Evil Hangman

Suppose that you are playing Hangman and it's your turn to choose a word, which we'll assume is of length four. Rather than committing to a secret word, you instead compile a list of every four-letter word in the English language. For simplicity, let's assume that English only has a few four-letter words, all of which are reprinted here:

ALLY BETA COOL DEAL ELSE FLEW GOOD HOPE IBEX

Now, suppose that your opponent guesses the letter 'E'. You now need to tell your opponent which letters in the word you've “picked” are E's. You haven't picked a word so you have multiple options about where you reveal the E's. Here's the above word list, with E's highlighted in each word:

ALLY B**E**TA COOL D**E**AL **E**LS**E** FL**E**W GOOD HOP**E** IB**E**X If you'll notice, every word in your word list falls into one of five “word families”:

• ---- contains the word ALLY, COOL, and GOOD • -E-- contains BETA and DEAL  
• --E- contains FLEW and IBEX  
• E--E contains ELSE

• ---E contains HOPE

You can choose to reveal any one of the above five families. There are many ways to pick which family to reveal – perhaps you want to steer your opponent toward a smaller family with more obscure words, or toward a larger family in the hopes of keeping your options open. In this assignment, in the interests of simplicity, we'll adopt the latter approach and always choose the largest of the remaining word families. In this case, it means that you should pick the family ----. This reduces your word list down to

ALLY COOL GOOD

and since you didn't reveal any letters, you would tell your opponent that his guess was wrong. Now the list of words you have to choose from has been reduced to these three words. If your opponent guesses the letter O, then you would break your word list down into two families:

• -OO- contains COOL and GOOD • ---- contains ALLY

Since the -OO- family is larger (two words) we go ahead and choose it, revealing two O's in the word and reducing the list down to

COOL GOOD

But what happens if your opponent guesses a letter that doesn't appear anywhere in your word list? For example, what happens if your opponent now guesses 'T'? This isn't a problem. If you try splitting these words apart into word families, you'll find that there's only one family; the family ---- in which T appears nowhere and which contains both COOL and GOOD. Since there is only one word family here, it's already the largest family, and by picking it you would maintain the word list you already had.

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There are two possible outcomes of this game.

1. Your opponent might be smart enough to pare the word list down to one word and then guess what that word is. In this case, you should congratulate the player.
2. By far the most common case, your opponent will be completely stumped and will run out of guesses. When this happens, you can pick any word you'd like from your list and say it's the word that you had chosen all along.

The beauty of this setup is that your opponent will have no way of knowing that you were dodging guesses the whole time – it looks like you just picked an unusual word and stuck with it the whole way.