Jack, the Hunter

From an ordinary deck of playing cards, take out the Jack of Spades and place it face up on the table. Now deal, face down, two piles each with fifteen cards. Cut one pile into two subpiles, that we shall call A and B; cut the second pile similarly into two subpiles, C and D. Ask someone to select one card from the remaining twenty-one cards, remember what it is but not to tell you, and then place it on one of the subpiles, say A. Now place on top of this subpile one of the piles C and D, say C.

You will now put the Jack of Spades face up on the subpile D and place on top of this the subpile B. Now place one of the resulting two piles on top of the other to form a single deck, all cards face down except the Jack of Spades. For example, we could have in order from the top the A, unknown card, C, D, Jack of Spades, B.

Deal the cards alternatively face down (except for that the Jack remains face up) into two piles. Reject the pile not containing the Jack and deal the remaining sixteen cards alternately into two piles. Again reject the pile not containing the Jack and deal the remaining eight cards alternately into two piles. Repeat the process to get successively piles with four and then two cards. The Jack will have "hunted down" the unknown card which will be the other card in the final pile containing the Jack.

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Why does it work? The subpiles A and B together contain fifteen cards, as to the subpiles C and D. When the piles are finally amalgamated into a single pile, there will be fifteen cards between the Jack and the unknown card. After the thirty-two cards are dealt into two piles and the one not containing the Jack rejected, the Jack and the unknown card will both be in the remaining pile, separated now by seven cards. At the next stage, they will be separated by three cards. When we get down to dealing out four cards, they will be separated by a single card, so that the two cards will end up in the same pair.