Choose Your Weapon

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A friend from Regina recently asked a question that has been discussed elsewhere, but there is no harm in going over it again as it is something poker players discuss now and then. Let's build the question into a story.

An interstellar spaceship lands in Toronto under the mistaken impression it is the capital of Earth. Two inhabitants of the ship emerge on the second day following its landing. The large throng of international government officials, security personnel, international media, and general public that has gathered is taken aback when the smaller of the two aliens says in good English, "Please choose a poker player at random from the population of this country and bring him or her to this very spot 48 hours from now."

The crowd is stunned and mystified as the two aliens return to their ship without uttering another word. Speculation runs rampant for the ensuing 48 hours and, as most observers predict, the same two aliens reemerge from their ship precisely at the designated time. This time the smaller of the two provides more information. He states, "People of Earth, I represent the Zapaduan Confederation of Planets and my companion is the commander of the battle station you see in front of you. Given the mess humanity has made of Earth and the recent attacks on individual freedom as represented by laws outlawing or barricading the playing of online poker, the Confederation has decided to eradicate humanity. However, we are going to give you a chance to escape this fate."

The sudden roar of the people in attendance dies quickly when it is realized a ray of hope has appeared. There is a hush as the alien continues. "The Zapaduan commander next to me is going to play a single hand of Texas hold'em against your chosen representative. If your player wins or ties, your planet will be spared, but if the commander wins the hand, humanity will be wiped out. There are some conditions though. The commander's hand will be the two red aces and your player can choose any two of the remaining cards..."

The alien pauses for a moment before completing his sentence and in that moment all the poker players in attendance or watching on television know the obvious choice is to pick the other two aces. This follows because almost all hands will end in a tie. The only way the alien can win the hand is for the board to allow either a heart or diamond flush such that the board itself is not a straight flush to the queen or less. This gives the alien only a 2.17% chance of winning the hand.

But then the alien completes his sentence, "except the other two aces." Oh, oh, the obvious answer is not allowed! What do we do now? Given that an opponent has the two red aces, which two cards should a player choose to have the best chance of not losing the hand?

We make some observations and first consider pairs. Let's use 10-10 as an example. In going against red aces, do red 10s fare better than 10-10 of hearts and clubs? Think of these as scenario one and scenario two, respectively. If a board does not contain the 10 of clubs, we use the same board for both scenarios. In this case, the value of the A-A hand is the same in both scenarios. If the red aces and red 10s have a draw in scenario one, then the board plays and the other 10-10 pair either remains the same or improves. Thus, the number of ties and wins is not affected in this subcase.

If the red tens have a win in scenario one, then the only 10-10 hand which changes value from scenario one to scenario two is a straight flush in diamonds. In scenario two this becomes a straight or flush for 10-10 and remains a flush or bigger for A-A. So there are 169 boards in scenario one that give the red 10s a win and turn into an A-A win in scenario two. Any board that has four clubs and no full house or better for A-A is a winner for A-A in scenario one, but becomes a winner for 10-10 in scenario two as the latter hand becomes a flush. There are 16,830 boards of this type.

This takes care of the boards not containing the 10 of clubs. If the board does contain the 10 of clubs in scenario one, then replace it with the 10 of diamonds to get the rest of the boards in scenario two. The 10-10 hands are the same in both scenarios. If the A-A hand is a winner in scenario one, then it is a winner in scenario two. So the numbers are unaffected by this subcase. If the two hands are tied in scenario one, then they have either the same straight or the same flush. If they have the same flush, it must be a club flush on board. It becomes a 10-10 winner in scenario two, but that does not affect the number of ties and wins. If they have the same straight, it must be a straight on board to one of 10, J, Q, or A. If there happen to be three diamonds on board too, then A-A becomes a winner in scenario two. There are 50 boards for which this happens. So A-A gains 50 boards in this subcase.

We finally consider the boards for which 10-10 is a winner in scenario one, with a 10 of clubs on board, but revert to an A-A winner in scenario two. The 10-10 hand has at least trips and doesn't change in scenario two. The A-A hand improves only if replacing the 10 of clubs with the 10 of diamonds moves it from something up to a flush. Thus, 10-10 goes from a winner to a loser if it is trips in scenario one and there are three diamonds on board, or it is a straight in scenario one with three diamonds on board, or it is a diamond straight flush to the king in scenario one. Because we are choosing four ranks from 11 and some already have been considered above, there are at most 330 rank sets involved with 12 choices of for combinations of suits with three diamonds. This means that A-A can gain at most 3,960 boards.

We conclude that 10-10 of clubs and hearts does better than the red 10s against the red aces. The moral of this story is the following. If you look in the right places, you can find people who have determined which two-card hand does best against A-A by programming a computer to check all possible two-card hands. That is an ugly approach. Instead, we are going to use simple logic as above to whittle down the possible candidates until we need to check only a few; hopefully just two.