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

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

Length 5
TUBULES, ASSIGN
FIXATES, COWSON
SCHANSE, PEGME

Length 4
POINTY, AFEFE
DAMNER, CLAIM
WRENCH, EMIKE
MUZLIN, HENCE
Fritos, LIKED
REFRET, MALMO
CROWED, OCHR
EUCLID, PRICE

Length 3
ACUTATE, BRASSO
MIDEWIN, DEARNE
EXPANSA, SHOMER
RUTHENE, CALCII
JANEIRO, IMIDIC
XENATES, SIMSON

GIRDER, BINAM
SPALCH, COKIE
KEFIRS, FACIA
GOFAST, HIERA
REDHOT, MADGE(!)
BONANO, MAMMA
TERSEL, OMANG
CUPOLA, REACK
GIRDER, BINAM
SPALCH, COKIE
KEFIRS, FACIA
GOFAST, HIERA
REDHOT, MADGE(!)
BONANO, MAMMA
TERSEL, OMANG
CUPOLA, REACK

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, HAFTED/UNSETS, GENOA
MAPOLD/MAPOLT, LOACH SCOPID/SCPIN, PLAG.

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 KOJIC, DEAF
KOTAL, DESK UPMET, ECHO GAVIN, FUME UNWET, GIRO
PIXIE, GOOD(!) MUFTY, HONE MUITI, HONK RITES, IKON(!)
ALCOA certainly have furnaces, and maybe a KILN CONCH, LAKE MAFIA, LECH
COTYN, LEEK COXED, LISA(!) VINOS, MEAD ERMIN, MEDE
RETEx, MOOS SCOTS, PLEA(!) SABIN, RAGE ASTIR, RAKI
WEFTS, RANA SAFER, REAM CULOT, RICE BURSE, SCAN
BURSA, SCAR ATIR, SKIM TALCS, SKIP AXOID, WIFE(!).

Length 5 (selection from 108 pairs)

STONK/STOPS, AEAC NOTES/POTES, AEOE NOCHE/POCHE, ALEC STAUD/STAIN, ASHE
KINIC/USNIC, BEEF GINEP/YWRIT, BIEK GINZO/MOTHS, BELK KNIFE/SURPS, CEC
OLDEN/TWONE, CHAI SOJER/SOTIL, DEEM KOFTA/SOFIA, DINS AGLOW/ONIKS, FECH
JOSEF (and NIEF) becomes EDNA! IDIOT/NINTY, EEFE BIRD/HOFTE, GINO DOLMA/TILMA, KCAL
HONES/UNOFT, GAIN ELDIN/HAINS, GHEE BIRDS/HOFTE, GINO BONES/VIAO, MAIN
CONKS/TILD, LACH CONES/THIRD, LAIN CONEY/COPYE, LAIT SCRE/SCRIM, POID
AOTES/KYES, NEON CREFT/TERSE, OMAN SCOME/SCOPY, PLAI ANO/BED/REDE/REFER, MAAM.

Length 5 (selection from 4 quadruples)

DELTs?/FELDE/FELTS/ONGON, AGHA CAJOU/GENIC/GENIO/PRINT, BIEF
DOPE/EPDE/PEDON/SHITS, KAKA.

Length 5 (selection)

ACHIM/KINOS/MOTSO, BEAD CAPUT/SETON/GETON, BOEA BEDOT/ONCH/RUTIN, CAKE
LINIE/LOTOS/ROTO, CEED ADMIN/?/FRINS/KNEAF, CID ECHO/KING, BEG DIMLY/DIMPA/?/NIEFS, EDAM
CHAIN(!)/INGOT/JELDI, EJHE JODIE/NITOS/TYNE, EKED DONER/SHIRE/ZONER, KAIM
ANORA/REDER/REFER, MAAM.

Length 5 (quintuplets)

HILDE/HILTS/JILTS/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 NORM, ACE HIED/OPTS/POST, ADA TUNS, AGE
TUNA, AGM POCO, ALL MONG, BAG CAFE/GINO/KINO/SUZY, BEA
SUPT, BED GINS/KINS, BEE ECHO/KING, BEG GIRT, BIB
PRIM/TRIM, BID KIRK/TRIP, BIG GIRD, BIN CAST, BRA
KNOB, CAM HEFT, CAN ADEW/URSA, CAR BETH/SPAM, COL
SOFA, DIE YULE, DIG EIRE/MIRE, DIM PLUG/SHORT, DIN
CHEZ, ECU CHAP, EGO INCH, EKE DIVA, EMU
HOPI, GAG PINA, GEM HAFT, GEN BIRD/SLUG, GIN
GONG/WONG, HAG JAM, ILK FOAL, INK SIRE, JIM
TING, KEG GRIM, KID JULY/TIRE, KIM DODO/JOIII, KKK!
COPT, LAD FRCS (= Fellow of the Royal College of Surgeons), LOP!
BONA/OBAN/REFS, MAM CRIT, OK ATOP, SEA WIRE, NIM
WHIT, OAK CRIT, OK YING, PEG BRIN, PIE
WEFT, RAN CULS, RIG ATOP, SEA TALC, SKI
AVOW, UGH VASE, URN.
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.

| MONKS - BACH - ABE - AC | AGLOW - FECH - ABE - AC | OINKS - FECH - ABE - AC |
| MENIE - HIED - ADA - CC | SOTHS - DELK - AGA - FF | PIRNS - GIDE - BEA - CD |
| BIRDS - GINO - BEA - CD | HOFTE - GINO - BEA - CD | BIDRY - GENG - BIG - GB |
| UNSEL - GENG - BIG - GB | JINKS - AECH - DBE - BC | CHILD - EACH - DBE - BC |
| TONKS - EACH - DBE - BC | ONSEN - AENI - DIE - ED | EXION - SOFA - DIE - ED |
| FELDE - AGHA - FAG - EF | FELTS - AGHA - FAG - EF | ONGON - 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/PORY/POLS/PORK/PORY/TURK
BD, ECG, CHEL/GLIB/JEHO/JOLE/NILE/NALS/PURY/TOLE/TORK/TORY
BE, ECH, CHEM?/GLIA/GLOW/INKS/JOLT/NILD/TOLE/TOLT/WROG/WROW
DD, AEA, HIDE/HINO/NOTS/NOTU/?/ONST/POTS/POTU/STON/STOP/STYX
AD, BCG, GILE/GILS/KILE/MOLE/MOLS/MORK/MORY/SURY/TRUN
BB, ACA, ABED/BADE/IHED/KLOP/NORS/POLK/PORS/STRU/TURS
CD, BEA, CAFE/EGBA/?/GIDE/GINO/KIDE/KINO/MOTS/MOTU/SUZY
DA, GCD, ELIE/?/HOLH/HOLP/HORN/IPSQ/JOHO/SLES/SLIM/UNKO
FB, CIG, BENG/BENU/?/FIRK/FIRY/HENG/LIRK/RULE/SPYR/TVNG
GB, BIG, ACLE/GENG/GENU/GIRK/SULE/TRIB/?/TRIP/WULE
GE, BID, GENJ/GIRN/KIRN/PRIE/PRIM/SULP/STRI/TRY/WYPT
JJ, AKA, BALK/BALM/HITS/NOPE/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 simulacrums 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?, 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