ABSOLUTE DIFFERENCE WORDS

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LONGEST WORDS

This article is a continuation of "Word Arithmetic" from the November Word Ways. Dmitri Borgmann in Beyond Language gave the four-letter absolute difference word FORM = 6 15 18 13 becomes 9 3 5 ICE. In "Difference Words" in the August 1971 Word Ways, Ross Eckler found in Webster's Collegiate 15 five-letter words such as SAFER and CHILD and three six-letter words from elsewhere: ELDEST, RETAIN, FRITOS. In "Difference Words Ride Again" in the August 1975 issue, Tom Pulliam added 10 more six-letter words from Webster's Unabridged, Second and Third editions.

I found the following number of source words, but many are obscure or imperfect (acronyms, especially for three-letter words):

<table>
<thead>
<tr>
<th>Length</th>
<th>8</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>2</td>
<td>20</td>
<td>157</td>
<td>1146</td>
<td>2957</td>
<td>2589</td>
</tr>
</tbody>
</table>

The following source and target words are all to be found in major dictionaries (OED, Web 2, Web 3, OSPD, Stedman's Medical Dictionary, Pulliam and Carruth The Complete Word Game Dictionary, American Heritage) or in past issues of Word Ways, or are proper names. A few which are of interest, but for which I have no respectable source, are indicated with a question mark. Acronyms are included at my discretion.

Length 8
BEDRIGHT, CANIBAL

Length 7 (selection)
STATOM, ASSEGE
HETHNES, COLFIN
MYXOID, LAIFEO
EXCERSE, SUBMAN.

Length 6 (selection)
POLYPS, ACMIC
DAINTY, CHEFE
WROITES, Eikon
OUJAS, FLAIR
FRIGID, LIBBE
BONBON, MALMA
VIXENS, MOSIE
SCOVERS, PLAIN
WAFTER, VENOM.

Length 5
TUBULES, ASSIGN
FIXATES, COWSON
SCHANSE, PEGME
ACUTATE, BRASSO
MIDEWIN, DEARNE
EXPANSA, SHOMER
RUTHENE, CALCII
JANEIRO, IMIDIC
XENATES, SIMSON

Length 4
POINTY, AFEFE
DAMNER, CLAIM
WRENCH, EMIKE
MUZLIN, HENCE
FRITOS, LIKED
REPRET, MAMO
CROWED, OCHRA
EUCLID, PRICE
EFTEST, ANONA
SPALCH, COKIE
KEFIRS, FACIA
GOFAST, HIERA
REDHOT, MADGE
BONANO, MAMMA
TERSEL, OMANG
CUPOLA, REACK
GIRDER, BINAM
SPAWNS, COVICE
FLUGHT, FINAL
PETITE, KOKKO
ANODES, MAKAN
REJOIN, MEEFE
SCHILD, PEACH
EXPUGN, SHENG
Length 6 (selection of pairs, which give rise to a branching tree)
ADIGHT or KNIGHT give CEBAL  |  HAFTED/UNSETS, GENOA     |  ELDEST/UNFEST, GHANA
MAPOLD/MAPOLT, LOACH      |  SCOPID/SCOPIN, PLAGIE.

Length 5 (selection)
TUNES, AGIN               |  DESEX, ANNS(!)          |  MONKS, BACH       |  MONEY, BAIT(!)
CAFES, BEAN              |  CAMLE, BLAG             |  RUVID, CAME       |  HEFTY, CANE(!)
DAINT, CHEF              |  SPANS, COME             |  MINOS, DEAD       |  KOJC, DEAF
KOTAL, DESK              |  UPMET, ECHO             |  GAVIN, FUME       |  UNWET, GIRO
PIXIE, GOOD(!)           |  MUFYT, HONE             |  MUFTI, HONK       |  RITES, IKON(!)
ALCOA certainly have furnaces, and maybe a KILN
COTYN, LEEK              |  COXED, LISA(!)          |  CONCH, LAKE       |  MAFIA, LECH
RETEX, MOOS              |  SCOTS, PLEA(!)          |  VINOS, MEAD       |  ERMIN, MEDE
WEFTS, RANA              |  SAFER, REAM             |  SABIN, RAGE       |  ASTIR, RAKI
BURSA, SCAR              |  ATIR, SKIM              |  CULOT, RICE       |  BURSE, SCAN

Length 5 (selection from 108 pairs)
STONK/STOPS, AEAC         |  NOTES/POTES, AEON       |  NOCHE/POCHE, ALEY  |  STAI/STAIN, ASHE
KINIC/USNIC, BEEF         |  GINEP/YWRIT, BEIK       |  GINZO/MOTHIS, BELK |  KNIFE/SURS, CECA
OLDEN/TWONE, CHAI         |  SOJER/SOTIL, DEEM       |  KOKT/POTATHOA, DINS|  CHILD/TONKS, EALCH
JOSEF (and NIEF) becomes ENDA!
HONSE/UNOFT, GAIN         |  ELDN/HAINS, GHEE        |  IDIOT/NITY, EFEE   |  AGLOW/ONKEK, DEXH
CONKS/THILD, LACH         |  CONES/THIRD, LAIN       |  BIRDS/HOFTE, GINO  |  DOLMA/TILMA, KACAL
AOTES/KYES, NEON          |  CREFT/TERSE, OMAN       |  CONETY/COPYE, LAIT |  BONES/VJIAO, MAIN
SAPAN/WETE, ROOM          |  EXITS/TAPED, SOKA       |  SCONTE/SCOPY, PLAI |  SCRE/SCRIM, POID

Length 5 (selection from 14 triplets)
ACHIM/KINOS/MOTSO, BEAD   |  CAPUT/SETON/GETON, BOEA |  BEDOT/OLON/PUTIN, CAKE
LINIE/LOTOS/ROTOS, CEED   |  ADMIN/?FIRNS/KNEAF, CID |  DIMLY/DIMNA/?NIEFS, EDM
CHAIN(1)/INGOT/JELDI, EGE |  JODIE/NITOS/TYNIE, EKED |  DONER/SHIRE/ZONER, KAIM
ANONED/REDER/REF/MAAM.

Length 5 (selection from 4 quadruplets)
DELT/3/FELDE/GETL/ONGON, AGHA | CAJOU/GENIC/GENIO/PRINT, BIEF
DOPEDE/EPONED/PONISH, KAKA.

Length 5 (quintuplets)
HILDE/HILTS/ILTS/NOLDE/PORZY all make ACHA, a word I have seen but sadly cannot source.

Note that some of the multiples (eg quadruplets) not presented would qualify as lesser multiples: eg KOTOS and MINIM both make DEED, hence a valid pair, even if MINIE and SOTOS could not be sourced convincingly. Thus, in an exhaustive sourcing exercise, some of the unquoted multiples may be downgraded, increasing the count of lower multiples, and decreasing the count of higher multiples.

Length 4: There is a huge number of words of this length, but very many use acronyms. The following examples use common words, and are sometimes apt

ONLY, ABM
TUNA, AGM
SUPT, BED
PRIM/ABTM, BID
KNOB, CAM
SOFA, DIE
CHEZ, ECU
HOP, GAG
GON/WONG, HAG
TING, KEG

COPT, LAD
BONA/ fi/BED, MAM
WHIT, OAK
WEFT, RAN
AVOW, UGH

FRCS (= Fellow of the Royal College of Surgeons), LOP!
IVAN, MUM
CRIT, OIK
YING, PEG
CULS, RIG
ATOP, SEA

TUNES, AGE
CAFE/GINO/KIN/SUZY, BEA
GIRT, BIB
CAST, BRA
BETH/SPAM, COL
PLUG/SHORT, DIT
DIVA, EMU
BIRD/SLUG, GIN
SIRE, JIM
DODO/JUJU, KKK!
In "Difference Words" in August 1971, Eckler found the trees SLUG (or BIRD) - GIN - BE and GRIM - KID - BE. By extending these with the letter C, we may call these trees with a depth equal to the word length of four. Pulliam essentially extended this to five with SOFIA - DICHEFEAAANDLOFTY - CINE - FEI - AD - C. (note that the first cannot continue to a single letter). In Making the Alphabet Dance, Eckler gave another example of depth five: BOXTY - MIDE - DEA - AD - (A). Here is a selection of the 203 such trees that I found, with emphasis on a common three-letter word or acronym. They are arranged in order of the two-letter words; some adjacent examples will be seen to belong to the same tree. Thus, BEA fans out twice to GIDE and GINO, and GINO in turn fans out twice. A few cannot end in a single letter.

Trees of depth 5 (selected, omitting final letter)
MONKS - BACH - ABE - AC
AGLOW - FECH - ABE - AC
OINKS - FECH - ABE - AC
MENIE - HIED - ADA - CC
SOTHS - DELK - AGA - FF
PIRNS - GIDE - BEA - CD
BIRD - GINO - BEA - CD
HOPFS - GINO - BEA - CD
BIDRY - GENG - BIG - GB
BIRDS - GINO - BEA - CD
HOPFS - Gino - BEA - CD
CHILD - EACH - DBE - BC
UNSEL - GENG - BIG - GB
JINKS - AECH - DBE - BC
EXION - SOFA - DIE - ED
WOPNE - HABI - GAG - FF
FELTS - AGHA - FAG - EF
ONGON - AGHA - FAG - EF
FELDE - AGHA - FAG - EF
WOPNE - HABI - GAG - FF
FURZY - OCHA - LEG - GB
BONDS - MAJO - LIE - CD
FELDE - AGHA - FAG - EF
WOPNE - HABI - GAG - FF
FURZY - OCHA - LEG - GB
BONDS - MAJO - LIE - CD
EGYPT - BRID - PIE - GD
DEYDE - ATUA - SAT - RS
FEYDE - ATUA - SAT - RS.

It might rightly be assumed that there are very many trees of depth four. I found 2093, though as with most numbers quoted in this article, the count is highly dependent on the acceptability of mainly two-letter and three-letter words. Because of the volume, we will comment only on the fact that branching is very common at this level. I found one fanout of 11, three of 10, and eight of 9 branching out from a three-letter word. Here they are:

BD, ACG, ABEL/DEHA/HILE/KLIP/NORK/NORY/POLE/POLS/PORK/PORT/TURK
BD, ECG, CHEL/GLIB/EHOL/JOLE/NILE/NILS/PURY/TOLE/TORK/TORY
BE, ECH, CHEM/QLIA/GLOW/INKS/JOLT/NILD/TOLD/TOLT/WR0G/WROW
DD, AEA, HIDE/HINO/NOTS/NOTU/?ONST/POTS/PUTS/STON/STOP/STYX
AD, BCG, GILE/GILS/KILE/MOLE/MOLS/MORK/MORY/SURY/TRUN
BB, ACA, ABED/BADE/HEH/KLOP/NORS/POLE/PORT/SRUV/TURS
CD, BEA, CAFE/EGBA/?GIDE/GINO/KIDE/KINO/MOTS/MOTU/SUYZ
DA, GCD, ELIE/?HOLH/HOLP/HORN/IPSO (facto)/NURN/SLIE/SLIM/SUKO
FB, CIG, BENG/BENU/?FIRK/FIRY/HENG/LEIRK/RULE/SPYR/TWNG
GB, BIG, ACLE/GENG/GENU/GIRK/KIRK/SULE/TRIB/?TRIP/WULE
GE, BID, GENJ/GIRN/KIRN/PRIE/PREM/SULP/TREI/TRIM/WYPT
JJ, AKA, BALK/BALM/HITS/NODE/ONYX/OPED/PODE/STIH/TSHI

Here are trees of depth four, again omitting the single-letter root, chosen for the familiarity of the three-letter and at least one four-letter "word" (and keeping other branches).
Our trees are rarely very tall, but sometimes bush out alarmingly! Nevertheless, little simalacrum of trees with branches at multiple levels do exist: ABE comes from both BACH and PECH; though BACH comes only from MONKS, PECH comes from both AGLOW and OINKS (of course, Bach has nothing to do with oinks!).

**PALINDROMES**

A palindromic source word with an even number of letters cannot have a target since the central two letters must be the same. There therefore cannot be a normal tree of palindromes, though branching exists (see especially MAAM):

Ababa, Aaaa; Stots?, AerEA; DeKed, Affa; Deled, Agga; DeWeD, arra; Stats, asss; Minim, Deed; Sotos?, Deed; Otato, esse; Mapam, lool; Anona, MAAM; Reder, MAAM; Refer, MAAM; Anana, MMMM; HuHuH, MMMM; SeDeS, Naan; sapaS, ROoR