# SABOTEUR (SOLUTION)

by Celestine Lau

This puzzle is based on the card game Saboteur (the base game). Solvers must determine, on each board, the best first move for the Saboteur (You). Some important things to note about the rules include:

- The gold miners win if they manage to complete a path from the start card (the ladder) to the gold. Hence, your objective is to prevent the miners from doing so.
- The given cards may be rotated 180 degrees before playing. However, they may not be played crosswise (i.e. rotated only 90 degrees in either direction).
- Note that a card may only be played if all its sides are compatible with the already played cards and only if there is an uninterrupted path from the start card to it.
- Given the above rule, if the miners can win by playing particular card(s) on a space, apart from directly blocking that space with a card of your own, another effective means of blocking is to play a card adjacent to a space with an open path facing the space you wish to block, such that the miners' cards are incompatible with that space.
- As there are two gold miners, take note of possible one-two combos between them and aim to disrupt those.
- Also, several of the boards require different responses after the initial move based on what the miners play. Ensure that the remaining cards in your hand are sufficient to respond to any possible threat.

After determining the best initial first move on each board, note the cards that were used and the spaces (or players) that they were played on. Take the corresponding squares on the extraction grid and perform a Caesar shift on the given letters based on the card played.

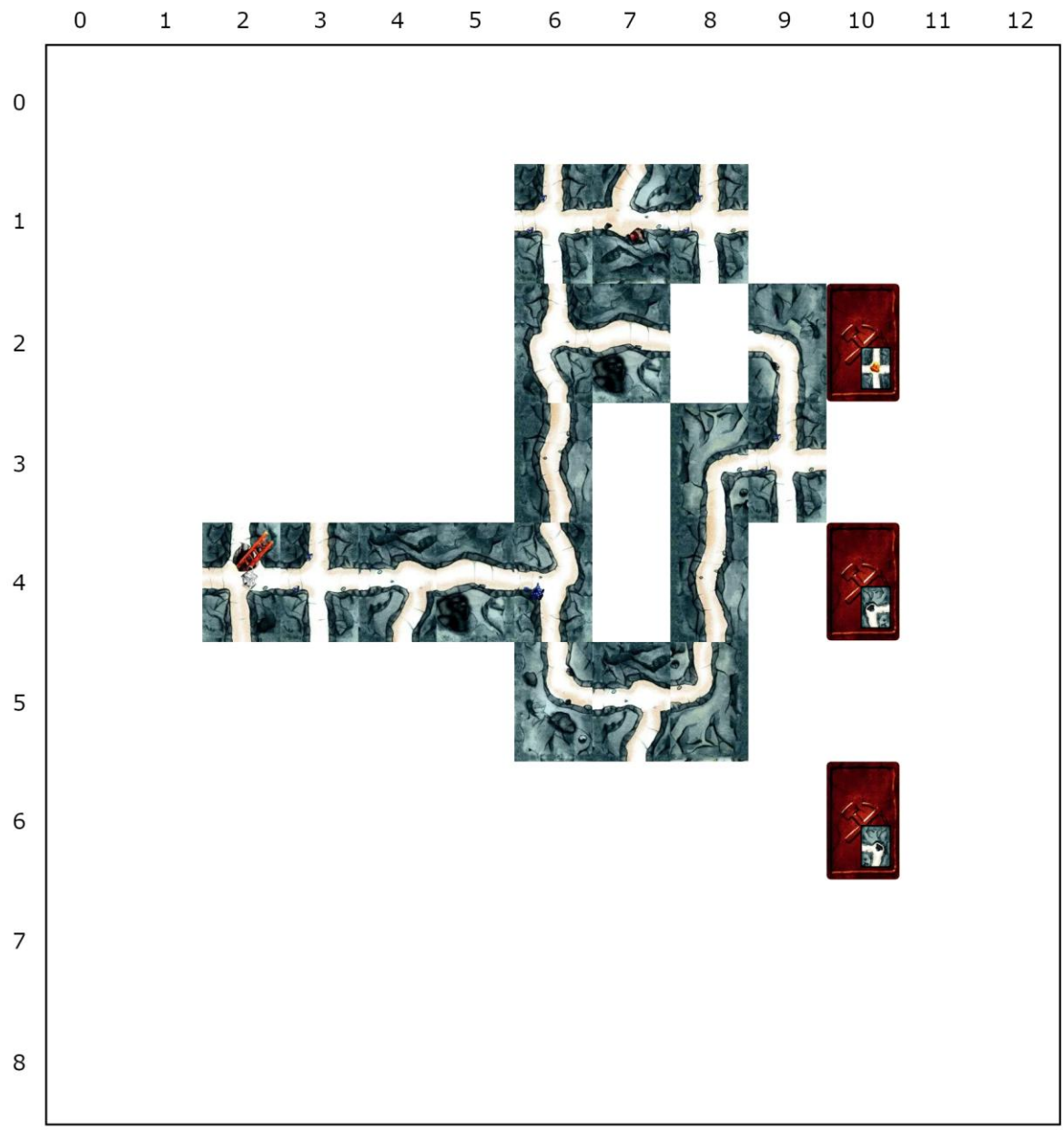
| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| U | N | D | E | R | M | I | N | I | N | G | S | U |
| B | V | E | R | S | I | O | N | D | I | S | R | U |
| P | T | I | O | N | V | A | N | D | A | | L | I |
| S | M | S | P | O | I | L | (10) A→M | (3) G→E | E | I | M | P |
| A | I | 目 | R | M | E | (6) N→T | T | (7) W→A | (1) R→L | | E | C |
| K | I | N | G | D | E | S | T | R | U | C | (2) T→G | I |
| O | N | M | A | K | I | N | (8) G→N | A | (4) B→O | | I | G |
| M | E | S | S | D | A | M | A | G | (9) I→M | N | G | C |
| R | I | P | P | L | I | N | G | R | U | I | N | S |

| | |
|---|---|
| Gold Miner 1 | Gold Miner 2 |
| (5) P→E | Q |

Reading the letters in grid order after shifting gives the final answer **METAL GNOME**.

Solutions to individual puzzles

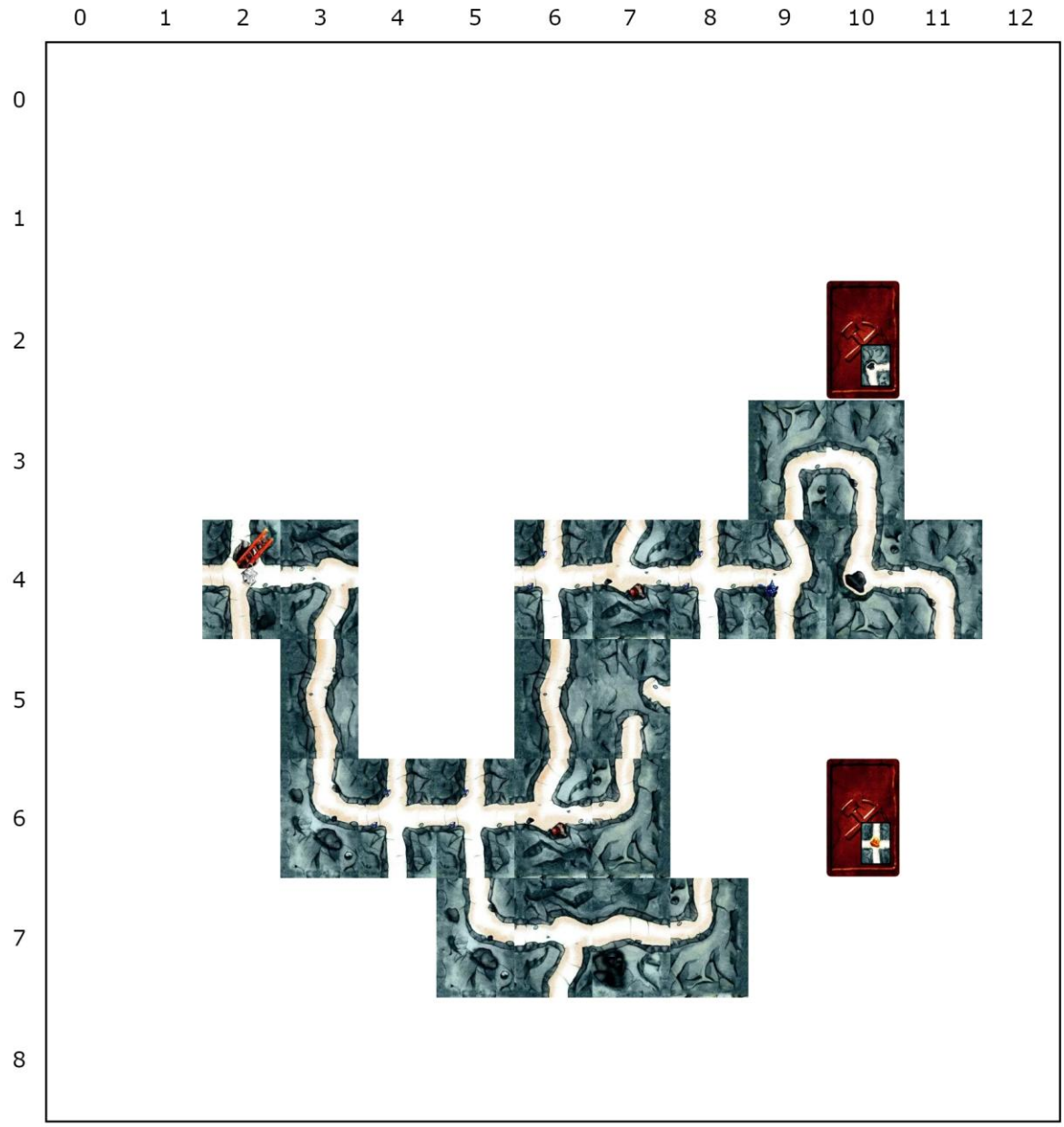
**Simulation 1**




Solution:  at col 9 row 4 (hereafter represented as (9, 4).

Either of the miners can win at (10, 3) on their turn, but you cannot block that directly with your card as it would complete a path to the gold. Instead, playing at (9, 4) reveals the coal card with an open path pointing up, blocking both opponents from completing the path.

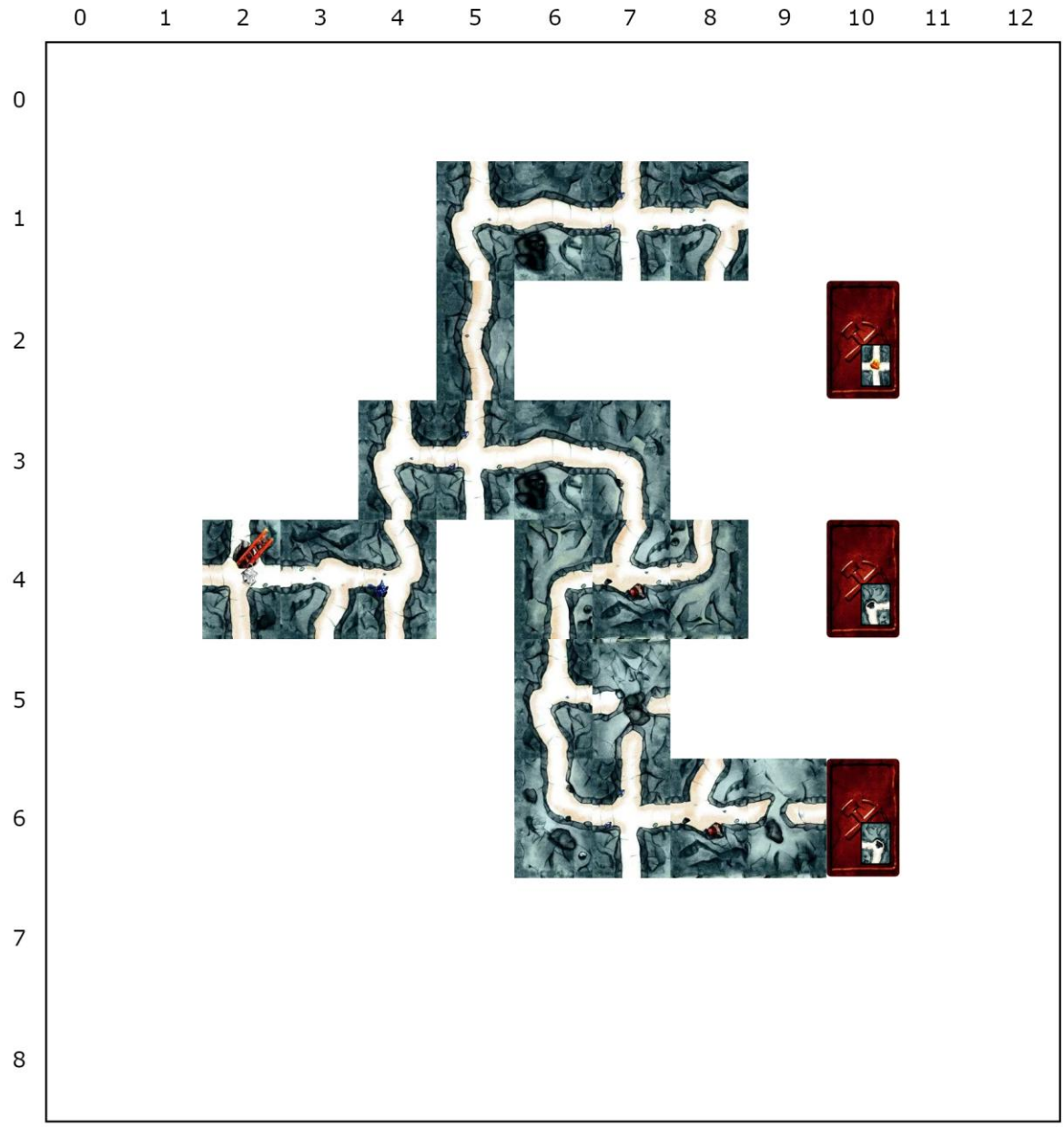
**Simulation 2**




Solution:  at (11, 5)

The miners' only path to victory is playing at (11, 5) followed by (11, 6), hence, blocking that space ensures your win.

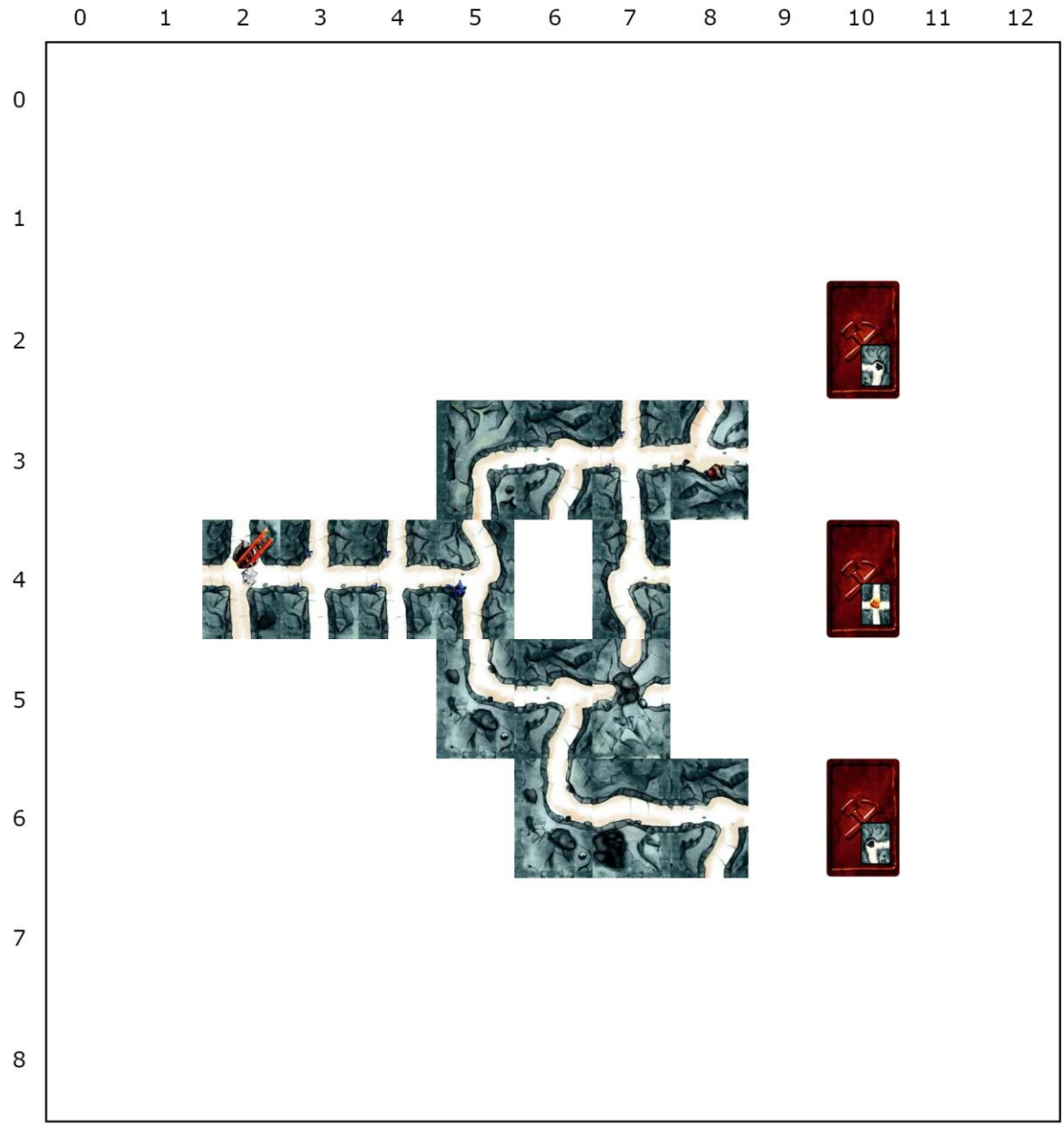
**Simulation 3**




Solution:  at (8, 3)

The miners directly threaten a win with the 7-shaped-tunnel at (8, 2) and the horizontal tunnel at (9, 2), so that is the highest priority to block, and it can effectively be blocked with the vertical tunnel at (8, 3). The remaining r-tunnel can block either follow up on (9, 1) from the miners: both the 7-tunnel by miner 1 or the straight tunnel by miner 2. Note that playing the vertical at (8, 2) is the wrong move, as then if miner 1 plays the 7-tunnel at (9, 1), you will be unable to block it.

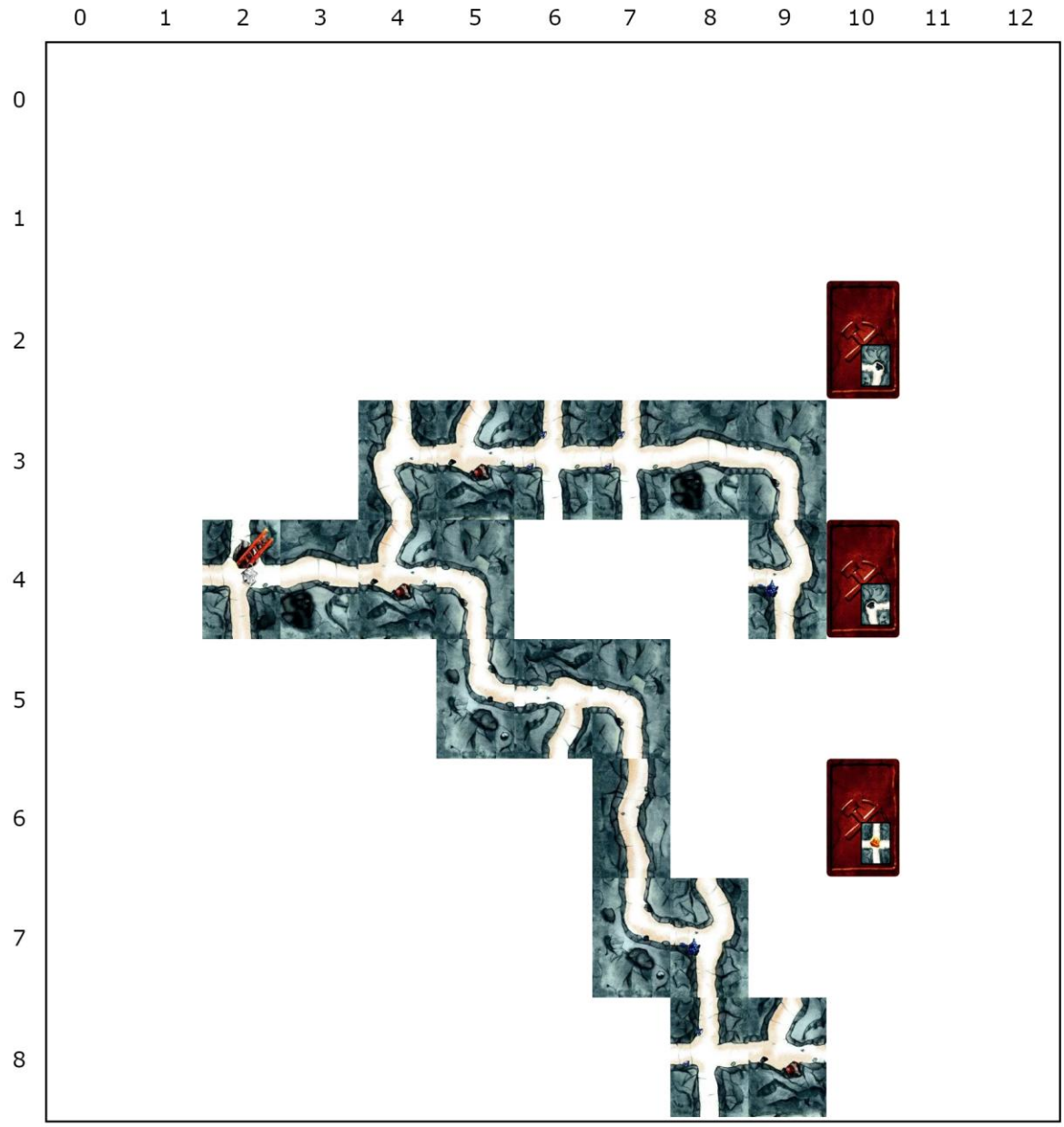
**Simulation 4**




Solution:  at (9, 6)

The miners' most direct route to victory is for miner 1 to play the horizontal T at (9, 6) followed by miner 2 playing the vertical tunnel at (10, 5), hence the correct initial play is to block it. Given the cards held by the miners, the only other viable route of advancement is for them to play the r-tunnels at (9, 3) and (9, 2), but that can be blocked on your next turn by playing at (10, 3).

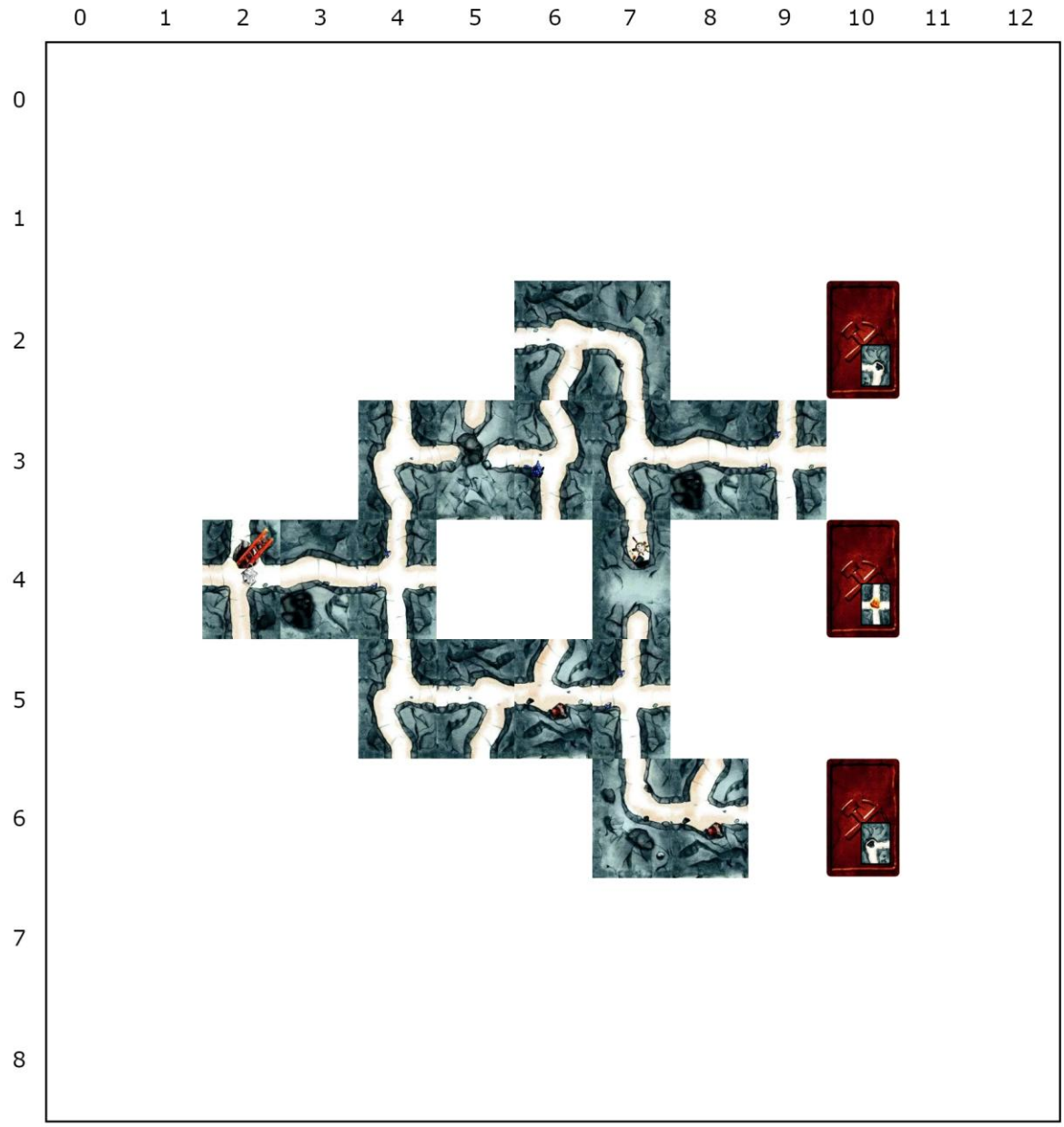
**Simulation 5**




Solution:  on gold miner 1

Gold miner 1 can complete the path on their own by playing at (9, 7) with the vertical T then (10, 7) or (9, 8), while gold miner 2 cannot complete the path on their own in any way. Playing the straight tunnel first is also futile as it cannot block (9, 7) and once the vertical T is played, either miner 1 or miner 2 can complete the path on their next turn.

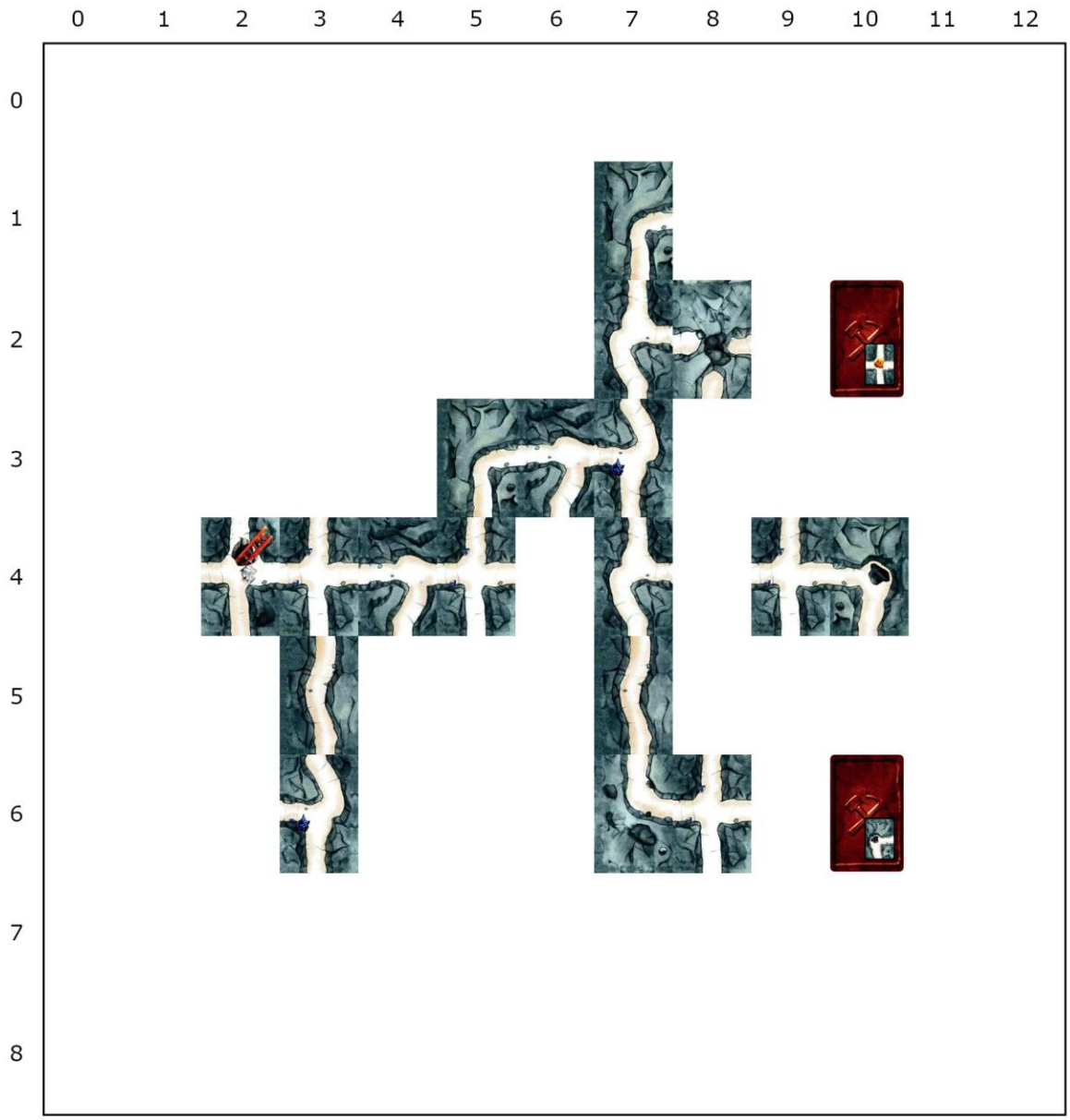
**Simulation 6**




Solution:  at (6, 4)

(6, 4) is critical to block, as otherwise gold miner 1 will play the vertical tunnel there and gold miner 2 can win easily. However, note that playing your other card (the vertical T dead end) at (6, 4) is not a winning strategy, since if gold miner 2 then plays the cross at (9, 6) revealing the r-shaped coal tunnel, blocking at (10, 5) is insufficient, as on the gold miners' second turns they can win with the vertical tunnel at (9, 5) and the vertical T-tunnel at (9, 4). Hence, the vertical T dead end must be saved to block (10, 5) on your second turn.

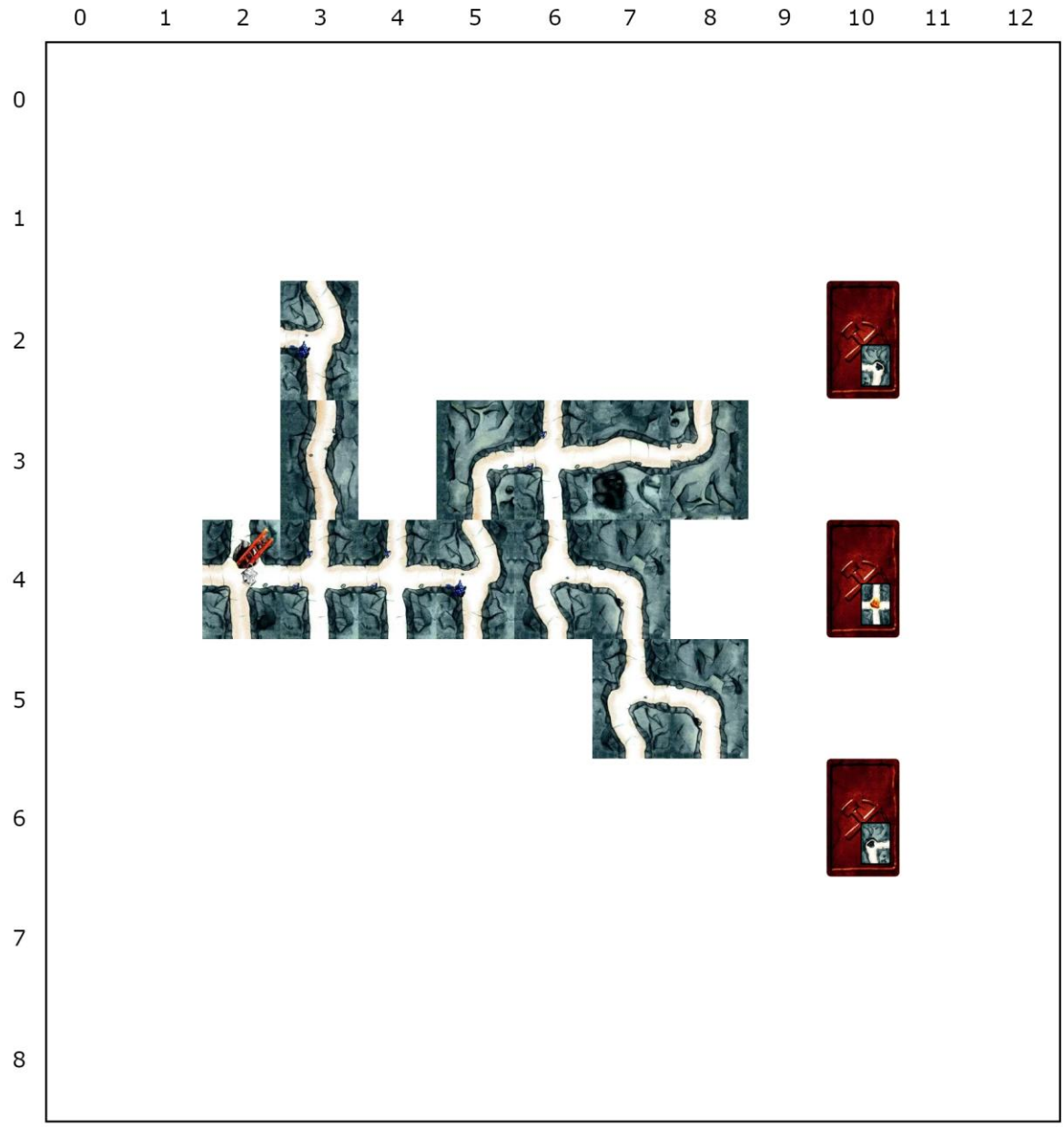
**Simulation 7**




Solution:  at (8, 4)

In this puzzle, the opponents could decide on their path of attack based on which card you played first. For example, if you played the straight dead end anywhere but at (8, 4), leaving the r-tunnel, the miners could play the horizontal T at (8, 4) and the r-tunnel at (9, 3), and you would be unable to block on your next turn. On the other hand, if you played the r-tunnel anywhere legal, the opponents could play the horizontal T at (8, 4), save both r-tunnels for their second turns, and leave (9, 3) and (10, 3) empty. That way, you would be unable to block (9, 3) with the straight dead end. Hence the only winning move is to block (8, 4) with it on your first turn.

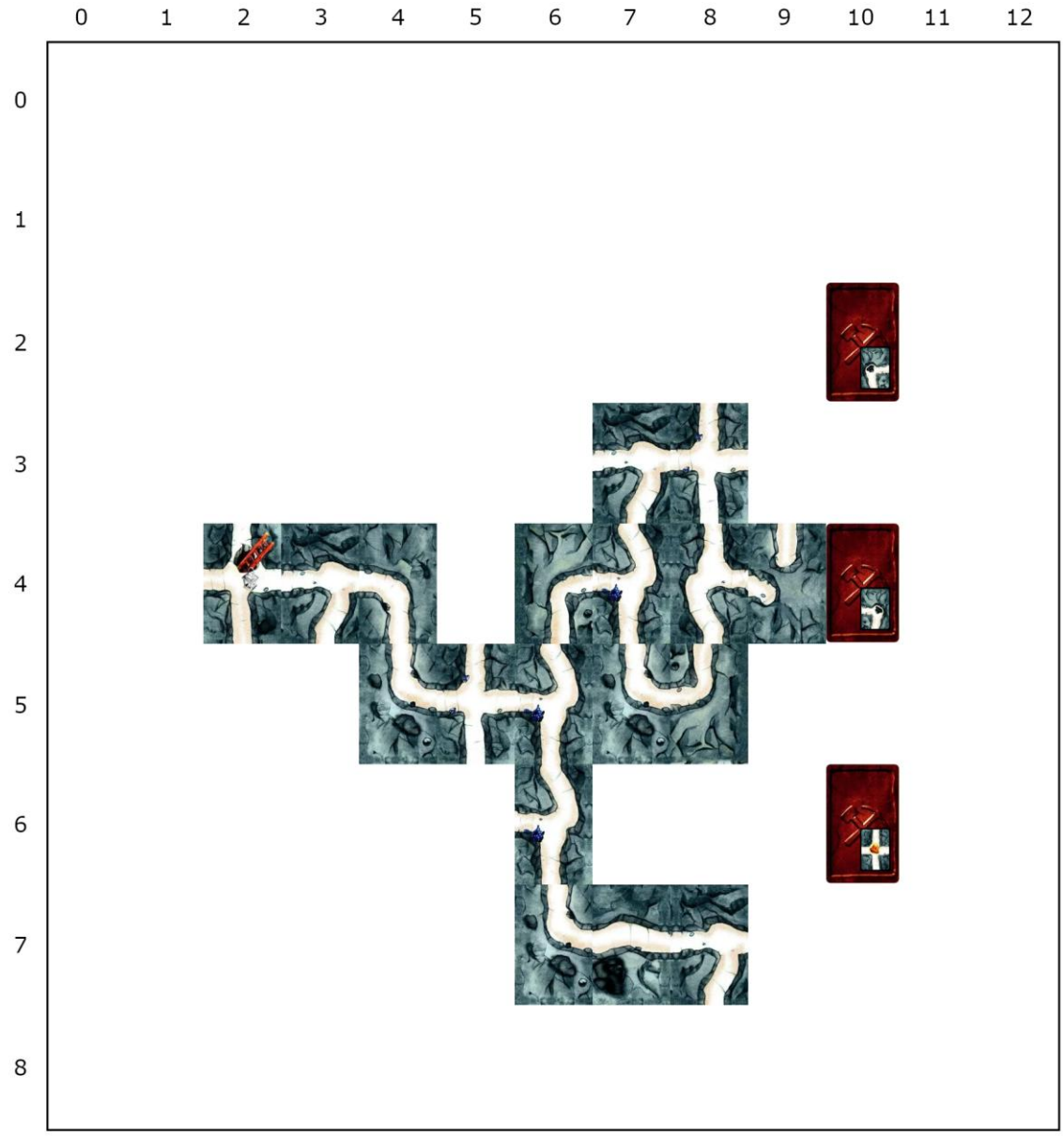
**Simulation 8**




Solution:  at (7, 6)

The miners have only one main path of attack, which is playing the 7-tunnel at (8, 6) followed by miner 2 playing the straight tunnel at (9, 6), which is unblockable next turn by either of your cards. The cross, normally one of the weakest cards for the Saboteur, turns out to be useful here as it allows blocking the (8, 6) play.

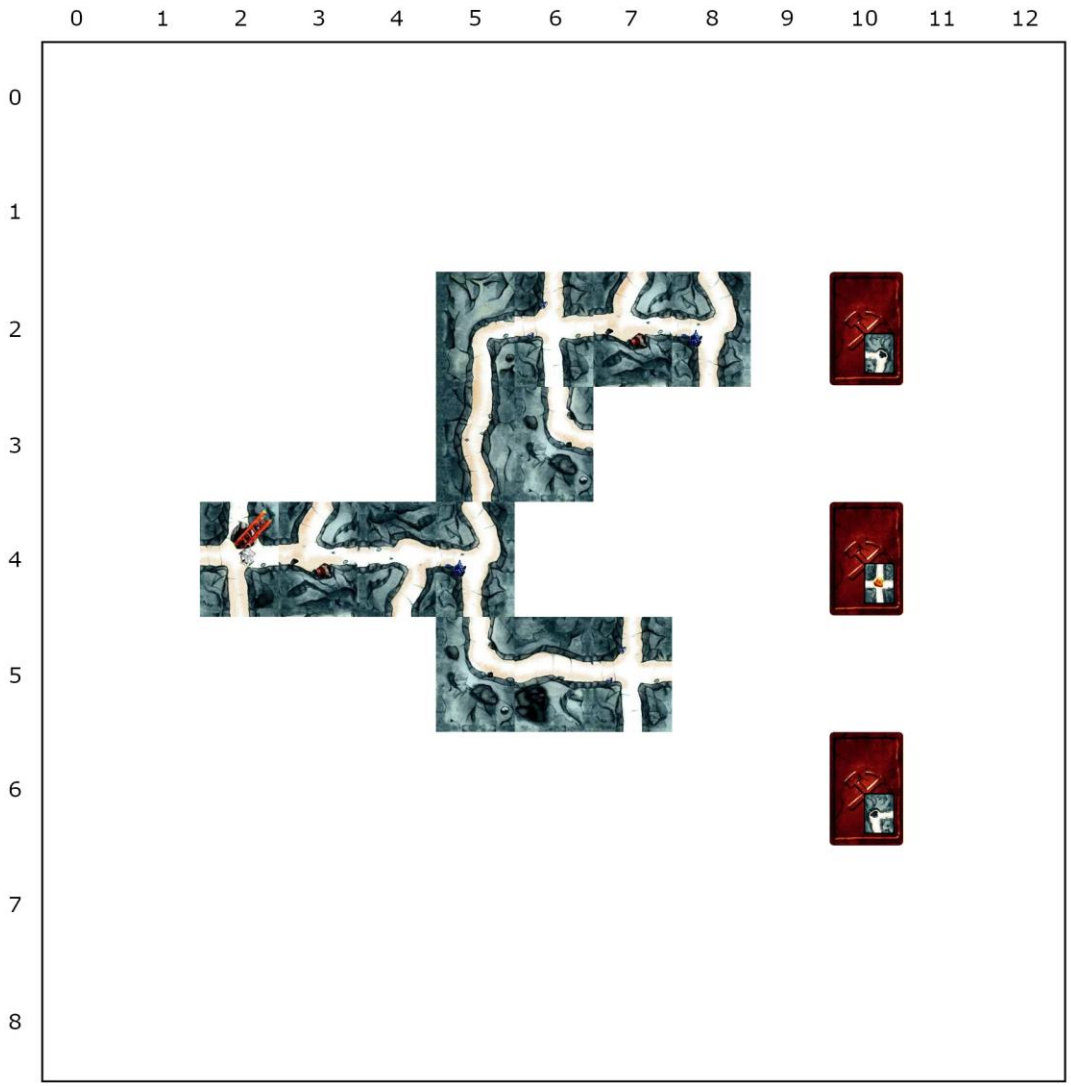
**Simulation 9**




Solution:  at (9, 7)

The rockfall card makes this a pretty tricky puzzle, as miner 1 can effectively undo your first move, or clear out the dead end at (9, 4). Hence, the key is figuring out which of your remaining cards is better at blocking a follow-up move. Should miner 1 respond with a rockfall at (9, 7) followed by miner 2 playing either of their cards there, the 7-tunnel allows blocking it either way, while if you had used the 7-tunnel first, you would be unable to block miner 2 playing the vertical T at (9, 7). Likewise, even if miner 1 clears (9, 4) and miner 2 plays the straight tunnel there, the r-tunnel would be able to block at (10, 5) where the straight dead end would not.

**Simulation 10**




Solution:  at (7, 3)

With 3 cards per player, this is by far the hardest subpuzzle. It also should not be necessary to solve every subpuzzle to obtain the final answer, so this subpuzzle was mainly included to provide solvers with a challenge.

The key to this subpuzzle is identifying that there are 4 main paths of advancement for the miners which can result in a win. Starting from (8, 3), (7, 4), (8, 5), it only takes 3 cards to win, and starting from (7, 6) it would take 4 cards. Since the miners only have tunnels with 2 exits, they can advance from these 4 points in single steps but not create additional "forks". On the other hand, because both miners get to go in between your turns, they can create multiple threats by advancing two of these 4 paths simultaneously. If they manage to create a situation where there are 2 separate

points that each require only 2 cards to reach the gold, and where you cannot block both with a single card, they win. Given that there are 3 starting points where it takes only 3 cards to win, it is insufficient to simply block one of them, as then the miners can advance the other two paths by 1 step each to create the aforementioned situation.

Fortunately, there is a play which can block 2 paths of advancement – playing the horizontal T-tunnel at (7, 3) blocks both the approach from (8, 3) and (7, 4), leaving the other two paths. Now there are two remaining paths of advancement requiring 3 and 4 steps respectively, but either can be blocked by the 7-tunnel (since miner 2 only has one 7-tunnel (if before the bottom coal card has been revealed) or the dead end card (after the bottom coal card is revealed).

Playing the dead end first at (7, 4) would not work, as miner 1 can respond by playing an r-tunnel at (8, 5), which you cannot block with the horizontal T since (7, 4) is already filled. Then they can trivially win on their next turn with another r-tunnel at (8, 4) then the straight tunnel at (9, 4).

Playing your 7-tunnel first in most places would also not work, as then miner 2 can play the 7-tunnel at (7, 6) on their first turn, play a straight tunnel at (8, 6) on their next turn (which you can neither block with the T or the vertical dead end), then finish with miner 1 playing straight at (9, 6) followed by miner 2 playing the vertical tunnel at (10, 5).

Constructor's Notes:

I had actually not played Saboteur prior to constructing this puzzle, but I've certainly heard a lot of it – it was very popular when it first came out. I'm not aware of any other Saboteur-based puzzle ever created (a search on devjoe didn't turn up any results), so this was a good opportunity to try something new. The logic turned out to be fairly challenging to construct as the premise is finding a way to prevent a particular outcome from happening, rather than achieving an outcome on its own. Also, to make the game more realistic (and also add to the challenge), I added an extra opponent. This means that, just like in the actual game, the saboteur has to watch out for multi-card combos from the opponents.

One of the trickiest parts of constructing this puzzle is ensuring that the solution is unique (or even valid). To verify this, I wrote a full solver for the game. This was pretty challenging on its own (turns out there's a lot of ways to write subtle bugs when trying to adapt the two-player zero sum game algorithm to three players, two of which are co-operative). Also, because of the large search space, and since I didn't really spend much time optimizing it, solving subpuzzle 10 took my program over 6 hours to run. On the whole, having a solver was absolutely worth it as it allowed me to try constructing various boards without having to manually prove the uniqueness of the solution.