



Chess Tests: Unsolved positions

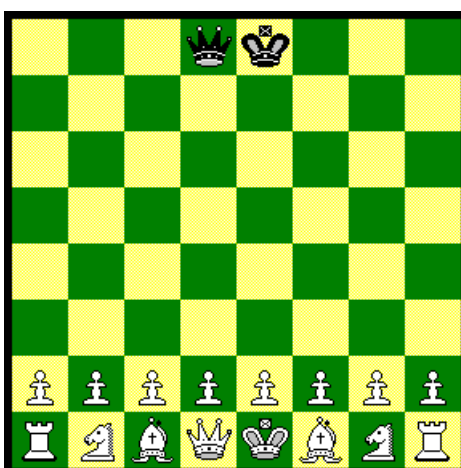
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See the Notes on Problem Solving

91.- "Mate the Royal Couple" - Proposed by V. Albillo



FEN: 3qk3/8/8/8/8/PPPPPPPP/RNBQKBNR/ w

White to play and mate: 1. ?

Results

| Program | CPU/Mhz | Hash table | Move | Value | Plys/Max | Time | Notes |
|----------------------------------|---------------------|----------------|-------|---------|----------|----------|--------------------|
| Chess Master 5000 | P100/Win 95 | unknown <32 Mb | e2-e4 | +32.68 | 12 | 48:00:00 | 1.700.000.000 pos. |
| NEW Rebel Decade 2.0 | P100 | 512 Kb | e2-e4 | +31.73 | 12 | 04:38:53 | 235.754.343 posit. |
| Crafty 12.7 | P100 | 24+5 Mb | e2-e3 | +36.258 | 15 | 63:27:31 | 3.778.604.670 pos. |
| KAI Chess Master 5500 | Pentium Pro 200 Mhz | ? | e2-e3 | +31.76 | 10 | 00:07:27 | mate not found |
| PANEK Chess Genius 5.0 | PII/266 | 16 Mb | e2-e4 | +35.24 | 13/25 | 09:22:00 | can't see mate |

Notes:

Despite its simple, innocent aspect, this is an *incredibly computationally expensive* mate problem, inspired by **Test 12**, a problem proposed by english problemist Henry Dudeney where the object was to mate the lone king in 6 moves.

Here, he is not alone but has his powerful wife to help. This makes the task much more difficult. Of course, it has to be a mate in some number of moves, but I have been yet unable to determine in how many, and which move begins the mating sequence. My best *conjecture* is that *it's a mate in 12 moves*, but I have yet to prove it.

For this one, no endgame tablebases will save the day. It has to be solved by computing muscle alone, and the number of possible moves at each ply is large.

Chess Master 5000, running under Windows 95 on a Pentium 100 with 32 Mb of RAM, set to Infinite time, Brute Force, looks at 1.700.000.000 positions (yes, *1.7 billion positions* !) in some 48 hours, but even so, it's unable to find the mate. By the way, though

1.700.000.000 positions seem a lot, they can be examined by **Deep Blue** in *less than 9 seconds*, you know ...

Rebel Decade 2.0 goes to 12 ply-depth, examines a modest (in comparison) *235.754.343 positions* in less than 5 hours, but fails to see the mate, just the obvious large advantage.

Crafty 12.7, running on a Pentium at 100 Mhz, and with 24 Mb for the main hash table and 5 extra Mb for the pawn structures hash table, cannot find the mate either after searching to a depth of 15 plies in some *63 hours*. It looks at 3.778.604.670 positions (almost *4 billion positions*, it would take **Deep Blue** nearly 20 seconds to examine that many), of which only 1.217.302.718 are evaluated, but the best it finds is that *I. e3* leads to a gain of at least +36.258. No good. It should be mate, nothing else will do.

Just for fun, **Kai Luebke** let **Chess Master 5500** look at this position for some 7 minutes on his powerful hardware, and it reached 10 plies no less. At that depth, its evaluation of the move was significantly less, and of course it found no mate at all. Perhaps letting it look at the position for some weeks could prove useful!

Ed Panek also tried his hand at this position with **Chess Genius 5.0**, running on a very fast computer with a large 16 Mb hashtable. After *more than 9 hours* it reached 13/25 plies, yet it *couldn't* find the mate. However, not to be outdone, **Ed** tried a different approach. See the **Addendum** below.

Incidentally, this could be a good way to completely *solve the game of chess*. Just keep adding new men to help the Royal Couple, one at a time, and determine the minimum number of moves to give checkmate. When you've added some 14 additional men, that's it. *Simple, right?*

Addendum:

Kai Luebke sent e-mail about this position, and told me this:

"... *BTW, none of my programs solved Test 91 in under 1 hour (I also tried MChess at "mate in 12" level). Maybe a special mating solver like Alybadix can do it, but I doubt even Rebel 9 or MChess 7 will find this under 10 hours. Maybe Cray Blitz ...*"

Ed Panek, who also tried very hard at this position, sent an e-mail telling me his further efforts after the unsuccessful attempt. He let **Chess Genius 5.0** play both sides continuously, game after game, for a total of 12 games, at 1 min. per move. The results, in his own words:

"... *Genius never mates in under 12 full moves or over 13 moves, but always finds mate. I would conclude that there are many mates in 12, and maybe a few in 11 ... Unsure for now ... Wait for next generation of processors to come out, or until I go on vacation and let the computer run all time! ...*"

Addendum 2020:

Vincent Lejeune used **ChessMaster 9000** in 2003 to try and solve this position and found that *e4* is a *mate in 11*, posting the following results:

```
[d]3qk3/8/8/8/8/8/PPPPPPPP/RNBQKBNR w
```

```
CM9000 found the mate !!!  
Celeron@875Mhz, 64 MB hash, SS=12
```

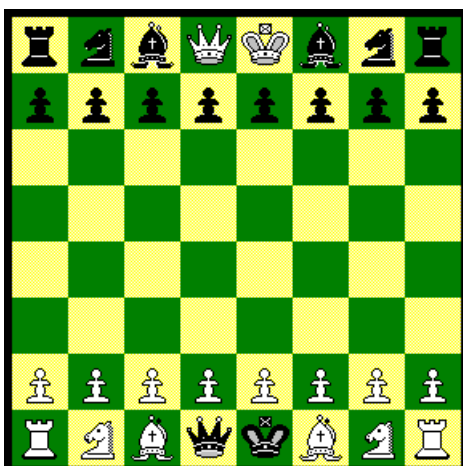
| Time | Depth | Score | Positions | Moves |
|----------|-------|--------|------------|---|
| 1:53:34 | 1/16 | Mate12 | 1010138257 | 1.e4 Qd4 2.Bb5+ Ke7 3.Qg4 Qe5 4.Qd7+ Kf8 5.d4 Qxe4+ 6.Ne2 Qe7 7.Bh6+ Kf7 8.Bc4+ Kg6 9.Qxe7 Kxh6 10.Bd3 Kh5 11.f4 Kg4 12.Qg5# |
| 2:37:19 | 2/17 | Mate12 | 1427960663 | 1.e4 Qd4 2.Bb5+ Ke7 3.Qg4 Qe5 4.Qd7+ Kf8 5.d4 Qxe4+ 6.Ne2 Qe7 7.Bh6+ Kf7 8.Bc4+ Kg6 9.Qxe7 Kxh6 10.Bd3 Kh5 11.f4 Kg4 12.Qg5# |
| 13:14:57 | 3/18 | Mate11 | -898402141 | 1.e4 Qd4 2.Qg4 Ke7 3.Nf3 Qd6 4.d4 Kd8 5.Bb5 Kc7 6.Bf4 Kb6 7.Bxd6 Kxb5 8.Qc8 Kb6 9.Na3 Ka5 10.b4+ Kb6 11.Bc5# |
| 17:12:32 | 4/19 | Mate11 | 1533143766 | 1.e4 Qd4 2.Qg4 Ke7 3.Nf3 Qd6 4.d4 Kd8 5.Bb5 Kc7 6.Bf4 Kb6 7.Bxd6 Kxb5 8.Qd7+ Ka6 9.Nc3 Kb6 10.Bc5+ Ka6 11.Qa7# SS=12 |

Afterwards in 2013, **Hans Havermann** reported in his blog that he used **HIARCS Chess Explorer** with the **Deep HIARCS 14 WCSC** 32-bit analysis engine set to its default hashtable size setting and also found in a few hours that *e4* is indeed a *mate in 11*. Later, he restarted the chess engine with the hashtable size set to its **2 Gb** maximum and though it took longer to report *e4* as a *mate in 11* it also discovered that *Nc3* is a *mate in 11* as well.

The other 18 possible moves produced *mate in 12* (*a4, b3, b4, c3, c4, d3, d4, e3, h3, h4, Nf3, Nh3*), *mate in 13* (*a3, f4, g3, g4, Na3*) or *mate in 14* (*f3*).

He also stated that as **HIARCS** is not a mate solver, it's possible for these results to be amenable to some improvement, though not likely.

92.- "Surrounded" - Proposed by V. Albillo



FEN: mbQKbnr/pppppppp/8/8/8/PPPPPPP/RNBqkBNR/w

White to play and mate in 12: 1. Nb1-c3

Results

| Program | CPU/Mhz | Hash table | Move | Value | Plys/Max | Time | Notes |
|----------------------------------|---------------|------------|--------|--------|----------|-----------|----------------|
| NEW Rebel Decade 2.0 | P100 | 512 Kb | Nb1-c3 | +6.35 | 11 | 06:28:11 | can't see mate |
| Crafty 12.9 | P100 | 6 Mb + 1Mb | Nb1-c3 | +6.857 | 15/21 | 144:02:46 | can't see mate |
| PANEK Chess Genius 5.0 | PII/266 | 16 Mb | Nb1-c3 | +8.96 | 12/24 | 16:10:00 | can't see mate |
| MARXEN CHEST | Solaris/P166? | 70 Mb | Nb1-c3 | Mate12 | ? | 36:00:00 | shortest mate |

Notes:

Another extremely *computationally intensive* position, where both royal couples start completely surrounded by the enemy, and must try to checkmate, while avoiding being checkmated themselves, just as in the normal starting position. Only this time is *real frenzy* !.

In fact, there are *so many mating combinations* for both sides in this position that chess engines have a real hard time trying to decide who wins. White has a *decisive* advantage, being first, but just the slightest failure to maintain it and it's suddenly lost. For instance, the almost "obvious" move 1. Ng1-f3+, which leaves Black with one and only one forced response, results in White (not Black) being *checkmated* !. See the **Addendum** below for further details.

Rebel Decade 2.0 suffers a lot with this kind of highly combinatorial positions because of its small hash table. When looking at up to 10 plies, it prefers the losing (but very tempting) 1.Ng1-f3+, but fortunately it selects the probably correct first move, 1. Nb1-c3 when looking at 11 plies in some 6 hours. It examined 373.291.281 positions and evaluated the selected move at +6.35.

Chess Genius 5.0, running in a fast computer with a large hashtable, looks at 12/24 plies, taking more than 16 hours to reach that depth, but cannot see mate. All it sees is a large +8.96 advantage for White. It selects the probably correct first move (not proved), 1. Nb1-c3. However, see **Ed Panek** further comments in the **Addendum** below.

Crafty 12.9, running on a P100 and with reasonably large hashtables, goes deeper, at 15/21 plies, yet it doesn't see mate either just a large advantage, +6.857 for White after playing the same move, 1. Nb1-c3. However, it took more than 144 hours to get there ! That's 6 days of continuous running, yet it still doesn't see the forced mate !.

CHEST is a special-purpose chess program which specifically searches for mates. It was written by **Heiner Marxen**, **MARXEN**, who is unafraid of Bizarre Positions, Unsolved Positions, etc., and thus tried this position with his program **CHEST**, running under Solaris (Unix) and using a 70 Mb transposition table, found the shortest, forced *mate in 12* with 1. Nb1-c3 in some 36 hours.

You can have a look at another **CHEST's** great performance in cracking the extremely difficult **Bizarre Position Test 75**. *Amazing* !

Addendum:

PANEK

Ed Panek sent an e-mail stating that the *Principal Variation* predicted by **Chess Genius 5.0** after looking at 12/24 plies is:

b1c3, g8f6+, e8xf7, e1xf1, g1f3+, f1xg2, h1xd1, b8c6, d1g1+, g2xf2

But then **Ed** tried the position resulting *after* these moves are made and discovered that:

"... now when *CG5.0* is walked to this point it predicts:

c3d1+, f2xe2, f3d4+, c6xd4, d8xc7, d7d6, c7c4+, e2f3, c4d3+, f3f4, d3e3+, f4f5, g1g5++

... [so it seems to be a] mate in 12 ... "

KAI

Kai Luebke also liked the position, and tried it very tentatively with some of his best programs, **MChess 7** and **Rebel 9**, just to have a quick look. He reports this:

"... Very nice position, you're surely an inventive guy! :-). Here's a quick first glance from my top programs:

MChess 7:

```
move depth time value
Nf3+, 5 ply, 1:37, +6,57
Nf3+, 6 ply, 2:44, +6,57
```

Rebel 9:

```
Nf3+, 8 ply, 0:12, +4,31
Nf3+, 9 ply, 1:01, +5,01
```

Playing the first two obvious moves (1.Nf3+ Kxf2) and then continuing the analysis didn't help a lot ... "

My reply to this last statement was:

VA: " ... It will surprise you no doubt, but if White plays the "obvious" 1. Nf3+, it gets *mated*. This was discovered both by **Crafty** and **Chess Genius 1.0** and they switch to 1. Qxc7, then to 1.Nc3. I am not sure that White wins, both kings are in real danger and in the *Principal Variation* calculated so far (15/18), White had to give its Queen ... "

Here's a resume of **Crafty 12.9's** analysis of this position. Note that the disastrous **1. Ng1-f3+** is considered best at depths 6, 7, 8, 9, 10, 11, and 12. At depth 13, the winning **1. Nb1-c3** is discovered, but notice that it's listed *without any Principal Variation*, just the first move by itself. It continues to be considered best at depths 14 and 15, this time listed with an usable *Principal Variation*.

Though the last timing listed is 8642:46 (i.e. more than 6 days !), actually I let it go up to 13000:00 (more than 9 days !!), but it didn't change its mind, nor did it find the forced mate.

| depth | time | score | variation (1) |
|-------|---------|-------|--|
| 5-> | 4.31 | 2.080 | Qxc8 Qxc1 Qxb7 Nf6+ Kxf7 Kxf1 Qxa8 Qxb2 |
| 6-> | 9.92 | 4.372 | Nf3+ Kxf2 Ne5 Nf6+ Kxf7 Qxf1 Rxf1+ Kxf1 Qxc8 Kxg2 Qxb7+ |
| 7-> | 11.88 | 4.671 | Nf3+ Kxf2 Ne5 Nf6+ Kxf7 Qxf1 Rxf1+ Kxf1 Qxc8 Kxg2 Qxb7+ |
| 8-> | 22.69 | 3.310 | Nf3+ Kxf2 Ne5 Nf6+ Kxf7 Qxf1 Nd3+ Kxg2 Rxf1 Ne4 Nf4+ Kxf1 Qxc8 |
| 9-> | 1:50 | 5.048 | Nf3+ Kxf2 Qxc7 d6 Qc4 Bd7+ Kxf8 Nf6+ Kxg7 Rg8+ Kxf7 Rg4 Nc3 Qxc2 |
| 10-> | 10:01 | 3.555 | Nf3+ Kxf2 Qxc7 d6 Qc4 Bd7+ Kxf8 Nf6+ Kxg7 Rg8+ Kxf7 Rg4 Nc3 Qxc1 Rxc1 Rxc4 Kxe7 |
| 11-> | 17:15 | 5.687 | Nf3+ Kxf2 Qxc7 d6 Qc4 Bd7+ Kxf8 Nh6+ Kxg7 Nf5+ Kxh8 Be6 Qc3 Nd7+ Kxh7 Nf6+ Qxf6 exf6 |
| 12-> | 114:33 | 4.515 | Nf3+ Kxf2 Qxc7 d6 Qc4 Bd7+ Kxf8 Nh6+ Kxg7 Nf5+ Kxh8 Be6 Qxe6 fxe6 Na3 h6 Nc3 |
| 13-> | 845:02 | 4.814 | Nc3 Qxc2 d3 Kxf1 Qxc7 Nf6+ Kxf7 d6 Qxc8 Nbd7 Nf3+ Kxg2 Ne1+ Kh3 Qxa8 Nb6 Nxc2 Nxa8 |
| 14-> | 2260:06 | 6.188 | Nc3 Qxc2 d3 Kxf1 Qxc7 Nf6+ Kxf7 d6 Qxc8 Nbd7 Nf3+ Kxg2 Ne1+ Kxh1 Qxb7+ d5 Nxc2 Re8 Bf4+ Kg2 Qxa7 |
| 15-> | 8642:46 | 6.857 | Nc3 Qxc2 d3 Kxf1 Qxc7 Nf6+ Kxf7 d6 Qxc8 Nbd7 Nf3+ Kxg2 Ne1+ Kxh1 Qxb7+ d5 Nxc2 Re8 Bf4+ Kg2 Qxa7 |