Section 5. In Search for a Maximum

In mysteries of this section, reader is expected to find hands with maximal scores, number of fans and other limiting parameters.

Contents

5-1. Full House

Sherlock Holmes, Dr. Watson and Mrs. Hudson are sitting in the lounge at 221B Baker Street. Holmes asks Dr. Watson:
"There are 81 fans in MCR rules. Isn't it interesting how many different fans one can place in a winning hand?"
"Watson", Holmes continues, "I must leave to buy some tobacco. Let's discuss your solution to the problem. I guess it should take no more than half a pipe."

Question: Please, construct a hand containing the maximum of ***different*** fans (recurring fans are counted as one).

Hint
Solution

5-2. What's the Maximum Score?

Returning with tobacco, the great detective discussed the solution to the problem of the hand containing the maximum number of different fans (see 5-1. Full House) shown by Dr. Watson and Mrs. Hudson.
"Well, well!", he said. "So, for you to find a hand with a maximum score for hand value, it should take no more time for me to light my pipe, I guess?"

Question: Please, construct a hand containing the maximum score for a hand.

Hint
Solution

5-3. Irregular Maximum

At 221B Baker Street, Sherlock Holmes and Dr. Watson are sitting at the table waiting for Mrs. Hudson to bring them their morning coffee.
"Mrs. Hudson is definitely delayed," said Watson. "I will go into the kitchen to see what's the matter."
It turned out that Hudson is sitting at the table turning tiles back and forth and writing something.
"Mrs. Hudson, what are you doing? We are tired of waiting for our morning coffee!"

After bringing the morning coffee, Mrs. Hudson explains, "I'm trying to determine the maximum value of the mahjong hand for all valid types of structures."
"Well, the maximum value for the hand with a regular structure is known, which is 328 points without flowers, if I am not mistaken. For the hand with Big Three Dragons, All Honors etc.," said Watson.

"As written in the "Green Book" there are three more valid hand structure which are not regular:

- "Seven Pairs";
- "Thirteen Orphans";
- "Greater/Lesser Honors and Knitted Tiles"

said Mrs. Hudson.

"I would also add here one more type – "Semi-Regular" – for the hand consisting of three knitted sequences of "Knitted Straight", Chow / Pung / Kong and a Pair," Holmes joined the conversation. "It is easy to distinguish types of hand structures. A regular hand has four times Chow / Pung / Kong and a Pair. This hand allows declaring sets, thus I would say it is also allows collecting the handpieces. Three types of irregular hands consisting only of pairs and single tiles do not allow any declarations prior to "Hu". Finally, a Semi-Regular type of hand allows only one declaration of a set."

"So, Mrs. Hudson, what's your question?" asked Watson.
"Quite simply, how does one determine the maximum value of a hand for each hand structure. We speak here specifically about hand value, and not about the total points won," said Hudson.

"Part of the issue, definitely, is an investigation as to which fans or combinations of fans related to `Hu' declaration or winning tile are applicable," continued Holmes. "Here is a list of those fans":

- fan #44 Last Tile Draw;

- fan #45 Last Tile Claim;
- fan #46 Out with Replacement Tile;
- fan #47 Robbing The Kong;
- fan #56 Fully Concealed Hand;
- fan #58 Last Tile;
- fan #77 Edge Wait;
- fan #78 Closed Wait;
- fan #79 Single Wait;
- fan #80 Self-Drawn.

Question: For each of the following four types of hand structure determine the maximum value for the hand (without Flowers):

- "Seven Pairs";
- "Thirteen Orphans";
- "Greater / Lesser Honors and Knitted Tiles";
- "Semi-Regular" (three knitted sequences of "Knitted Straight", Chow / Pung / Kong and a Pair).

Hint
Solution

5-4. One for All

During the traditional Sunday mahjong game at 221B Baker Street, and after declaring "Hu," Lestrade started to list his fans.
"How interesting, Holmes," said Watson. "I see that one specific tile enters many fans."
"Yes, you are right, Watson," answered Holmes. "I would say there are two types of "entries", let's call it with this word. The tile may enter fan as a constituent part like in "Pure Double Chow" or "Tile Hog". Alternatively, some fan may apply to the whole hand as in "All Green" or "All Pungs". That entry may be considered as indirect."

"Anyway, what is the maximum number of entries for one tile into a winning hand?" questioned Mrs. Hudson.

Question: Please, provide a hand and a tile which enters as many fans for this hand as possible, either directly or indirectly.

Hint
Solution

5-5. Mrs. Hudson's Mahjong Training

We find ourselves at 221B Baker Street. Watson has gone away on business. Sherlock is sitting in the living room, reading, drinking coffee, and puffing on his pipe. Mrs. Hudson, using the break, decides to study more thoroughly the structural features of many-point one-suited fans.

She took the "Green Book" and started to write down fans aiming at 32 points or higher one-suited fans. Here is a list she has compiled (excluding fans with honor tiles):

- 88 = fan #3 All Green;
- 88 = fan #4 Nine Gates;
- 88 = fan #6 Seven Shifted Pairs;
- 64 = fan #12 Four Concealed Pungs;
- 64 = fan #13 Pure Terminal Chows;
- 48 = fan #14 Quadruple Chow;
- 48 = fan #15 Four Pure Shifted Pungs;
- 32 = fan #16 Four Pure Shifted Chows.

Then she takes 36 tiles of the same suit and decides to take out fourteen tiles to see what kind of fans could come out of the starting hand. From the very beginning, she collects an amazing hand. She turns to Holmes, "Sherlock, in my hand I can count no less than nine tiles for each of the eight fans on my list. That's incredible! My hand is ..."
"Never mind, Mrs. Hudson. This is elementary! Your hand is ..." and Holmes dictated fourteen tiles.

Question: Please, provide possible one-suited 14-tile hands having eleven "ready" tiles for some fans from Mrs. Hudson's list; and at least nine "ready" tiles for each of the other seven fans of that list.
Note: For the fans consisting of twelve tiles (for instance, "Quadruple Chow"), tiles in the remaining pair can be any possible tiles. For fan "Nine Gates" the 14th tile can be any possible tile.

Hint
Solution

5-6. Detective Story

Mrs. Hudson after a month of training enters her first MCR championship of London. During the very first deal a real detective story occurs. Please listen to what the spectators were saying, "So quick and overwhelming!" "Nobody had a chance to make a move!"

Mrs. Hudson's starting hand:

concealed –  .

Question: Please determine the maximum winning points for Mrs. Hudson and calculate the hand's value provided no other players had a chance to make any move.

Hint
Solution

Hints

5-1. Full House

Try to use as many possible fans from the “Incidental Bonus” group.
Please, note that this mystery is about a maximum number of ***fans*** and not points.

Solution

5-2. What’s the Maximum Score?

Try to combine four 64- and 88-point fans.

Solution

5-3. Irregular Maximum

As Sherlock mentioned, part of the solution is to find which fan or combinations of fan related to “Hu” declaration and winning tile are applicable.

Solution

5-4. One for All

Search for the solution amongst suit tiles, apply tile groups (sets of tile patterns).

Solution

5-5. Mrs. Hudson's Mahjong Training

No hint can really help in this mystery. Be persistent!

Solution

5-6. Detective Story

There is a hidden snake in the bushes!

Solution

Solutions

5-1. Full House

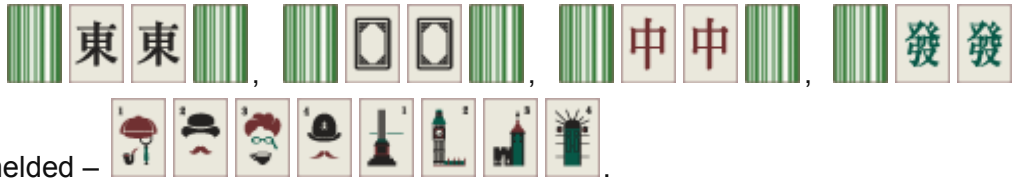
Omitting reasoning here is a hand: concealed –  ,  ,  , melded –  . After replacing Kong  comes (as last tile from the wall and last tile of a kind):

1. 2 = Prevalent Wind;
2. 2 = Seat Wind;
3. 1*2 = Pung of Terminals or Honors (twice);
4. 16 = Three Concealed Pungs;
5. 2 = Double Pung;
6. 8 = Two Concealed Kongs;
7. 4 = Outside Hand;
8. 2 = Tile Hog;
9. 1 = One Voided Suit;
10. 1 = Closed Wait;
11. 4 = Fully Concealed Hand;
12. 8 = Out with Replacement Tile;
13. 8 = Last Tile Draw;
14. 4 = Last Tile;
15. 1*8 = Flowers (8 times).

Totalling 72 points on 15 different fans (altogether 23 fans).

5-2. What's the Maximum Score?

Here we provide the solution found by running a special routine written by Alexander Egorov:

concealed –  , melded – .

Winning after kong replacement on  , which is last tile in the wall ( is both the Seat and Prevalent Wind):

- 88 = Big Three Dragons;
- 88 = Four Kongs;
- 64 = All Honors;
- 64 = Four Concealed Pungs;
- 8 = Last Tile Draw;
- 8 = Out with Replacement Tile;
- 4 = Fully Concealed Hand;
- 2 = Seat Wind;
- 2 = Prevalent Wind;
- 1*8 = Flowers (8 times).

Total 336 points.

5-3. Irregular Maximum

As Sherlock mentioned, part of the solution is to find which fan or combinations of fan related to "Hu" declaration and winning tile are applicable from the list:

- 8 = fan #44 Last Tile Draw;
- 8 = fan #45 Last Tile Claim;
- 8 = fan #46 Out with Replacement Tile;
- 8 = fan #47 Robbing The Kong;
- 4 = fan #56 Fully Concealed Hand;
- 4 = fan #58 Last Tile;
- 1 = fan #77 Edge Wait;
- 1 = fan #78 Closed Wait;
- 1 = fan #79 Single Wait;
- 1 = fan #80 Self-Drawn.

Since 8-points fans are most costly, they should be used in the first place. Which combinations of these fans work? Definitely, #44 + #46 (whenever kong may be a part of a structure), what else? Key information can be found in the "Green Book", p. 3.7.2.3 which reads: `the second way to make mahjong is by discard (to make mahjong with a tile discarded by another, including Robbing the Kong).' This means that #45 and #47 are combinable! The second part of a solution is to determine the applicability of fans #58 and #77-79 (waits). The third part is to find the best scoring hand within the given structure of a hand. Let's look at hand structures one by one.

"Seven Pairs"

For "Seven Pairs" hand an increase of hand value comes mainly from choosing what tiles to use to form a winning hand. One should use an appropriate tile group or combination of groups. The maximal hand will have "All Green" as the main group and a bunch of supplementary groups with winning on the last tile of the wall and three "Tile Hogs".

Concealed – 
(as last tile of the wall):

- 88 = All Green;
- 24 = Full Flush;
- 24 = Seven Pairs;
- 8 = Last Tile Draw;
- 8 = Reversible Tiles;
- 4 = Fully Concealed Hand;
- 2*3 Tile Hog (three times);
- 2 = All Simples.

Totaling 88+24*2+8*2+4+2*4=164 points.

"Thirteen Orphans"

This hand always scores exactly 88 points. Moreover, both types of waits: for single tile or 13-sided are not recognized by the "Green Book". No Kongs can be placed into the hand, hence, both #44 + #56 + #58 or #45 + #47 would yield the same 16 points.

The maximum score is 88+16=104 points.

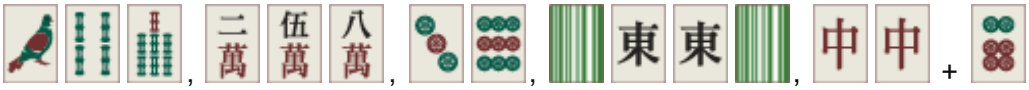
"Greater/Lesser Honors and Knitted Tiles"

The maximum hand scores 24 points, either "Greater Honors" or "Lesser Honors" plus a "Short Straight". Is thiself-drawn or from a discard? For the self-drawn, we have #44 + #56 + #58 =8+4+4=16 points. From a discard: #45 + #47 =8+8=16 points again. Unfortunately, #58 “Last Tile” is always implied by #47 “Robbing The Kong”. Since any hand of the hand structures considered has a 3-sided wait there are no points for the Wait.

The maximum score is 24+16=40 points.

"Semi-Regular"

This hand besides the fixed three knitted sequences of "Knitted Straight" allows one set in a form of Chow / Pung / Kong plus a Pair. The best choice is to have the fan "All Types". So, the plan is: concealed hand with Kong, winning after Kong replacement with Suited tile (although a wait into any knitted sequence is not recognized by the "Green Book". Still the "Last Tile" will bring four points which is more than one point for a "Single Wait"), being the last tile of the wall.

Concealed – 
(as last tile from the wall and last tile of a kind):

- 12 = Knitted Straight;
- 8 = Last Tile Draw;
- 8 = Out with Replacement Tile;
- 6 = All Types;
- 4 = Fully Concealed Hand;
- 4 = Last Tile;
- 2 = Prevalent Wind;
- 2 = Seat Wind;
- 2 = Concealed Kong.

Totaling 12+8*2+6+4*2+2*3=48 points.

5-4. One for All

Here is the 9-entries solution. The hand: concealed –  , melded – , winning self-drawn on as the last tile from the wall and last tile of a kind:

1. “Closed Wait";
2. "Last Tile Draw";
3. "Last Tile";
4. "Tile Hog";
5. "Pure Double Chow";
6. "All Chows" – indirect entry;
7. "Reversible Tiles" – indirect entry;
8. "Full Flush" – indirect entry;
9. "Lower Four" – indirect entry.

5-5. Mrs. Hudson's Mahjong Training

This para-mahjong problem requires math and persistence to solve it. Research revealed that there are several dozens of solutions.

For instance, here are two solutions with the number of "ready" tiles per one hand = 11 and the maximum total sum of "ready" tiles = 77:

-  ;
-  .

5-6. Detective Story

Some of the readers may simply calculate the hand value after Mrs. Hudson said "Hu!":

- 48 = Quadruple Chow;
- 24 = Full Flush;
- 8 = Reversible Tiles;
- 4 = Fully Concealed Hand;
- 2 = All Simples;
- 2 = All Chows ;
- 0*3 = Tile Hog (three times), does not combine with Quadruple Chow.

This totals a hand value of 88 points and gaining (88+8)*3=288 points in the total score.

Please note that a hand is multivariate; it allows four different tile grouping methods before scoring:

1. (234)*4+55 – Quadruple Chow;
2. 222+333+444+234+55 – Pure Shifted Pungs;
3. (234)*2+(345)*2+22 – Pure Double Chow twice;
4. (22)*2+(33)*2+(44)*2+55 – Seven Pairs.

Now, reader, please note, that there is a trick, a hidden snake, in the text! The phrase "no other players had a chance to make any move" may open up a new perspective.

At the Championship

Mrs. Hudson was a novice player who had been playing MCR for only a month. When she saw her starting hand, she was so excited about an 80+ pts. hand that she unintentionally dropped her tiles face down. "Sorry about that. Please, allow me to open my hand again," she asked her opponents.

After standing her tiles back up, she faced something different due to the rearranged tiles, and an entirely new plan came to her mind:

 .

“Kong!” which was quickly followed by many more new words, “Flower, Flower, Kong, Flower, Flower, Flower, Flower, Kong, Flower, Flower, Kong, Hu!”

There was a deathly silence, and the partners at the table sat pale and silently as they listened to Mrs. Hudson’s explanations.

 :

- 88 = Four Kongs;
- 64 = Four Concealed Pungs;
- 48 = Four Pure Shifted Pungs;
- 24 = Full Flush;
- 8 = Reversible Tiles;
- 8 = Out with Replacement Tile;
- 4 = Fully Concealed Hand;
- 2 = All Simples;
- 1*8 = Flower (8 times).

Totaling hand value of 254 pts. and gaining (254+8)*3=786 pts. in the total score.

After explanations and calculations Mrs. Hudson heard emotional exclamations from the spectators, “So quick and overwhelming!” “Nobody had any chance to make a move!” “Looks pretty much in accordance with the Rules but still it’s is unbelievable!”

P.S. Some of the fans in the latter hand do not count:

- “All Pungs” – does not combine with “Four Concealed Pungs”;
- “Self-drawn” – does not combine with “Out with Replacement Tile”.