LETTER TREES

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On March 13 2005, Will Shortz presented an interesting word puzzle on National Public Radio: rearrange the letters of K + ANALOGIES into a tree, where every path leading downward is a four-letter word. The tree at the left yields saga, sage, sane, sank, sine, sink, silk and silo.

There are thousands of ten-letter groups that form eight different words, so it is necessary to restrict the conditions of the problem. First, the ten letters must form a word; second, all ten letters must be different; third, the solution must be unique (only one tree arrangement is possible). If one restricts the eight words to the Official Scrabble Players Dictionary (1995), there are still at least 28 solutions:

adsorptive d-io-vtr-aesp
beansprout t-ao-bpr-usen
complaints s-cl-aot-ntpm
dispatcher p-ai-rct-desh
eulations m-ai-uls-nteo
impersonal l-ei-anm-rsop
mailperson l-ei-anm-rsop
outdrawing g-ar-uo-dntw
panegyrics r-ai-cpn-yesg
resampling g-ai-mer-psnl
shadflower h-ao-rew-lsdf
taperingly p-ai-rln-tyeg
unchastely l-au-scn-heyt
wardenship w-ai-rns-pdeh

amphiboles s-hl-oia-epmb
blandisher b-ai-snr-hedl
diplomates l-ai-mtd-peso
dogwatches s-ch-aoe-gtwd
headstrong h-ao-ren-tdsg
inculpates p-ao-cn1-etsi
neutralism m-ai-ulr-ntes
outlandish s-ah-uo-nltd
polyanthus s-hl-uaa-ntpy
restacking r-ai-tcn-sekg
stewarding d-ai-wrn-steg
tradesfolk f-ao-trln-sedk
underplays p-ao-rln-desy
restamping g-ai-mer-psnt

The obvious generalization is to arrange 15 letters in a tree to generate 16 different words. Here it seems advisable to relax the three conditions. Again drawing words from the OSPD, one can construct several families of solutions. For example, the first solution places B E in place of the + + along the left edge of the tree, and A N in place of the - - along the right edge of the tree.

B       +       B       D       E       E       M       N
A U      E       E       D       R       Y       Y
R       L       R
+       K       L       -       -       A       G       N       R       R
+       S       Y       S       -       N       H       T       O       Y

B       +       N       R       M
A U      S       E       S
R       L       R
+       K       L       R       -       O       S
+       Y       S       Y       -

6x5 = 30 solutions
3x2 = 6 solutions
S + C C K K L L N N R R  10x3 = 30 solutions
P T A Y E Y L T S Y T Y
I A I
+ T R - C N N
+ E S K - H G T

S + E T E T E T L E L E L N T N T  8x3 = 24 solutions
P T D S L S R S R L S L D L Y S E S
I A O
+ + R O - D L P
+ + E K -

Editor’s Note: Many more solutions are possible if one enlarges the word stock. For example, using Webster’s Second the letter tree s-h-t-e-a-o-l-n-w-f-deks (shelf, shed, shend, shene, shand, shane, share, shark, stand, stane, stare, stark, store, stork, stowk, stows) has at least 168 relatives in its extended family. It may be time to issue a challenge to the reader to find a letter tree consisting of 32 different six-letter words. Even a letter tree consisting of 64 seven-letter words may be possible if a sufficiently large set of words is used (Rex Gooch?).