

Sum Card

While the teachers back is turned, students pick **some** card fro a deck of 52 cards and places it face down on the desk. The teacher turns around and tells them the hidden card.

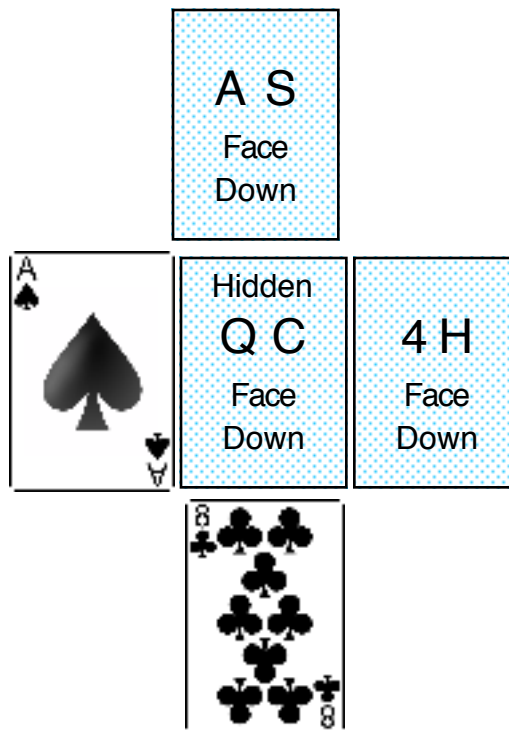
Preparation:

A deck of 52 playing cards is required. An assistant who is proficient in converting numbers from 1 to 13 base 10 into base 2 is required

Procedure:

The teacher turns their back to the students and the assistant. The assistant asks 5 different students to select 1 card each and hand that card to them. The assistant selects one of the 5 cards, shows it to the students, and says this is the card that will be hidden from the teacher. The assistant places that card face down on the desk. The assistant then takes the other 4 cards and lays them out in a diamond pattern surrounding the hidden card. Some of the cards are face down and others may be face up.

Example



The teacher turns around, looks at the cards and names the hidden card.

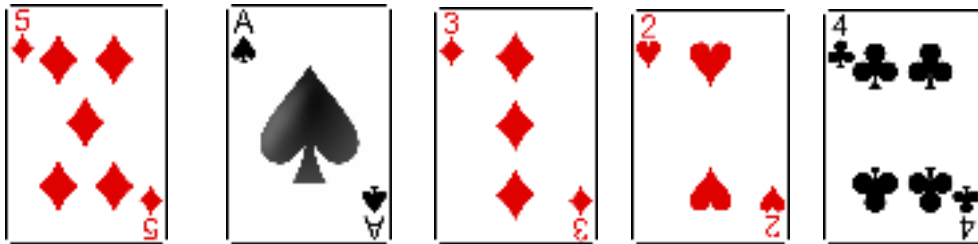
**How to select the card that will be the hidden card
and the card that will be the first face up card.**

A deck of cards has 4 different suites: **Clubs, Spades, Diamonds and Hearts.** The trick requires that 5 cards are selected from the deck. The first 4 cards selected may all have different suits but the fifth card must have a suit that repeats a suite already drawn. There may be more than two cards with the same suite. There may be 2 sets of cards with matching suits of different types but with 5 cards we **are guaranteed that at least 2 of those cards will have the same suite.**

Take the cards with one type of matching suit and select any one of them to be the **hidden card.** Reserve a second card of the same suit to use as the **first face up card.**

Example 1

There
5 cards
were selected
by the students.

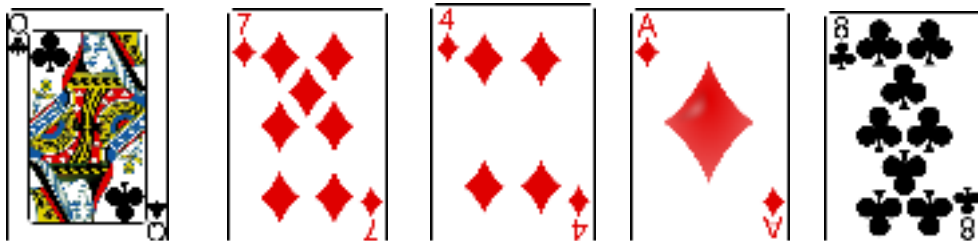


The hidden card must be a card that has at least one other card with the same suite. There are 2 diamonds. Lets take the 5 of Diamonds to hide.

Reserve a second card of the **same suit** to place as the **first face up card.** **The 3 of Diamonds is reserved as the first face up card.**

Example 2

There
5 cards
were selected
by the students.



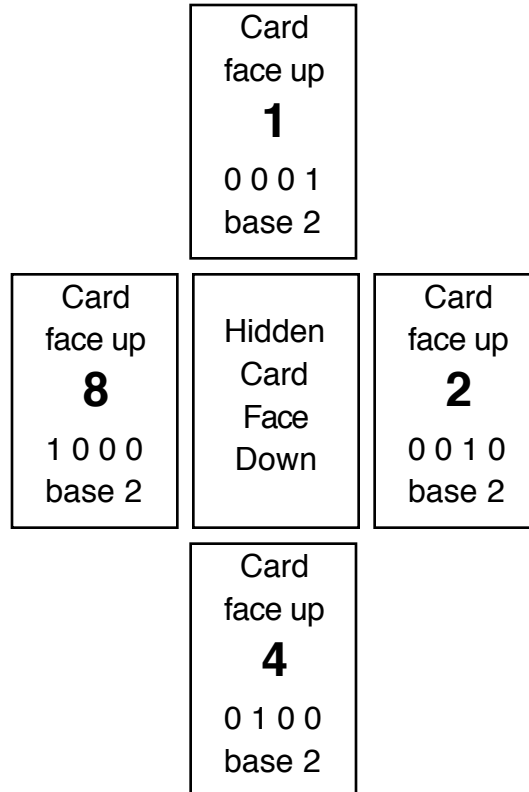
The hidden card must be a card that has at least one other card with the same suite. There are 3 diamonds and 2 clubs so you can use either suit. Let take the Queen of Clubs to hide.

Reserve a second card of the same suit to place as the **first face up card.** **The 8 of Clubs is reserved as the first face up card.**

How does the teacher find the number of the hidden card

There are 4 cards that surround the hidden card.

The value of the top card at 12 o'clock is **1** if it's face up and 0 if it's face down.
The value of the next card as we move clockwise to 3 o'clock is **2** if it's face up and 0 if it's face down.
The value of the next card as we move clockwise to 6 o'clock is **4** if it's face up and 0 if it's face down.
The value of the next card as we move clockwise to 9 o'clock is **8** if it's face up and 0 if it's face down.



Which cards are face up and which cards are face down

Write the number of the hidden card in base 2.

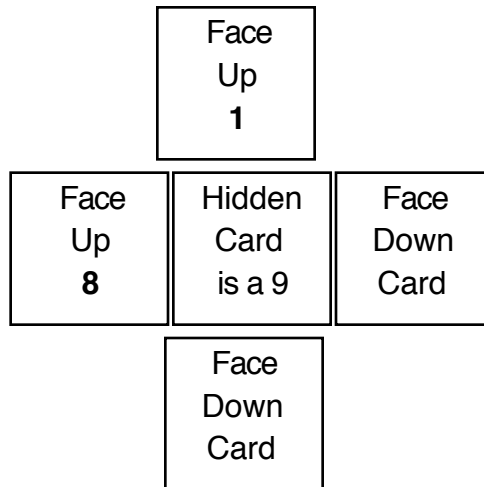
If there is a 1's digit in the 1, 2, 4 or 8th place value you put a **Face Up** card in that location.

If there is a 0's digit in the 1, 2, 4 or 8th place you put a **Face Down** card in that place.

Example 1

The hidden card is 9 $9 = 8 + 1$ so 9 base 10 is $\frac{1}{8's}$ $\frac{0}{4's}$ $\frac{0}{2's}$ $\frac{1}{1's}$ base 2
place place place place

The cards worth 8 and 1 are face up. The other cards are face down.



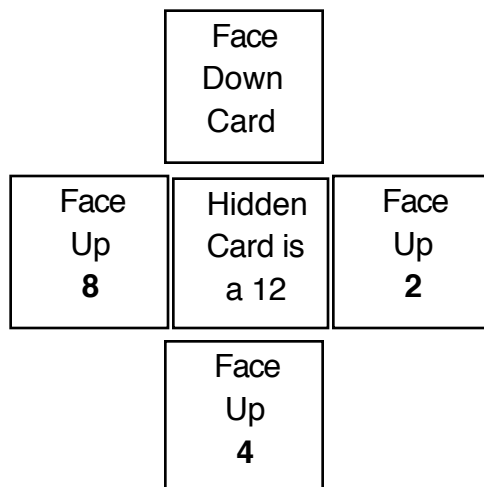
The total of the face up cards is 9. The hidden card is a 9.

Example 2

The hidden card is a queen. The queen is worth 12. if the hidden card is 12

then write 12 in base 2 $12 = 8 + 4 + 2$ so 12 base 10 is $\frac{1}{8's}$ $\frac{1}{4's}$ $\frac{1}{2's}$ $\frac{0}{1's}$ base 2
place place place place

The cards worth 8 , 4 and 2 are face up. The other cards are face down.



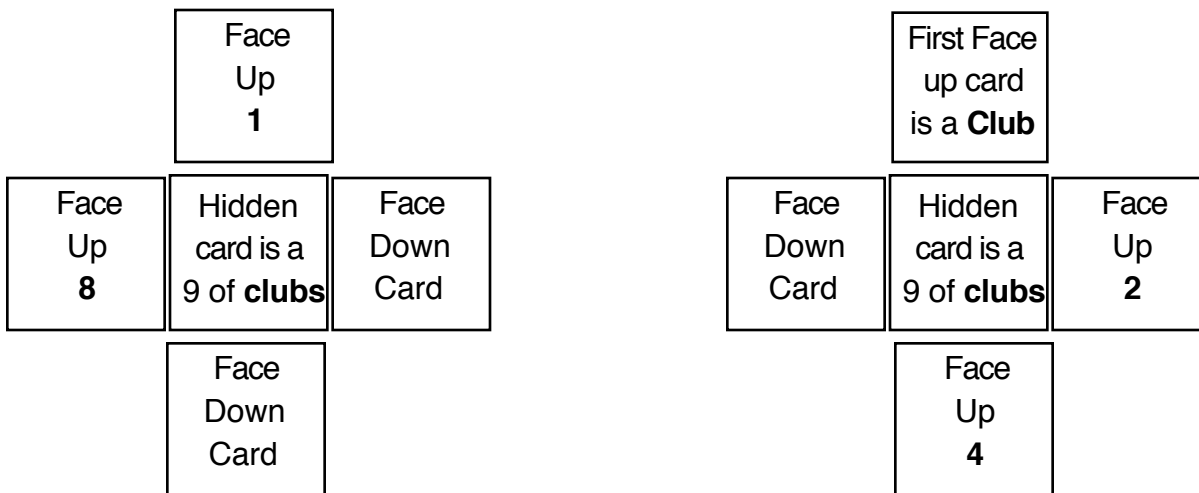
The total of the face up cards is 12. The hidden card is 12 or a Queen

Finding the suite of the card

We select the hidden card by taking the cards with one type of matching suit and select any one of them to be the **hidden card**. We then reserve a second card **of the same suit to place as the first face up card**.

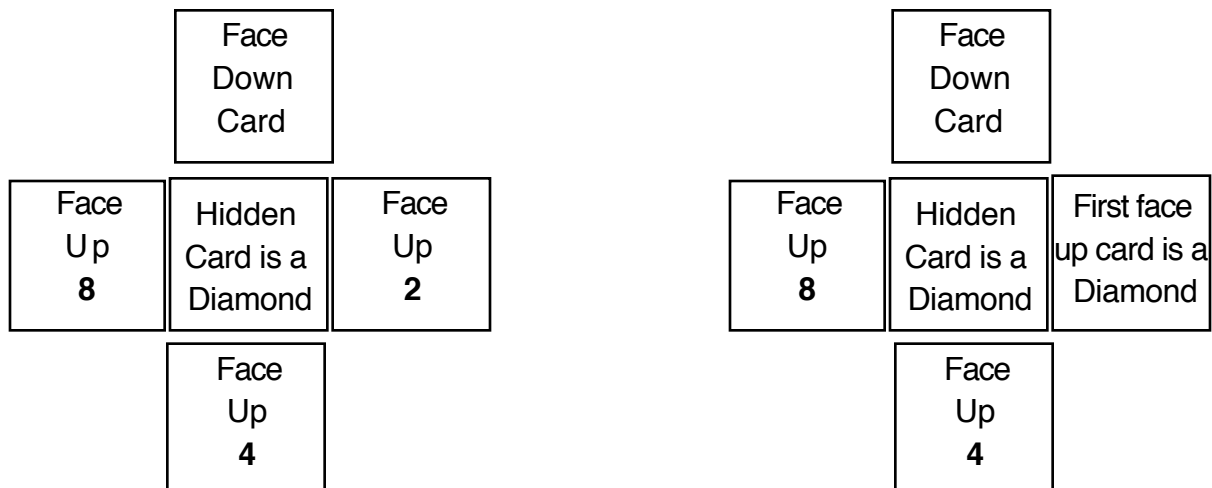
Example 1

The hidden card is a 9 of **Clubs**. A 9 requires the 1 and 8 cards be face up and the other cards face down. The first face up card when start at the top and go clockwise must be a Club. The first face up card is the 1 card so a card with a club will be put face up in that spot. That first face up card is a club so **the hidden card is a Club**.



Example 2

The hidden card is a Queen of **Diamonds**. The Queen is worth 12 and 12 requires the 8, 4 and 2 cards be **face up** and the other cards face down. The first face up card when start at the top and go clockwise must be a diamond. The first face up card is the 2 card so a card with a diamond will be put face up in that spot. That first face up card is a diamond so **the hidden card is a Diamond**.

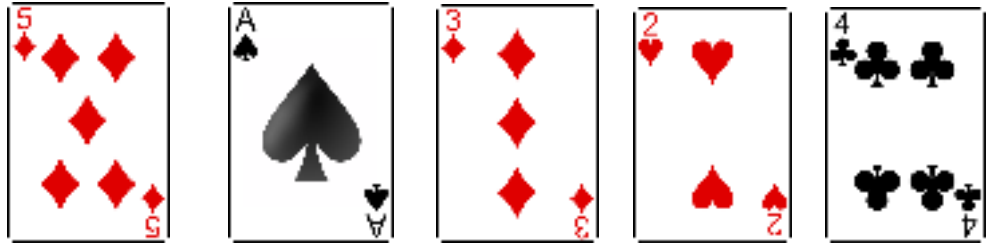


Performing the trick

Example 1: The following 5 cards were chosen

The hidden card must be a card that has at least one other card with the same suite. There are 2 diamonds. Lets take the 5 of Diamonds to hide and reserve the 3 of Diamonds as the first face up card.

There is more than one card with a diamond.
The 5 of Diamonds is chosen and put face down



$5 = 4 + 1$ **Cards 1 and 4 will be face up and Cards 2 and 8 cards will be face down**

The first face up card as we go clockwise from the top **must be a diamond.**

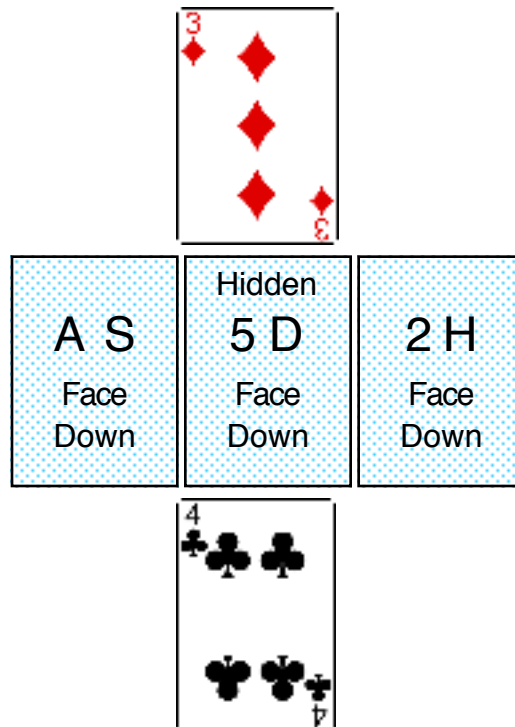
We **reserve the 3 of Diamonds as the first face up card.**

Card 1 = Face Up 3 of Diamonds

Card 2 = Face Down (any remaining card)

Card 3 = Face Up (any remaining card)

Card 4 = Face Up (any remaining card)



How its done:

The 3 of Diamonds is the first face up card when start at the top and go clockwise. That card is a diamond so **the hidden card is a Diamond.**

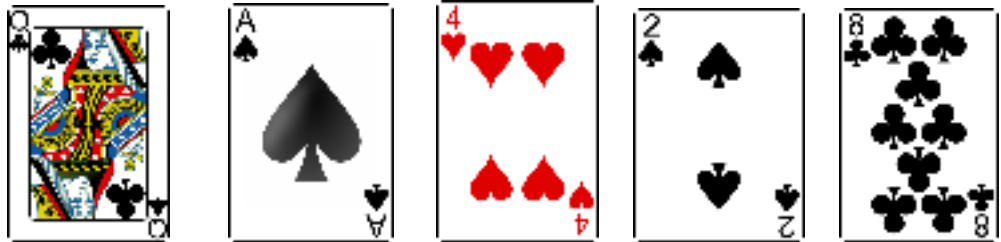
When you go clockwise from the top , **Cards 1 and 4 are face up $4 + 1 = 5$**

The card is a 5 of Diamonds. Turn the hidden middle card over and see that you ae correct.

Example 2: The following 5 cards were chosen

The hidden card must be a card that has at least one other card with the same suite. There are 2 spades and 2 clubs so you can use either suit. Let take the Jack of Clubs to hide.

There is more than one card with a club.
The Jack of Clubs is chosen and put face down



The Queen is a 12 of Clubs

$12 = 8 + 4$ Cards 8 and 4 will be face up and Cards 2 and 1 will be face down

The first face up card as we go clock wise from the top must be a club.

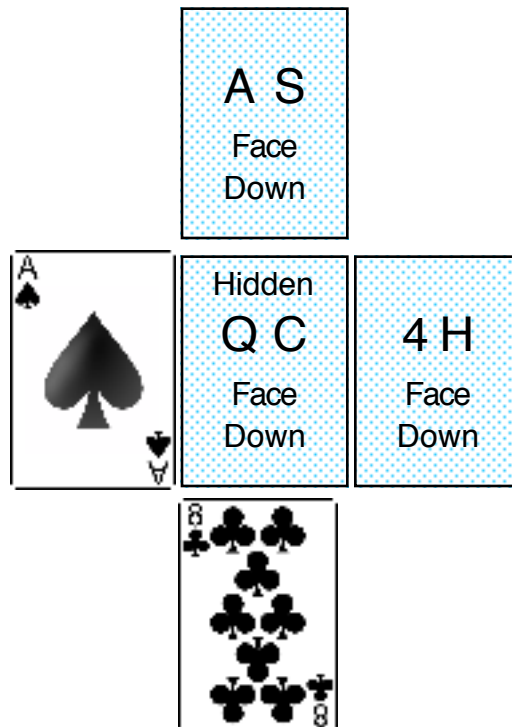
We reserve the 8 of Club as the first face up card.

Card 1 = Face Down (any card not 8 Club)

Card 2 = Face Down (any card not 8 club)

Card 3 = Face Up (the 8 of Clubs)

Card 4 = Face Up (any remaining card)



How its done:

The 8 of **Clubs** is the first face up card when go clockwise form the top. That card is a Club so **the hidden card is a Club.**

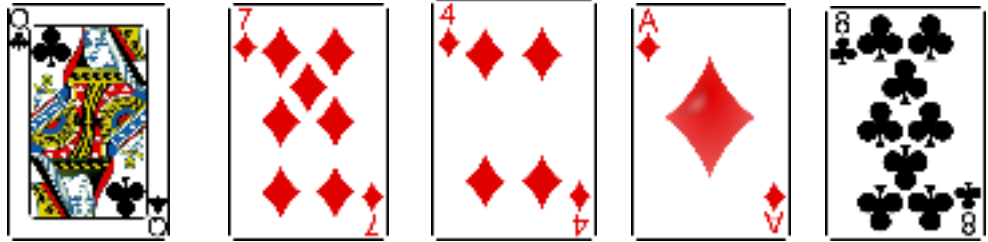
When you start at the top and go clockwise, **Cards 4 and 8 are face up** $4 + 8 = 12$

The card is a Queen(12) of Clubs. Turn the hidden middle card over and see that you ae correct.

Example 3: The following 5 cards were chosen

The hidden card must be a card that has at least one other card with the same suite. There are 3 diamonds and 2 clubs so you can use either suite. Let take the 4 of Diamonds to hide.

There is more than one card with a Diamond
The 4 of Diamond is chosen and put face down



4 = 4 + 0 **Card 4 is face up and Cards 1, 2 and 8 will be face down**

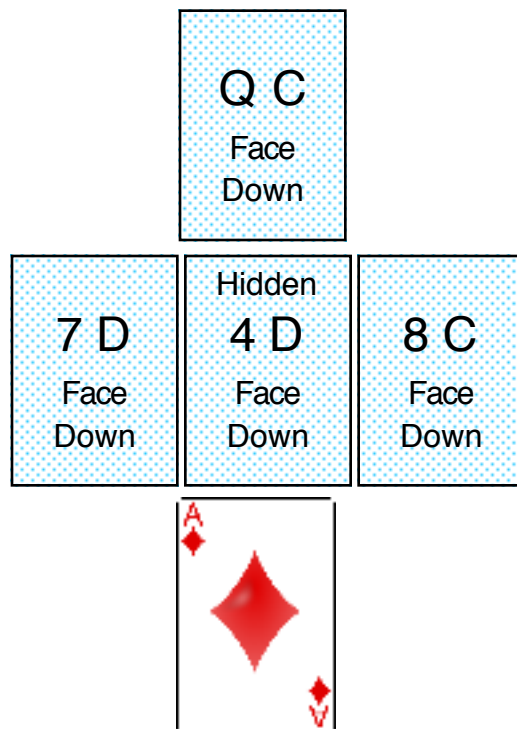
The first face up card as we go clock wise from the top must be a Diamond
We **reserve the Ace of Diamonds as the first face up card.**

Card 1 = Face Down (any card not A D)

Card 2 = Face Down (any card not A D)

Card 3 = Face Up (Ace of Diamonds)

Card 4 = Face Down (any remaining card)



How its done:

The Ace of **Diamonds** is the first face up card when you start the top and go clockwise. That card is a Diamond so **the hidden card is a Diamond.**

When you start at the top and go counter clockwise, **Cards 4 is the only face up card**

The card is a 4 of Diamonds. Turn the hidden middle card over and see that you are correct.

Base 2 digits for the numbers 1 to 13 base 10

Hidden Card		card 8 1000 Face	card 4 0100 Face	card 2 0010 Face	card 1 0001 Face
Ace = 1	$0 + 0 + 0 + 1$	Down	Down	Down	Up
2	$0 + 0 + 2 + 0$	Down	Down	Up	Down
3	$0 + 0 + 2 + 1$	Down	Down	Up	Up
4	$0 + 4 + 0 + 0$	Down	Up	Down	Down
5	$0 + 4 + 0 + 1$	Down	Up	Down	Up
6	$0 + 4 + 2 + 0$	Down	Up	Up	Down
7	$0 + 4 + 2 + 1$	Down	Up	Up	Up
8	$8 + 0 + 0 + 0$	Up	Down	Down	Down
9	$8 + 0 + 0 + 1$	Up	Down	Down	Up
10	$8 + 0 + 2 + 0$	Up	Down	Up	Down
Jack = 11	$8 + 0 + 2 + 1$	Up	Down	Up	Up
Queen = 12	$8 + 4 + 0 + 0$	Up	Up	Down	Down
King = 13	$8 + 4 + 0 + 1$	Up	Up	Down	Up