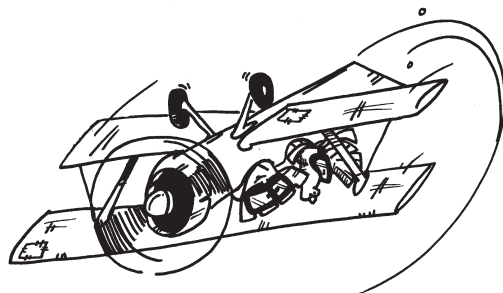
François Labelle 2019
Puzzling Side of Chess

14 pieces
(8 pawns, 6 knights)

There are five solutions, all symmetrical, all the same pattern on different ranks. Reflections and rotations are not counted, a convention used for all tasks.

The record with an equal number of each piece is 8 (column 162).

Pb2 Pa3 Nb4 Pd3 Ne4 Pg3 Nh4 Pg2 Ph3 Ng4 Pe3 Nd4 Pb3 Na4 *
Pb3 Pa4 Nb5 Pd4 Ne5 Pg4 Nh5 Pg3 Ph4 Ng5 Pe4 Nd5 Pb4 Na5
Pb4 Pa5 Nb6 Pd5 Ne6 Pg5 Nh6 Pg4 Ph5 Ng6 Pe5 Nd6 Pb5 Na6
Pb5 Pa6 Nb7 Pd6 Ne7 Pg6 Nh7 Pg5 Ph6 Ng7 Pe6 Nd7 Pb6 Na7
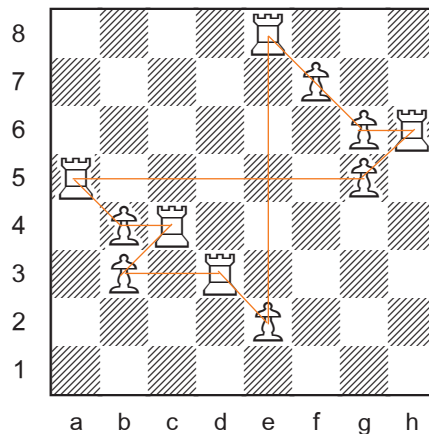Pb6 Pa7 Nb8 Pd7 Ne8 Pg7 Nh8 Pg6 Ph7 Ng8 Pe7 Nd8 Pb7 Na8

* *diagram position*

Single RP Loop

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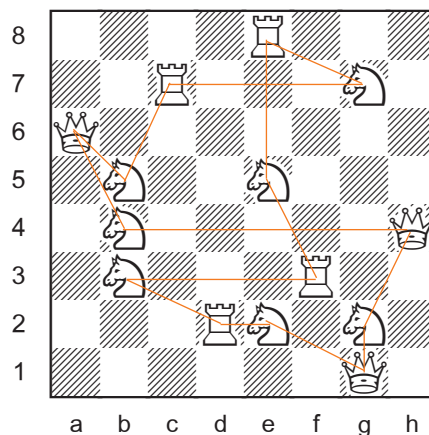

11 pieces

(6 pawns, 5 rooks)

There are 112 solutions, none symmetrical. All patterns contain six pawns and five rooks.

The record with an equal number of each piece is 10 (column 162).

Single QRN Loop

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*Puzzling Side of Chess*
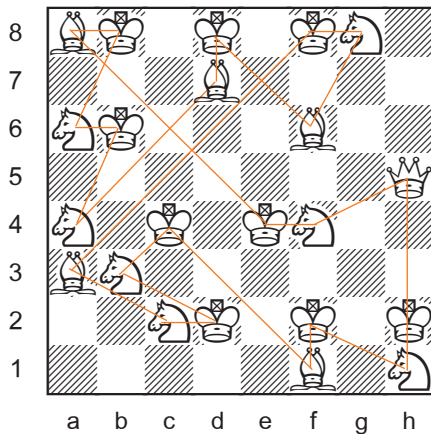

14 pieces

(7 knights, 4 rooks, 3 queens)

There are 162 solutions, none symmetrical. 117 with one queen, 41 with two queens, 4 with three queens.

The record with an equal number of each piece is 9 (column 164).

Single QBN Loop
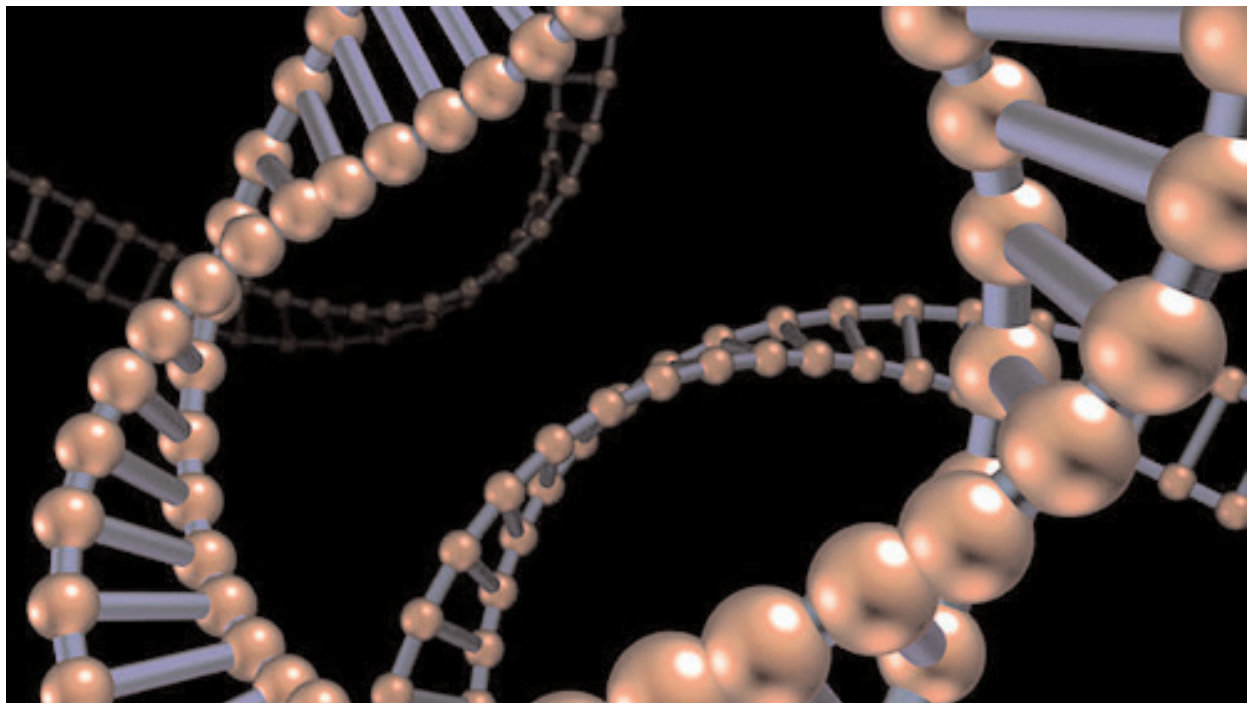
François Labelle 2019
Puzzling Side of Chess

19 pieces

(9 knights, 9 bishops, 1 queen)

A unique solution!

The record with an equal number of each piece is 12 (column 164).

Single KQN Loop

François Labelle 2019
Puzzling Side of Chess

19 pieces

(9 kings, 9 knights, 1 queen)

A unique solution!

The record with an equal number of each piece is 12 (column 164).

Single QRBN Loop

François Labelle 2019
Puzzling Side of Chess

20 pieces

(9 knights, 8 bishops, 2 rooks, 1 queen)

There are 3 solutions. The third is the same as the second with a bishop on g6 instead of g8.

The record with an equal number of each piece is 12 (column 168).

Single KQRN Loop

François Labelle 2019
Puzzling Side of Chess

20 pieces

(10 knights, 6 kings, 2 rooks, 2 queens)

There are 3 solutions. The diagrammed position is symmetrical. In the other two solutions, the queen on b8 is replaced by a rook or a king.

The record with an equal number of each piece is 12 (column 168).

Single KQBN Loop

François Labelle 2019

Puzzling Side of Chess
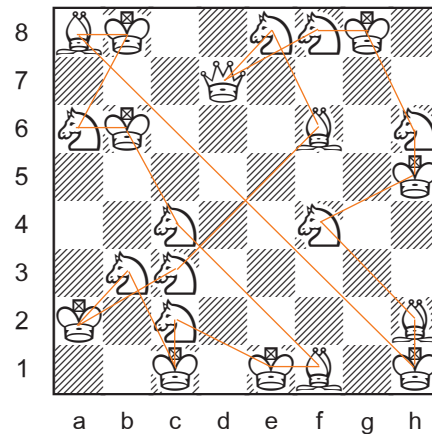
22 pieces

(9K, 7N, 5B, 1Q)   (9N, 8K, 4B, 1Q)

There are 5 solutions. The second position above can be changed in two ways: replace the king on a2 with a bishop and/or change Kh1/Bh2 to Nh1/Kg3.

The record with an equal number of each piece is 12 (column 168).

Subatomic Loopometry

Single KQRBN Loop
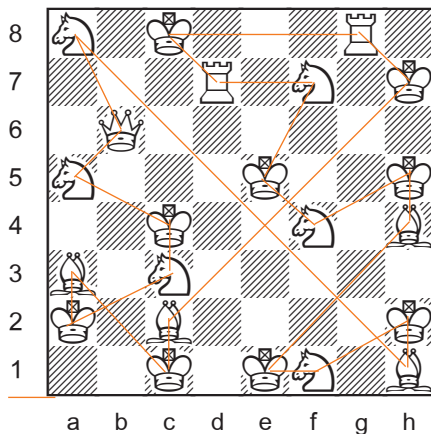
François Labelle 2019

Puzzling Side of Chess
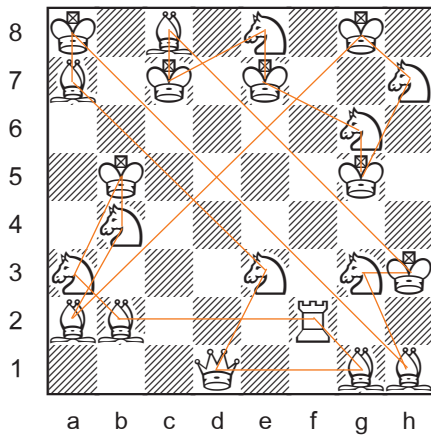
22 pieces

(7K, 7N, 6B, 1R, 1Q)
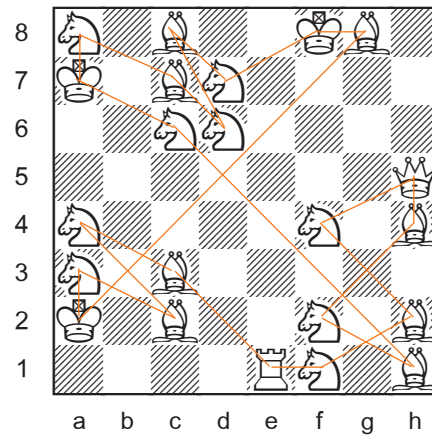
(9N, 8B, 3K, 1R, 1Q)
most N, most B, fewest K

(9K, 6N, 4B, 2R, 1Q)
most K, fewest B, most R
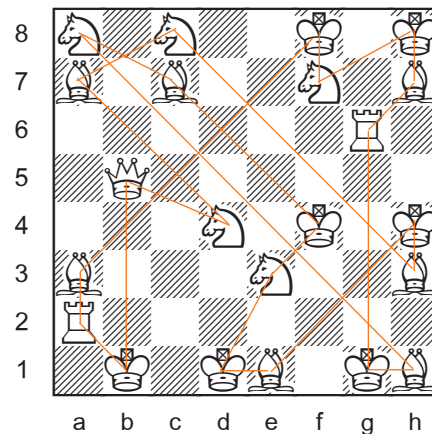
(7K, 7B, 5N, 2R, 1Q)
fewest N, most R

There are 24 solutions, none symmetrical, all with one queen. The range of other pieces is K:4-9, R:1-2, B:4-8, N:5-9.

The record with an equal number of each piece is 15 (column 168).

Single KQRBNP Loop

François Labelle 2019

Puzzling Side of Chess
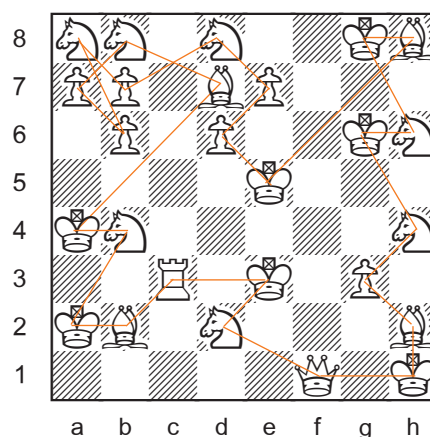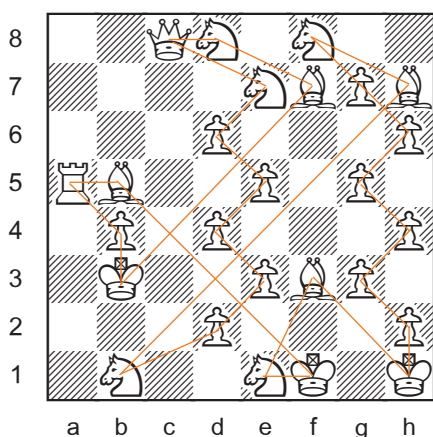
26 pieces

(12P, 5N, 4B, 3K, 1Q, 1R)   (7K, 7N, 6P, 3B, 1Q, 1R)

most P, fewest N   *fewest P, most K*

There are 30 solutions, none symmetrical, all with one queen and one rook. The range of other pieces is K:2-7, B:2-6, N:5-8, P:6-12. Here is a selection of solutions showing the extremes.

Nd1 Pe3 Pd4 Pe5 Pd6 Pe7 Nd8 Bb7 Na8 Pb6 Pa7 Nb8 Bd7 Ka4 Na3 Rc2 Nh2 Qf1 Be1 Pg3 Ph4 Pg5 Nh6 Kg8 Ng7 Bh5   most N(8), fewest K(2)

Kb1 Nb2 Qa4 Pa5 Pb6 Pa7 Nb8 Ba6 Kf1 Be1 Pd2 Rc3 Bf3 Kh1 Bh2 Pe5 Pd6 Pe7 Nd8 Be6 Nh3 Pg5 Ph6 Pg7 Nh8 Bg6 most B(6), fewest N(5)

Qf1 Kh1 Ph2 Pg3 Nh4 Kg6 Nh6 Kg8 Bh8 Ke5 Pd6 Pe7 Nd8 Pb7 Na8 Pb6 Pa7 Nb8 Bd7 Ka4 Nb4 Ka2 Pb2 Rc3 Ke3 Nd2 fewest B(2), most K(7)

The record with an equal number of each piece is 12 (column 170).

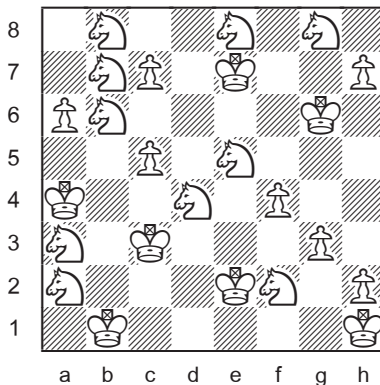# Three-Piece Single Loops with Pawns
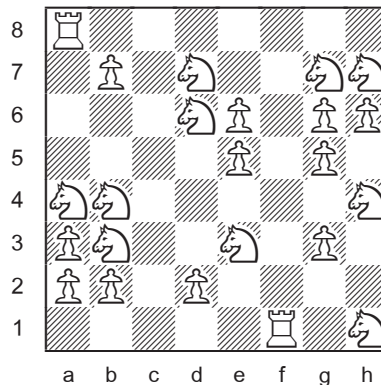
François Labelle 2019

Puzzling Side of Chess

BNP
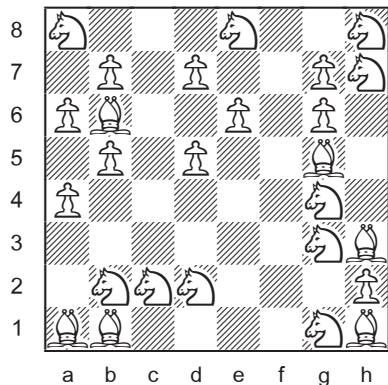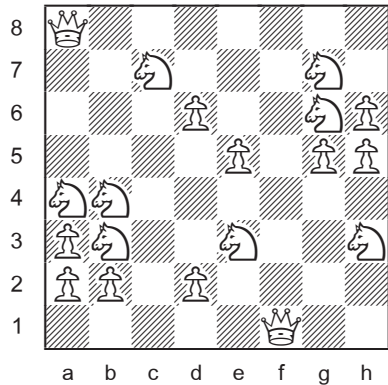
26 pieces

(24 with equal pieces)

4 solutions

KNP

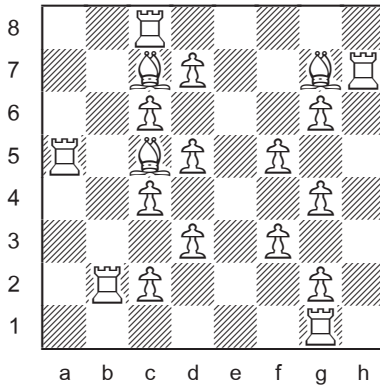24 pieces

(21)

31 solutions

RNP

23 pieces

(18)

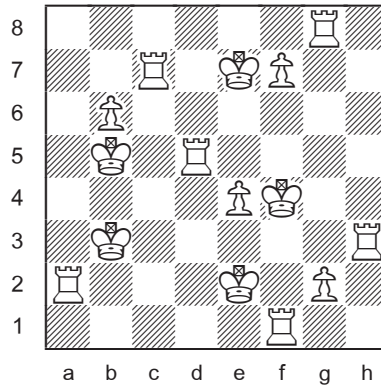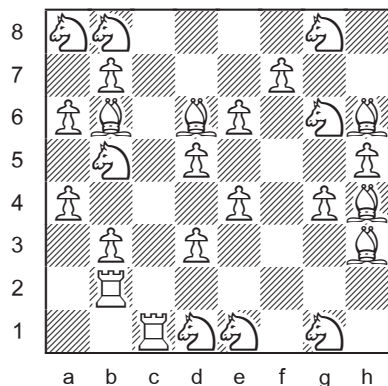unique solution

QNP

19 pieces

(15)

unique solution

RBP

19 pieces

(15)

8 solutions

KRP

15 pieces

(12)

2 solutions

(*Rc7→a7, Ra2→c2*)

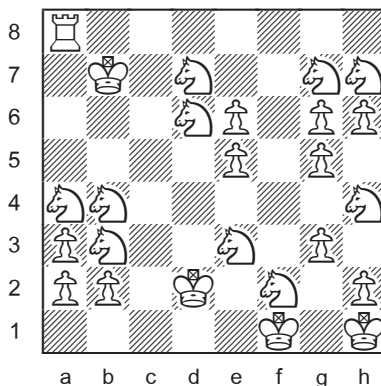# Four-Piece Single Loops with Pawns
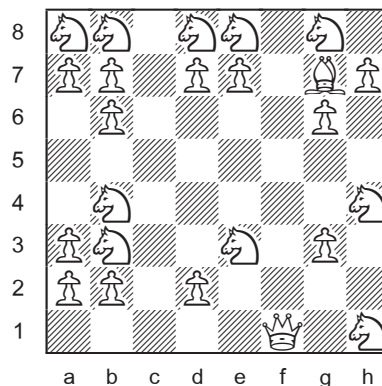
François Labelle 2019
Puzzling Side of Chess

RBNP
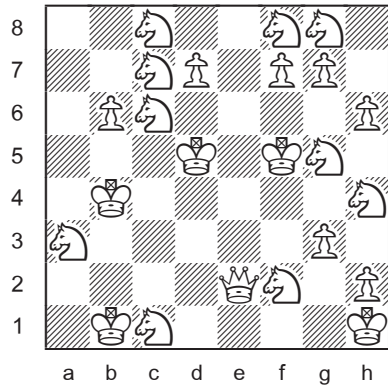
26 pieces

(20 with equal pieces)

81 solutions

KRNP
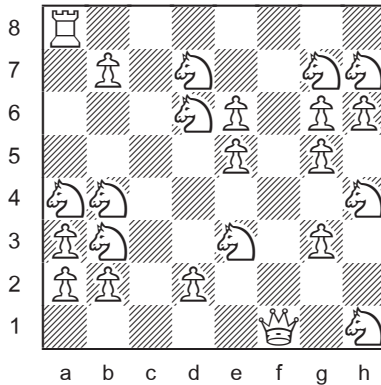
25 pieces

(16)

4 solutions

QBNP

24 pieces

(12)

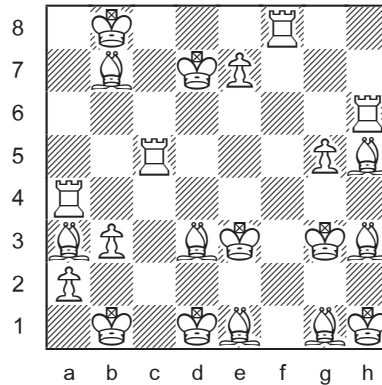36 solutions

KQNP

23 pieces

(12)

35 solutions

QRNP

23 pieces

(12)

2 solutions

(*Nh1→f2*)

KRBP

22 pieces

(20)

2 solutions

(*Bb1 Kg6 Bh6 Kd2
Bd1 Kg4 Bh4 Kf2
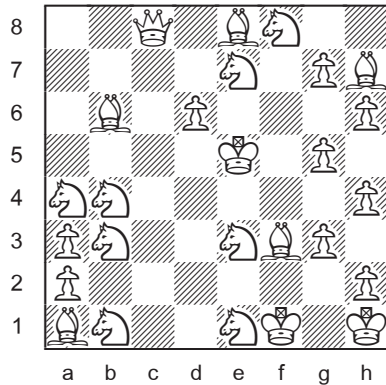Bf1 Kc4 Pb4 Ra5
Ka7 Bb7 Kh1 Bh2
Kd6 Pd7 Re8 Kg8
Bh8 Kb2*)

See column 172 for KBNP (29 pieces).

Five-Piece Single Loops with Pawns

François Labelle 2019

Puzzling Side of Chess

KQBNP

KQRNP

QRBNP

KQBNP	KQRNP	QRBNP
26 pieces	24 pieces	24 pieces
(15 with equal pieces)	(15)	(15)
44 solutions	4 solutions	unique solution
	(Pb7→K and/or Pd2→K)	

The KRBNP single loop (29 pieces) was given in column 172.

Downtown Minneapolis

Maximum Pieces in Single Loop

Black = Equal Number of Each Piece   Orange = Unequal

BN	20		KBN	21	**24**	KRBN	20	**25**	KQRBN	15	**22**
KB	20		RBN	18	**21**	QRBN	12	**20**		
KN	20		KRB	15	**20**	KQRN	12	**20**	KRBNP	20	**29**
RN	16		KRN	15	**20**	KQBN	12	**22**	KQRNP	15	**24**
RB	14		KQN	12	**19**				KQBNP	15	**26**
QN	12		QBN	12	**19**	KBNP	24	**29**	QRBNP	15	**24**
KR	12		QRN	9	**14**	KRBP	20	**22**		
						RBNP	20	**26**	KQRBNP	12	**26**
RP	10	**11**	BNP	24	**26**	KRNP	16	**25**		
NP	8	**14**	KNP	21	**24**	KQNP	12	**23**		
			RNP	18	**23**	QRNP	12	**23**		
			QNP	15	**19**	QBNP	12	**24**		
			RBP	15	**19**					
			KRP	12	**15**					

Until next time!