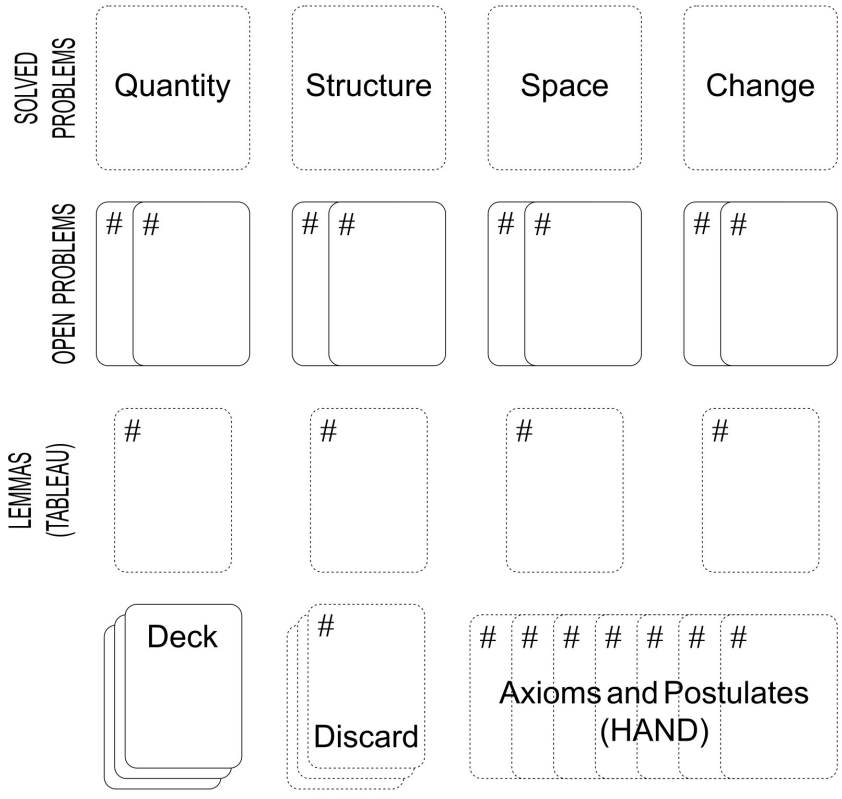
Fields Medal Solitaire
Designed by Gary Dahl

Components:

37 Cards – Start with a standard deck of playing cards, and remove all of the tens, face cards, and jokers. One of these removed cards should be returned to the deck and will be referred to as the ADVANCEMENT card going forward. The aces are all left in the deck, and are considered to have a value of one.

Setup:

After shuffling, deal out a row of four pairs of cards. The values of each pair forms a two digit number representing an open math problem from one four different areas of mathematics. Deal yourself five cards to form your starting hand. This hand represents established mathematical axioms and postulates. If the ADVANCEMENT card was dealt to any of the four problems or to your own hand, replace it with a new cards and then shuffle it back into the deck.



Objective:

The objective of this game is to earn the Fields Medal by solving an open problem in each following four areas of mathematics: quantity, structure, space, and change. This will be done by first playing axioms and postulates from your hand to create new lemmas. These lemmas in your tableau will then be used to form larger proofs that solve the open problems in front of you. If you are able to solve a problem in each category before getting stuck and unable to make further legal moves, then you win!

Play:

The two digit numbers formed by each pair of problem cards represent the targets for both devising clever lemmas and for solving open problems. To reach these targets, you will be combining cards using any combination of familiar mathematical operations: addition, subtraction, multiplication, division, exponentiation, and one potentially less familiar operation of concatenation: joining numbers by arranging their digits in sequence. For example, you could combine 3, 5, and 7 to reach the target 42 by first concatenating 3 and 5 into 35 and then adding 7. You may evaluate these operations in any order that suits you. So you could also reach the target 312 with these numbers by first adding 5 and 7 to get 12, and then concatenating the 3 onto the front of this number.

If you can reach one of these problem targets by combining cards from you hand, then you may:

1) discard those cards from your hand,
2) move the problem cards down into your tableau of lemmas, and
3) draw a replacement pair of problem cards.
   Note: you should not redraw any cards to your hand at this time.

If you can reach one of these problem targets by combining cards from your tableau, then you may:

1) discard those cards from your tableau,
2) flip over the problem cards to mark that you have solved a problem in this category,
3) draw a replacement pair of problem cards, and
4) draw two new cards to your hand.

An alternative way to use these cards in your tableau, is to discard them in exchange for drawing two new cards to your hand. If your tableau ever contains more than four lemmas, then you must immediately exchange the excess for two cards in your hand apiece. If your hand size ever exceeds seven, then you must discard down to seven.

Whenever the ADVANCEMENT card is drawn, you must:

1) immediately move that ADVANCEMENT card to the discard pile,
2) draw a replacement for whatever this ADVANCEMENT card had been drawn for, and
3) add a third card to the left most problem that currently has two cards. This will turn the target for this problem from a two digit number to a three digit number, making it more difficult to reach in the future. If all of he problems are three digits long, you may remove this ADVANCEMENT card from the game.

Whenever the deck runs out of cards, shuffle all of the cards in the discard pile to reconstitute it.

Play continues in this way, until either you have solved a problem in each category or you have run out of legal moves that can be made.