For many years word buffs at these laboratories have made a game out of finding words which contain strange digrams (pairs of letters side-by-side). The problem, as originally posed by M. D. McIlroy, was to complete a table with 26 rows and 26 columns, labeled by the letters A, B, ..., Z. The space where row L crossed column L' was to be filled by a word containing the digram LL'. Of the 676 \(= 26 \times 26\) words needed, about 80% are easy to find. Each of the others presents a difficult puzzle and some must be impossible under any reasonable rules for deciding what words are allowable. The rules adopted here accept only words from the second edition of Webster's unabridged dictionary, spelled without a capital letter, without a hyphen, and without the sign || by which Webster denotes words in foreign languages. The word may be listed as an archaic form (below the line at the bottom of the page), as a recent word (in the addendum), or as an alternate spelling.

A. Ross Eckler and Faith W. Eckler used different rules for their trigram table, now being serialized in *Word Ways*. Our rules are more permissive in using a larger dictionary but also less permissive in rejecting hyphenated words and neologisms. Although our rules are natural ones they dictate peculiar choices for certain digrams. Thus, for the digram ZB, the rules reject buzz bomb (two words) and whizz-bang (hyphenated) but allow ezba and blitzbuggy. For the digram LJ, aljoba is acceptable (although it is below the line) but aljama is rejected as a foreign word; kill-joy (hyphenated) is also rejected. For the digram MZ, Zemzem (capitalized is forbidden but lamizkte is acceptable). The only known word for the digram FZ is alephero, which appears in the definition of alef null as an alternate form. Likewise the only known word with digram PQ is upquiver, which Webster includes in a list of words with prefix up- but does not define.
Clearly one can criticize these rules. However, one must adopt some authority like Webster to settle any argument about what words are allowed. Without Webster's restraint it is tempting to invent new compound "words" (like offkey for the rare digram FK) which are not single words at all. Having agreed on Webster it is then disheartening to find a good ZM word, queezmadam, spelled without a hyphen in Funk and Wagnall but with a hyphen in Webster.

The digram table is complete. Wherever the table fails to give a word, the reason is that no allowable word exists with that digram. We now know exactly which digrams can appear because of a study, made at RCA, in which an electronic computer sorted through all the words of Webster's second edition. It listed all the different tetragrams it found (but not words containing them).

Although I have only the tetragram list with no explanation to go with it, the list seems to cover exactly the same words which are allowed for the table. In the tetragram list the word space # counts as a letter (thus the word "for" contributes the tetragrams # # # #, # # # # #, # # for, for #, or # # #, r # # # to the list).

If a digram occurs at all it occurs at the beginning of some tetragram. Thus to test whether a rare digram, say KX, occurs one needs only consult the list for tetragrams beginning KX. The only such tetragram listed is KXIA. This proves that there is such a word. Furthermore by looking for tetragrams # KXI, AKXI, ..., ZKXI one finds only CKXI listed. Then the word sought contains the pentagram CKXIA. Continuing in this way one finds that the word contains IGKXIA. However, there are so many tetragrams like # ICK, HICK, PICK, SICK, etc. that the table is not helpful in supplying more letters. Indeed the KX word was the last one found; D. Borgmann contributed the word kickxia.

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In the table which follows, the digrams which have no corresponding words are indicated by XXX. A few words are marked with an asterisk to show that they are obscure forms which Webster put below the line. Conclusions based on the tetragram list may not be absolutely reliable. For instance the list omitted the common tetragram #BE#. It also gave no tetragram beginning QV although I find QVINT below the line in Webster.

By relaxing the rules slightly one can find words for some of the "impossible" digrams. Other dictionaries contain words like avgas, tradevman, and muzjik. Proper names, foreign words, or hyphenated words would supply more, but one ought to stop short of allowing names of radio stations.

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**Notes:**

- Table continues on the next page.
- The table includes various digrams and their corresponding words or marks indicating their status.
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WORD WAYS

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## The Diagrams of Webster's Unabridged Dictionary

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**WORD WAYS**