ABSOLUTE DIFFERENCE WORDS

REX GOOCH
Welwyn, Herts, England

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)
STATOHM, ASSEGE
HETHNES, COLFIN
MYXOIDS, LAIFEO
EXCERSE, SUBMAN.

Length 6 (selection)
POLYPS, ACMIC
DAINTY, CHEFE
WRITES, EIKON
OUJAS, FLAIR
FRIGID, LIBBE
BONBON, MALMA
VIXENS, MOSIE
SCONES, PLAIN(!)
WAFTER, VENOM.

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

Length 4
POINTY, AFEFE
DAMNER, CLAIM
WRENCH, EMIKE
MUZLIN, HENSE
FRITOS, LIKED
REFRET, MALMO
CROWED, OCHRA
EUCLID, PRICE

Length 3
ETFTEST, ANONA
SPALCH, COKIE
KEFIRS, FACIA
GOFAST, HIERA
REDHOT, MADGE(!)
BONANO, MAMMA
TERSEL, OMANGE
CUPOLA, REACK
GIRDER, BINAM
SPAWNS, COVIE
FLIGHT, 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
MAPOLD/MAPOLT, LOACH
HAFTED/UNSETS, GENOA
SCOPID/SCOPIN, PLAG.
ELDEST/UNFEST, GHANA

Length 5 (selection)
TUNES, AGIN
CAFES, BEAN
DAINT, CHEF
KOTAL, DESK
PIXIE, GOOD(!)
ALCOA certainly have furnaces, and maybe a KILN
COTYN, LEEK
RETEX, MOOS
WEFTS, RANA
BURSA, SCAR
DESEX, ANNS(!)
CAMLE, BLAG
SPANS, COME
UPMET, ECHO
MUFTY, HONE
MONKS, BACH
RUVID, CAME
MINOS, DEAD
GAVIN, FUME
MUFTI, HONK
CONCH, LAKE
VINOS, MEAD
SAVIN, RAGE
SAFER, REAM
ATIR, SKIM
MONNY, BAIT(!)
HEFTY, CANE(!)
KOJC, DEAF
UNWET, GIRO
RITES, IKON(!)
Mafia, Leh
ERMIN, MEDE
ASTIR, RAKI
BURSE, SCAN
AXOID, WIFE(!).

Length 5 (selection from 108 pairs)
STONK/STOPS, AEAC
KINIC/USNIC, BEEF
OLDEN/TWONE, CHAI
JOSEF (and NIEF) becomes EDNA!
HONES/UNOFT, GAIN
COKNS/THILD, LACH
AOTES/KYES, NEON
SAPAN/WEETER, ROOM
NOTES/POTES, AEON
GINEP/YWRIT, BEIK
SOJER/SOTIL, DEEM
EDLN/HAINS, GHEE
CREFT/TERSE, OMAM
EXIT/S/TAPEP, SOKA
NOCHE/POCHE, ALEC
GINZO/MOTIS, BELK
KOFTA/SOFTA, DINS
BIRDS/HOFTE, GINO
CONY/COPYE, LAIT
SCHO/SCOPY, PLAII
STAID/STAIN, ASHE
KNIFE/SPARS, CEEA
CHILD/TONKS, EACH
AGLOW/ONIKS, FECH
BONES/VIAO, MAIN
SCHRE/SCRIM, POID

Length 5 (selection from 14 triplets)
AICHM/INROS/MOTSO, BREAD
LINIE/LOTOS/ROTO, CEEED
CHAIN(!)/INGOT/JELDI, EGEH
ANOANA/REDER/REFER, MAAM.
CAPUT/SETON/GETON, BOEA
ADMIN/?/FIRNS/KNEAF, CID.
JODIE/NITOS/TYNE, EKEH
BEDOT/LONCH/RUTIN, CAKE
DIMLY/DIMNA/?/NIEFS, EDAM
DONER/SHIRE/ZONER, KAIM

Length 5 (selection from 4 quadruplets)
DELTES/FELDE/FELETS/ONGON, AGHA
Doped/Epode/Pedon/Shits, Kaka.
CAJOU/GENIC/GENIO/PRINT, BIEF

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 unquouted 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/TRIM, BID
KNOB, CAM
SOFA, DIE
CHEZ, ECU
HOPI, GAG
GONG/WONG, HAG
TING, KEG
NORM, ACE
POCO, ALL
GINS/KINS, BEE
KIRK/TRIP, BIG
HEFT, CAN
YULE, DIG
CHAP, EGO
PINA, GEM
JAMB, ILK
GRIM, KID
HIED/OPTS/POST, ADA
MONG, BAG
ECHO/KING, BEG
GIRD, BIN
ADEW/URSA, CAR
EIRE/MIRE, DIM
INCH, EKE
HAFT, GEN
FOAL, INK
JULY/TIRE, KIM
TUNS, AGE
CAFE/GINO/KINO/SUZY, BEA
GIRT, BIB
CAST, BRA
BETH/SPAM, COL
PLUG/SOFT, DIN
DIVA, EMU
BIRD/SLUG, GIN
SIRE, JIM
DODO/JJU, KKK!

COPT, LAD
BONA/OBAN/REFS, MAM
WHIT, OAK
WEFT, RAN
AVOW, UGH
FRC5 (= Fellow of the Royal College of Surgeons), LOP!
CRIT, OIK
CULS, RIG
VASE, URN.
IVAN, MUM
YING, PEG
ATOP, SEA
WIRE, NIM
BRIN, PIE
TALC, SKI
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 - DICH - EFE - AA and LOFTY - 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)

<table>
<thead>
<tr>
<th>MONKS - BACH - ABE - AC</th>
<th>AGLOW - FECH - ABE - AC</th>
<th>OINKS - FECH - ABE - AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MENIE - HIED - ADA - CC</td>
<td>SOTHS - DELK - AGA - FF</td>
<td>PIRNS - GIDE - BEA - CD</td>
</tr>
<tr>
<td>BIRDS - GINO - BEA - CD</td>
<td>HOFTE - GINO - BEA - CD</td>
<td>BIDRY - GENG - BIG - GB</td>
</tr>
<tr>
<td>UNSEL - GENG - BIG - GB</td>
<td>JINKS - ACH - DBE - BC</td>
<td>CHILD - EACH - DBE - BC</td>
</tr>
<tr>
<td>TONKS - EACH - DBE - BC</td>
<td>ONSN - AEN - DIE - ED</td>
<td>EXION - SOFA - DIE - ED</td>
</tr>
<tr>
<td>FELDE - AGHA - FAG - EF</td>
<td>FELTS - AGHA - FAG - EF</td>
<td>ONGON - AGHA - FAG - EF</td>
</tr>
<tr>
<td>WOPNE - HABI - GAG - FF</td>
<td>FURZY - OCHA - LEG - GB</td>
<td>BONDS - MAJO - LIE - CD</td>
</tr>
<tr>
<td>EGYPT - BRID - PIE - GD</td>
<td>DEYDE - ATUA - SAT - RS</td>
<td>FEYDE - ATUA - SAT - RS</td>
</tr>
</tbody>
</table>

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/PORY/TURK
BD, ECG, CHEL/GLIB/JEHO/JOLE/NILE/NILS/PURY/TOLE/TORK/TORY
BE, ECH, CHEM?/GLIA/GLOW/INKS/JOLT/NILD/TOLD/TOLT/WROG/WROW
DD, AEA, HIDE/HINO/NOTS/NOTU?/ONST/POTS/POTU/STON/STOP/STYX
AD, BCG, GILE/GILS/PILE/SCALE/SELS/MORK/MORY/SURJ/STUN
BB, ACA, ABED/BADE/IZED/KLOR/MORS/POLE/PORE/SHUL/TURS
CD, BEA, CAFE/EGBA?/GIDE/GINO/KIDE/KINO/MOTS/MOTU/SUX
DA, GCD, ELIE?/HOLK/HOLP/HORN/IPSO (favo)/NURM/SLIE/SLIM/UNKO
FA, CGI, BIG/GEN/GENG/GINK/IRIK/KIRK/SUL/TUB?/TSP/WILE
GE, BID, GENJ/GIRL/KIN/KRIE/KRIN/PRIM/SULP/STRI/STRIM/WYPT
JI, AKA, BALK/BALM/HITS/NODE/ONYX/OPED/PODE/STII/TSII

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 simulacrum of trees with branches at multiple levels do exist: ABE comes from both BACH and FECH; though BACH comes only from MONKS, FECH 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, AAAAA; STOTS?, AEEA; DEKED, AFFA; DELED, AGGA; DEWED, ARRA; STATS, ASSA; MINIM, DEED; SOTOS?, DEED; OTATO, ESSE; MAPAM, LOOL; ANONA, MAAM; REDER, MAAM; REFER, MAAM; ANANA, MMMM; HUHUH, MMMM; SEDES, NAAN; SAPAS, ROOR