Section 8. Difficult Problems

Mysteries of the current section are hard-to-crack ones.

Contents

8-1. Four Patterns Hand

During a friendly game, Mrs. Hudson (being East) was dealt a winning hand. Since there was no point in continuing the deal, she declared "Hu!" winning the table. Remarkably, her hand consisted only of four tile patterns in the distribution 4-4-3-3, or AAAABBBBCCCDDD, where A, B, C, D equal tile patterns.

Note: Quotation from "Green Book", p.3.5.5.1.(1) "A complete set of tiles is comprised of 6 types of 42 patterns total (Character, Dots, Bams, Winds, Dragons, and Flowers)." So, the term "pattern" is used for a unique "tile ***face***".

Questions

Please, provide maximal scoring of Mrs. Hudson's hand under ***different*** assumptions:

1. D = , so the hand looks like AAAABBBBCCC ,

2. D = , so the hand looks like AAAABBBBCCC ,

3. C = , D = , so the hand looks like AAAABBBB ,

4. D = , so the hand looks like AAAABBBBCCC ,

5. D = , so the hand looks like AAAABBBBCCC ,

6. D = , so the hand looks like AAAABBBBCCC .

8-2. Mrs. Hudson's Four Wins

On Friday night Sherlock Holmes, Dr. Watson, Mrs. Hudson and Inspector Lestrade decided to play mahjong at 221B Baker Street. While preparing the wall, they started to speak about the ability to handle game opportunities.

"One of the most difficult problems for a player is to know when to stop by winning a deal, and when to continue with it," said Holmes. "Whenever the hand value does not bring the expected result, continue to play! And, if you decide to continue playing, remember, somebody else may get mahjong."

Everybody agreed by nodding their heads. So, the wall is built, the tiles are dealt. Mrs. Hudson is East. And then something truly unexpected occurred. Mrs. Hudson was pondering on something thoroughly. Then she declared mahjong after making several calls, so that nobody had a chance to make any move.

"Gentlemen!" she said. "I had the chance three times to finish the deal, but I was confused with the prospect of finishing the game so early. So, the fourth time, my patience was finished and I declared mahjong."

Questions

Question 1: Give an example of Mrs. Hudson's starting hand and show how she decided to continue playingthree times.

Question 2: How many declarations (calls) did she make provided that there were no flowers in her winning hand?

Question 3 (for experts): Is it necessary for Mrs. Hudson's hand to be one suit only?

Question 4 (for experts): Is it possible to find in four mahjong hands of Mrs. Hudson (three missed and one declared) an 88-point fan?

8-3. Charleston

Our foursome gathered to play mahjong at 221B Baker Street. The wall is built and broken. Tiles are dealt. Dr. Watson then says, "According to the newspaper 'Mahjong News' the rules of mahjong vary in different countries. For instance, considerat an amazing rule called the

"Charleston" in American mahjong. The essence of it is that before the game, players pass three unwanted tiles to another player and do this several times."

"Why all this?" asked Mrs. Hudson.
"It's rather elementary!" said Holmes. "You give out unwanted tiles but may receive good ones to exactly collect mahjong."
"Provided that all tiles will fite," Lestrade corrected.
"Why don't we try this rule,as an experiment?" asked Mrs. Hudson. "For instance, I do not have in my hand any ready three-tile set (Chow or Pung). I would be eager to exchange three unwanted tiles for more useful ones."
"Strange to say, I *also* do not have any ready three-tile sets in my hand," replied Watson.
"I too! I too!" shouted Holmes and Lestrade.
"Well, well, it is decided!" said Mrs. Hudson sitting at the East position. "Gentlemen, please, take three unwanted tiles and pass them to the player to your right. Let's see what happens."

In the next moment something unexpected happened. Mrs. Hudson, after receiving three different Dots tiles, has in hand complete mahjong, while the three gentlemen's hands become waiting for mahjong. It is incredible!

Questions

Please, provide all four hands under conditions:
- hands before the passing of tiles do not have any ready three-tile sets (Chow or Pung);
- group of passed tiles consisted **strictly** of three Bamboo, three Characters, three Dots, three different Honor tiles;
- there are no Flowers in the hands.

Question 1: Main (maximum of points) fan for all four hands is strictly the same.

Question 2: Main (maximum of points) fan for all four hands is strictly different, the sum of points of main fans of all four hands is maximal.

Note: Waiting hands for determining the main fan are considered to be completed by adding the appropriate waiting tile.

Hint
Solution

8-4. 8th of March

On the 8th of March (International Women's Day), the three gentlemen congratulated Mrs. Hudson. After a nice dinner, prepared by Dr. Watson, everybody decided to play mahjong.
"I'd like to win. Only, I warn you not to give in!" warned Mrs. Hudson.

By the last-but-one deal of the game Mrs. Hudson was in 4th place, trailing the 3rd place by almost 100 points. To get to 1st place was virtually impossible, since this gentleman recently won "Thirteen Orphans" with a self draw.

When finally she had a waiting hand, Lestrade discarded a suitable tile. "Mahjong?" asked Mrs. Hudson to herself. "No, the hand is worth only 30 points, so I will end at the last place anyway. Let's wait!"

Next move. Dr. Watson discarded Mrs. Hudson's waiting tile, **different** from the tile discarded by Lestrade. "Mahjong?" asked Mrs. Hudson to herself again. "No, even though the hand will score higher than the first discard, I will find myself just at 3rd place. I will wait for a higher score!"

Next, Holmes's discard, is **different** from the tiles discarded by Lestrade or Watson. Again, Mrs. Hudson could declare mahjong. "Nice hand! With that mahjong, I would be in 2nd place. But, it seems that something **celebratory** is going on. I shall wait!"

In the next move, Mrs. Hudson declared mahjong from the wall with a winning tile, **different** from the tiles discarded by the three gentlemen. It is not hard to guess that she won the whole game in the very end, taking 1st place, breaking even the 300-point gap from the leader (since the value of her hand was already above 100 points).

"Congratulations! Not surprisingly this happened on Women's Day!" all gentlemen shouted in unison.

Question: Give an example of Mrs. Hudson's hand waiting for at least four different tiles and yielding mahjong with different scores.

Hint
Solution

Hints

8-1. Four Patterns Hand

Since patterns of winning hand are fixed then please find the way to increase hand value with tile groups.

Solution

8-2. Four Wins of Mrs. Hudson

Please determine which type of hand allows for declaring both "Hu" and other calls.

Solution

8-3. Charleston

Please, first determine what hand structure is applicable for waiting hands. Secondly, try to find which top-scoring fans suit the conditions.

Solution

8-4. 8th of March

For the hand to wait on four different tiles with significantly different hand values it should be one suit only. Please, try to discover what will be the main fan of such a hand.

Solution

Solutions

8-1. Four Patterns Hand

This story is about the so-called "Pattern Groups". One cannot find this notion written explicitly in "Green Book" although one can observe it in fan definitions and scoring. Pattern group is a body of tiles having some feature so that this feature is reflected in "Green Book" as a stand-alone fan. Let's look at table listing all possible pattern groups:

#	Pattern Group	Patterns in Group	Fan	Fan Score, pts.
1	Green	6	All Green	88
2	Honors	7	All Honors	64
3	Terminals	6	All Terminals	64
4C	Terminals or Honors	13	All Terminals or Honors	32
5	Suit Pure	9 (*3)	Full Flush	24
6	Lower Tiles	9	Lower Tiles	24

7	Middle Tiles	9	Middle Tiles	24
8	Upper Tiles	9	Upper Tiles	24
9	Lower Four	12	Lower Four	12
10	Upper Four	12	Upper Four	12
11	Reversible	14	Reversible	8
12C	Suit Mixed	7+9 (*3)	Half Flush	6
13	Simples	21	All Simples	2

Here the column "Patterns in Groups" is the number of different tile patterns within that group. Pattern group "Suit" has three possible tile implementations – Characters, Bamboos, and Dots. "4C" and "12C" are pattern groups combining two other subgroups, each subgroup has at least two tiles for a pattern group not scored higher.

Please, note that the listed fans score points *regardless of* hand structure. Though, there are several fans which stipulate structure, for instance, "All Even". The most striking fact is

that any tile pattern can be in several pattern groups. For instance, is in groups: "Green", "Suit", "Lower Tiles", "Lower Four", "Reversible", "Simples" (and can also be used for a fan "All Even"). When a hand consists of tiles belonging to several pattern groups, all possible fans based on those pattern groups as-a-whole can be scored (though with some limitations).

Now, let's go back to Mrs. Hudson's AAAABBBBCCCDDD hand. Points come from two sources: hand partitioning into sets and pattern groups.

Hand structure

Four identical tiles in a distribution 4-4-3-3 cannot form kong or two pairs (as in Seven Pairs), so, at least one tile of these four should form a chow. If one A and one B are in *different* chows then we have (A is interchangeable with B, and C with D):
Variant 1. (ACD)+(BCD)+(AAABBBCD) or (ACD)*2+(BCD)+(BBB)+(AA). Tiles C and D can make two different chows only if they are adjacent numbers in one suit, so numbers in all patterns go by order A-C-D-B or A-D-C-B in one suit. The current variant does not score a lot: 24 (Full Flush) + 2 (Tile Hog) + 1 (Double Chow) + points for Pung and pattern Groups.

Alternatively, A and B are in the same chow: (ABC)+(AAABBBCCDDD). There exist three ways to partition the second part:
Variant 2. (ABC)+(AAA)+(BBB)+(DDD)+(CC) – Three Pungs, the only restriction is for patterns A, B, C to form a Chow.

Variant 3. (ABC)+(ABD)*3+(CC) – Triple Chow, all used patterns are in one suit numbered in order C-A-B-D or D-A-B-C.

Variant 4. (ABC)+(ABD)+(ACD)*2+(BB) – impossible chows, does not work.

As a summary, variants 1 and 3 strictly require a one-suited chain of numbered patterns (A/B or C/D are interchangeable), while in variant 2 pung DDD may be any – honor, same or different suit. Variant 2 is more promising both in terms of points and tile pattern combining possibilities.

Pattern Groups

To get the maximum score from Mrs. Hudson's hand, we need to find such patterns which fit as many high-scored pattern groups as possible.

Answer 1. D = , hand is AAAABBBBCCC . Variant 2 suggests to use

, or plus one more pattern. Bingo! Since , ,

 are Green tiles then maximum points hand is (may be replaced by)

 + + + + :

- 88 = All Green;
- 24 = Full Flush;
- 16 = Three Concealed Pungs;
- 4 = Fully Concealed Hand;
- 2*2 = Tile Hog (twice);
- 2 = All Simples.

A total hand value of **138** pts.

Answer 2. D = , hand is AAAABBBBCCC . Variant 2 suggests to use

, or plus one more pattern. In case this last pattern

continues as a one-suit chain, a 24-pts. fan can be generated – "Pure Shifted Pungs",

also adds "Reversible Tiles" in comparison with . So, the maximum points hand is

 + + + + :

- 24 = Full Flush;
- 24 = Pure Shifted Pungs;
- 16 = Three Concealed Pungs;

- 8 = Reversible Tiles;
- 4 = Fully Concealed Hand;
- 2*2 = Tile Hog (twice);
- 2 = All Simples.

A total hand value of **82** pts.

Answer 3. C = , D = , so the hand looks like AAAABBBB . Variant 2 suggests to use 6 subvariants (combining patterns from Answer 1 and Answer 2): , , , or . Two subvariants consist of "Reversible Tiles" and only one belongs to "Middle Tiles"! So, a maximum points hand is + + + + :

- 24 = Middle Tiles;
- 16 = Three Concealed Pungs;
- 8 = Reversible Tiles;
- 4 = Fully Concealed Hand;
- 2*2 = Tile Hog (twice);
- 2 = Double Pung.

A total hand value of **58** pts.

Answers 4-6. What is changed in our analysis when D is a Dragon tile? Are three Dragons the same, in some sense "brothers"? No! They are "stepbrothers" since is a Green tile, is Reversible and has no additional properties. The only possible hand structure is variant 2. Additional points can be found in suit pungs. Three hands are:

4. .

The total hand value is 16+6+4+2*2+2+1 = **33** pts.

The current hand can have six versions: any of three suits and tiles 1-2-3 instead of 7-8-9.

5. .

The total hand value is 16+8+6+4+2*2+2+1 = **41** pts.

6. .

The total hand value is 88+16+6+4+2*2+2 = **120** pts.

8-2. Four Wins of Mrs. Hudson

Answer 2. Answering Question 2 first, one can notice that Mrs. Hudson for the first three times could not declare anything else but "Kong" without giving out a move to the opponents. So, she made exactly four calls: three times "Kong!" and one "Hu".

Is it possible to declare four kongs? No. Otherwise after the 3rd kong and just before declaring the 4th, one hand structure would be 4-1 which is not legal for winning (3+2) if she decided to stop.
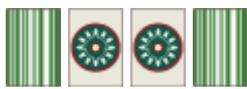
Answer 1. Here is one of possible Mrs. Hudson's hand.
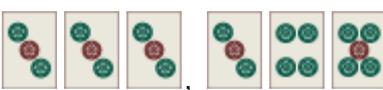
1A. Start.

Concealed – [tiles] , , , , , , .

Mahjong – Seven Pairs, declaration – "Kong" on [tile] ([tile] is replacement tile).

1B. After 1st kong.

Table – [tiles] , concealed – [tiles] , [tile] , declaration – "Kong" on [tile] ([tile] is replacement tile).

1C. After 2nd kong.

Table – [tiles] , [tiles] , concealed – [tiles] + [tiles] , declaration – "Kong" on [tile] ([tile] is replacement tile).

1D. After the 3rd kong.

Table – [tiles] , [tiles] , [tiles] , concealed – [tiles] , [tiles] .
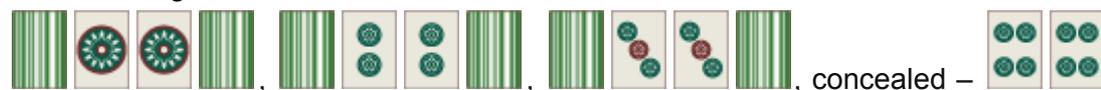
The solution above shows only one of the possible transformation chains in which Mrs. Hudson has three sets of identical tiles ([tile] , [tile] and [tile]) in her initial hand. We can show it schematically as:

4442 –> (4)+443 –> (4)(4)+431 –> (4)(4)(4)+32.

Nevertheless, there exist other transformation chains having two or even only one set of identical tiles in the initial hand, new kongs in the hand appear after replacement tiles, for instance:
- 4433 –> (4)+4331 –> (4)(4)+431 –> (4)(4)(4)+32;
- 41333 –> (4)+1334 –> (4)(4)+134 –> (4)(4)(4)+23.

Answer 3. In all of the above-mentioned transformation chains, we assumed that the tiles in Mrs. Hudson's hand belonged to one suit, since it is much easy to use specific tile in Chow or Pung. Can we abandon the one-suit restraint?

Yes! The 1st kong might consist of another suit or even of Honors! A reader may replace

 for any other tile in the above solution to check it.

Answer 4. Based on answer 3 here is a possible hand with the 88-point fan "All Green":

 .

It is highly possible for Mrs. Hudson to have such a nice hand from the start to the finish of the deal immediately assuming that the maximum for the current deal is achieved.

8-3. Charleston

Let's first consider which hand structures are possible in hands. We know the following hand structures:
- "Regular" (four Chow / Pung / Kong and a Pair);
- "Seven Pairs";
- "Thirteen Orphans";
- "Greater/Lesser Honors and Knitted Tiles";
- "Semi-Regular" (three knitted sequences of "Knitted Straight", Chow / Pung / Kong and a Pair).

Here are general considerations on the applicability of a hand of specific hand structures:
- "Regular" hand structure does not work for any 14-tile hand since it has four ready three-tile sets which cannot be formed "from scratch" by adding three tiles, though this hand structure does allow for a 13 tile hand;
- "Thirteen Orphans" does not work for all four hands (first case) since one tile will be missing though it may work as a hand for the second case. It can be used in either a 14-tile hand or a 13-tile hand;
- "Seven Pairs" works perfectly for all cases, though it has some limitations;
- "Greater/Lesser Honors and Knitted Tiles" works perfectly for all cases;
- "Semi-Regular" has a very low main fan (twelve points only).

The other point of view is to look at top-scoring fans to find an appropriate solution. Skipping the details, final solutions looks like the following.

Answer 1. The same main fan.
All hands have the main fan "Greater Honors and Knitted Tiles".

Mrs. Hudson, , tiles received are three Dragons.

Holmes, , tiles received are three Bamboo.

Watson, , tiles received are three Characters.

Lestrade, , tiles received are three Dots.

There also exists a solution using the fan "Seven Pairs".

Answer 2. Different main fans.

All four hands may have an 88-point fan! The "Green Book" lists seven 88-point fans. Two of these cannot be used: "Nine Gates" (due to high connectivity of one-suited tiles) and "Four Kongs" (due to a lack of declarations). Lastly, the fan "Big Three Dragons" should be eliminated since the solution will need five tiles (two in "All Green", one in "Thirteen Orphans" and two in "Big Three Dragons")!

Here is a solution for four 88-points fan.

Mrs. Hudson, , fan #7 "Thirteen Orphans", 88 points, tiles received are .

Holmes, , waiting for fan #3 "All Green", 88 points, tiles received are .

Watson, 二萬 二萬 三萬 三萬 四萬 四萬 伍萬 伍萬 六萬 七萬 七萬 八萬 八萬, waiting for fan #6 "Seven Shifted Pairs", 88 points, tiles received are 四萬 四萬 六萬.

Lestrade, 東 東 東 南 南 南 西 西 西 北 北 🀡 🀡, waiting for fan #1 "Big Four Winds" (only for 北), 88 points, tiles received are 東 南 西.

8-4. 8th of March

There are two basic approaches to construct Mrs. Hudson's hand: based on fan "Four Pure Shifted Pungs" or on fan "All Green". A hand is a concealed one-suiter. Here is a list of fans to be used in calculations of Mrs. Hudson's hand value:

- 88 = All Green;
- 64 = Four Concealed Pungs;
- 48 = Four Pure Shifted Pungs;
- 24 = Full Flush;
- 24 = Seven Pairs;
- 24 = Pure Shifted Pungs;
- 16 = Three Concealed Pungs;
- 8 = Reversible Tiles;
- 4 = Fully Concealed Hand;
- 2 = Tile Hog;
- 2 = Two Concealed Pungs;
- 2 = All Simples;
- 2 = Concealed Hand;
- 1 = Pung of Terminals or Honors;
- 1 = Pure Double Chow.

Concept 1. Concealed – 🀞🀞🀞🀢🀢🀢🀠🀠🀠🀕🀕🀔🀔:

- Lestrade, wins on a discard of 🀕🀔 = 24+2+2+1=29 pts.;

- Watson, wins on a discard of 🀢🀠 = 24+2+8+2+2+1+1=40 pts.;

- Holmes, wins on a discard of 🀕🀕 = 24+2+8+16+24+6=80 pts.;

- Hudson, self-drawn win on = 24+4+48+64+8=148, leap for (148+8)*3=468 pts.

Concept 2. Concealed – :

- Lestrade, wins on a discard of = 24+2+2+2+2=32 pts.;

- Watson, wins on a discard of = 24+2+2+2+2+2=34 pts.;

- Holmes, wins on a discard of = 88+24+2+16+2+2+2=136 pts.;

- Hudson, self-drawn, wins with = 88+4+24+24+2+2+2+2=148, leap for (148+8)*3=468 pts.

The question remains, how many points does each player have before a series of mahjong declarations by Mrs. Hudson?

Here is a list which works for both concepts:
- Hudson: -200 pts.;
- Lestrade: 391 pts.;
- Watson: -101 pts.;
- Holmes: -90 pts.