

Section 5. In Search for ...

In mysteries of this section, the reader is expected to do some search in order to find hands, walls, etc. having limiting parameters.

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Mysteries

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](#)
- [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 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**
- **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 the fan as a constituent part like in **Pure Double Chow** or **Tile Hog**. Alternatively, some fans 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 entered her first MCR London championship. 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:



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](#)



5-7. About Discards

This mystery contains several questions under the topic of "Discards". Common to all the questions: mahjong is declared. The zone of interest is the discard zone, and the circumstances are all according to MCR rules.

Question 1: What is the *minimum* number of tiles in the discards zone of a player who declared mahjong, provided that there are no tiles in the discard zones from any other player?

Question 2: What is the *maximum* number of tiles in the discard zone of a player who declared mahjong, provided that there are no tiles in the discard zones from any other player?

Question 3: What is the *maximum* number of tiles in the discard zone of all players, provided that the number of discarded tiles for three of the players are equal, and there are no tiles in the discard zone of the 4th player?

Question 4: What is the *maximum* number of tiles in the discard zone of a player, provided that there are no tiles in the discard zones of other players?

Question 5: What is the *maximum* total number of tiles in the discard zone of all the players, provided that there are no tiles in the discard zones of one player?

[Solution](#)



5-8. Four Cherished Words



Sherlock Holmes, Dr. Watson, Inspector Lestrade and Mrs. Hudson decided to play mahjong. When the three gentlemen entered the room, they found Mrs. Hudson doing something very strange. She threw two dice twice, and then counted the tiles, and then pulled some of them out from the wall, turned them so that she could look at them, sighed and returned them back into the wall. "Still nothing!" she sighed.

"Nothing what?" asked Holmes.

"It was Wan Dongtiao. He said that he would write on the four tiles of the White Dragon four cherished words for me. Then he placed the tiles into the wall and said, "It does not matter how many times the wall will be broken, East will never start with these four tiles, the tiles with the magic words."

"So I'm trying to find these tiles," continued Mrs. Hudson. "I have already thrown the dice probably a hundred times."

"In that case, you will never find them, according to Wan Dongtiao's words. And why not just try to take down the wall, tile-by-tile, in order to find these four tiles," assumed Watson.

"It is not necessary to disassemble the wall. It is elementary," said Holmes. "And here are those four tiles," he pulled out the four tiles from the wall and handed them to Mrs. Hudson.

"Mahjong forever, Mrs. Hudson!" whispered Mrs. Hudson reading the secret writing on the four tiles.

Question: Please, locate four such tiles which cannot, under any circumstances, be in East's first four tiles taken when breaking the wall.

[Hint](#)

[Solution](#)



5-9. Fan Excess Points

221B Baker Street. While waiting for Inspector Lestrade before a traditional mahjong game, Mrs. Hudson is asking Sherlock Holmes, "Holmes, I wonder why the minimum hand value for some hands having a 8-point fan exceeds 8 points, where is a trick?"

"You definitely mean the fan **Out with replacement tile**, right?" replied Holmes. "For this fan winning hand must have at least one declared kong." "But why are points for that kong not implied?" commented Dr. Watson. "Like **One Voided Suit** is implied in a fan **Reversible Tiles** and, hence, it adds no points." "The matter is that declared kong may be of two types, **Melded Kong** yielding 1 point or **Concealed Kong** yielding 2 points," explained Holmes. "It looks like whenever there is a **choice** then extra points are not implied. Hm-m. Let's do some systematization on what we know from 'Green Book'."

Fan Excess Points

"Let's introduce some definitions," started Holmes with a sheet of paper. "**Fan Excess Points**' or "excess" for short for the fan **X** is the difference between the **minimum** of total hand value containing the fan **X** and value of that fan (taken among all possible hands, containing the considered fan). For instance, Excess for the fan **Out with replacement tile** is 1 point since minimum hand value equal to 9 points is achieved with **Melded Kong**. Excess is seemingly equal to zero points for the majority of fans."

"I found the Excess equals to as much as six points for **Little Four Winds**," shouted Mrs. Hudson. "Hand has its minimum value when the set except Winds is a non-terminal Chow, leading to **Half Flush**, while other options lead to additional fans **Outside Hand**, **All Pungs** or even **All Honors**."

Lestrade entered the room only at a time when the whole list of fans valued 8 points or higher had been checked by friends. "What are you doing?" asked a surprised Lestrade. "We have tried to find extra-valued fans!"

Question 1: Please, list all fans with value **8 points or higher** for which "Fan Excess Points" (that is, the difference between the **minimum** of total hand value containing fan under the consideration and value of that fan) is 6 points or higher.

Question 2: Which fan has the highest "excess" value?

[Solution](#)



5-10. Matryoshka Dolls



As a sign of gratitude from Russian nobleman for solving a delicate case, Sherlock Holmes has received a set of so-called Matryoshka dolls. These twelve-in-one wooden dolls, placed in the lobby of the apartment at 221B Baker Street, served as some kind of exhibit attracting the attention of both visitors and households. On rare occasions of leisure time, Mrs. Hudson liked to disassemble the biggest wooden doll and then place all the dolls back into the big one.

One day Sherlock noticed Mrs. Hudson's "workout" and he said, "You see Mrs. Hudson these twelve dolls may serve perfectly as some model in MCR mahjong scoring." "But how? I do not quite understand", replied Mrs. Hudson.

"According to "Green Book" there are exactly twelve "**fan point grades**". I mean that any fan can be scored strictly: 88, 64, 48, 32, 24, 16, 12, 8, 6, 4, 2 or 1 point. It is interesting to know how many fans of different point grades can be in one hand. It looks pretty much like several dolls of different sizes inside the biggest doll."

Question: Please, provide a hand with the most possible number of fan point grades under the condition that **strictly no more than one fan is entering each point grade group**. Out of the solutions with the same number of point grade groups please find one with maximum hand value. Please, provide a hand in tiles and list entering fans.

[Hint](#)

[Solution](#)



5-11. Time for a Puff



At a certain point of gameplay, it turned out that no matter the actions of the players (these actions are legal by Rules moves, though they may not obey any sense or logic), the deal would end in a draw. It is important that none of the players has been declared as a “deadhand”.

Please, give the number of tiles left in the wall, concealed and melded parts of players’ hands and explain why further play would inevitably lead to a draw for two different conditions.

Question 1: All four players have declared at least one set.

Question 2: Only three players have declared at least one set, the fourth player has no declarations except **Flower Tiles**.

[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](#)



5-8. Four Cherished Words

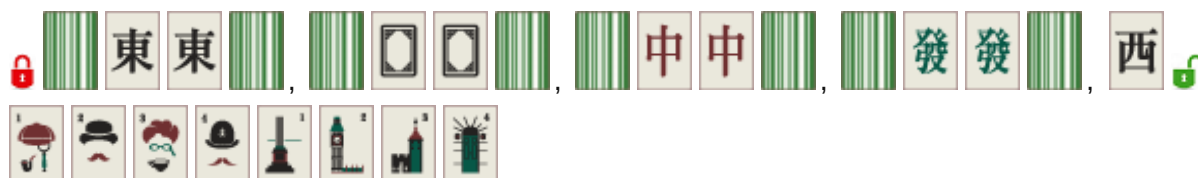
Please, build the wall and do the tests.



[Solution](#)



5-2. What's the Maximum Score?

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



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 = **Flower Tiles** (8 times)

Total 336 points.



5-3. Irregular Maximum

As Sherlock mentioned, part of the solution is to find which fan or combinations of fans 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**.

 (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 Simple**s

Totalling $88+24*2+8*2+4+2*4=164$ 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.

Honors and Knitted Tiles

The maximum hand scores 24 points, either **Greater Honors and Knitted Tiles**, or **Lesser Honors and Knitted Tiles** plus a **Knitted Straight**. Is it self-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 the 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.



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:



self-drawn on  as the last tile from the wall and last tile of a kind:

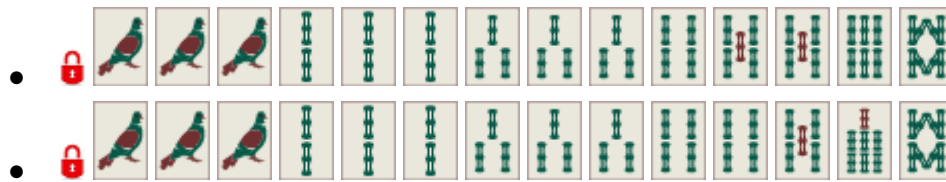
1. Closed Wait
2. Last Tile Draw
3. Last Tile
4. Tile Hog
5. Pure Double Chow
6. All Chows – indirect entry
7. Reversible Tiles – indirect entry
8. Full Flush – indirect entry
9. Lower Four – indirect entry



5-5. Mrs. Hudson's Mahjong Training

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

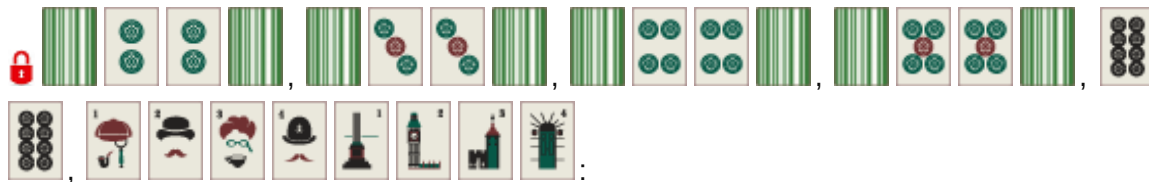
Mrs. Hudson was a novice player who had been playing MCR for only a month. When she saw her starting hand, she was so excited about an 80+ point hand that she unintentionally dropped her tiles face down. “Sorry about that. Please, allow me to open my hand again,” she asked her opponents.

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 Simple**s
- 1*8 = **Flower Tiles** (8 times)

Totaling hand value of 254 points and gaining $(254+8)*3=786$ points 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 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**



5-7. About Discards

Note: In the solution below:

- "DZ" stands for "discard zone"
- "DZ=N" means that DZ has exactly N tiles
- "EDZ", "SDZ", "WDZ", "NDZ" stand for discard zone of players: East, South, West, North

General consideration. Please, note that:

- **Regular** hand structure $3+3+3+3+2$ (where "3" may be Chow/ Pung/ Kong) allows claiming discards for sets / mahjong declarations up to five times
- **Semi-Regular** hand structure " $3+2$ +Knitted Straight" allows claiming discards for set/ mahjong declarations only twice
- hand structures $7*2$, $14*1$, $2+12*1$ are considered to be concealed, so they allow claiming discard only once, for mahjong

Answer 1. 0. Obviously, mahjong was declared by the East immediately after the flower replacement phase.

Answer 2. 5. East starts the deal and makes a discard, EDZ=1. Further discards by South, West or North are intercepted by East, EDZ=2. This situation is repeated three more times until EDZ=5. Please, note, that any discard might be intercepted by Chow/ Pung/ Kong

declaration of South, West or North at any stage. It is important that none of the discards of South, West or North is left unclaimed.

Answer 3. 15 (three times 5 tiles). Mahjong will be declared by the North. East (the player to the right of the North) starts discarding, EDZ=1. This is followed by South, SDZ=1, and West, WDZ=1. North's discard is taken by East, so NDZ=0, and East has one melded set. Another round of discards leads to EDZ=SDZ=WDZ=2. North's discard is taken again by East, so NDZ=0, and East has two melded sets. Let's repeat this procedure two more times. EDZ=SDZ=WDZ=4, NDZ=0, East has four melded sets. Now, another round of discards leads to EDZ=SDZ=WDZ=5. North declares mahjong from the wall, so NDZ=0. Please note that some of the discards of North or even East may be taken by South or West, though it is crucial that East ultimately has to intercept the last discard of this series.

Answer 4. 5. Getting a tile in the DZ after discard interception is possible only when declaring set/ mahjong. Four melded sets of a player mean DZ=4 for that player. An additional tile in the DZ is only possible after discarding in the first move, so the player is East. The solution coincides with Answer 2.

Answer 5. 27! Mahjong will be declared by the North. The solution partly resembles Answer 3, though there is no need for the number of tiles in EDZ, SDZ, and WDZ to be equal. So, after WDZ=5 (as in the Answer 3 solution) North's discard is taken by South (!) since 4 sets of East have already been melded, EDZ=5. South discards, one set of South is melded, SDZ=6, West discards, WDZ=6. Repeating this procedure three more times, we have: EDZ=5, SDZ=9, WDZ=9. Only West has a concealed hand. Now, North's discard is taken by West (!), and repeating this procedure three more times after West's discard we come to EDZ=5, SDZ=9, WDZ=13, totaling $5+9+13=27$ tiles in DZ while NDZ=0. North, in turn, declares mahjong from the wall.



5-8. Four Cherished Words

The quickest way to solve this math-jong mystery is to build a wall and turn face up any tiles which could be taken by East in his first turn. That should be done for all possible combinations of dice count. Let's look at the visual interpretation of all possibilities.

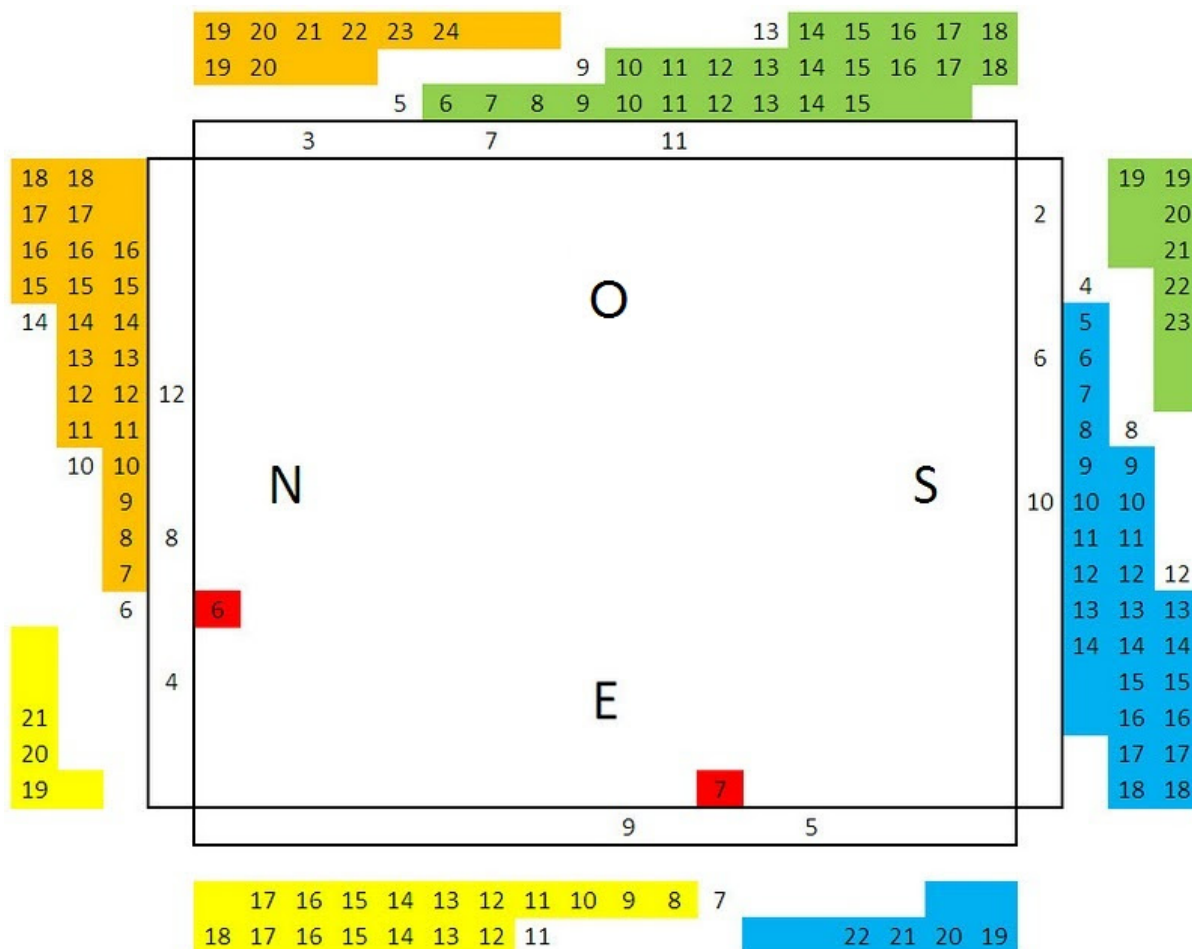
In the diagram below starting dice count from the first throw is shown at white-board vertical or horizon stripe adjacent to white square 18x18:

- 5 and 9 for East wall
- 2, 6 and 10 for South wall
- 3, 7 and 11 for West wall
- 4, 8 and 12 for North wall

Dice count from the second throw in the range from 2 to 12 is added to the respective dice count from the first throw. Summarizing count is marked in colours: a different colour for each wind.

Looking at the whole diagram one can see only two two-tile stacks: East's 7th and North's 6th, which cannot be taken by East under any possible combinations of dice count. Those

four tiles are White Dragon tiles on which are written the four cherished words, "Mahjong Forever, Mrs. Hudson!"



5-9. Fan Excess Points

Answer 1. Here is a list of all fans with value 8 points or higher for which "Fan Excess Points" is 6 points or higher. Next to the fan, the value of Excess, chosen configuration and some explanation are shown:

- #1 **Big Four Winds**, 6 points → **Half Flush** with the pair of non-terminal and non-honor tiles



- #3 **All Green**, 7 points → **Half Flush** with 1 point for **Pure Double Chow**



- #9 **Little Four Winds**, 6 points → **Half Flush** with non-terminal Chow and no extra points for Winds



- #11 All Honors, 6 points → Two Dragons with no extra points for Winds



Answer 2. Why have fans in Question 1 been limited to 8+ points? The matter is 8+ points fan alone can provide the required minimum of points for the valid hand while fans scored 1-6 points require some "company". In a sense, provided the valid hand is scored exactly 8 points the Excess for any fan with a value of "X" points is equal to 8-X points. According to that maximum value of Excess is equal to 8-1=7 points, right? **NO!** There is a totally unique fan, **Flower Tiles** which never is scored toward the required minimum while it is present in almost every hand. So, the answer is 8 points for **Flower Tiles**.

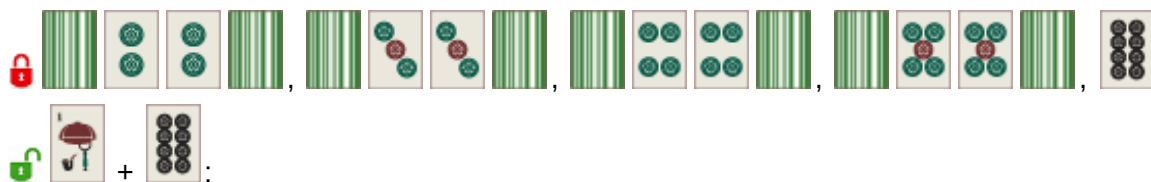


5-10. Matryoshka Dolls

Firstly, it is impossible to get into one hand representatives of all twelve fan point grades. Secondly, since only one fan is allowed in a grade, then there may be available several solutions having the same scores.

Below is the solution having 8 fans with the total score of 239 points.

Hand 1.



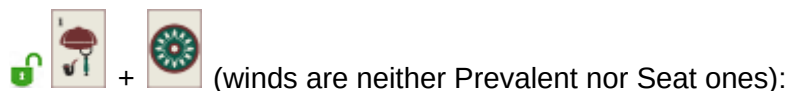
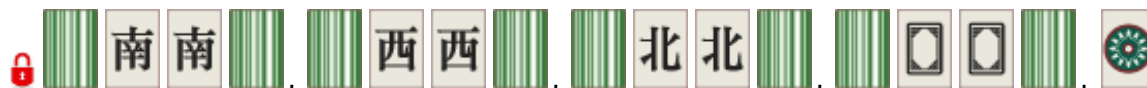
- 88 = #5 **Four Kongs**
- 64 = #12 **Four Concealed Pungs**
- 48 = #15 **Four Pure Shifted Pungs**
- 24 = #22 **Full Flush**
- 8 = #40 **Reversible Tiles**
- 4 = #56 **Fully Concealed Hand**
- 2 = #68 **All Simple**
- 1 = #81 **Flower Tiles**
- "Green Book" bans:
 - 0 = #49 **All Pungs** due to #12 **Four Concealed Pungs**
 - 0 = #79 **Single Wait** due to #5 **Four Kongs**

Totalling 8 fan scoring groups and 239 points.

Note: fan #40 **Reversible Tiles** can be replaced by the other 8-point fan #44 **Last Tile Draw**, or fan #46 **Out with Replacement Tile**, when the suit will be changed for Bamboo or Characters.

Now, can the number of fan scoring groups be increased to 9? Research shows that 9 fans are feasible to attain, even more, there are three different solutions with the various combinations of fan scoring groups.

Hand 2.

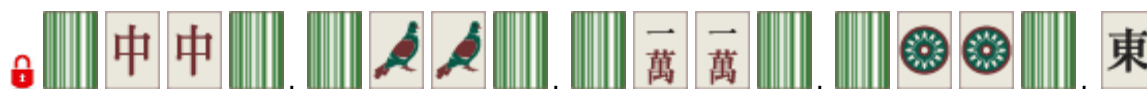


- 88 = #5 **Four Kongs**
- 64 = #12 **Four Concealed Pungs**
- 32 = #18 **All Terminals and Honors**
- 12 = #38 **Big Three Winds**
- 8 = #46 **Out with Replacement Tile**
- 6 = #50 **Half Flush**
- 4 = #56 **Fully Concealed Hand**
- 2 = #59 **Dragon Pung**
- 1 = #81 **Flower Tiles**
- “Green Book” bans:
 - 0 = #49 **All Pungs** due to #18 **All Terminals and Honors**
 - 0 = #73 **Pung of Terminals or Honors** due to #18 **All Terminals and Honors**
 - 0 = #79 **Single Wait** due to #5 **Four Kongs**

Totaling 9 fan scoring groups and 217 points.

Note: that solution has been found by Zhuoran Li (Canada).

Hand 3.



- 88 = #5 **Four Kongs**
- 64 = #12 **Four Concealed Pungs**
- 32 = #18 **All Terminals and Honors**
- 16 = #32 **Triple Pung**
- 8 = #44 **Last Tile Draw**
- 6 = #52 **All Types**
- 4 = #56 **Fully Concealed Hand**
- 2 = #59 **Dragon Pung**
- 1 = #81 **Flower Tiles**
- “Green Book” bans:
 - 0 = #49 **All Pungs** due to #18 **All Terminals and Honors**
 - 0 = #73 **Pung of Terminals or Honors** due to #18 **All Terminals and Honors**
 - 0 = #79 **Single Wait** due to #5 **Four Kongs**

Totalling 9 fan scoring groups and 221 points.

Note: that solution has been found by Sylvain Malbec (France).

Hand 4.



- 88 = #3 All Green
- 64 = #12 Four Concealed Pungs
- 32 = #17 Three Kongs
- 24 = #24 Pure Shifted Pungs
- 8 = #46 Out with Replacement Tile
- 6 = #50 Half Flush, 6 points
- 4 = #56 Fully Concealed Hand
- 2 = #59 Dragon Pung
- 1 = #79 Single Wait
- "Green Book" ban:
 - 0 = #49 All Pungs due to #12 Four Concealed Pungs

Totalling 9 fan scoring groups and 229 points.

Note: that solution with the slight modifications has been found by several contestants of the 4th season contest: Naoki Nishioka (Japan), tsumogiri (Russia), Cyrille Rak (France), Florent Descamps (France), Denis Lugannikov (Russia), Andre Gouadon (France).



5-11. Time for a Puff

Solution. First of all, let's review the allowable hand structure for declaring mahjong. We know [Regular](#), [Semi-Regular](#), [Seven Pairs](#), [Thirteen Orphans](#) and [Honors and Knitted Tiles](#) hand structures. The first four of them strictly require a pair, that is a pair of identical tiles. The last one does not need a pair but instead has the other limitation — at least 5 different honor tiles.

Answer 1. Under the first condition with at least one declared set all players strictly require a pair of identical tiles to complete their hands. Hence, the "first glance" solution is to have in play only 34 single tile patterns and 8 "flower" tiles. To maximize the number of tiles left in the wall all players must have 4 declared sets.

As a summary:

- unplayed tiles — exactly one copy of 34 tile patterns and 8 "flower" tiles
- players' hands — each hand has 4 declared sets without "flowers" and 1 "standing" tile
- wall — $34+8-4*1=38$ tiles left

So, wild guess is: as many as **38** tiles can be left in the wall. Now, can this number be improved?

The second idea is to allow three declared sets and even tiles for making pairs while impossible to declare chow or pung as the 4th set of a hand. Let's have in a pool the following tiles:

- three suits each containing a pair or 1's, 2's, 4's, 5's, 7's and 8's, in other words, some set of tiles from which it is impossible to create pung or chow
- pairs of all honor tiles from which it is impossible to create pung
- 8 "flower" tiles

Altogether we have:

- unplayed tiles — $6*2*3+7*2+8=58$ tiles
- players' hands — each hand has 3 declared sets without "flowers" and 4 "standing" tiles
- wall — $58-4*4=42$ tiles left

Hence, the idea of breaking pungs and chow worked well, **42** tiles left in the wall can force a deal to end in a draw.

Answer 2. With one concealed hand we need to cope with [Seven Pairs](#), [Thirteen Orphans](#) and [Honors and Knitted Tiles](#) hand structures. The easiest way is to eliminate any pairs and any 3 honors tile patterns. With only 4 honors tile patterns it would be impossible to build neither [Thirteen Orphans](#), nor [Honors and Knitted Tiles](#).

As a summary:

- unplayed tiles — exactly one copy of 31 tile patterns (all 34 except 3 honors) and 8 "flower" tiles
- players' hands — three players have each 4 declared sets without "flowers" and 1 "standing" tile
- the fourth player has 13 "standing" tiles
- wall — $31+8-(3*1+13)=23$ tiles left

So, as many as **23** tiles can be left in the wall under the second condition.

