Conventions for Hanabi

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1 Game rules

Hanabi is a cooperative card game for 2-5 players. A Hanabi deck is composed of 50 cards, 10 for each of the colours red, yellow, green, blue, and white. We use black color to denote a generic colour.

The values of the 10 cards of each colour are $\boxed{1}\boxed{1}\boxed{1}\boxed{2}\boxed{2}\boxed{3}\boxed{3}\boxed{4}\boxed{4}\boxed{5}$.

There's an optional sixth colour rainbow with exactly one copy of each card of value from 1 to 5, which increases the total card number to 55.

1.1 Setup

At the beginning of the game, each player draws 4 cards (if the number of players is 4 or 5) or 5 cards (if the number of players is 2 or 3). The cards must face *the other players*: one player does not know which cards are in their hands, but they know which cards are in the other players hands.

The players start with 8 *clues*, 3 *lives*, and configuration $\boxed{0}\boxed{0}\boxed{0}\boxed{0}\boxed{0}\boxed{0}$.

Definition 1.1. A card $\boxed{k}$ is *playable* if $\boxed{k-1}$ belongs to the current configuration.

The players must decide who start first *before* drawing the initial hands. The game then proceeds clockwise.

1.2 Game turn

During their turn, the current player must do one of the following actions.

Play a card The current player picks a card in their hand and puts it face-up on the table. If the card is playable, then it replaces the current one of the same colour in the configuration. Furthermore, if the card has value 5, the players gain one clue (unless they have 8).

If the card is not playable, then it's discarded and the players lose a life. In either case, the current player draws another card (if possible).

Discard a card The current player picks a card in their hand and puts it in the *discard pile*. That card cannot be used any more during the game. The players gain a clue (unless they have 8), and the current player draws another card (if possible).

Give a clue There must be at least one clue to perform this action. The current player chooses another player and tells them which of their cards have a certain colour (eg. *These cards are blue*), or which ones have a certain value (eg. *These cards are 3's*). They must point exactly the subset of the other player's hand with that property, and that subset cannot be empty. The players lose a clue.

1.3 Game end

The game ends immediately if the players have 0 lives. If that does not happen, after the last card of the deck is drawn, each player has exactly one turn left (including the one who drew the last card). The *final score* is the number of cards played when the game ends, or equivalently the sum of the values in the final configuration.

Note 1.2. If the players score 30 with 3 lives left, then the score is 30L, because why not make it like an exam?

In our version of the game, the players may always look at the discard pile, and they may always ask which clues have been given so far, by who, and when. This is not supposed to be a game based on memory: public information is always available.

They are also allowed to rearrange their hand according to any new information which is *known to everyone*, but they may **not** rearrange their hand in any other moment (that would be cheating). Each player's current hand ordering is known to everyone.

2 Notation

Definition 2.1. A card is *clued* if its owner has received a direct clue about that card, and it's *unclued* else.

A card is number-clued if its owner has been told its value, and it's colour-clued if the owner has been told its colour. A card is completely-clued if it's both number-clued and colour-clued.

In order to distinguish some cases, we will

- leave an unclued card untouched [2]
- underline a number-clued card [3]
- colour the box of a colour-clued card [4]
- do both for a completely-clued card [5]
- use ? for a card of any value, and black for a card of any colour [2] [?] [?]

We will use letters from A to E to denote players, going clockwise. A string like C [3] [2] [3] [4] means that player C has those four cards in their hand, and they have been clued on the first two ones. We will use + for the configuration (the played cards).

We also want to name some properties.

Definition 2.2. A card is

- *relevant* if no copy of the same card has already been played,

- *useless* if another copy of the same card has already been played,
- *unique* if it is relevant and also it is the only copy of that card left.

3 Basic conventions

From now to the end of the paper, we assume that the game has five players and 55 cards (so including rainbow ones).

In order to achieve a better score, the players may agree beforehand on what each clue means. Be aware that any of these conventions may be broken if there's a good reason to do so: just trust your team mates, and do not assume that they're wrong if they are not playing as you were expecting. Team play is the most important thing in Hanabi.

Alert 3.1. No convention is strict. Players are always allowed to break them if they think it's better to do so.

3.1 Clues are precious

In the 55 cards, 5 players version of the game, the players have about 18 clues to play 30 cards. This means that there's no way to explicitly tell value and colour of each card before playing it. The most important thing is the *timing* of the clues: if a player is giving a clue, they're doing so for a reason. This can be summed up as follows.

Do not clue the same card twice Unless there's an important reason to do so, you should not give more than a clue on the same card. Even if the owner has not enough information to decide whether or not they should play it, they can just wait until it's clear by some other mean.

Never give intersecting clues You should never clue a card if another identical card has been clued earlier in the game. Doing that, apart from being a waste of clues, usually leads to confusion and mistakes, and more clues are needed to prevent losing lives. Avoid that if possible. This is known as *disjoint clues principle*.

Play clued cards If a player is giving you a clue on some cards, it's very likely that you're supposed to play them. Do not be scared and trust your team mates. The most noticeable exception involves cards which were about to be discarded while being the only copy left. Then they may have been clued because other players didn't want you to discard them.

3.2 Hand ordering

In one player's hand, the cards on which they have any explicit clue on, and the cards on which they have no information, should not interact in any way.

Newer cards are usually put *closer to the player*. We are going to assume that this coincides with one player's *left*, but that's not a rule. Similarly, older cards are put *farther from the player*, and again we are going to assume that this means on their *right*. According to this rule, the rightmost card is the one whose front is fully shown to the other players, and the leftmost one is the one whose back is fully shown to its owner.

When a player is clued on some of their cards, those cards are rotated in some way to keep track of that clue, but *preserving the relative order*. When a player draws a card, they should put it in the leftmost position.

The starting hands are canonically ordered in the same way in order to make clues not ambiguous.

3.3 Play left, discard right

It's usually a good idea to let other player know if you're going to discard some important card, or playing some other one. There's an easy and allowed way to do so.

Play left When a player have some indistinguishable clued cards that they are supposed to play, and sometimes even if they are somehow distinguishable, they should start from the leftmost one. This makes sense because of the *timing* (if no one clued them before, then probably the new one is the most important).

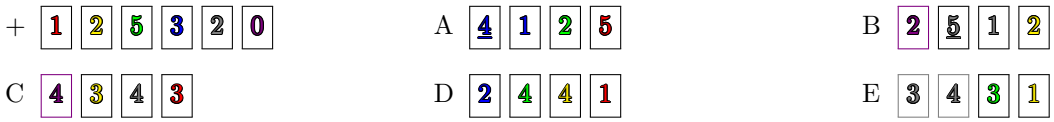
Discard right When a player is going to discard a card, they are supposed to discard the rightmost one. This card should be the oldest among the unclued ones, so it makes sense to discard it (no one clued that card, so it is probably not an important one).

4 The finesse

This is probably the most important convention in Hanabi. It takes a while to get used to it, but then it's an extremely powerful tool. It consists of cluing the card $\boxed{k+1}$ when $\boxed{k}$ is playable and unclued, in order to get both played with one single clue.

4.1 The simple finesse

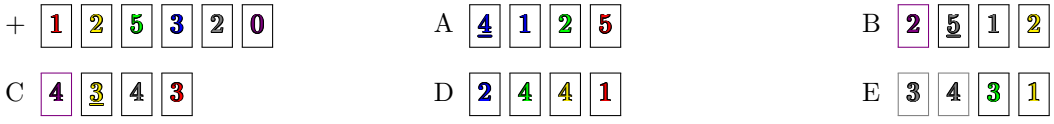
Let the setting be the following.



If B is to play, they can clue *yellow* to D. Without any other information, C should assume that D is going to play their yellow card (since they've been clued on it), which is not playable. C must do something, and so they ask themselves: "Why did B give that clue?". The only reason is that C can actually make that card playable. So, blindly trusting B, they (conventionally) play their leftmost unclued card. This led to playing two cards with one clue.

4.2 Which card to finesse?

Let the setting be the following.



This is the same setting as before, except that the 3× in C's hand has been number-clued at a certain point during the game. C is to play, and B just clued *yellow* to D. This is a finesse, but which card should C play? Their leftmost unclued card, or their *3*-clued one? In this case, one should always pick the *leftmost compatible clued card*, if any. So, the 4⋈ must be excluded (it can't be a 3×), while the 3× is compatible and has to be played. If there are several compatible cards, C should (conventionally) pick the leftmost.

4.3 The reverse finesse

Let us take the same example given in 4.1, but switching C and D. So the setting is the following.

+ 1 2 5 3 2 0	A 4 1 2 5	B 2 5 1 2
C 2 4 4 1	D 4 3 4 3	E 3 4 3 1

If B is to play, they simply clue *yellow* to C. Then C sees that the D's leftmost unclued card is a 3×. They do not rush playing and do something else (eg. discard). Now, D sees that C did not play. It means that someone else has a 3× as leftmost unclued card, and since D cannot see any, then it must be in their hand. So they play that card. Of course this still works if we switch D and E (or A).

Remark 4.1. What if we replace the 4× with a 3×? In fact, this is no issue at all: after C's turn, D just doesn't play. In fact, maybe C had another good reason to not play the yellow-clued card. Even if D can deduce to have a 3× as leftmost unclued card, they should not play it, else C would think that their card is a 4×.

There's another, possibly better, way to deal with it. B simply does not clue *yellow* to C, and they instead let C clue *yellow* to D. This would avoid any ambiguity. Even better, if B happens to have a 4× in their hand (and they can't know), C could clue *yellow* to them instead, saving one clue.

4.4 Multiple finesse

Let the setting be the following.

+ 1 2 5 3 2 0	A 4 1 2 5	B 2 5 1 2
C 4 2 3 3	D 2 4 4 1	E 3 4 3 1

The setting is the same as before, except that now C's leftmost unclued card is a 2★, which is playable. The next one is a 3×. If B is to play, they can still clue *yellow* to D. As before, C should play their leftmost unclued card, and so they do. Since C played, D can deduce that their card is not a 3×, but it's a 4× instead, so they wait. During their next turn C should keep playing, and so they have to pick their second leftmost unclued card *at the moment they received the clue* (which is a very important information to track). They play the 3× and next D plays the 4×, leading to play three cards with one clue.

Remark 4.2. A *finessed* player should keep playing until they see the expected finessed card, or they get a stop sign (which will be discussed later).

4.5 Unfinessing a card

Let the setting be the following.

+	1 2 5 3 2 0	A	4 1 2 5
B	2 5 1 2	C	5 2 5 3
D	2 4 4 1	E	3 4 3 1

Similar as before, but now C has a 5× (not playable) between the 2★ and the 3×. Still, B clues *yellow* to D, and C plays the 2★. Since C played out of the blue, D should ask themselves "Why did C play?" and deduce that they don't have to play immediately. So D (eg.) discards, E plays the 3◇, A plays the 4✱, and then B *must* clue *5* to C. Since the card that was their second leftmost unclued one round ago is a **5**, it cannot be a 3×. So C simply moves the 5× among their clued cards and plays the third leftmost, which is (correctly) a 3×. Then D plays their 4× and the trick is complete.

Remark 4.3. The player that unfinesses a card should be the same one who gave the finessing clue before (because the finesse may involve other players), but not always. In the previous setting, A's hand may have been 4 3 3 5 (see 4.6), so they may have been involved in the finesse as well. In that case, no one should have played nor clued about that cards any more.

But if the other 3× is among the discarded cards, then A isn't involved in the finesse for sure, so they can safely clue *5* to C if they think it's better to let B do something else.

4.6 Multiplayer finesse

Let the setting be the following.

+	1 2 5 3 2 0	A	4 3 3 5
B	2 5 1 2	C	5 2 5 1
D	2 4 4 1	E	3 4 3 1

B just clued *yellow* to D, and C is to play. They see that A has a 3× in their hand, but not in the leftmost unclued position. Cluing *red* to A may be ambiguous, since A's red cards cannot be played. How can C deduce if they're being finessed or not? They can't, but it's not an issue at all: C should just play their leftmost unclued card. If that's a 3×, then C was being finessed everything is fine. If not, then A is being finessed, but their leftmost unclued card is a 3★, not playable. Then C's leftmost unclued card must be a 2★, so they still play.

Remark 4.4. Multiplayer finesse is very risky, and it requires great understanding and trust among the players. It's very easy to mistake a generic clue for a multiplayer finesse, so be careful and think to every possible scenario before giving such a complicated clue.

Of course all these finesse techniques may be combined, but as always, be careful before doing something risky or unclear. Think to every possible interpretation of your clue, and it you're reasonably sure that your team mates will understand, then go for it. If not, better do something safer.

5 Multiple cards clue

It is often convenient to include multiple cards in a clue, in order to give as much information as possible while saving clues. To do so, one has to be precise in explaining what each clue means.

5.1 Two cards colour clue

Cluing two cards of the same colour usually asks the clued player to play the leftmost, and possibly play the rightmost afterwards.

If the player gets clued again on these cards, then the second clue has a very precise meaning. If the player gets a number clue on the leftmost card, then it means that the rightmost is to play. If they get a number clue on the rightmost, in means that *none* is to play! In fact, if the leftmost was playable, they wouldn't need another clue until their next turn.

Remark 5.1. If one has some cards to play, it's better not to give them any clue (except for finesses, of course) until they play those cards.

This is because they may interpret the new clue as a stop signal. Also, if you wait until they play, then they will have more cards in their hand, and this may give room for better clues.

Rule 5.2. Other cards may be involved in the second clue. The information on these cards has no precise meaning, so the player should just move them among the clued cards and wait until new information is given.

If, after playing the first card, the player gets another unrelated clue (except finesses), then it should be interpreted as stop signal. Unfortunately, this is usually quite unclear. We'll discuss it in Section 9.

Example 5.3. Let the setting be the following.

+	1 2 5 3 2 0		
A	4 3 3 5	B	2 5 1 2
C	5 2 5 1	D	2 4 4 1
E	3 4 3 1		

Player E has just been clued *white*, and it's their turn. They play their leftmost card, which is a 3◇. One round later, they will play the 4◇. Notice that E sees the 5◇, so they must assume that their clued card is a 4◇ unless told otherwise, since you are supposed to play clued cards.

Example 5.4. Let the setting be the following.

+	1 2 5 3 2 0		
A	4 3 3 5	B	2 4 1 2
C	5 2 5 1	D	2 4 4 1
E	3 4 3 1		

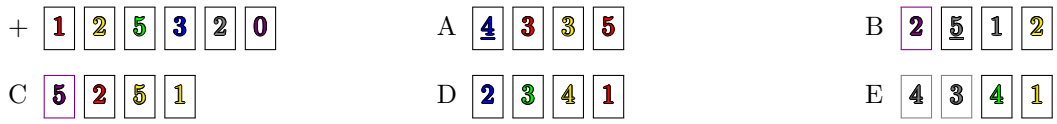
Same as before, but we replaced the 5◇ that B had with a 4◇. Once again, player E has just been clued *white*. They play their 3◇. One round later, they will still play the 4◇: in this case, E sees B's 4◇, and since no one clued it, then it must not be relevant. In fact, cluing *4* to B would have been a great way to tell E not to play their second white card, if other players didn't want it to happen.

Example 5.5. Let the setting be the following.

+	1 2 5 3 2 0		
A	4 3 3 1	B	2 4 5 2
C	5 2 5 1	D	2 4 4 1
E	4 2 3 1		

In this case, E played the 3◇ one round ago, and it's their turn again. No other information on white cards is available. E is allowed to play their white card, but now it depends on what happened during the last round: if everyone was busy playing or giving important clues, then it may be better to wait. If nothing relevant happened, instead, it should be safe to play. In this case, though, cluing *red* to B would be a great move (see why?), so E should do that and wait a bit more.

Example 5.6. Let the setting be the following.



C just clued *white* to E, and D is to play. They must do something, or else E would play their leftmost card, a 4◇. According to what we said before, they should clue *4* to E. Then E will play the 3◇ with the 4◇ to follow. E will also keep the 4γ among their clued cards until they eventually realize that it's useless, and discard it.

In this particular case, though, D could be smarter. In fact, they can clue *3* to E. It usually means that no white card is to play, but it can't be the case because of course a 3◇ is playable. E should also understand that their other card is a 4◇, because they see the only 5◇ in B's hand, and B should at least start suspecting that their 5 is white. Moreover, cluing *3* instead of *4* won't involve the 4γ, which is an useless card that we don't want to keep. This is a nice example of a situation in which you should break the conventions.

5.2 Three cards colour clue

As for the two card case, cluing three cards of the same colour usually asks the clued player to play them from the leftmost to the rightmost. And once again, if the player gets clued again on these cards, then the second clue has a very precise meaning.

If the player gets a number clue on the leftmost card, then it means that *no card* is to play. This is an emergency play, and it should be avoided to clue three cards of the same colour if none is playable. If they get a number clue on one of the other two cards, then it means that the third one is to play.

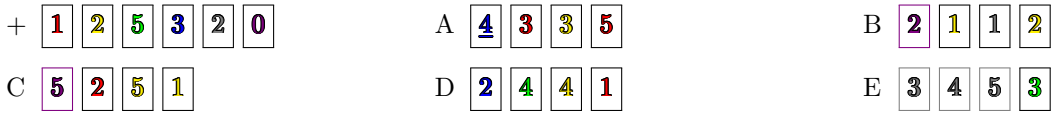
Let's see why this makes sense. As we said, if one clues three cards of the same colour, then one should be playable. If it's the leftmost, then no more clues are needed. If not, then the most efficient way to pass informations is to give a clue on the non-leftmost, non-playable one. Giving such a clue implies that the leftmost card is not playable, and it also tells the value of the other two cards: the clued one because of the clue itself, and the other one because we assume that it's playable.

Remark 5.7. Despite seeming so efficient, this technique is barely par. It's true that you usually cannot tell colour and value of three cards with just two clues, but that's no real gain! The important thing is the amount of cards played per clue, not the amount of information given: players are getting to play three cards with two clues, so 3/2 cards per clue. This is close to the 5/3 cards per clue needed to achieve a perfect score, so it's fine.

With just two cards, this becomes extremely inefficient if they aren't ordered in the right way! So, try to find another way to get them played.

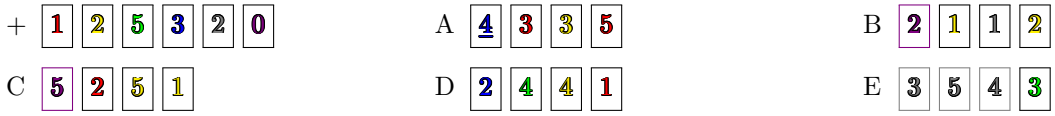
Of course, if the leftmost card is playable, but the second leftmost is not, we fall in the *Two cards colour clue* case, and behave as before.

Example 5.8. Let the setting be the following.



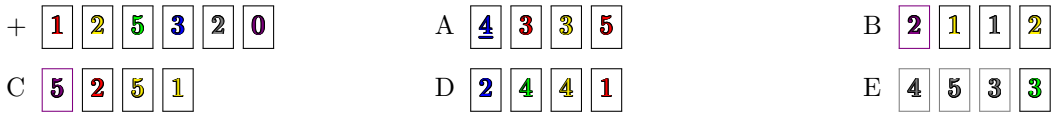
Player E has just been clued *white*, and it's their turn. They will play their white cards left to right, with the nice result of playing three cards with one clue.

Example 5.9. Let the setting be the following.



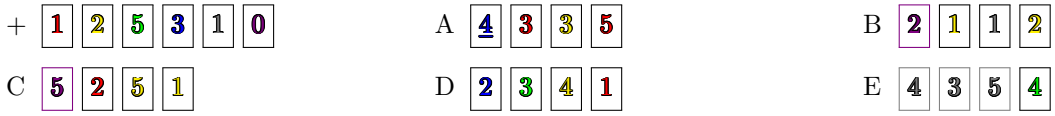
Same setting as before, but we switched the 4◇ and 5◇ in E's hand. In this case, we wait until E plays their 3◇, then we clue *4*, according to the two cards case.

Example 5.10. Let the setting be the following.



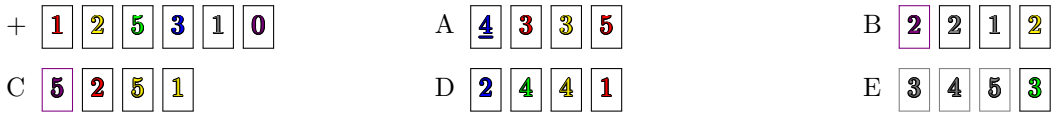
Same setting, but different permutation. In this case, we should immediately clue *5* to E.

Example 5.11. Let the setting be the following.



Different permutation, and also no card of E is playable. C just clued *white* to E, and so D should immediately clue them *4*. It's a huge waste, because it also moves the useless 4γ among the clued cards. It would have been better to clue *5* to E instead of cluing *white*, if we wanted to stop them from discarding the 5◇.

Example 5.12. Let the setting be the following.



Slightly different. C just clued *white* to E, but now D shouldn't clue E again. Why? Look at B's hand...

5.3 Four cards colour clue

There's no explicit convention for this. According to regular conventions, in fact, these cards should be all different and also different from already clued cards of the same colour, which seems implausible.

The guideline is the same that we use for the three cards case. Remember that giving another clue implies that the leftmost card is not playable, and try to make it clear if there are some useless or double cards. Just think what's best!

5.4 Multiple cards number clue

This works exactly as the colour clue case, with two main differences. The first is that you just have to be a little more careful before playing, because usually a number clue is less explicit than a colour clue if you want to get cards played. Think if there are other possible interpretations of the clue: for example, the cluing player could have wanted to prevent you from discarding your rightmost card (and it should be easy to determine if it can be the case). If you don't find any other interpretation, just play left to right as usual.

The second reason is obvious, instead: if you get a clue that reveals three **4**'s in your hand, but there are only two **3**'s in the configuration, then of course the third **4** should not be played, even if some other **3** appears later. Just keep it and wait until more information is known.

6 Complement clues

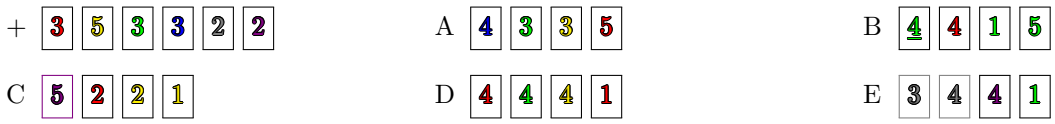
Sometimes, for example during the first round, relevant clues should involve **1**'s, and late in the game they should involve the few remaining cards. So, it is convenient to interpret almost every clue as one involving those cards.

6.1 Late game complement

Late in the game, some clues are just useless. It's clear that cluing *1* when all the six **1**'s have been played, or cluing *red* after the **5★** has been played, doesn't mean that you have to play those cards. It is a complement clue instead.

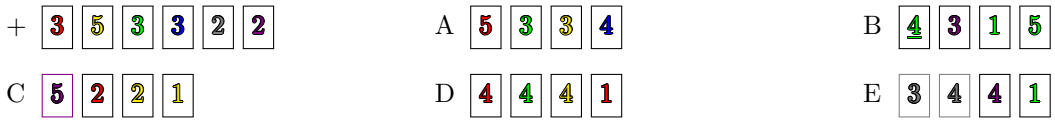
Cluing any set of useless cards means that the clued player should play the complement (the cards not involved in that clue) *left to right* (the usual order). The clued player should start with their compatible clued cards (if any) and then their unclued cards, as for finesses.

Example 6.1. Let the setting be the following.



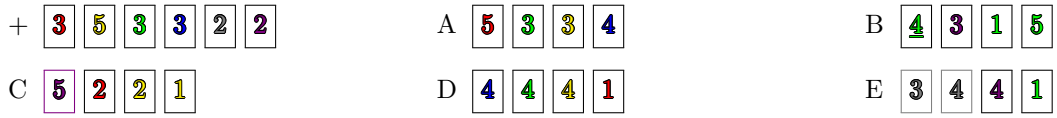
A is to play. They can safely clue *1* to B, who should play their **4γ** (followed by **4★** and **5γ** in the upcoming rounds). Immediately after, C can clue *green* to A. In fact, A knows that their green card is useless (both A and C see the **5γ** in B's hand), hence A should play the complement left to right. The **5★** is not immediately playable, it will be at the right moment (B has to play the **4★** their next turn).

Example 6.2. Let the setting be the following.



Similar as before, but now B doesn't have a **4★**. D has one, but they don't know about it, and the **5★** is the leftmost card in A's hand. C can still clue *green* to A, and this becomes a finesse for D: C is asking A to play their leftmost card (which isn't playable), so it must be a finesse.

Example 6.3. Let the setting be the following.



Similar as before, but there is no **4★** around. In this case, C may clue *5* to A (no 5 is playable, except the green one), which allows D to clue *green* to A. If the **5★** weren't A's leftmost card (eg. switching **5★** and **4★** in A's hand), C may clue *green* to A anyway, hoping for a **4★** to show up as soon as possible, and possibly cluing *5* to A if it doesn't (same principle as unfinessing cards, see 4.5). It is *not* a finesse because the **5★** isn't A's first card to play.

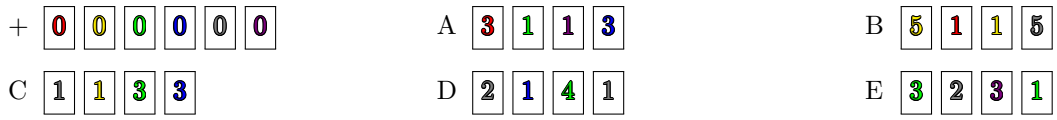
6.2 First round complement

During the first round, cluing *3* or *4* to any player means that they should play the complement (their unclued cards) *right to left* (opposite than the usual order, see 8). During the first turn only, if certain hypotheses hold (see 8), cluing *2* or *5* have the same meaning.

This is because cluing *3* or *4* in the first round is pretty useless, since you almost certainly want to clue *1*. This way, you get extra information and also have the chance to give more efficient clues (eg. playing two **1**'s and one **2** with the same clue).

One should read Section 8 to understand what to do during the first round; here we just want to introduce complement clues.

Example 6.4. Let the setting be the following.



First round of the game, A is the first player. They clue *5* to B: B sees that A could have clued *1* (or *3*) to C, for example, so it's a complement clue (not a direct one). B plays their **1×** (they have to play right to left). C clues *4* to D: any *3* or *4* clue is a complement clue, so D plays their **1◇** (right to left, again). At last, E clues *3* to A: it's still the first round, so it must be a complement clue.

We'll see more examples in Section 8.

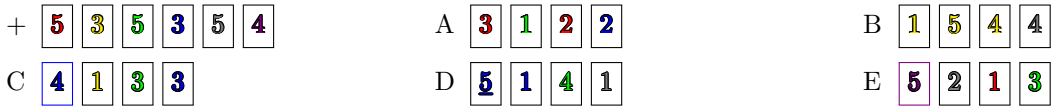
7 Discard clues

Late in the game, some players may be sure that they do not have relevant cards, because they can see all the other ones. Also, they can be short on clues. They can gain some time using discard clues.

A player may discard any card in their hand to ask *the next player who doesn't have information on what to do* to play their card in the mirrored position with respect to the discarded one.

The mirrored position trick is useful because in this case, if one discards the standard *discard* card (the rightmost one), the other should play their standard *to play* card (the leftmost one).

Example 7.1. Let the setting be the following.

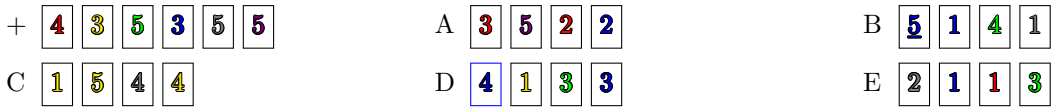


A to play, no clues left, two cards in the deck. One 4× has been discarded. In order to achieve a perfect score, B must play their 4× immediately, but they don't know which card is it (in B's perspective, it may still be in the deck). All the other players already know what to do.

A knows that they don't have any relevant card, so they discard their third card from the right (the 1γ), asking B (the first player who doesn't know what to do) to play their third card from the left (the 4×). They do, then C, D, E play their clued cards, A clues *5* to B with the clue they gained the last round, B plays the 5×, and the players score a 30!

This trick was worth a full point, but it can get even better.

Example 7.2. Let the setting be the following.



As before, A to play, no clues left, two cards in the deck, one 4× has been discarded. B, C, and D have been permuted, and also A, not E, has the 5⋈ in their hand. Notice that there is no way to point the 4× in B's hand with one single clue.

A discards their fourth card from right (the 3★). It may have been the 5⋈, but it was still worth the risk (see why?). B knows that their only relevant card is the 5★, so in particular they know that they must not play. Also, C have to play two cards, so B must not discard either. In this case, B clues *5* to C. C plays the 4× according to A's discard, then D plays their 4★, and E, with no clues left, discards their second card from the right (the 1★). A plays (accordingly) their second card from the left, B and C play their 5's, and once again the players score a 30.

Without the discard clue trick, they would have probably scored 28, so even in the worst-case scenario (eg. A discarded the 5⋈ to let C play their 4×) it would still have been worth a full point.

8 First round conventions

As we already said, during the first round the only relevant information involves 1's and some 2's, so it would be a waste to explicitly give clues on that card. There are some useful rules that can make first round clues extremely efficient.

8.1 Discard carefully

It's highly unlikely that a player is allowed to discard during the first round, because there's a chance that no one had the possibility to tell them not to do so.

A player is not allowed to discard if all the players before them either played or gave positive clues (clues given to play cards). A player may be allowed to discard if someone gave any negative clue (eg. card-saving clues or time-wasting ones, like a *rainbow* clue on the rightmost card) to some other player whose turn is after theirs. In any case, you should think carefully before discarding during the first round, or even later if many clues are available.

Example 8.1. Let the setting be the following.

+	0 0 0 0 0 0	A	3 4 5 3
B	5 1 1 5	C	1 1 1 3
D	2 1 4 1	E	3 2 3 1

First round of the game, A is the first player. They clue *5* to B (complement clue). B plays their 1× (they have to play right to left). C can't clue D or E about their **1**'s (because they're not disjoint from B's ones), so they clue *5* to A (a wasting-time clue). D can now clue *3* to C, asking them to play their **1**'s, and E is quite sure that they can discars, because of the *5* clue that C gave to E (if E's rightmost card was at risk, C should have clued them instead).

8.2 Point at least two cards

The very first player is not allowed to give a clue that leads to playing just one card (which must be a **1**). This is because there's a good chance that they have the same **1** with some other playable cards, and giving such a clue would make more difficult to get those cards played efficiently.

If the first player can't give any clue leading to play two or more cards, they should give some *2* or *5* clue instead. In the unlikely case that they can't, they can give a *rainbow* clue if possible, or else evaluate risks and do something else.

Of course there are some exceptions: the first player is always allowed to clue *1* if it's the 1⋈ or if they can see all the three copies of that **1** (because they can't have that **1** in their hand).

Example 8.2. Let the setting be the following.

+	0 0 0 0 0 0	A	1 1 3 3
B	5 2 1 5	C	1 4 5 3
D	2 3 4 1	E	3 1 1 1

First round of the game, A is the first player. They can't clue *1* to C, because they may have the 1γ with another **1** in their hand (and in fact they do). They can clue *1* to B (because there's a single copy of the 1⋈) or to D (because all the 1×'s are visible, so A can't have any). They can also clue *3* to E, asking to play the complement and stopping them two turns later, but it's probably better to let them discard first.

It's usually better to clue players whose turn is closer, so maybe cluing *1* to B is the best.

8.3 Complement 3 and 4

During the whole first round, any *3* or *4* clue should be interpreted as *play the complement* clue (see 6.2). The complement must be played *right to left*; we'll discuss the reason soon.

During the *first turn only*, *2* and *5* clues should be interpreted as *play the complement* clues too, but only if both the first player and the one who received the clue know that the former could have given some other clue leading to play at least two cards.

It should be easy to distinguish negative *2* and *5* clues from positive ones, just give a look to other players' hands.

Example 8.3. Let the setting be the following.

+ 0 0 0 0 0 0	A 3 4 5 3	B 2 1 2 1
C 1 4 2 3	D 5 2 1 5	E 3 2 3 1

In this case, A can safely clue *5* to D: seeing that B has two different **1**'s in their hand, D knows that it must be a complement clue. A can't clue *2* to B, though: B doesn't know that A can let D play two cards (a colour-clue won't work, and B does not see any other clues that allow someone play two cards), so B should interpret a *2* clue as a negative one.

8.4 Inverting playing order

During the first round, there are some good reasons to play cards in the opposite order with respect to the usual one.

1's included in the starting hand must be played *right to left*, even if the clue is given later. This is because if a player has multiple **1**'s, but you don't want all of them to be played (because some were already played, or some have the same colour) you can just wait until they discard the ones to the right of the relevant ones, then give the clue, then give a stop signal before they play the ones to the left (or do nothing if all six the **1**'s have been played in the meanwhile). This is cheaper than spending multiple clues to get just a single **1** played.

Colour clues must be played *left to right*, as usual, while complement clues must be played *right to left*. This way, if some complement clue involve only **1**'s, then it's the same as cluing *1* (but better); if it doesn't, then it's likely to involve **1**'s and **2**'s of the same colour, so you can just give a colour clue if they're in the *left to right* order, and a complement clue otherwise.

8.5 Combining complements and finesses

Sometimes it is convenient to give a complement clue, even if not all the cards in the complement are immediately playable. In this case, if some of these cards is close to being played, it might be a finesse.

All the players between the cluing player and the clued one should follow the normal rules for finesses (i.e. if the clued player is about to play a card that's not playable, but might be playable in their turn if you play, then play your finessed card). The players between the clued player and the cluing player should be more careful, since they won't get a chance to listen the cluing player again before the clued player's next turn; if they see, in the hand of any player between themselves and the clued player, all the cards that have to be played before the clued player's next turn, they should not play, and might even give a clue about those cards if they're not in playing position. If they don't, they can just play their finessed card as usual.

Example 8.4. Let the setting be the following.

+ 0 0 0 0 0 0	A 3 4 5 3	B 2 4 2 1
C 1 4 2 3	D 5 2 3 3	E 3 2 3 1

In this case, A clues *4* to B: B plays the 1×, C can clue *yellow* to D, who has to be careful. D sees a 1γ in E's hand, but it's not in playing position, so they have to clue *1* to E. E plays the 1γ, A clues *green* to C (it's a finesse on E), B plays the 2γ, and C sees no 1◇'s, so they must play their newest card.

8.6 Wasting time

Dealing the first round this way can be so efficient that one may find themselves with no cards to play and no useful clues to give. In this case, one should try to give a clue that's as clear as possible (it shouldn't be mistaken for a finesse), and if none is available, just repeat some previous one. This may be a waste, but it's both unlikely to happen and necessary to make first round clues this efficient.

9 Stop signals

It happens quite often that you give a clue that asks a player to play multiple cards, but you don't want that player to play all of them. Another clue is needed to stop them, so it's better to make it useful and pass more information than a simple *stop*.

In general, any number clue given to a player that is supposed to play some cards due to a multiple cards clue given before should be interpreted as a stop signal. That player have to stop playing and wait until more information is known, and move that card among the clued ones. Same holds if the stop clue involves both clued cards among the ones they were supposed to play, and unclued ones.

A colour clue is usually a finesse, instead, so the clued player should check that it may be a finesse and keep playing if it is. If not, they should consider if that colour-clue is just asking to play the clued card, is a stop signal, or both. This heavily depends on the context, so the clued player should consider all the possibilities and see if any makes sense.

10 Cyclic rearrangement

It happens quite often that a player discards to prevent the next player from doing the same, usually because the next player's rightmost card is important. It also may happen that a player has two cards of the same colour that they should play, but the higher is on the left. Both issues can be fixed with this idea.

When a player discards, the next one *who does not play a card* should move their rightmost card to the leftmost position among the unclued ones. Of course this should be done during the turn of the player that is supposed to rearrange their cards (doing that before is cheating, because it passes informations about who should play and who shouldn't).

If the player who should rearrange their cards have at most one unclued card, then they do nothing. If they want to discard, they should cycle their cards *before* discarding, so they have to discard their second card from the right. If a round passes with all the players playing, then no one should rearrange their cards.

Remark 10.1. It is *very* important that players keep track of who discarded, when deciding whether to play or not. This is because if the player who have to rearrange their card discards, they will discard their second card from the right, and it must be considered. Players are allowed to discard after rearranging (even if it's better to avoid, if possible), so keep that in mind during your turn.

11 Artificial (mod 8) clues

Some triggering conditions can be used to give a completely artificial meaning to a clue.

11.1 Just cycled and one clue left

If a player has only one clue left, and they have to cyclically rearrange their cards, then that clue, if given, has an artificial meaning.

The clue is given as a number modulo 8. Colour clues represent numbers from 0 to 3, from the player on the cluing player's left to the player on their right; number clues represent numbers from 4 to 7, in the same order. Which kind of clue to give is up to the cluing player, with the usual rules (i.e. try to avoid cards that have already been clued or played, and more generally, try to say something useful).

To the player on their left, the clue means "play or discard a card", with the following convention. 0 means "play your leftmost card", 1 means "play your second card from the left", 2 means "play your third card from the left", 3 means "play your fourth card from the left", 4 means "discard your leftmost card", 5 means "discard your second card from the left", 6 means "discard your third card from the left", 7 means "discard your fourth card from the left".

To all the other players, the clue is just the number of their leftmost card on which they don't have any direct clue on the number (this counts as a direct clue), where 0 means that the card has already been played.

The cluing players should then give the clue corresponding to the sum, modulo 8, of the clues they intend to give, and the next player should passively do what the cluing player asked them to do (otherwise the other players won't understand).

Exception: if a player is in this situation because someone has already been, they told the next player to discard, and no other clue has been given yet, then the clue is a normal one (it doesn't have this artificial meaning).

12 Other ideas

This is not yet official.

When a player have more than one playable card, they should decide which to play by looking at other players' hands. If they can allow someone else play, they probably should do so. If they can't, they should play to make as clear as possible for other players whether they should play too or not.

Example 12.1. Let the setting be the following.

+	2 3 2 3 4 5	A	3 4 2 2
B	3 4 4 1	C	5 1 3 4
D	4 1 3 3	E	5 2 1 3

A to play. They know that both the 3★ and the 4× are playable. B has a 4★, but they don't know its colour. A plays the 3★, so be knows that their **4** is red (else A should have played the 4×, allowing E to play their 5×). B plays the 3γ instead, so C knows that their **5** isn't red (it's white). They can clue *yellow* to E instead.

13 Relevant examples

Example 13.1 (A brilliant first round)**.** Let the setting be the following.

+	0 0 0 0 0 0	A	1 1 4 3
B	1 3 4 4	C	1 2 2 5
D	2 3 2 4	E	2 1 1 3

First round of the game, A is the first player. They clue *3* to E, asking to play the complement right to left. Then, B clues *yellow* to C. This is a (fantastic) finesse involving A and D. Then, C and D aren't really allowed to discard (it's still the first round), so they may clue *red* and *1* respectively to B, meaning that no red card is to play and that there is one available to discard (because the 1★ will be played by E).

With the first two clues, the players get to play 9 (nine!) cards with just two clues. The drawback is that the following clues are quite useless, but pointing out three cards in B's hand may still be helpful, since they will discard their 1★ with no fear and eventually play the two remaining red cards. This leads to 11 cards played and 1 useless card discarded with just four clues.