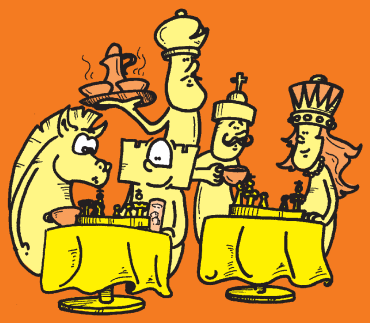


THE PUZZLING SIDE OF CHESS

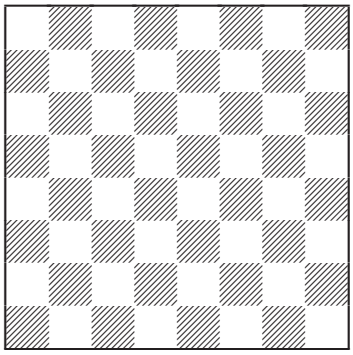
Jeff Coakley

LOOPOLOGY XIV End of the Line

number 198 January 31, 2021

This column concludes the puzzling side of *defensive loops*. It consists of three parts: (1) introductory puzzles, (2) double loops with unequal pieces, (3) loops with the maximum number of a specific type of piece.

Multiloops



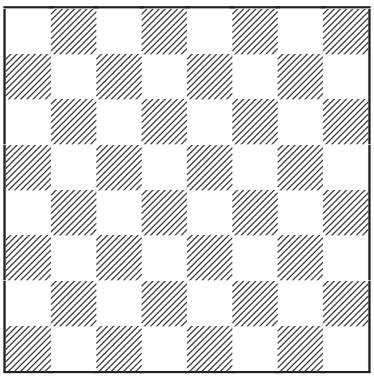
Place the following pieces on the board so that
each white and black group forms an independent single loop.
(Every piece guards exactly one other piece in a continuous chain.)
Pieces in one group may not attack a piece in the other group.
When a group has two bishops, they must be on opposite colours.

A. ♔♕♖♗♘♙ ♚♛♜♝♞♟

B. ♔♕♖♗♗♘♙ ♚♛♜♝♝♞♟

For more multiloops, see columns 181 and 184. The next puzzle is a new kind of multiloop. The groups of pieces in the individual loops are not identical. In this case, three double loops are formed: one with rooks, one with bishops, one with knights.

Mixed Double Multiloops



Place the three groups of pieces (4R / 4B / 4N), so that each group forms an independent double loop. In a double loop, every piece is guarded exactly twice in a continuous chain. Pieces in one group may not attack a piece in another group.

The problems in the remainder of the column aim to maximize the length or the number of specific pieces in loops with unequal pieces. That is, in loops with different numbers of each type of piece. For example, a loop with 10 bishops and 2 pawns.

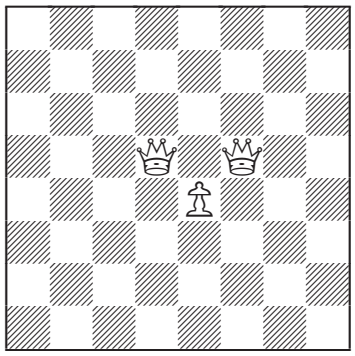
Because of their complexity, finding the optimal solutions for many of the tasks is better left to computers. The problems are included here for the sake of loopological completeness. Thanks to François Labelle for kindly calculating full lists of record positions.

DOUBLE LOOPS WITH UNEQUAL PIECES

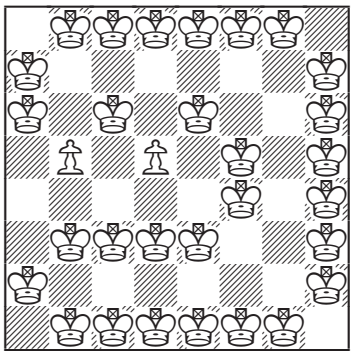
This section features double loops in which there is no requirement for an equal number of each piece. By using different numbers of pieces, records for maximum length can be extended. In all tasks, at least one piece of each designated type must be used. For example, a position with only queens and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

In a double loop, the pieces form a continuous chain of defence in which every piece guards exactly two other pieces. As noted in earlier columns, knights can never be part of a multi-piece double loop.

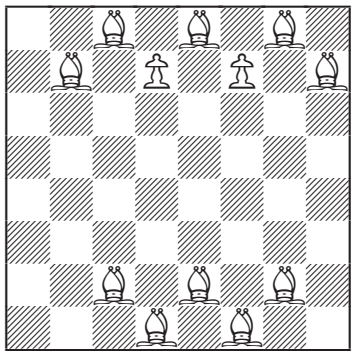
Two-piece double loops with pawns are impossible with an equal number of each piece. But loops with unequal numbers are possible for QP, KP, and BP. However, all three cases are trivial, as shown in these diagrams. Pawns may not be placed on the 1st or 8th ranks.



QP 3 pieces



KP 31 pieces



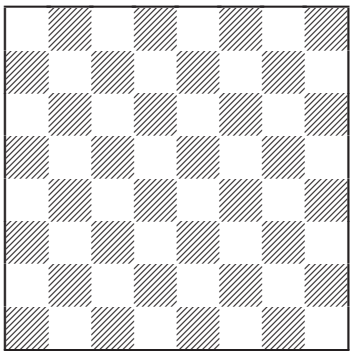
BP 12 pieces

A QP double loop can only have 3 pieces. Double loops with KP and BP have the same patterns as the one-piece loops with 31 kings and 12 bishops, but with one or two pawns substituted for king or bishop. Two pawns are the maximum for both tasks.

Loop of Death / Jesper Tjäder *Norway 2016*

As you will soon realize if you attempt them, most loops in this section that involve kings look a lot like the 31-king position from column 151. For that reason, the tasks without kings are probably more appealing.

The maximum length of a QR double loop with equal pieces (16) can not be increased using an unequal number of each piece. But the length of other two-piece groups can be increased.

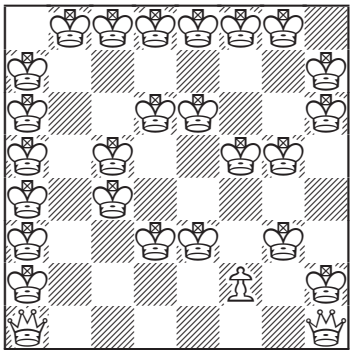


Two-Piece Double Loops

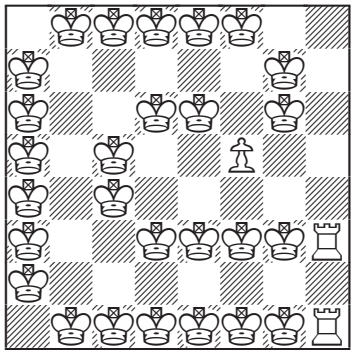
Make a double loop with the maximum number of pieces, using any number of each piece.

A. ♔♗
B. ♔♖
C. ♔♕
D. ♕♗

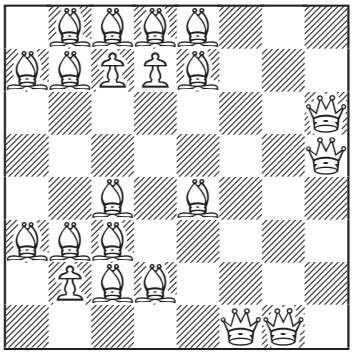
The only three-piece double loop with equal pieces that includes pawns is KBP. With unequal pieces, KQP, KRP, and QBP are also possible. But again the tasks are not interesting. The optimal solutions are simply the corresponding two-piece loops (KQ, KR, QB) with pawns substituted for king or queen. One pawn is the maximum with KQP and KRP. Three pawns are possible with QBP. See diagrams.



KQP 27 pieces

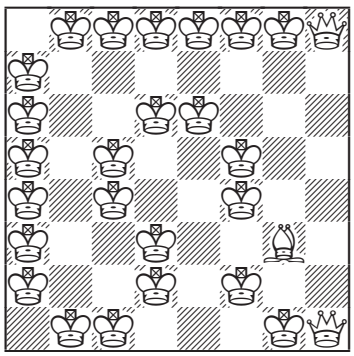


KRP 30 pieces

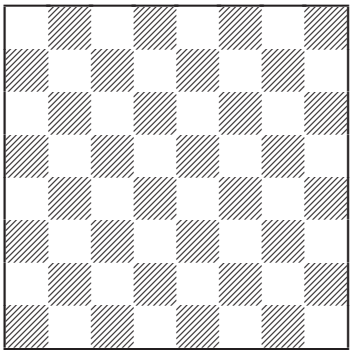


QBP 21 pieces

Also uninspiring is the KQB double loop. The optimal solution with unequal pieces is the same as the corresponding two-piece KQ loop with one bishop substituted for a king. Though it should be said that this pattern is unique.



KQB 27 pieces

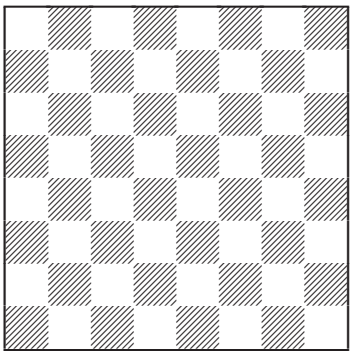


Three-Piece Double Loops

Make a double loop with the maximum number of pieces, using any number of each piece.

A. ♔♗♙
B. ♔♕♖
C. ♔♖♗
D. ♕♖♗

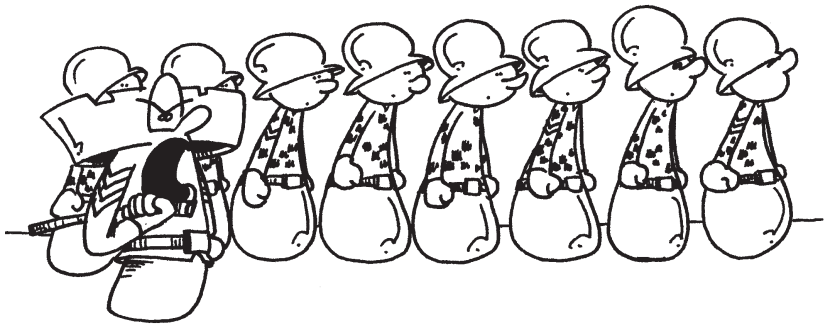
The optimal solutions for the four-piece KQRB and KQRP loops with unequal pieces are identical to the three-piece KQR position except that a bishop or pawn is substituted for the king on b2. That leaves three other four-piece groups to consider. Part D is the five-piecer.



Multi-Piece Double Loops

Make a double loop with the maximum number of pieces, using any number of each piece.

A. ♔♕♗♙
B. ♔♖♗♙
C. ♕♖♗♙
D. ♔♕♖♗♙



Maximum Pieces in Double Loop

Black = Equal Number of Each Piece Orange = Unequal

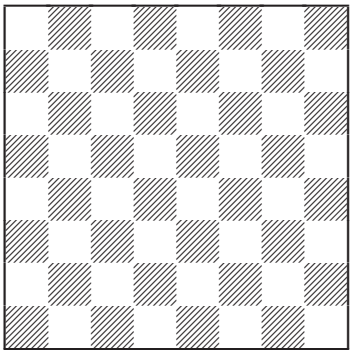
N	32	KB	26	31	KBP	21	31	KQRB	16	29
K	31	KR	22	30	KQR	18	29	KQBP	16	28
R	16	KQ	16	27	KQB	18	27	KRBP	16	30
Q	14	QR	16	16	KRB	18	29	KQRP	0	29
B	12	QB	14	21	QRB	12	19	QRBP	0	20
		KP	0	31	KRP	0	30			
		BP	0	12	KQP	0	27	KQRBP	15	29
		QP	0	3	QBP	0	21			

LOOPS WITH MAXIMUM NUMBER OF ONE PIECE

This section looks at loops which have the most pieces of one type. For example, the record for knights is 32, achieved in a double N loop. The maximum knights in a single loop with equal pieces is 10, using the groups RN or KN. However, with unequal pieces, the number of knights in a single loop can be increased.

The following records are all achieved by loops with equal pieces.
Single loop: 6 queens (QN), 8 rooks (RN), 10 bishops (BN).
Double loop: 32 knights (N), 31 kings (K), 14 queens (Q), 16 rooks (R).

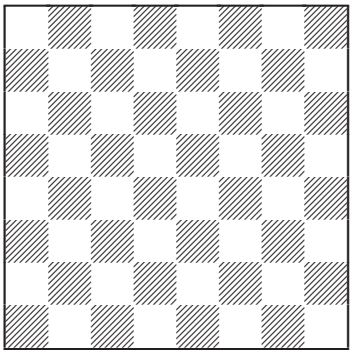
The five tasks below improve on the following equal-piece records:
Single loop: 10 kings (KB, KN), 10 knights (BN, KN), 8 pawns (BNP).
Double loop: 13 bishops (KB), 7 pawns (KBP).
A complete table of records is given on the final page.



Single Loop Piece-Type Maximizer

Make a single loop using any number of any type of piece so that there is a maximum number of the designated piece.

A. ♔
B. ♘
C. ♗



Double Loop Piece-Type Maximizer

Make a double loop using any number of any type of piece so that there is a maximum number of the designated piece.

A. ♕
B. ♗

SOLUTIONS

The total number of solutions stated for various problems does not include reflected or rotated positions that are otherwise identical.

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.

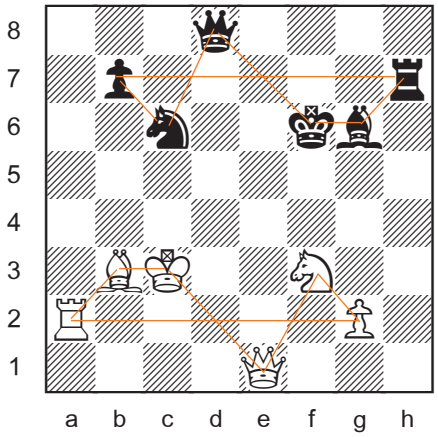
Archives. Past columns and an index of problem-types, composers, and side themes are available in the *Puzzling Side of Chess* archives.

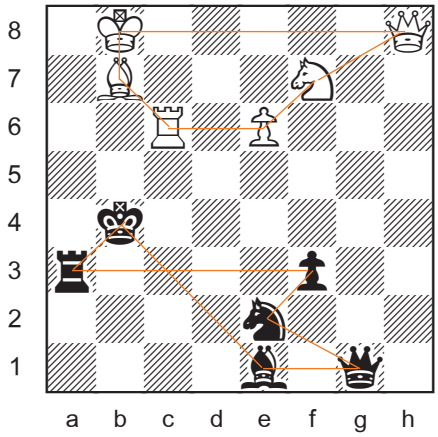
Multiloops

Jeff Coakley 2021

Puzzling Side of Chess

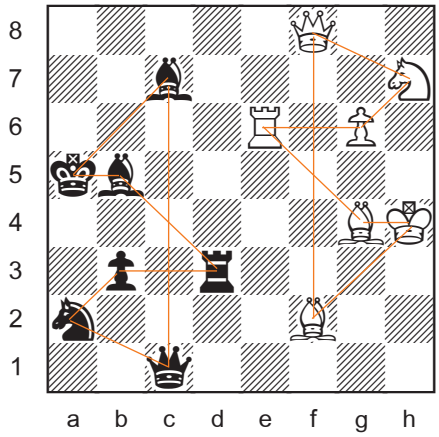
A. KQRBNP





Two of numerous solutions, the first symmetrical.

B. KQRBBNP

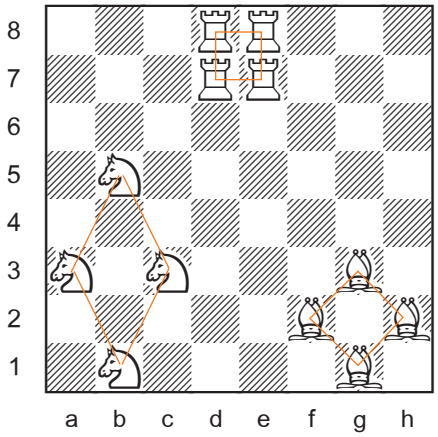


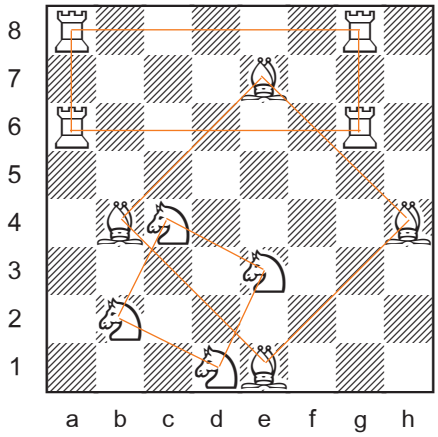
There are many solutions, this one symmetrical.

Mixed Double Multiloops

Jeff Coakley 2021

Puzzling Side of Chess





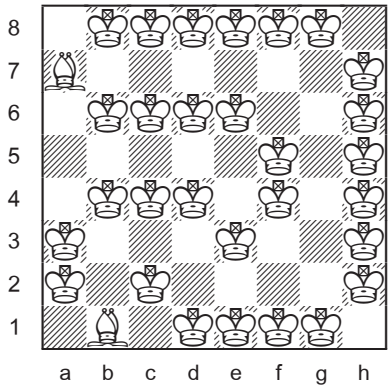
Each position has three independent double loops, the first isolated, the second overlapping.

Sky Calibre Waterslide *Avalanche Mountain*

Two-Piece Double Loops

François Labelle 2021
Puzzling Side of Chess

A. 

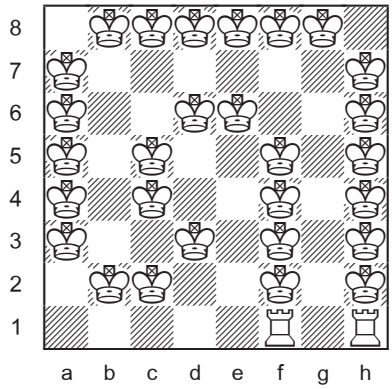


31 pieces
(29 kings, 2 bishops)

8 solutions, all versions of a 31K double loop with one or two bishops substituted for a king.

Record with equal pieces: 26 (column 156).

B. 

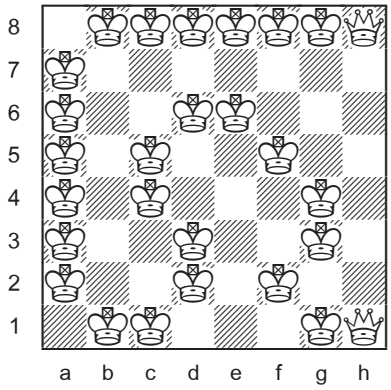


30 pieces
(28 kings, 2 rooks)

There are only 2 solutions. The other is the same position with a king on d4 instead of c4.

Record with equal pieces: 22 (column 156).

C. 

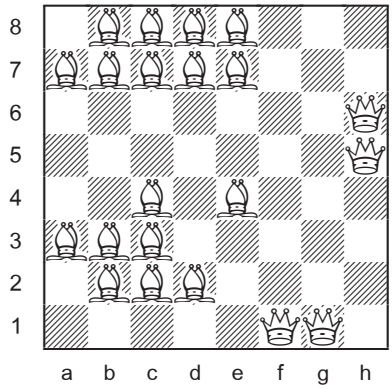


27 pieces
(25 kings, 2 queens)

There are only 2 solutions. The other is the same position with a king on f4 instead of g4.

Record with equal pieces: 16 (column 156).

D. 



21 pieces
(17 bishops, 4 queens)

The solution is unique.

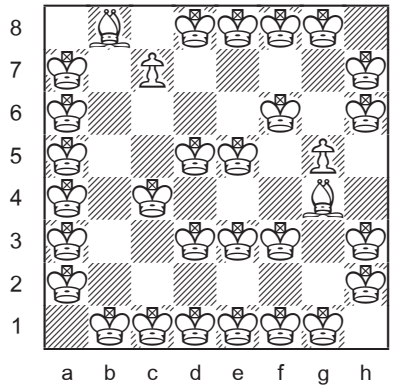
Record with equal pieces: 14 (column 156).

Three-Piece Double Loops

François Labelle 2021

Puzzling Side of Chess

A. ♔♗♙

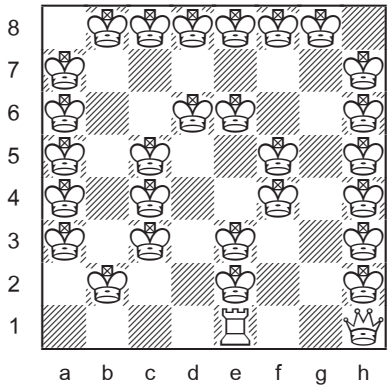


31 pieces
(27 kings, 2 bishops, 2 pawns)

22 solutions. Fifteen have 1B 1P. Three have 1B 2P. Three have 2B 1P. Only this one has 2B 2P.

Record with equal pieces: 21 (column 158).

B. ♔♕♖

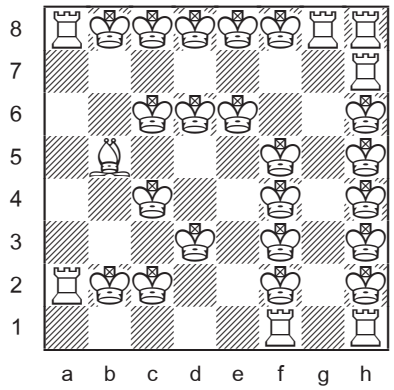


29 pieces
(27 kings, 1 queen, 1 rook)

There are only 2 solutions. The other is the same position with Rf1 Kf2 instead of Re1 Ke2.

Record with equal pieces: 18 (column 158).

C. ♔♖♗

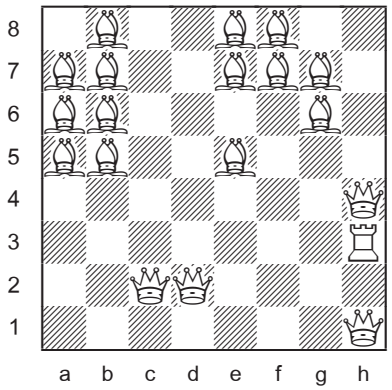


29 pieces
(21 kings, 7 rooks, 1 bishop)

82 solutions. 61 have 2R 1B. 15 have 2R 2B. 3 have 2R 3B. 2 have 6R 1B. This one has 7R 1B.

Record with equal pieces: 18 (column 156).

D. ♕♖♗



19 pieces
(4 queens,14 bishops, 1 rook)

2 solutions. The other is R: c8 Q: h1 e8 c7 h6 B: g2 f3 d5 b3 a4 b5 g3 f2 d4 b2 a3 b4 d2 g5

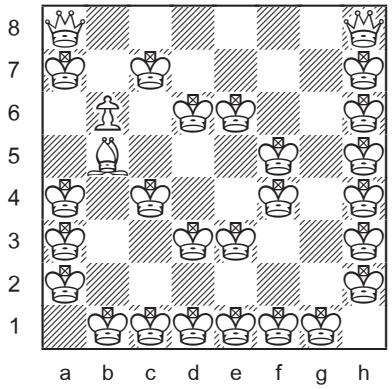
Record with equal pieces: 12 (column 156).

Multi-Piece Double Loops

François Labelle 2021

Puzzling Side of Chess

A. ♔♕♗♙

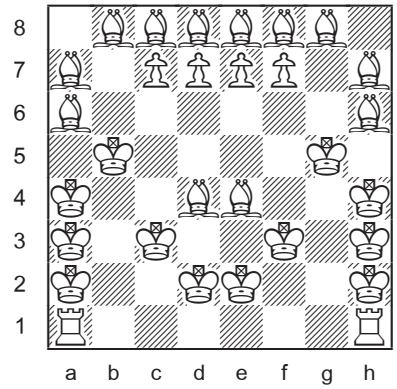


28 pieces
(24 kings, 2 queens,
1 bishop, 1 pawn)

2 solutions. The other is the same position with a bishop on c7.

Record with equal pieces: 16 (column 160).

B. ♔♖♗♙

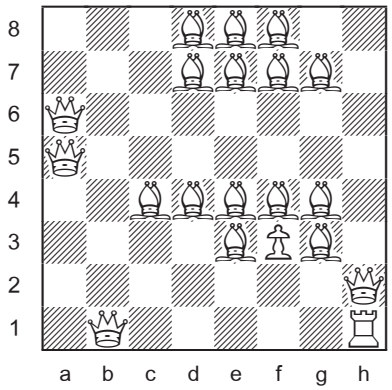


30 pieces
(12 kings, 12 bishops,
4 pawns, 2 rooks)

Unique and symmetrical!

Record with equal pieces: 16 (column 160).

C. ♕♖♗♙

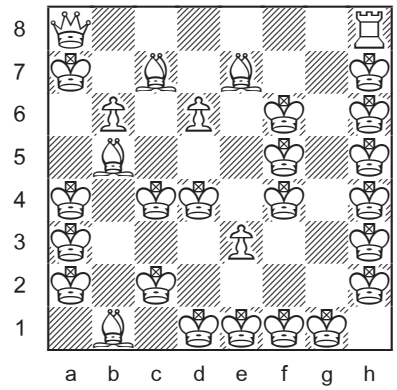


20 pieces
(4 queens, 1 rook,
14 bishops, 1 pawn)

4 solutions. The other three are the same position with a pawn on e3 and/or e7.

A double QRBP loop with equal pieces is impossible.

D. ♔♕♖♗♙



29 pieces
(20 kings, 1 queen, 1 rook,
4 bishops, 3 pawns)

57 solutions, all with 1Q 1R. This position has the maximum pawns (3) and bishops (4).

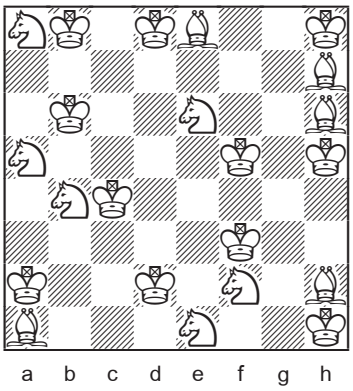
Record with equal pieces: 15 (column 160).

Single Loop Piece-Type Maximizer

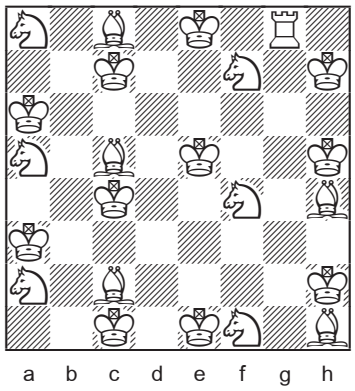
François Labelle 2021

Puzzling Side of Chess

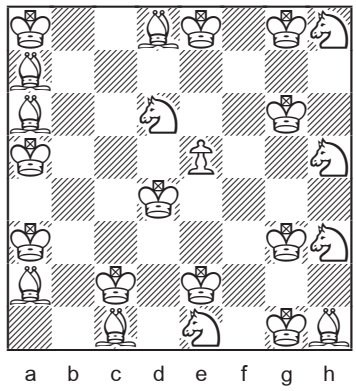
A. ♔



KBN 22 pieces
11 kings



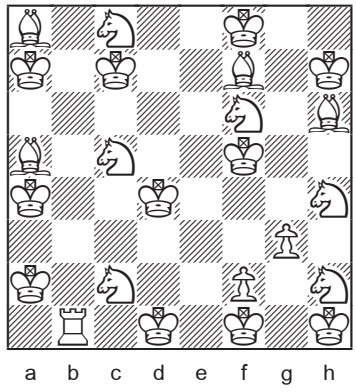
KRBN 23 pieces
11 kings



KBNP 23 pieces
11 kings

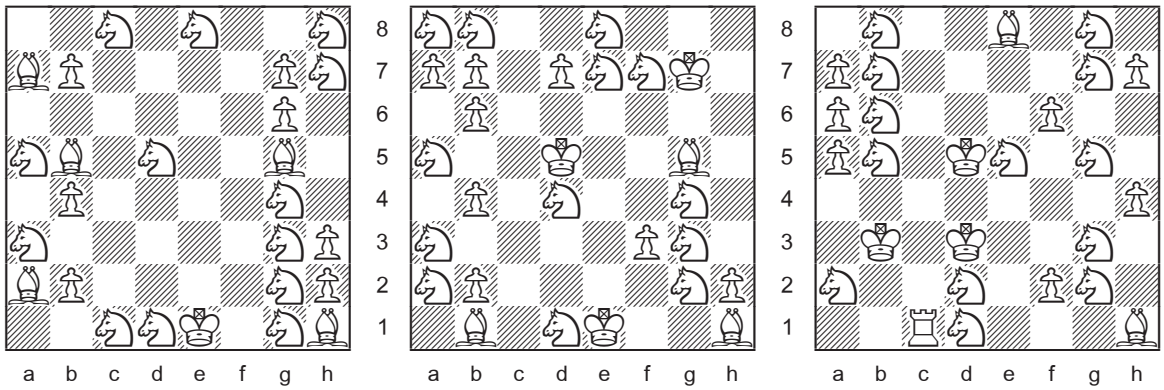
There are a total of 72 solutions (5 KRBNP, 23 KRBN, 3 KBNP, 41 KBN) with 22 to 24 pieces. The most economical are the eight KBN positions with 22 pieces.

When was the last time you did a loop? Not a chess puzzle. An actual physical gravity-defying loop. Mine was a few years ago on the *Big Apple Coaster* in Las Vegas, high atop the New York-New York casino.



KRBNP 24 pieces
11 kings

B. ♘



KBNP 26 pieces
13 knights

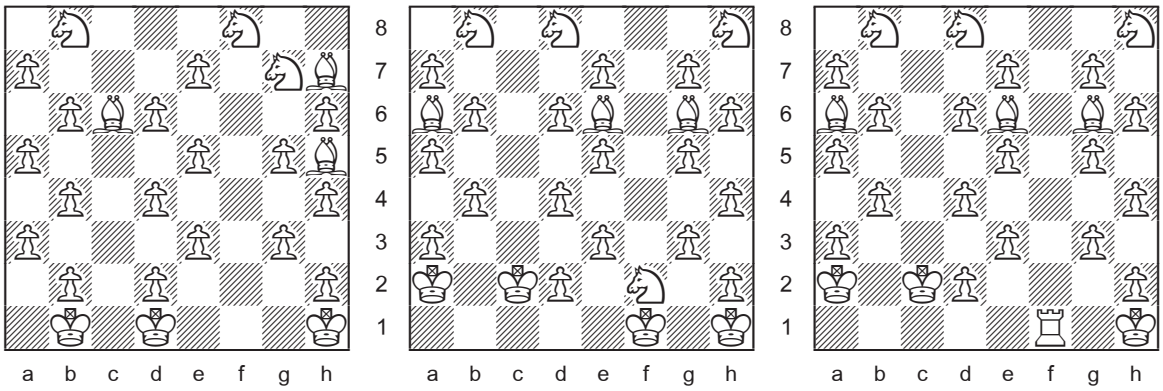
KBNP 27 pieces
13 knights

KRBNP 26 pieces
13 knights

There are 14 solutions (10 KBNP, 4 KRBNP) with 26 or 27 pieces.

Aqualoop *Slovenia*

C. ♙



KBNP 26 pieces
17 pawns

KBNP 28 pieces
17 pawns

KRBNP 27 pieces
17 pawns

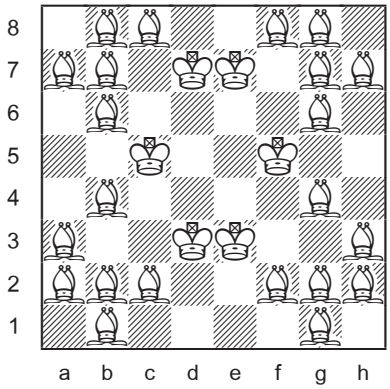
These are the only 3 solutions. The first is the most economical, the second the longest. The third includes a rook.

Jaguar stunt loop *Shanghai 2017*

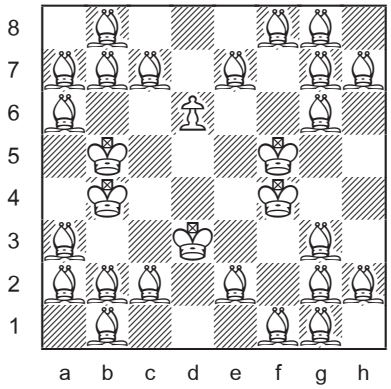
Double Loop Piece-Type Maximizer

François Labelle 2021
Puzzling Side of Chess

A. ♗



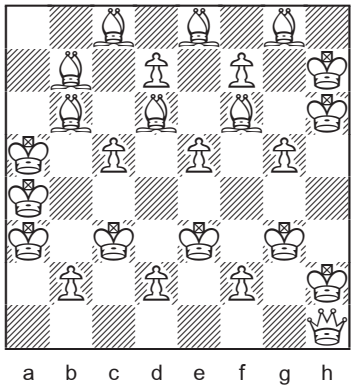
KB 28 pieces
22 bishops



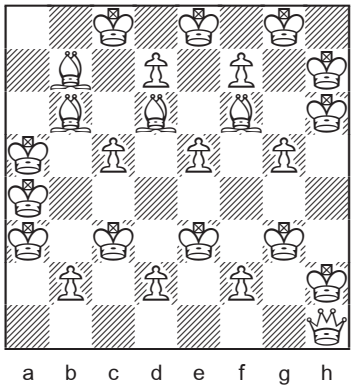
KBP 28 pieces
22 bishops

These are the only 2 solutions. The first is symmetrical.

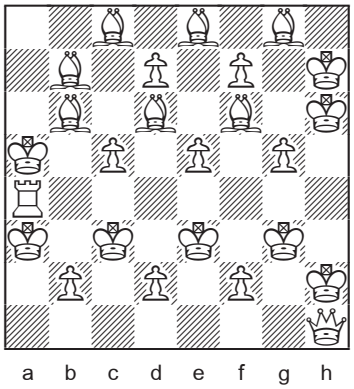
B. ♙



KQBP 25 pieces
8 pawns



KQBP 25 pieces
8 pawns



KQRBP 25 pieces
8 pawns

There are 16 solutions. The only differences are the type of piece on a4, c8, d8, g8. Is a king more economical than a rook or bishop?

Maximum Pieces of One Type

	Single Loop		Double Loop		
♘	13	KRBNP, KBNP unequal	32	N	(column 140)
♔	11	KRBNP, KRBN, KBNP, KBN unequal	31	K	(column 151)
♖	8	RN equal (column 86)	16	R	(column 155)
♕	6	QN equal (column 143)	14	Q	(column 59)
♗	10	BN equal (column 162)	22	KB unequal	
♙	17	KRBNP, KBNP unequal	8	KQRBP, KQBP unequal	

Loop the Loop *Atlantic City 1901*

Until next time!