THE GAMES AND PUZZLES JOURNAL

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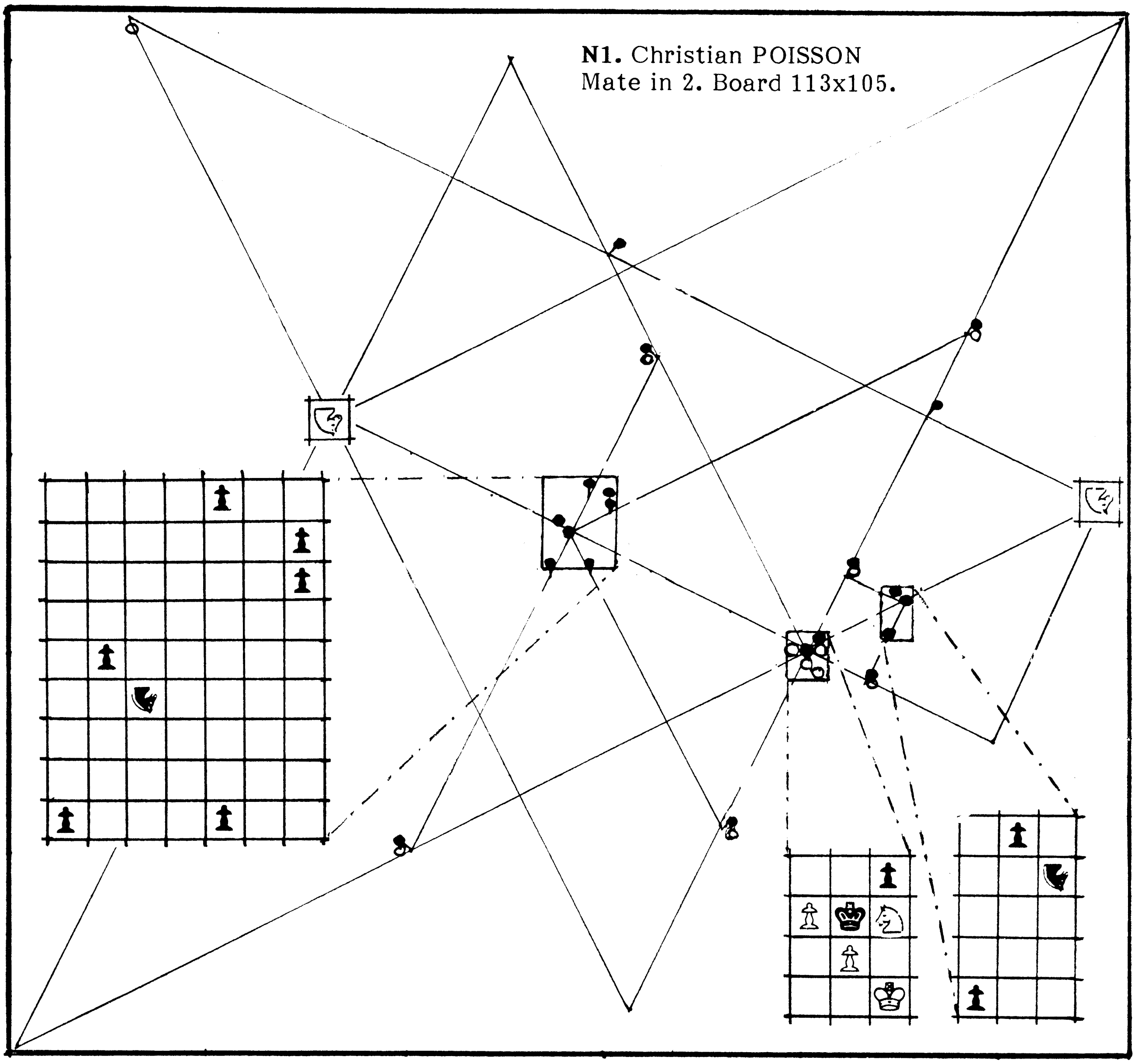
T.R.Dawson Centenary Nightrider Tourney

The deadline for this tourney is extended by a further six months to end of May 1990. It is for direct-mate two-movers with Nightriders on boards of any size. Other straight-line riders may also be employed (including composites such as Rook+Nightrider). Some other examples will be found in my article 'Notes on Generalised Chess' in Variant Chess issue 1.

N1. Christian POISSON
Mate in 2. Board 113x105.



N1. The pieces and the squares occupied are as follows: White: K(82,39), N(33,65), N(111,56), S(82,41), P(13,104), P40,21), P(65,71), P(73,23), P(80,41), P(81,40), P(86,49), P88,38), P(98,73). Black: K(81,41), N(57,53), N(91,46), P(40,22), P(55, 50), P(56,54), P(59,50), P(59,58), P(61,56), P(61,57), P(62,82), P(65,72), P(73,24), P(82,42), P(86,50), P(88,39), P89,43), P(90,47), P(94,66), P(98,74). The P(61,57), added by the editor, stops the cook 1P=B for 2B-(79,39)‡ It could also be placed at (59,59), which the composer preferred - but I'd already drawn the diagram!

Publishing Programme

GAMES AND PUZZLES JOURNAL

The journal will be published QUARTERLY in 1990. In fact only four issues will have appeared for 1989 also. It has not proved possible to catch up on schedule. Issue 12 will complete 1989 and Volume 1. Issue 13 will start 1990. Both will appear in January. Price will remain at £1($2) per 16-page issue, £4($8) annually.

VARIANT CHESS

Most of the Chess items - games and problems -in G&P Journal will be transferred to this new QUARTERLY magazine. [Chess-related mathematical questions will remain in the Journal.] First issue, out in December for the first quarter of 1990, will be 12 pages, price 75p($1.50) or subscription £3($6) for the four issues of 1990.

Subscribers who have paid in advance may transfer their subscription to Variant Chess if preferred, or claim a refund, or spread it over both, or carry on with G&PJ alone.

Professor Cranium

'Dash' who drew the cartoon strip in the first issue is willing to draw some more if a script-writer can be found who will write the jokes. Any offers? A sketch of background/motivation is available.

Hubert Phillips

Alan Parr wrote: 'I notice the mention of Hubert Philips/Caliban. It has occurred to me before that he deserves to be better remembered than seems likely to be the case - as a broadcaster, games inventor/writer, puzzle composer, humorist (another pen name was Dogberry), poet, journalist, and no doubt much more besides.

I wonder if any of your readers knows any more about him? I can recall him broadcasting regularly ("Round Britain Quiz") & have a number of his collections, but perhaps he lived at just the wrong time to have the same sort of impact as Martin Gardner. Such an interesting life really merits a biography, but at least it would be nice to know a little bit more about him.' [22 viii 89].

I wrote to The New Statesman, asking if they had any information about Hubert Philips, and if it was OK to reproduce the Eddington problem. I received a phone call confirming the latter, and the information that their Archives are now lodged with the City University, but that's as far as I've got.

Eddington's Cricket Problem

The following is an extract from the score of a cricket match between Eastershire and Westershire:

EASTERSHIRE: Second Innings	
A.A.Atkins	6
Bodkins	8
D.D.Dawkins	6
Hawkins	6
Jenkins (J.)	5
Larkins	4
Meakins	7
Hon.P.P.Perkins	11
Capt.S.S.Simkins	6
Tomkins	0
Wilkins	1
Extras	0
Total	60

Bowling Analysis:

	Overs	Mdns	Runs	Wkts
Pitchwell	12.1	2	14	8
Speedwell	6	0	15	1
Tosswell	7	5	31	1

The score was composed entirely of singles and fours. There were no catches, no-balls, or short runs. Speedwell and Tosswell each had only one spell of bowling. Pitchwell bowled the first over, Mr Atkins taking first ball. Speedwell was the other opening bowler.

Whose wickets were taken by Speedwell and Tosswell? Who was not out? What was the score at the fall of each wicket?

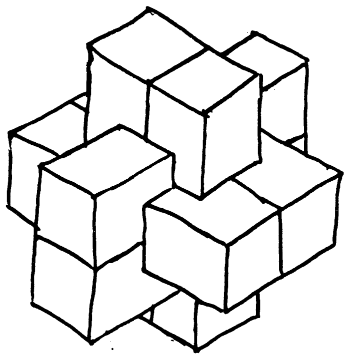
Enigmas

For those (overseas) readers who may not have heard of 'Round Britain Quiz' the questions asked were of the sort I like to call Enigmas - that is questions requiring some obscure specialised or 'in' knowledge in order to answer them completely. Often they would be similar to an extended clue in a cryptic crossword - 'Cryptic Quiz' would have been a more descriptive title. Examples are invited from readers - preferably original. Here is an effort of my own:

Enigma 1. What may be described as:
Pleonastically, a tree:
Theologically, a grievous fault:
Futuristically, a means of transport.

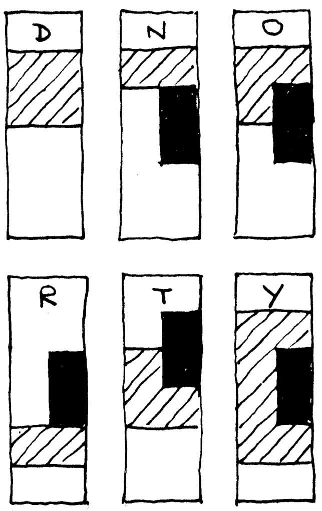
The DNORTY Puzzle or Chinese Cross

This is one of the three-dimensional wooden puzzles made by the Pentangle company. It consists of six grooved pieces that fit together to form a three-dimensional 'cross' or 'burr':



The pieces bear the impressed letters D, N, O, R, T, Y, whence the name of the puzzle. The company also makes a 'Cross Compendium' which contains 42 different pieces, lettered A - Z and AA - PP (if my memory is correct) from which six pieces may be selected to form the above burr in 314 different ways. This set comes in a presentation case and accompanied by an explanatory booklet 'The Chinese Cross' by the appropriately named C.A.Cross.

The DNORTY puzzle consists of six pieces selected from this set. These pieces are cut as follows, where the black areas represent a hole cut all the way through the wood, and the shaded areas a cut of half this depth.



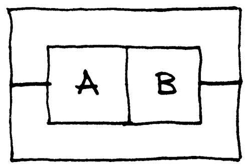
Evidently pieces N and R are reflections of each other (enantiomorphous). The same is true of O and T (as becomes evident if T is rotated to the left), the letter T being impressed on the wrong (outer) face of the piece.

There are six solutions, the pieces being paired together as follows:

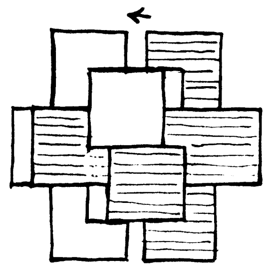
1. DN-OR-TY
2. DR-NT-OY
3. DO-NR-TY
4. DO-NT-RY
5. DT-NR-OY
6. DT-NY-OR

Apart from the T the letters always face 'inwards' so that they are not visible in the final construction.

When placing two pieces together, always ensure that there is a gap in each of the areas A and B shown below (to ensure that a piece can pass through each):



In the last move of construction, three or four of the pieces can be held fixed while the others slide into place together, e.g.:



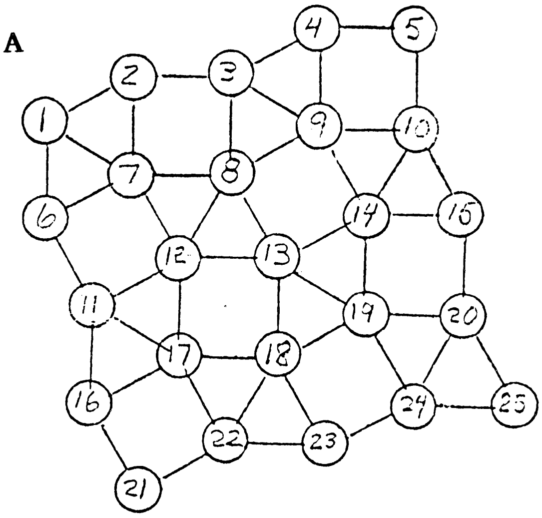
The puzzle is supposedly of ancient Chinese origin, and has an extensive literature of mathematical analysis. This particular set of six pieces has been selected I should think because they are all different, and they give a number of different solutions, thus adding variety, and reducing the difficulty slightly - though it is still not easy for anyone new to it.

ZigZag Square Solitaire

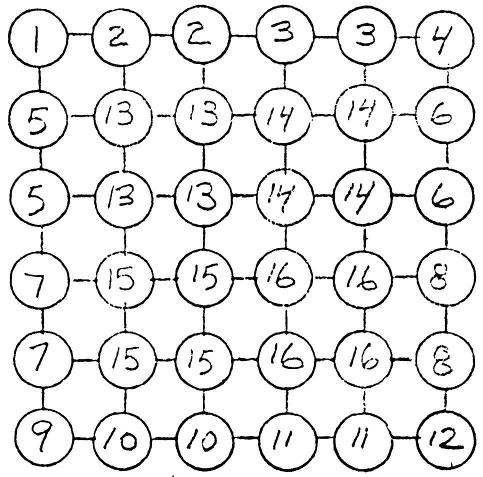
By Leonard J. GORDON

[Following on from"Leapfrog Solitaire" in last issue]: I now introduce a game pattern of my own. It has GPJ's criterion [of all cells being accessible in Leapfrog moves] plus something else. You can choose alternate cells to land on after a jump. Play as in ordinary solitaire. Jump along "straight" lines only. "Straight" is defined as having no more than a 30 degree bend. Jump 1-8, or 1-12, or 7-9, but not 7-13. A solution is: 15-13, 12-14, 5-15-13, 3-10, 1-3-12-14, 11-1-8, 25-15-5-3-13-18, 24-22-13-15-24-13. (10 moves)

A

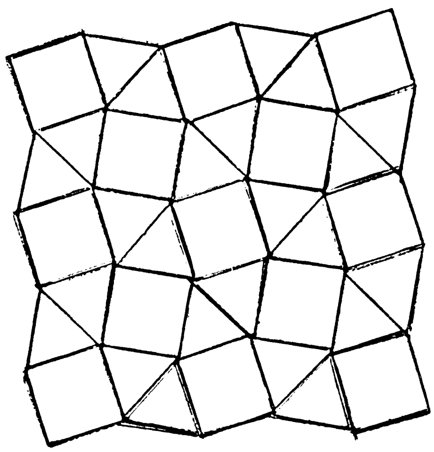


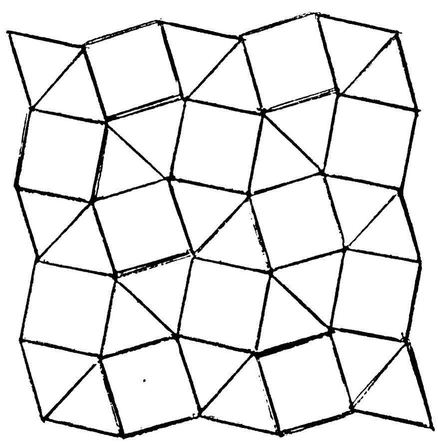
B



There is only one possible 25 cell zigzagged square board - as illustrated above (A). The game gets interesting when we extend to 36 cells. For regular solitaire, on a 6x6 board, there is a neat proof of the minimum moves needed for solution. Divide the board into 16 zones as shown above (B). One jump must start from every zone in order to clear the board. This is not an easy puzzle, but John Harris, Harry Davis and Wade Philpott among them have demonstrated theoretical 15 or 16 move minimum solutions for all possible openings.

Len Gordon (21 ii 1989)





The zone theory does not apply to the zizgzag boards shown. Harris found the following 14 move solution to the one on the left. He is sure it can be improved. Neither of us has tried the right field yet.

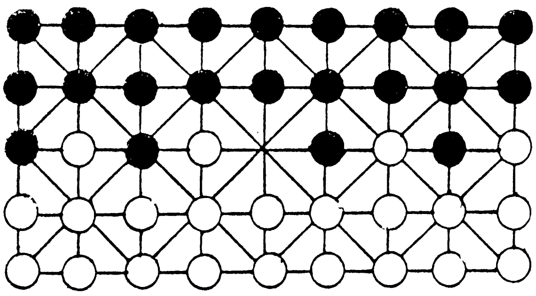
Len Gordon (9 iii 1989)

31-33, 34-32, 36-34, 19-31-33-35, 24-36-34, 23-35-33, 12-24, 21-23, 7-19-21, 10-22-20-32-34-22, 8-20, 3-16-14-26-28-16, 6-10-22-30-18-16, 1-3-5-17-15.

Fanorona & The Swordsman

By G.P.JELLISS

In Bell's Board and Table Games from many Civilisations, vol 2 (1969) and also in Murray's History of Board Games other than Chess, there are descriptions of an old Madagascan* game called Fanorona. This game is played on a board 5x9 with the opening position shown. All the moves are single steps along the lines of the board.



R.C.Bell says that the game developed from Alquerque (from which Draughts also in part derives) about 1680.

In this game, a piece captures another by moving into a position adjacent to it or by moving out of a position adjacent to it; in each case the move being in a straight line with the victim. As well as the victim, all other enemy pieces beyond him and in unbroken succession in a straight line are captured at the same time. Further, captures are compulsory, as in Draughts, and each capture entitles the player to continue capturing with the same piece; provided each capturing move is along a different line.

Michael Keller's World Game Review No 4 reviewed a book on the game: Fanorona - The National Game of Madagascar by J&S Chauvicourt, translated by Leonard Fox, and published by The International Fanorona Association, 278A Meeting St, Charleston, SC 29401, U.S.A. (1984, $4.75).

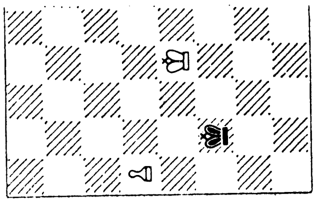
*The correct term is Malagasy [L.Fox].

At the recent Bournemouth BCPS/FIDE chess problem meeting I obtained joint second prize in the New Ideas Tourney (one of the events celebrating T.R.Dawson's centenary) with a 'Swordsman' composition. The Swordsman is a chess piece that moves like a King but captures in accordance with the rules underlined in the above account of Fanorona.

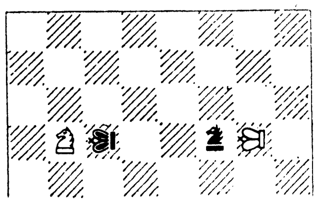
The Swordsman is a 'Baroque' piece - that is, it does not capture by the usual chess method of 'eviction' in which the capturer moves to the square occupied by the victim.

My first experiments with the Swordsman date back to April 1974, and I give here two simple examples that I showed round the Fairy Chess Correspondence Circle then.

S1. G.P.J. Original (Composed iv 1974) Swordsman & Royal Swordsmen. Series helpstalemate in 10.



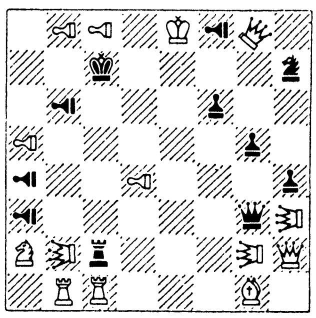
S2. G.P.J. Original (Composed iv 1974) Knights & Royal Swordsmen. Help‡3 (2 solutions).



And here are some 'Battles Royal' using only two Royal Swordsmen:

S3. G.P.J. Original. Black a8 White d4. (a) Mate in 3, (b) Helpmate in 2.
S4. G.P.J. Original. Black h3 White g1. (a) Stalemate in 6, (b) Mate in 6, with two ways on White's 5th move, (c) Grace-mate in 7, this means that White's mate must be preceded by a Black move that declines to mate White!

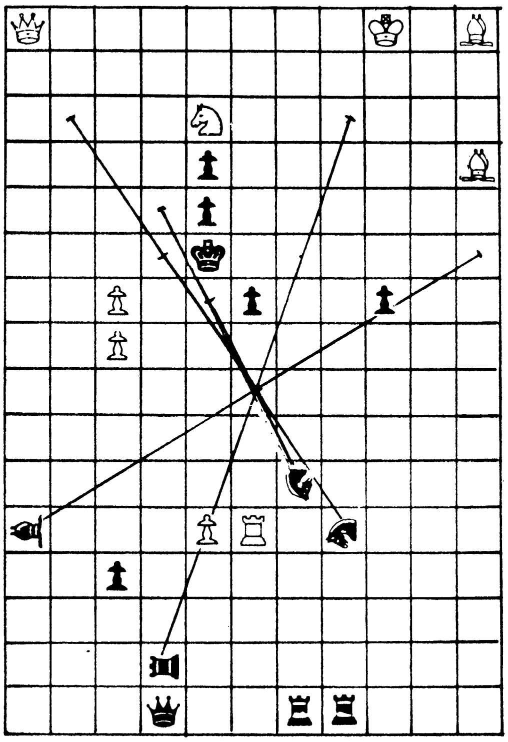
Solutions: (using N for Knight, S for Swordsman, RS for Royal Swordsman): **S1:** 1-10RS f2-g3-h4-g5-f6-e7-d6-c5-b4-c3-d2 for Sc1=. **S2.** 1Nf-d4 Nc3 2RSd6 RSg6 3RSe5 RSf6‡ & 1Nf-d6 Nc7 2RSd4 RSg4 3Rse5 RSf4‡ The second solution reflecting the first in rank 5. Change of axis of symmetry, orthogonal to diagonal. **S3.** (a) 1RSd5 RSa7/b8 2RSc6 RSb8/a7 3RSb7‡ (b) 1RSb7 RSc5 2RSa6 RSb6‡. **S4.** All three parts begin: 1RSg2+ RSh4 2RS g3+ RSh5 3RSg4+ RSh6 4RSg5+ RSh7 then: (a) 5RSg6+ RSh8 6RSf7=, (b) 5RSg6+/RSf6 RSh8/RSg8 6RSg7‡, (c) 5RSg6+ RSh8 6RSh7+ (now Black can mate by RSg7‡ but instead: RSg8 7RSg7‡. [Note that in the position with the swordsmen on g8,h7 either to play mates!



FOR SOLVING.

S5. G.P.J. Bournemouth New Ideas Tourney 1989 Mate in 2. Amazon (Q+Knight) g8 Lions b2, g2, h3. Swordsmen (4+4)

Lions hop over one man to any distance beyond and capture by eviction.



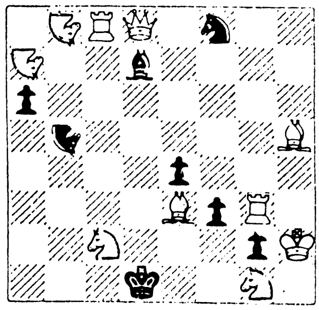
N2. Romeo BEDONI
Mate in 2. Board 11x16.

g6 = (1,2)R d2 = (2,6)R
h5 = (2,3)R a5 = (3,5)R

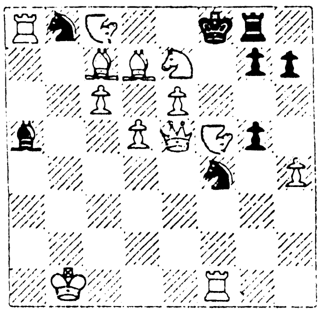
T.R.Dawson Centenary Nightrider Tourney

This tourney is extended to the end of May 1990.
I hope other journals will give it more publicity.
Some excellent compositions have been received.

N3. Edgar HOLLADAY
Mate in 2.



N4. Marcel SEGERS
Mate in 2.



Solutions to Chess Problems - Issue 10(March-April 1989)

117. GRUBER. 1Sc2 Kg4 2Se3 Kf3 3Sc4 Kg2 4Sd2‡ Ingenious N-S batteries [A.W.I.] Apart from the Nightriders, a little orthodox idea [E.B.]

118. WIDLERT. 1Qh7 (Ke5 2Qf7 Kf4 3Qg6 Ke4 4Qe6‡) (Kf4 2Qh5 Ke5 3Qg6 Ke4 4Qg4‡) Thanks for the hint! [A.W.I.] Diagram position repeated twice, but with different continuations [K.W.]

119. STEUDEL. 1b8=R Kb8(Ra1) 2Kd6 Kc8 3Ra8‡ Very simple, and Circe is only needed for promotion [E.B.] Possible twin: d5-b5 & c6-e6 for 1b8=Q. [A.W.I.]

120. OLAUSSON. 1MBc2 Qh8 2MBxa1 Qxa1‡ 1MBb6 Qh8 2MBa8+ Qxa8‡ 1MBa7+ Qb7 MBb5+ Qxb5‡. MB well exploited [D.N.]

121. BOGDANOV & VLADIMIROV. 1Bxd5 Qf7 2Kxd6 Qe7‡ 1Be5 Rxc6+ 2Kxd5 Qxf3‡ and 1cxd5 Rb6 2Kc4 Qc1‡

122. BARTEL. 1Ra3 Kc2 2Kb3 Rc3‡ and 1Rc1 Kb3 2Kc2 Rc3‡ Simple and symmetrical.

123. EBERT. (a) 1Ke6 f4 2Kf7 f5 3Ee8 f6 4Kg8 f7+ 5Ke8 f8=Q+ 6Eg8 Qh6‡
(b) 1Kd4 f4 2Ef7 f5 3Eb1 f6 4Kc3 f7 5Kb2 f8=Q 6Ka1 Qa3‡ Well known but nice echo [E.B.]
I think we can get mate in all four corners by moving E to b2 for zeroposition. Then:
(a) b2-g2 (b) b2-b8 (c) b2-f1 (d) f3-c3. Would Dr Ebert consider this an improvement? [A.W.I.]

124. INGLETON. 1Ke2 Kd3+ 2Kd1 Ke3 3Kc2 Ke2 4Kd3+ Kd1 5Ke3 Kc1 6Ke2Kc2 7Ke3 Kd3‡ (Set WKd3‡) Imitator seems to intimidate solvers. Remarkable double circuit. [G.P.J.]

125. INGLETON. 1Sa7 Kb2(Pb7) 2Pb6 Ka3 3Ka4(Bf1) Bg2 4Ka5(Bc1)+ Ka6 5Be3 Ka7(Sb8)‡ Very difficult. White cannot play 1...Ka3+ because this is also self-check.

126. BARTEL. 1Kf3 f8=NS 2NQe5 exf8=NR(NSg1)‡ and 1Kd3! e8=NB 2NQb2 fxe8=NQ(NBf1)‡ Neutral AUW. Impossible-looking double-check mates [G.P.J.]

127. WIDLERT. 1Rg1 Kf4 2e1=NR NRa1 3Rb1 Kg3 4b2 NRxb1‡ Neat underpromotion [A.W.I.] Clearance and switchback by the Black Rook. Standard NR mate. [G.P.J]

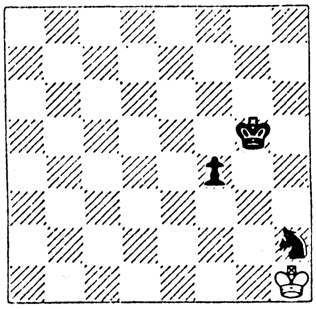
128. GRUBERT. (a) 1Re4 Rg6 2Bf4 Sh4‡ (b) 1Re6 Rg4 2Be5 Se3‡ Pretty Echo. [G.P.J.]

129. GRUBERT. (a) 1Re5 Se2+ 2Ke4 f4 3Rf5 Bxg2‡ (b) 1Re4 Bxg2 2Rc4 f4+ 3Kd4 Sb3‡ and (c) 1Kd4 Sd3 2Rc1 Bxg2 3Rc4 e3‡ Ideal mates with cylcical effects [H.G.] Not easy.

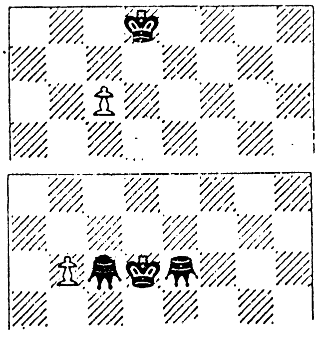
130. BORODATOV. (a) Retract Sc6x(S or B)d8+ Play exd8(Q or R)‡ (b) Retract Sc6-d8+ and Play Sa5‡ (c) Retract c7xSd8(S)+ Play cxb8(Q or R)‡ (d) Retract d7-d8(S)+ Play Qf3‡ Author's error: twin (b) should be Ra3 to f4 not c4, otherwise (a) also works in (b). Four distinct types of retraction move at d8. Motto "Flag 2" was missed out.

Caissa's Kaleidoscope - Judge for 1989-1990 Denis BLONDEL

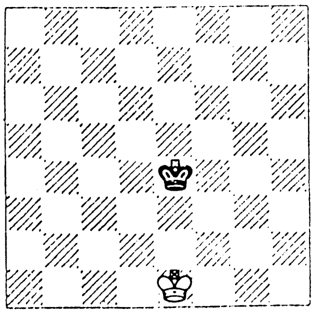
133. Hilmar EBERT
Black must check.
Reflexmate in 4
(b) h2 to h5



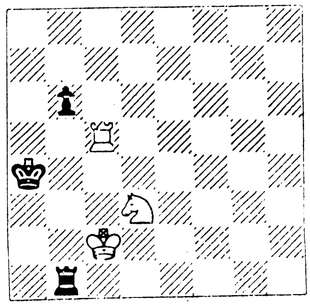
134/5. H.EBERT
Captureless Play
134: H‡3 (b)Pd6 (c)Pe6
135: H‡2½(3 var) No+s



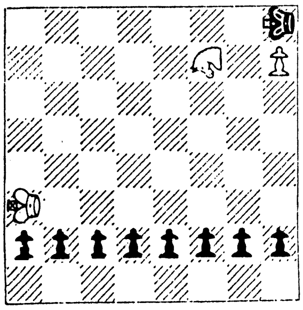
136. Peter WONG
Kamikaze Circe (RI)
W & B retract 1 move
for Helpmate in 1



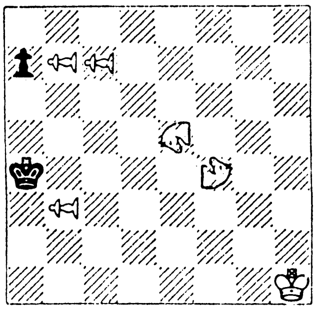
137. E.HOLLADAY
Helpmate in 2½
(b) b6 to b4
Circe



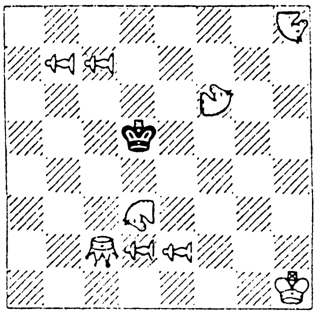
138. Th. STEUDEL
Helpstalemate in 9
Circe
Royal Wazirs
Camel f7



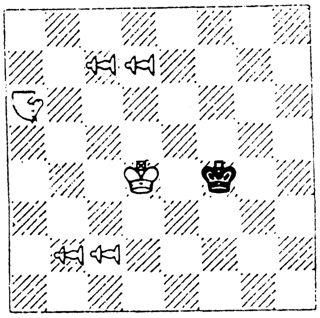
139. Erich BARTEL
H‡2 (2 ways)
Circe & Neutrals
N.Camel e5
N.Giraffe f4



140. Erich BARTEL
Helpmate in 2
Circe & Neutrals
NNh8, NZf6
NCd3, NGc2



141. Erich BARTEL
Helpmate in 2
Circe Malefique
Nightrider a6
Neutral Pawns



Notes for Solvers. Solvers are asked also to solve and comment on the Nightrider tourney problems N1-N4. I have drawn in some of the lines of action on the larger boards to help. The stipulations for **133-135** in German are: Schachzwang, Ohneschach, and Ohneschach+ Ohneschlag. In **135** the initial White move is the same in all three solutions. In Kamikaze Circe, Rex Inclusive, both capturing and captured men are removed and reappear on their home squares if vacant (but if captured at home, this does not mean that a piece returns there after its capturer has gone!). In Kamikaze retraction play the number of pieces on the board can increase remarkably quickly! In Circe +Neutrals a Neutral captured by W returns to a Black home square, and vice versa. In Circe Malefique pieces reappear on the home squares of the opponent (but remain the same colour), thus a Neutral captured by W in this case reappears at a W home square. The Nightrider in **140** is Neutral, but that in **141** is White. Solutions to reach me by 15th January 1990.

In future this competition will be transferred to Variant Chess. G&P Journal will concentrate on the more mathematical chess items.

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131. HOLLADAY. (a) 1Bb3 Bxb3 2eKd3 Kf3= (b) 1Bg5 fxg5 2dKe5 Bc5= (c) 1Bb5 Bxb5 2eKd5 Kf4= Exact echo ideal stalemates.

132. HOLLADAY. 1Kf3 Ke6 2f5+ Kd5 3Kf4= and 1Sg4 K5-c4 2Kf3 Kc-d3 3Se3=. Exact echo ideal stalemates [E.H.] Like clockwork but satisfying [D.N.] Superb [E.B.] Rectangle.

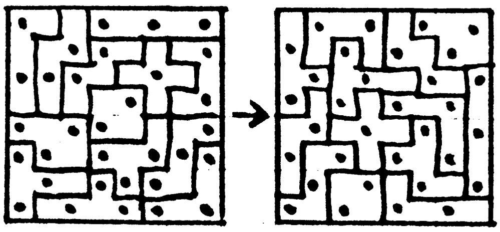
Solvers scores: S.Pantazis 31, A.W.Ingleton 30, D.Nixon 27, Erich Bartel 20. (Maximum 32).

Bodged Chessboards

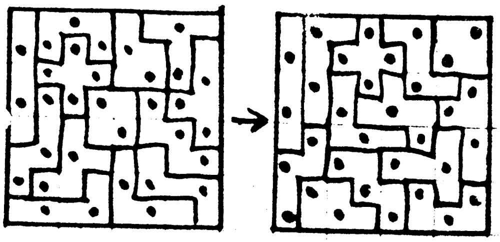
By Leonard J. GORDON

Page 9 of G&PJ poses a dissected chessboard puzzle. Page 25 gives a solution and poses an alternative problem. As I understand it, the problem is to take pieces which can assemble to a true chessboard, and assemble them into an 8x8 square which has the maximum errors, counting one error for every edge where two squares of the same colour are adjacent. Philip Cohen posed the problem. His solution allows turning pieces over (reverse of black squares being black). George Jelliss suggests not allowing turning. I present improved solutions for both alternatives. (A) shows an assembly with 48 errors. Pieces do not need to be turned over to form the true board. There is only one solution. (B) shows 50 errors. Pieces here must be turned over to form the true board. Again there is only one solution. (C) shows an assembly with 51 errors, however the pieces cannot form a true board, even allowing turning.

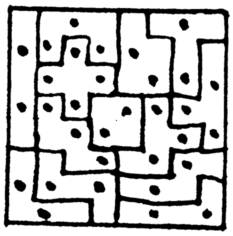
A



B



C



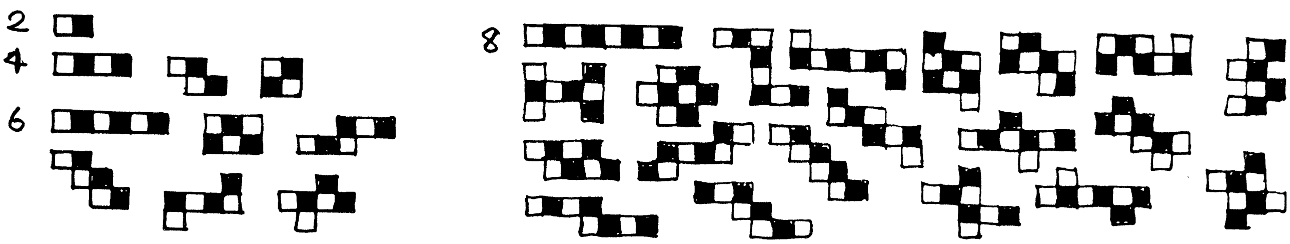
This problem was solved backwards. I had the computer print out a few hundred of the thousands of pentomino assemblies and chequer them. I then picked a dozen or so, altered the black/white patterns on certain pieces, and counted the errors. If the error count was high, I entered the altered piece descriptions in a checkerboard computer program to see if they could be assembled to a true chessboard.

The above solutions can probably be improved, but not by much. Philip Cohen says that there are 112 places where squares meet, but we should note that 53 of them are internal to the 13 pieces, so must be chequered. At most 59 can be matched (unchequered) in an assembly. 51 errors is getting pretty close to 59. I was surprised to find that there are combinations that allow only one, let alone zero solutions, allowing turning over. I hope it's not computer error. Assuming that is not the case, there may be fruit for theory here. Can someone show why the 13 pieces of the last set cannot form a chessboard?

Awkward Ominoes

By G.P.JELLISS

Back in Chessics 28 (the special issue on Chessboard Dissections) I gave a table of the numbers of polyominoes of 1 to 8 squares counted under various different assumptions, as to whether they could be turned over, and whether they were chequered on one or both sides. I promised there a listing of the 'awkward customers' that make these enumerations difficult. Here are those in which reversal of colouring is equivalent to rotation:



Calculator Keyboard Curiosities

By R.J.COOK (The one in Frome!)

I discovered accidentally, in Spring 1986, that if you take the basic calculator keyboard, calling the rows, columns and two main diagonals 'lines', and display any line of digits in order in either direction, followed by the same line of digits in reverse order, the resulting 6-digit number is exactly divisible by 111 (and 11), e.g. 147741, 654456, 951159, etc. I showed this result to a few colleagues and friends, then forgot all about it.

Recently I became a member of the Mathematical Association, purchased some back numbers of the Mathematical Gazette, and came across the following footnote (from issue number 454, December 1986):

A calculator coincidence?

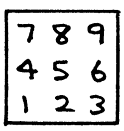
The following property of the calculator display

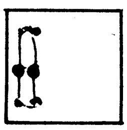
7	8	9
4	5	6
1	2	3

has been pointed out to me by R. J. Cook. Display (either in order or in reverse order) the three digits from any row, column or main diagonal. Follow those by the same three digits in the opposite order, giving a six-figure number such as 951159. Your displayed number is always divisible by 37.

So the question arose: had I unknowingly mentioned it to a member of the MA who had quoted me, or had the same discovery been made at about the same time by another R.J.Cook? Just how long is the long arm of coincidence? Well, it's possible. After all, there was a Dr R.J.Cook at the National Physical Laboratory at Teddington. I wrote to Victor Bryant, the editor, and asked him in effect the silly question: "Was this me?". He replied that the R.J.Cook in question was Roger Cook, a member of his own Department of Pure Mathematics at the University in Sheffield! The title to the footnote was thus an appropr-iate misnomer - the palindromic 6-digit multiples of 37 are a consequence of sequences of digits in arithmetical progression, as pointed out in the Gazette, No. 456, June 1987.

Having been reminded of this property of the keyboard numbers, I have found much more. For example, omitting diagonals for the moment, if you go along one line, you can return along another parallel line and still get a 6-digit display divisible by 111, e.g. 147852, 789321. You can also zigzag between parallel lines like this: 157842, 927183, etc. As you try these variations, you soon realise that there are many patterns of key sequences that have this property. There are, for example, loops, such as the hexagon 214896, and in any of these 6-digit loops you can start at any key and go round in either direction. There are 'square' groups of four keys, 1793, 2486, and the four small squares including 1452. These squares have the same property as the loops if you follow the sequence ABCCDA round the square, e.g. 256632, 179931. Similar four-digit loops can be formed by a rhombus such as 156621, or a parallelogram such as 149961. Start anywhere, go round either way.

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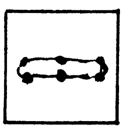
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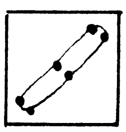
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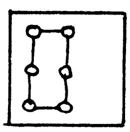
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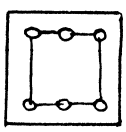
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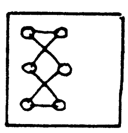
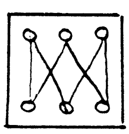

157842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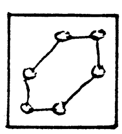
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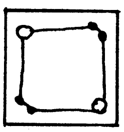
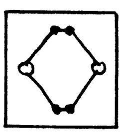

179931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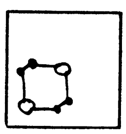
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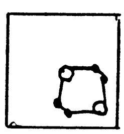
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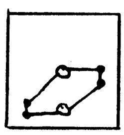
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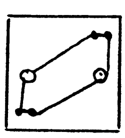
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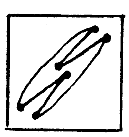
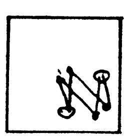
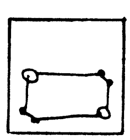

591519


352536


146631

[Diagrams of other examples will be given next time - try finding some for yourself.]

Reviews of Titles Containing Mathematical Recreations

The Mathematics of Games by John Beasley, (Oxford University Press, 1989, £14.95 hardback). This well written book is the 5th in the OUP 'Recreations in Mathematics' series. Its most interesting contents, to me, are its applications of statistical arguments to familiar sports like Golf, Football and Cricket which appear to show how great is the chance element - especially in Cricket: "So if we have a typical first-class batsman whose true average is 40 and we compute his actual average over 25 innings, this computed average has a standard deviation of 8 even if conditions are constant from one game to the next. Yet batting averages are regularly published to two decimal places, and they are lapped up by readers as if this precision were meaningful". Other games touched on are Bridge, Snakes & Ladders (see opposite), Chess (on gradings and "illusory comparisons between today's champions and those of the past".) and Poker: "Three assumptions have been made: that you can bluff without giving any indication, that nobody is cheating, and that the winner actually gets paid. You will not necessarily be well advised to make these assumptions in practice". The later chapters deal with more abstract games and puzzles, with special emphasis on Nim and Conway's concept of 'games' as generalised 'numbers'. The penultimate chapter is particularly philosophical: "we consider the fundamental paradox, that a game of pure skill can be played in competition only as long as the players are sufficiently ignorant". Finally the author ascends into the rarefied atmosphere of the infinite, as exemplified by Beggar-my-Neighbour, Turing's machine and Godel's theorem ("The hole at the heart of mathematics"). In short, an excellently readable, good humoured book, full of provoking ideas, In short - too short, that's my only complaint.

Fractal Report. This is another newsletter about Fractals, brought to my notice by Dr Tylor. Six issues have appeared so far, (starting with an issue 0 - presumably to lay down the ground-work). Issue 3 which I have received has 20 A4 pages. Sub for 6 issue is £10 in U.K. (£12 Europe, £13 else) payable to Reeves Telecommunications Laboratories Ltd, West Towan House, Porthtowan, TRURO, Cornwall TR4 8AX. (U.S. $23 payable to J. de Rivaz). Most of the illustrations occupy a whole page and are too detailed to reproduce here. My copier nearly had a breakdown trying to print the Julia set shown last time!

The Mathematical Association, produce a whole range of periodicals that contain much of recreational interest at different levels of sophistication: **Mathematical Pie** for 10-14 years age range (27p for one issue, reductions for quantities, and solutions - 'Teacher's Notes' separate), **Plus** for 14-18 (£1.80 for 3 issues/year). For Teachers there is **Mathematics in School** (these days recreational aspects of maths seem to be the basis of much teaching - so much so that one may even wonder if it is overdone). And of course **The Mathematical Gazette**, which while rigorous is nevertheless reader friendly. The address is 259 London Road, Leicester, LE2 3BE. Membership rates depend on what publications you take (c. £22), and you don't have to be a teacher or have a degree to become a member.

Eureka 'The Journal of the Archimedeans' appears annually (currently in March) from the Cambridge University Mathematical Society, c/o the Business Manager, The Arts School, Bene't Street, Cambridge CB2 3PY. Minimum subscription is £5 to open account. The Archimedeans also produce **QARCH**. Issue 11 appeared Feb 89, including a note I contributed long ago on Satin Squares, (elaborated on in G&PJ pp82-3 in 1988).

F.E.Whitehart of 40 Priestfield Road, Forest Hill, London SE23 2RS, is a book dealer who produces a mail-order catalogue of Maths & Physics and can sometimes supply titles on Mathematical Recreations.

The Journal of Recreational Mathematics is quarterly from Baywood Publishing Co Inc, 26 Austin Avenue, POBox337, Amityville, NY11710, USA. Individual sub $23.50* (back issues and Institutional sub is much more expensive). Unfortunately they only accept US checks drawn on US banks which makes it difficult for overseas subscribers. Editor is J.S.Madachy. (*incl. post to UK).

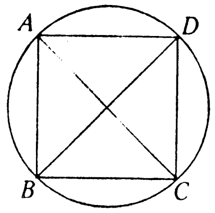
Mathematical Spectrum, which is subtitled 'A Magazine for Students and Teachers at Schools, Colleges and Universities' is published by the Applied Probability Trust, Hicks Building, The University, Sheffield, S3 7RH, and is £5.50 for three issues of 36 A5 pages (£6.50 in America/Australia) Volume 21 No. 2 contained a 7-page biographical sketch of H.E.Dudeney and his most notable mathematical results.

Quick Questions with Swift Solutions

There will be another set of 12 questions in the next issue.

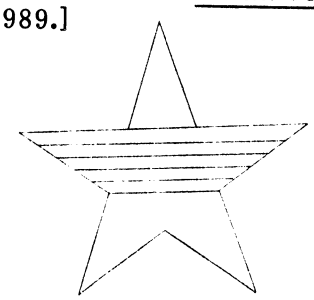
1. In how many ways is it possible to arrange four dots in a plane so that there are only two distinct distances between them? [A. Pounder, quoted in Math. Spectrum, Vol 21, No. 1, p8, September 1988.]

2. Draw the following figure with one stroke of the pencil, never lifting the pencil from the paper or going over a line twice.



Of course, strictly this is impossible - some 'trick' solution is required. [This was one of H.E.Dudeney's earliest puzzles composed when he was only 9, according to Angela Newing, Math. Spectrum, Vol 21, No 2, p39, January 1989 .]

3. Can you work out what fraction of the star is shaded? [P.H.R. Math. Pie No. 118 Autumn 1989.]



4. Find a fraction which, if you add one to its numerator it equals one third, but if you add one to its denominator it is one fourth. [P.Nicholson, Complete System of Mathematics, 1820 (quoted in Math. Pie, No. 115)]

5. Which is the odd one out of the following? A5, B7, C13, D17, E29. [Plus No. 11, Spring 1989]. I quote this only because in my view a good reason can be given for any of the 5 possible answers - an archetypal example of stupid 'intelligence test' type questions.

6. Choose 4 distinct hexominoes that can be arranged, without reflection, to form a 4x6 or a 3x8 rectangle. [Stephen Taylor]

7. Divide a 4x6 rectangle into four distinct hexominoes, each with an axis of symmetry. [Stephen Taylor, Original]

8. Show that the set of all numbers of the form $\sqrt{(a^2 + b^2)}$, where a, b are cardinal numbers (0, 1, 2, ...) is closed under multiplication (i.e. if x and y are in the set, then so is xy). [Source? forgotten]. These numbers are of course those that measure the lengths of moves on an unbounded chessboard.

9. The above is an example of a groupoid, that is a set A in which is defined an operation o such that if x and y are elements of A then so is xoy. In such a groupoid there are two ways of bracketing an expression of three elements: (xoy)oz and xo(yoz) and the results of these operations need not be equal (e.g. (1-2)-3 = -4 but 1-(2-3) = 2). How many ways are there to (meaningfully) bracket an expression of four elements: aobocod? Or an expression of five elements: aobocodoe? [Those who want something more difficult can provide a recurrence, or a formula, to calculate the number of bracketings of an expression of n elements: $a_1oa_2o...oa_n$. This was discussed in QARCH 10, 1988.]

10. In a groupoid (A, o), as defined above, an element a is called associative if for all x, y we have (xoa)oy = xo(aoy). Show that the set of all associative elements of the groupoid is itself a groupoid. [i.e. show that if a and b are associative, so is aob.] [G.P.J. Original? Probably not.]

11. In Snakes & Ladders we are approaching the foot of a ladder from a distance. There is one snake-head between us and our target. On which square would the snake present the greatest obstacle? (i.e. reduce our chances the most). [John Beasley, The Mathematics of Games - see review opposite.]

12. In a Bridge hand which distribution of suits is most probable - is it the same as the most even - 4-3-3-3? And of the two distributions 7-5-1-0 and 8-3-2-0, which is the most probable? [John Beasley, The Mathematics of Games.]

Solutions to reach me by 15th January 1990.
If there is sufficient response, we will start a solving ladder.

Bisatins and Double Satins

T.H.Willcocks writes as follows: "I was interested in your article [pp 160-161] and particularly in the two recurrence relations you found, which as you say are convenient for calculations.

"As I am possibly the only person left who remembers them, I feel I should mention two problems contributed to the Fairy Chess Correspondence Circle by H.H.Cross many years ago. I cannot find an exact date, but I think it would have been towards the end of 1959.

"The first problem was: 'In how many ways may 2n White Rooks be placed on an nxn board so that every row and every column contains exactly 2 rooks?' By a far from simple argument he found a solution in terms of a hypergeometric series $F(a,b;z) = 1 + abz + a(a+1)b(b+1)z^2/12 + \cdots$ the solution being:

$$F(-n,\tfrac{1}{2};2)\ n!/(-2)^n$$

I have evaluated this for n = 2,3,4 and 5 and find that the results are in complete agreement with those obtained by you for the total number of bisatins.

"H.H.C.'s second problem was: 'In how many ways may n White Rooks and n Black Rooks be placed on an nxn board so that every row and every column contains exactly one White and one Black Rook?' By a somewhat similar analysis he reaches the solution:

$$(-1)^n\ n!\ F(-n,1;1)$$

this being factorial n times sub-factorial n. Although I believe the mathematics to be correct it would be nice to have an independent check. Perhaps you have a recurrence relation here too!

"After H.H.C.'s death, his brother W.Cross (a champion solver) wrote to me saying that he thought many of H.H.C.'s contributions were remarkable in view of the fact that he was entirely self-taught and had never had any formal mathematical instruction. I would agree."

[T.H.W. 3 ix 1989]

The recurrence relation asked for is:

$$C_n = n^2 C_{n-1} + n!(-1)^n\ ,\ C_2 = 2$$

derived from that given on page 89 for the subfactorial of derangements.

An equivalent recurrence is:

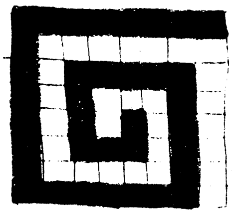
$$C_n = n(n-1)C_{n-1} + n(n-1)^2 C_{n-2}$$

with $C_2 = 2$ and $C_3 = 12$

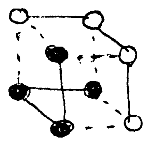
This form of the recurrence can be proved by the same argument as given on page 161 for B_n, but without the division by 2 in the second term. [See also W.W.R.Ball, Math Rec & Essays, 11th edn, p46.]

Close-Packed Snakes!

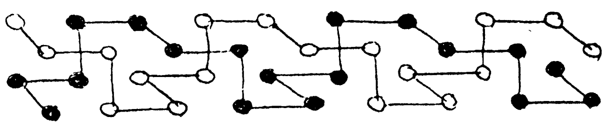
A question raised by Scott Kim and quoted by Martin Gardner in Scientific American is that of filling the whole of space with two "snakes" - a snake being a sequence of cubes, successive cubes having a face in common - is it possible? In the plane, yes:



In a 2x2x2 cube:



In a 2x2xn column I found:



a sort of double helix. Each 2x2x2 repeats the same pattern shown above. [This item was one I circulated round the FCCC in July 1981. Does anyone know if M.G. published a solution or negative proof of it?]

The Fairy Chess Correspondence Circle

Since this has received a couple of mentions on these pages, this may be the time to give more details about it. The FCCC was started in 1958 after the closure of Fairy Chess Review, as a means of keeping some of the regular solvers and composers in touch, and to exchange ideas. There were 12 members at any time and at the beginning of a month each would send a packet of items on to the next in the circle, and receive a packet from his predecessor in the circle - removing his own contribution and replacing it with a new one. The circle closed in 1982.

Palindromic Cubes

By T.W.MARLOW

Generator	Cube
1	1
2	8
7	343
11	1331
101	1030301
111	1367631
1001	1003003001
2201	10662526601
10001	1000300030001
10101	1030607060301
11011	1334996994331
100001	1000030000300001
101101	1033394994933301
110011	1331399339931331

Generator	Cube
1000001	1000003000003000001
1001001	1003006007006003001
1100011	1331039930399301331
10000001	1000000300000030000001
10011001	1003303931991393033001
10100101	1030331909339091330301
11000011	1331003993003993001331
100000001	1000000003000000003000000001
100010001	1000300060007000600030001
100101001	1003033091390931903303001
101000101	1030304090906090904030301
110000011	1331000399300039930001331
1000000001	1000000000300000000030000000001
1000110001	1000330399301991039300330001
1010000101	1030301309090330909031030301
1100000011	1331000039930000399300001331

All generators tested up to 1100000011.

I give here a list of (computer generated) palindromic cubes. There are several obvious infinite series, for example from the series of generators 11, 101, 1001, etc., and all these generators are themselves palindromic. The digits 2 and 7 are exceptional in not being in a series, though they are technically palindromes. The real odd-ball is 2201. Are there any others, or can it be proved that there are none? I raised these questions in Journal of Recreational Mathematics, Vol 17.3 p217 1984/5 but no answer resulted. This list takes the search further than has been published before so far as I know. I started this letter before G&PJ 8+9 arrived, so I now offer it under the name of digitology!

Tom Marlow (27 iv 1989)

Members of the Fairy Chess Correspondence Circle in order of accession.
[Information from Cedric Lytton (formerly Sells) who was the last Director of the Circle.]

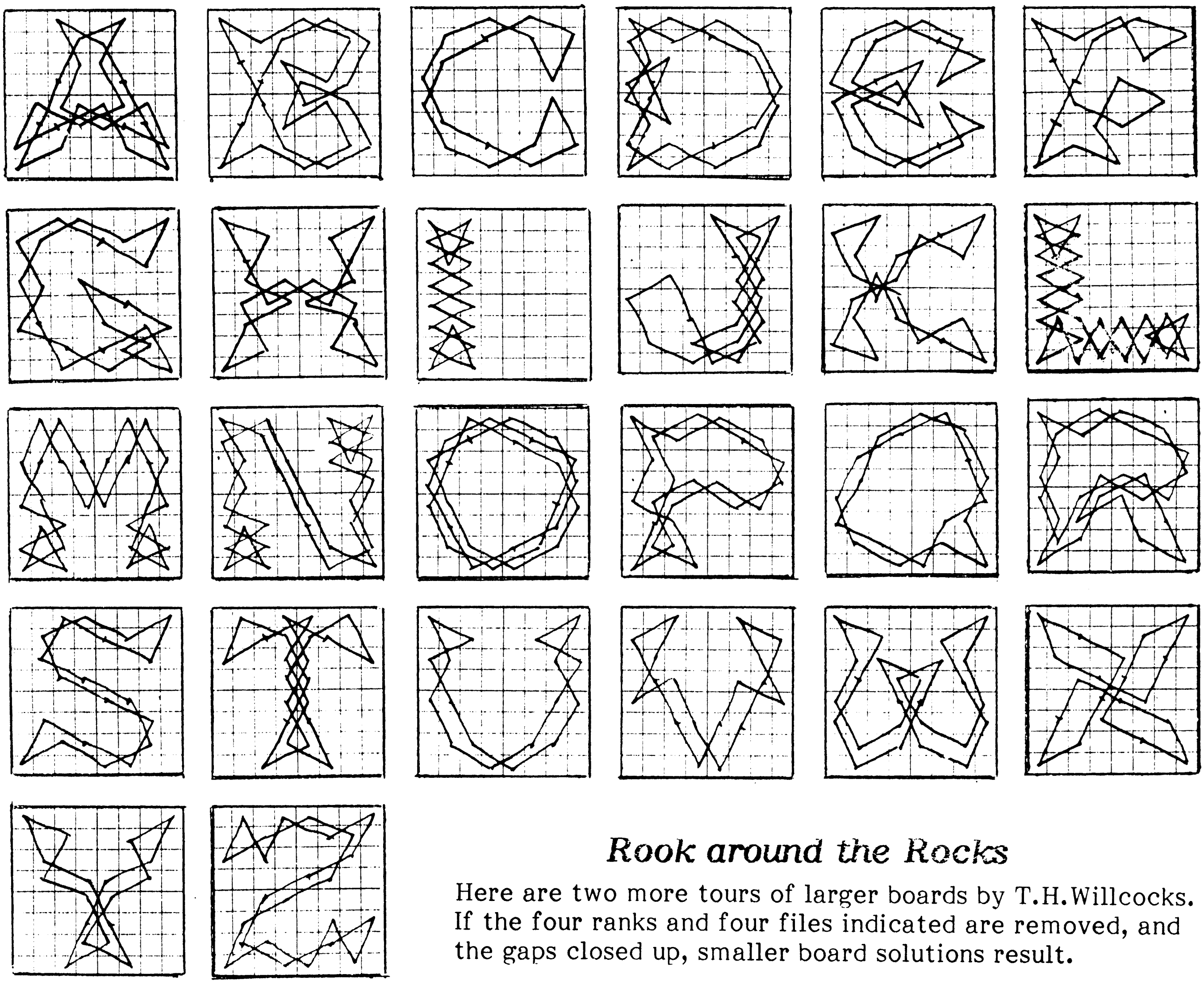
A. Rev A.W.Baillie	1958-60
B. W.H.Reilly	1958-77
C. T.H.Willcocks	1958-82
D. W.B.Renton	1958-66
E. W.Cross	1958-74
F. H.H.Cross	1958-62
G. C.E.Kemp	1958-70
H. P.C.Asbury-Smith	1959-66, 68-70
J. C.P.King-Farlow	1960-68, 74-82
K. B.Tunks	1960-61
L. J.P.Ford	1960-68
M. F.R.Oliver	1961-71
N. H.Handy	1961 (ii-vi)
P. E.T.O.Slater	1961-80
R. J.M.Rice	1962-66
S. J.E.Driver	1962-64, 65-79
T. C.R.Flood	1964-68
U. D.G.Fletcher	1964-65
W. A.S.M.Dickins	1966-81
X. W.B.Trumper	1967-70
Y. C.C.L.Sells	1968-82
Z. W.H.Duce	1968-82
AA. Rev P.R.Kings	1968-73
BB. C.J.Feather	1970-73
CC. E.Fielder	1971-73
DD. I.Sinclair	1972-73
EE. Dr J.E.H.Creed	1972-74
Q. R.Powell	1972-82
V. A.I.Houston	1973-82
FF. R.M.W.Musson	1973-82
GG. G.P.Jelliss	1974-77, 79-82
HH. C.M.B.Tylor	1977-82
JJ. B.D.Stephenson	1978-82

TOURS & PATHS

Chess Lettering

By G.P.JELLISS

The idea is to design an alphabet, each letter in the form of a knight's circuit on the chessboard. Improved designs are invited. The improvement can be in artistic appearance, or in reducing the number of moves needed to give a reasonable result. Note that designs that use two or more superimposed circuits are (for no good reason) prohibited.



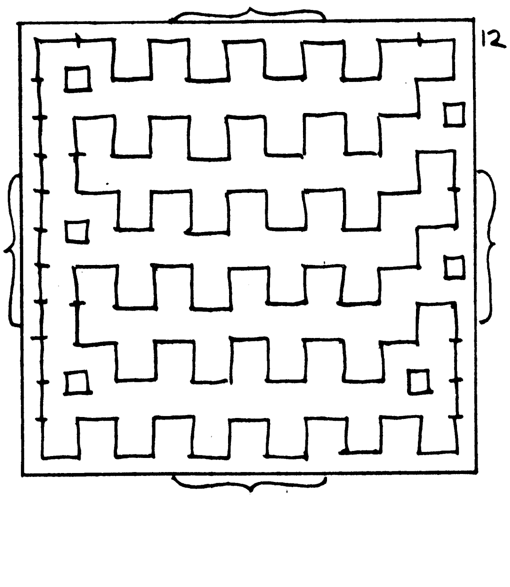
Rook around the Rocks

Here are two more tours of larger boards by T.H.Willcocks. If the four ranks and four files indicated are removed, and the gaps closed up, smaller board solutions result.

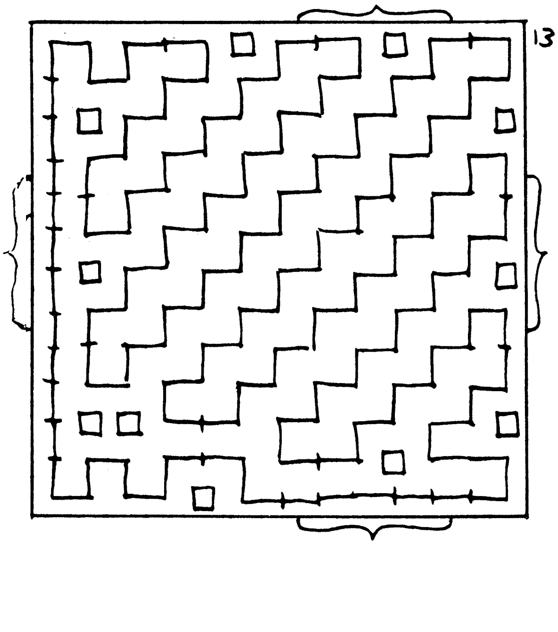
4x4 Wazir Tours with Square Nos in square or rectangle.

1	2	3	**4**
14	13	6	5
15	12	7	8
16	11	10	**9**

1	2	3	**4**
8	7	6	5
9	12	13	**16**
10	11	14	15



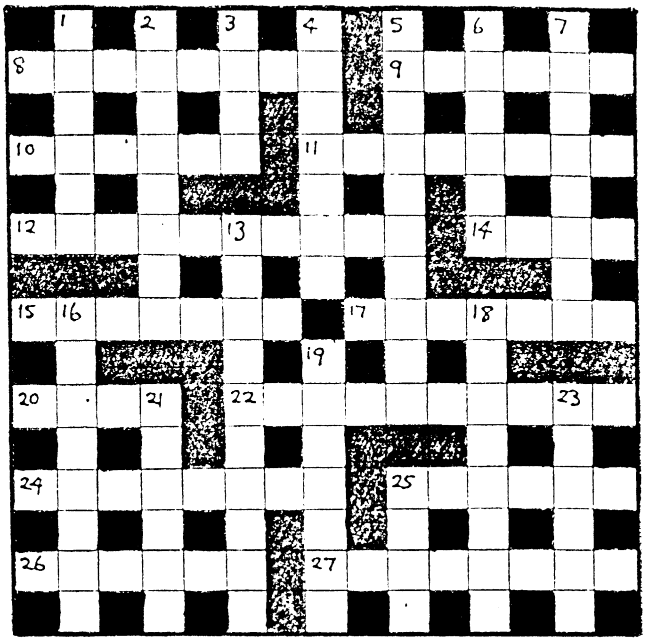
12



13

Cryptic Crossword - 9

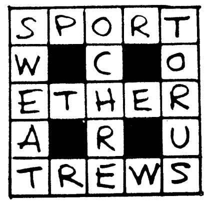
by QUERCULUS



The 8-letter words are related.

Crossword 8 - SOLUTION

Shuffle-Link 3
SOLUTION



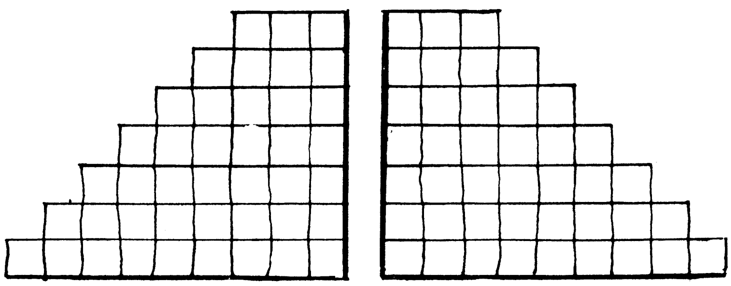
ACROSS
8. Age of Sir Ian, about fifty upwards. (8)
9. Negative concerning VAT returns to inn. (6)
10. Quietly angry seafarer. (6)
11. Past dates to invade on. (8)
12. Quieted son about to be interrogated. (10)
14. Source of teas. (4)
15. Quiet little gold town shortage. (7)
17. Expensive about mother coming first. (7)
20. Alphabets confused blackleg. (4)
22. Introducing Edward Mule to the world singlehanded. (10)
24. Age of eccentric Irish king. (8)
25. Look back, old boy, from the observatory. (6)
26. Measure partly illegal long ago. (6)
27. Time to try a rite. (8)

DOWN
1. One mule and I confused among the French. (6)
2. In old age most music jars. (8)
3. When to give it back to me. (4)
4. Painless, but done any harm? (7)
5. Doves among trees on the waterfront. (10)
6. A meeting place in fashionable street. (6)
7. Era when cat's iris evolved? (8)
13. Unauthorised entries stir unions. (10)
16. Age a hare can reproduce. (8)
18. Broken ice zooms past. (8)
19. Girl gets about to see birds. (7)
21. Water hole. (6)
23. Heat left at the ends of Winter months. (6)
25. Essential element of Danger Man. (4)

Autological Anagrams

Anagrams involve arranging the letters of one word to form another. They are more interesting if the two words are related in some way, e.g. by being synonyms (a well known example is ASTRONOMER = MOONSTARER). In the 'Autological' Anagrams that follow, the two words may be placed together to form a meaningful phrase. The clue given is to the meaning of the whole phrase, (e.g. 'Builder complains' would be MASON MOANS).

3: Play the part of Puss-in-Boots.
4: Egyptian river-boat company.
5: Feared snake.
6: Stage instruction in Oscar Wilde play.
7: Stewed gull.
8: Newspaperwoman put up a fight.
9: South American orange.



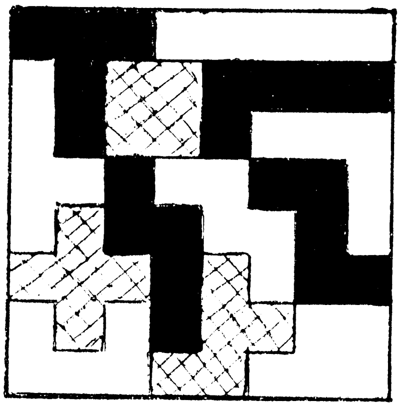
The Art of the State

By Leonard J. GORDON

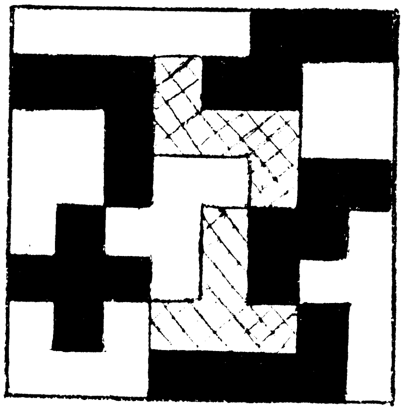
Once upon a time, a gang of 13 sachems [American Indian Chiefs or Political Bosses] decided to form a nation. They found that their total land came to a square 800 miles long by 800 miles wide. This divides into 64 units, 100 miles on a side, which they called districts. They decided that 12 of them could each take 5 districts, and someone would have to be satisfied with 4. The territory of each sachem would be called a state. They then called themselves governors.

It happened that one of the governors, Elbridge, was an imaginative fellow. He suggested that the shape of each state be different, and the others agreed. Then they decided that they needed a map. The map-maker informed them that they needed 3 colours for the map (it took a while to convince one of the governors, who had a PhD in history of mathematics, that they didn't need 4), and they chose blue, green and orange.

The map-maker then explained that to print the map, blue ink would cost \$1/square, green ink \$2/square and orange ink \$3/square, and suggested that they arrange their states so as to minimize the cost. Governors like ideas like that, so set to work on it. Here are a couple of results. Can anyone improve on them?



blue 30 @ \$1 = \$30
green 20 @ \$2 = \$40
orange 14 @ \$3 = \$42
total = \$112

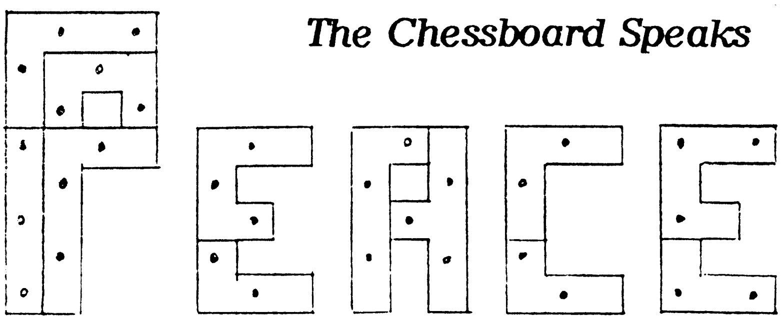


blue 29 @ \$1 = \$29
green 25 @ \$2 = \$50
orange 10 @ \$3 = \$30
total = \$109

Incidentally, can anyone guess Elbridge's last name? [L.J.G. 7 vi 1989]

The Chessboard Speaks

By Leonard J. GORDON



I present two word constructions that can be rearranged to make a chessboard. These were found by hand a few years ago. There are lots of possibilities here.
[Note dated Sept. 1987].