

## NOTES

**KPK ENDGAME DATABASES:  
A Response from the Source**

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I should like to comment on the contributions by Ard van Bergen and Theo van der Storm (ICCA Journal, Vol. 9, No. 1) and Allan Reed (ICCA Journal, Vol. 9, No. 2) about the accuracy of the tabulated values for the KPK endgame database given by Clarke (1977).

The table given for WTM (White to Move) positions by Clarke is essentially the following.

Wins at depth	Number of positions
0	12,749
1	11,300
2	9,624
3	7,864
4	10,511
5	2,564
6	1,416
7	1,457
8	1,122
9	941
10	685
11	670
12	586
13	572
14	307
15	78
16	22
17	8
18	3
Total wins:	62,479
Draws:	19,185 (including 2 WTM stalemates)
Illegal:	16,640
Grand Total:	98,304

Only positions with the Pawn on files a to d, ranks 2 to 7 are included, giving  $4 \times 6 \times 64 \times 64 = 98,304$  possible positions to consider. A WTM position is considered to be a depth-zero win if White can immediately promote his Pawn (to a Queen - or Rook if necessary to avoid stalemate) without its being immediately *en prise* and without giving stalemate. Depth-n wins are positions where WTM can force a transformation to a depth-zero win in n moves (i.e., 2n ply) at most.

Van Bergen, Van der Storm and Reed all claim (effectively) that the number of depth-zero wins should be 12,750 and the number of draws 19,184 and they ask whether other KPK databases agree with them.

I generated the KPK database (and some others) around 1977, obtaining - except for a different system of coding the values - the same table as Clarke, but with the (Van Bergen, Van der Storm, Reed) values of 12,750 depth-zero wins (total wins 62,480) and 19,184 draws. In Bramer (1978) I made the comment that my values 'are compatible' with those of Clarke (1977) 'which has a number of typographical errors in the tables given'. I gave the same figures in Bramer (1977) remarking 'A few minor printing errors in Clarke's paper are corrected here.'

That paper also gives the number of 'drawn by repetition' positions as 8,405 against Clarke's 8,406, which confirms another of Reed's results.

I discussed the KPK database at considerable length with Michael Clarke at the time and he was already aware of an error in his published results then.

It is a simple matter to write a program to count the depth-zero wins by generating all 16,384 possible positions with the Pawn on a7, b7, c7, or d7 and discarding those where two or more pieces are on the same square, the two Kings are on adjacent squares or Black is in check (all illegal), those where the Black King is next to the queening square and the White King is not (all drawn or wins at greater depths). Doing this produces a total of 12,750 depth-zero WTM wins.

These include positions such as WK:c6 BK:a7 WP:c7 where queening the Pawn gives stalemate. However, these can all be dealt with by under-promoting to a Rook.

The exception to this is the position (first pointed out by Tim Niblett around 1981, I believe) WK:a3 BK:a1 WP:b7, where promoting to a Rook also gives stalemate. This position is thus a depth-one win, but it appears that all database creators (including myself) have included it as a depth-zero win! [Incidentally, this position cannot account for the discrepancy in Clarke's KPK table previously discussed, since a) the position is still a win, not a draw; b) making this one change would have a knock-on effect on numerous other positions in the database, such as WK:a3 BK:b1 WP:b6.]

This annoying position invalidates a great deal of published work on the KPK ending. To avoid the need to revise all of this, I would suggest adopting the mathematicians' trick of *defining* the position WK:a3 BK:a1 WP:b7 as a depth-zero win for all future purposes.

## REFERENCES

Bramer, M.A. (1977). King and Pawn against King: Some Quantitative Data. Technical Report, Open University, Faculty of Mathematics.

Bramer, M.A. (1978). Computer-generated Databases for the Endgame in Chess. Technical Report, Open University, Faculty of Mathematics.

Clarke, M.R.B. (1977). A Quantative Study of King and Pawn against King. *Advances in Computer Chess 1* (Ed. M.R.B. Clarke), Edinburgh University Press, pp. 108-118.



Photo by M.T. Furstenberg

HURRAY WE WILL FOR MURRAY HILL!

Belle's beau being quizzed by the press in his winning streak.