LETTER TREES

ERIC IVERSON
Eagan, Minnesota

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.

```
        S
      A   I
    G   N   L
  A   E   K   O
```

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	amphiboles s-hl-oia-epmb
beansprout t-ao-bpr-usen	blandisher b-ai-snr-hedl
complaints s-cl-aoi-ntpm	diplomates l-ai-mtd-peso
dispatcher p-ai-rct-desh	dogwatches s-ch-aoe-gtwd
emulations m-ai-uls-nteo	headstrong h-ao-ren-tdsg
impersonal l-ei-anm-rsop	inculpates p-au-cnl-etsi
mailperson l-ei-anm-rsop	neutralism m-ai-ulr-ntes
outdrawing g-ar-uio-dntw	outlandish s-ah-iuo-nltd
panegyrics r-ai-cpn-yesg	polyanthus s-hl-uoa-ntpy
resampling g-ai-mer-psnl	restacking r-ai-tcn-sekg
shadflower h-ao-rew-ldsf	stewarding d-ai-wrn-steg
taperingly p-ai-rln-teyg	tradesfolk f-ao-trl-sedk
unchastely l-au-scn-heyt	underplays p-au-rln-desy
wardenship w-ai-rns-pdeh	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     6x5 = 30 solutions
      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           3x2 = 6 solutions
      A U           S E S
    R L R
  + K L R        - O S
+ Y S Y -
```

```
    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           + ET ET ET EL EL EL NT NT    8x3 = 24 solutions
   P T            DS LS RS RL SL DL YS ES
  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-ht-eao-lnrw-fdeks (shelf, sheld, 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?).