For an introduction to this series of articles classifying and summarizing unsolved logological problems in Word Ways, see the February 1979 Word Ways.

**Pattern Words**

Excluding letter-patterns having three or more consecutive identical letters, there are 161 possible six-letter patterns; NI examples for 128 of these have been found (71-227, 72-3). Can the 33 missing patterns be found in AD (the 12 without initial doubled letters seem the most easily findable)?

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\text{cbabaa aacbba bbacaa aabccb abaccb ababba aabaac}
\text{aacdbb aacbab aabacb abbaac abbcca bababb aabaca}
\text{aabbcd aacbba aabbca aabbac abccab bbaabb abacaa}
\text{acbbaa abcaab bbaaca aabcbc aababb bbabab}
\text{bcabaa babcaa aababc aabccb aabbab bbabba}
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Similarly, NI examples have been found for 39 different five-letter patterns: all but aabba and aabaa (71-113). Can these be found in UD?

For four-letter words, NI examples are known for 11 different patterns, with only aabb missing; can this be found in UD (71-228)?

The 11 known four-letter patterns can be expanded to include vowel-consonant patterns, using the notation abcD for 'aeon' or aBCa for 'else'. Excluding all-vowel and all-consonant patterns, the missing patterns are: aBCC, abCC, Abcc, ABBc, Abbc, ABAc, AAbC, AABc, AAbA (71-128).

Can any of these be found in AD?

The longest known pair of words with the same pattern in NI is 'uncontrovertibleness/uncontrovertableness'. If one requires that one word be changed into another by a non-trivial monoalphabetic substitution cipher (all letters must change), the longest such NI word-pair is believed to be 'demulsification/gynaecomorphous' (73-146), and the longest in PD or UD is 'conceputalism/exceptionably' (74-238). What are the longest pairs for PD or UD?

There are 210 different patterns of eight-letter words having two pairs of like letters; all but aabba and aabaa (71-113). Can these be found in UD?

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ed letters be found in UD or AD? 'South Cambridge NY' is an interesting place-name lexeme (73-176), and 'uncopyrightable(s)' has been attested (76-54). What about a longer pair isogram than the NI 'scintilllescent' in UD or AD?

The longest polygram (a word in which all letters appear at least twice) in NI is the inferred 'antianthropomorphisms', with 21 letters (72-49, 110); can anything better be found in UD? What is the best in 8C or PD? Among the 42 repeated-letter distributions of ten-letter words, 30 are in NI (71-231, 72-14); can anyone find those missing patterns that have five or fewer of any one letter, in UD: 433, 532, 541, 55? (Only coined words, such as 'repepperer' for 433, are known.)

Special patterns: All but four of the 40 single-word statenames match patterns with NI words; PA CT MA MI are missing (77-248). PA seems possible in UD, but the others require AD words at least. How about non-dictionary lexemes matching the patterns of ND SD NC SC? Is there a longer US place-name palindrome than 'Kanakanak' (in Alaska) or a longer tautonym than 'Walla Walla' (73-176)?

Terminal Letters

Letter at start, letter at end: For the 676 words of form a---a, a---b, ..., z---y, z---z, shortest and longest NI examples have been found for all but aq bq dj dq ej eq fq gq hj i j ij jq kq oq qj uq uv wz bx xj qx xv xy yj yq (71-195, 72-15, 40). Although a few might still be found in NI, it is likely that a full set of examples requires AD (possibly, UD).

Two letters at start: For the 676 words of form aa---, ab---, ..., zy---, zz---, examples in O have been found for all but bp cg fp fv hg hx jq jx qk vq xq (75-89, 207, 79-39). Can O words be found for these, or improving pq px qj qx xk?

Two letters at end: For the 676 words of form ---aa, ---ab, ..., ---zy, ---zz, examples in O have been found for all but bp cf cr gp jq jv jw jx kv mg mw pb pq pv qv vz zb xg xj xn xp xr zc (70-152, 75-165, 79-39). Can O words be found for these, or improvements for bj bv cv fb fg fj fm fp fv gz hj kq pq sz sj sx xq xz zb zp zv zf?

Restricted Letter Sets

A garble group is a set of words showing every possible choice from a sequence of letter sets, as (B)(AIU)(DG) = bad bag bid big bud bug. Find larger garble groups for NI words of length three through seven than (BFGRW)(AEIOU)(DT) = 50, (BLMFRST)(AI)(N)(EDGKS) = 70, (BPRSW)(AI)O(N)(DEG)(S) = 45, (DLNFRST)(AI)(P)(P)(E)(DR) = 24, and (CDJMRTW)(AI)(G)(L)(E)(DS) = 28 (70-144, 213, 71-15). Extend to words of eight or more letters. For PD words, garble groups through five-letter words are known (73-67, 156); extend to longer words.

What is the longest word-length of an NI garble group in which there is a choice of letter in each position? It is conjectured to be four, with (SF)(AI)(NT)(SE) (68-165). Can it be made five for UD or AD?

Place 24 or (maxim) the dice and the record for 'TNDWKY, UD fogy' (73-1)

Choose a matter the one letter from each require a total tan tea.

Letter Shapes

Find a letter symmetric Ax Ax

The alph. and tall ones numerously high one thar allow alter nation.

Proper Names

Find US delta, epsilon (70-210)

Many sta be built: Wy 26 links (70-132)

All but the Eisenhower, are known to Hiram and S (70-210)

Find an un (70-132) or (Obscure his 91).

Find 'Two
Place 24 different letters on four six-sided dice to (1) minimize, or (2) maximize the probability that a word can be formed by rolling the dice and arranging the letters thus obtained (70-29). The existing record for the first problem with PD words is QXJZYF, MPBHGC, TNDWKY, UEORLS which yield only 'heft', 'bevy', 'cozy' and 'fogy' (73-108).

Choose a sequence of letter-sets (no letter repeated) so that, no matter the order in which these sets are arranged, one can pick one letter from each set and form a word. Using PD words, three sets require a total of at least five letters: (NE)(A)(TR) = era era are and tan tea. For four sets, it is known that eleven letters suffice for (EOR)(PAE)(TL\gamma)(SL); can it be done with fewer (78-158)? What about five or more sets? Other dictionaries, such as NI? As a generalization, one can allow a letter to appear in two different sets, but one should insist that there be n! different words, one for each set arrangement.

The telephone dial is a special choice of eight sets with three letters apiece (no letters repeated). Isotels are words with letters that are selected in the same order from the different sets (that is, isotels have the same "telephone number"). Can one longer non-crashing NI isotel pair than 'amounts/contour' or 'astride/crushed', or an NI isotel triple longer (or better) than 'DDD/eff/fee' (75-227, 78-215). Allowing any arrangement of 24 letters in eight sets of three letters apiece, what is the longest non-crashing pair or triple?

**Letter Shapes**

Find a longer AD word than OKEECHOBEE made up of vertically symmetric letters (78-177).

The alphabet can be divided into narrow letters (acemnorsuvwxz) and tall ones (bdfghijklpqty). Find a longer narrow word than 'over-numerousnesses', a longer tall one than 'lillypilly', a longer all-high one than 'libidibi', a longer all-low one than 'gyp', and a longer alternating one than 'sinicizing' or 'luteinizing', all in NI (73-188).

**Proper Names**

Find US towns with Greek-letter place-names (alpha, beta, gamma, delta, epsilon, zeta, eta, theta, iota, kappa, sigma, omega are known) (70-210).

Many state names are also town names, so a state name chain can be built: Wyoming is in Delaware, Delaware in Virginia, etc. Beat 26 links (70-220, 71-15).

All but three Presidential surnames are also US town names; find Eisenhower, Ford or Carter. All Presidential given names but Harry are known to be US town names; can this be found? (Also, search for Hiram and Stephen, the first names of Grant and Cleveland.) (70-131, 70-210).

Find an unhyphenated US town name longer than Kleinfeltersville PA (70-132) or a multiple-word name of more than 34 letters (73-92). (Obscure historical examples of 25 and 69 letters have been found (73-91).)

Find 'Twenty' or 'Twelve' as US town names (78-45).
All planets but Uranus are US town names; find this (70-131).
Find one town name in all 50 states. Franklin is in 38 states in the Rand McNally Commercial Atlas, and the Century Atlas and TIG add four more; only DE FL HI NV NM RI UT WY are lacking. Is Washington or some other name better (70-210)?

Words in Words

Find words in AD containing all the Greek letters within them, like caRHop or DELLTarium. Only epsilon and upsilon remain undone (71-169).

A progressive word deletion removes a series of words from a longer one, each nested in the next. For example, 'pilgrimage' (rim, gag, pile or grim, lag, pie) is a two-way triple deletion. Find an NI word which allows an eight-way deletion, each triple or more, with no words used more than once ('vicissitudes' allows a seven-way deletion, all quadruple or better) (76-173).

Crashing Words

Two words of the same length are said to crash if they contain identical letters in the same position, as tiGer and anGry.

Find the longest possible list of n-letter words, no two of which crash. For PD, the lists are 10 for two-letter words, 17 for three-letter, four-letter and five-letter words, and 15 for six-letter words (73-67, 156); improve if possible, and extend to longer words. For NI the record is 19 five-letter words (72-107, 174); what can be done for other word-lengths in NI?

'Hated horny wines would fitly fauns' is a symmetric crash group of six five-letter words in which (1) each word crashes exactly once with each other word, (2) each letter participates in a crash, and (3) each letter is used exactly twice in a given position (78-230). Extend this to eight seven-letter words, using NI if possible, UD otherwise. Find four NI nine-letter words having three crashes for each pair of words, but each letter repeated four times.

Find a pair of non-crashing transpositions longer than 'oppositl (72-104, 174).

Miscellany

What is the longest word to which all 26 letters can be transadded? 'Sere' can be transadded to 26 NI words if the doubtful 'geres' and 'Ezer's' are allowed (72-106). Find a better four-letter example, or search for longer words with NI (or UD) transadditions.

Using 21 different letters five times apiece, form 21 five-letter words (no repeated letters in a word) such that (1) any pair of letters will be found together in exactly one word, and (2) any pair of words will have exactly one letter in common. Using O words, a 17-letter partial solution is known (75-250). There are numbers of related, but easier, multiple word group challenges in (68-212, 77-85).

There are 27 ten-digit squares (all digits different) which have five-digit squares as in a "us/train". Find it in NI.

A shiftgraph spaces along as ray-SBZ-Toland. A subvalue (A = 1) and refactorings can be traced strict to 8C words.

A word grid is converted to a 'badger/sunl' example. A group of words occur with the larger NI word subgroups that larger invariant subgroups the larger invariant subgroups (72-104, 174). What are the larger words in NI?
five-digit square roots (all digits different). Substituting letters for
digits as in a monoalphabetic cipher (1237069584/35172 is 'antichor-
us/train'), only one combination remains unsolved: 1532487609/39147.
Find it in NI (70-122).

A shiftgram is produced by shifting the letters of a word 1 to 25
spaces along the alphabet and transposing the result into a new word,
as ray-SBZ-TCA-cat. Find longer shiftgrams than 'perhaps/low-
land'. A subtransposal is formed by assigning the letters numerical
values (A = 1, B = 2, etc.), multiplying the letters of a word together,
and refactoring. Thus, lay = 12x1x25 = 20x15 = to are subtransposals.
Find a larger subtransposal set than 'beef/cede/roe/eel/job/lay/lee/
ode/to' = 300; find a numerically larger set than 'beeper/three' = 67500,
or 'Dmitri/miller' = 1516320 if proper names are allowed; find a
seven-letter (or longer) subtransposable word (69-24).

Find all ways of spelling schwa in English (75-232).

Find the longest NI words made up of abbreviations for elements
(TiNTINaBULaTIoN) or states (CaCoGaLaCtIa) (76-42, 91).

Find non-numerical meanings for the cardinals from 0 to 50. Like
'twenty-one' = a card game, or 'sixteen' = a Montana town. Only 37
and 47 are missing (75-10, 78-46).

Construct a 5x5° array of 25 different letters in which no NI word
can be traced out using a King's Move in chess (if impossible, re-
strict to 8C words) (70-148).

A word girder is a pair of words, with no repeated letters, that
is converted into a new pair by interchanging every second letter:
'badger/sunlit' to 'budlet/sangir’ (76-150). Find a seven-letter
NI example.

A group of letters in a word is alphabetically invariant if its letters
occur with the same spacing as in the alphabet, as 'elOPeRS'. Find
longer NI words consisting of one, two or three alphabetically invariant
subgroups than 'ghi', 'spurs/anode/abode' and 'operative'. Find a
larger invariant subgroup than the six in 'INOpeRaTvE'.

What are the longest words having four (or five, or six ... ) invariant
subgroups (72-140)?