

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):

Length	8	7	6	5	4	3
Number	2	20	157	1146	2957	2589

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 RUINATES, CLEMSON (University in South Carolina)

Length 7 (selection)

STATOHM, ASSEGE	TUBULES, ASSIGN	ACUTATE, BRASSO	RUTHENE, CALCII
HETHNES, COLFIN	FIXATES, COWSON	MIDEWIN, DEARNE	JANEIRO, IMIDIC
MYXOIDS, LAIFEO	SCHANSE, PEGMEN	EXPANSA, SHOMER	XENATES, SIMSON
EXCERSE, SUBMAN.			

Length 6 (selection)

POLYPS, ACMIC	POINTY, AFEFE	EFTEST, ANONA	GIRDER, BINAM
DAINTY, CHEFE	DAMNER, CLAIM	SPALCH, COKIE	SPAWNS, COVIE
WRITES, EIKON	WRENCH, EMIKE	KEFIRS, FACIA	FLIGHT, FINAL
OUIJAS, FLAIR	MUZLIN, HENCE	GOFAST, HIERA	PETITE, KOKKO
FRIGID, LIBBE	FRITOS, LIKED	REDHOT, MADGE(!)	ANODES, MAKAN
BONBON, MALMA	REFRET, MALMO	BONANO, MAMMA	REJOIN, MEEFE
VIXENS, MOSIE	CROWED, OCHRA	TERSEL, OMANG	SCHILD, PEACH
SCONES, PLAIN(!)	EUCLID, PRICE	CUPOLA, REACK	EXPUGN, SHENG
WAFTER, VENOM.			

Length 6 (selection of pairs, which give rise to a branching tree)

ADIGHT or KNIGHT give CEBAL HAFTED/UNSETS, GENOA
MAPOLD/MAPOLT, LOACH SCOPID/SCOPIN, PLAGE.

ELDEST/UNFEST, GHANA

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	MUFTI, HONK	rites, IKON(!)
ALCOA certainly have furnaces, and maybe a KILN		CONCH, LAKE	MAFLA, 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, AEON	NOCHE/POCHE, ALEC	STAIID/STAIN, ASHE
KINIC/USNIC, BEEF	GINEP/YWRIT, BEIK	GINZO/MOTHS, BELK	KNIFE/SPURS. CECA
OLDEN/TWONE, CHAI	SOJER/SOTIL, DEEM	KOFTA/SOFTA, DINS	CHILD/TONKS, EACH
JOSEF (and NIEF) becomes EDNA!		IDIOT/NINTY, EEFE	AGLOW/OINKS, FECH
HONES/UNOFT, GAIN	ELDIN/HAINS, GHEE	BIRDS/HOFTE, GINO	DOLMA/TILMA, KCAL
CONKS/THILD, LACH	CONES/THIRD, LAIN	CONEY/COPYE, LAIT	BONES/VIJAO, MAIN
AOTES/KYTES, NEON	CREFT/TERSE, OMAN	SCONE/SCOPY, PLAI	SCRIE/SCRIM, POID
SAPAN/WETER, ROOM	EXITS/TAPED, SOKA	EXITE/TAPET, SOKO.	

Length 5 (selection from 14 triplets)

ACHIM/KINOS/MOTSO, BEAD	CAPUT/SETON/GETON, BOEA	BEDOT/LONCH/RUTIN, CAKE
LINIE/LOTOS/ROTOS, CEED	ADMIN?/FIRNS/KNEAF, CIDE	DIMLY/DIMNA?/NIEFS, EDAM
CHAIN(!)/INGOT/JELDI, EGHE	JODIE/NITOS/TYNIE, EKED	DONER/SHIRE/ZONER, KAIM
ANONA/REDER/REFER, MAAM.		

Length 5 (selection from 4 quadruplets)

DELTS?/FELDE/FELTS/ONGON, AGHA	CAJOU/GENIC/GENIO/PRINT, BIEF
DOPED/EPODE/PEDON/SHITS, KAKA.	

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/SOFT, DIN
CHEZ, ECU	CHAP, EGO	INCH, EKE	DIVA, EMU
HOPI, GAG	PINA, GEM	HAFT, GEN	BIRD/SLUG, GIN
GONG/WONG, HAG	JAMB, ILK	FOAL, INK	SIRE, JIM
TING, KEG	GRIM, KID	JULY/TIRE, KIM	DODO/JUJU, KKK!

COPT, LAD FRCS (= Fellow of the Royal College of Surgeons), LOP!

BONA/OBAN/REFS, MAM	IVAN, MUM	WIRE, NIM
WHIT, OAK	YING, PEG	BRIN, PIE
WEFT, RAN	ATOP, SEA	TALC, SKI
AVOW, UGH	VASE, URN.	

TREES

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)

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/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/KILE/MOLE/MOLS/MORK/MORY/SURY/TRUN
 BB, ACA, ABED/BADE/IHED/KLOP/NORS/POLK/PORS/SRUV/TURS
 CD, BEA, CAFE/EGBA?/GIDE/GINO/KIDE/KINO/MOTS/MOTU/SUZY
 DA, GCD, ELIE?/HOLH/HOLP/HORN/IPSO (facto)/NURN/SLIE/SLIM/UNKO
 FB, CIG, BENG/BENU?/FIRK/FIRY/HENG/LIRK/RULE/SPYR/TWNG
 GB, BIG, ACLE/GENG/GENU/GIRK/KIRK/SULE/TRIB?/TRIP/WULE
 GE, BID, GENJ/GIRN/KIRN/PRIE/PRIM/SULP/TRIE/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).

AA, ABC, ABDA/NMOL/POMP/STRO/STRU
 AL, BAM, ECBO?/MONA
 BD, KIM, JULY/PENA?/TIRE
 BE, KID, GRIE/GRIM/NYPT
 BH, EGO, CHAP/GLET/NIPA
 BI, GEN, HAFT
 CA, ADC, DEAD/DEIF/DEIL/FEAD/FEIF/FEIL/HIMP/JIMP
 CA, LOP, FRCS (surgeons lop!)
 CC, ADA, BAED/BCGF?/DEIH/HIED/NOST/OPTS/POST/TUYX
 CD, URN, VASE
 CL, DAM, KONA/SONA
 DE, MID, ERIE
 DI, MIR, ANEW
 ED, DIM, EIRE/MIRE
 EE, DID, EIRN/MIRV(abbr?)
 FB, AGE, TUNS
 FB, ICE, CLIN/CLOT/FORM
 FF, AGM, BAHU/GHAN?/TUNA
 FH, CIA, BENO/FIRS/IFON/KNED/LOFE/ROFE/ROXY
 GD, LEA, COTS
 GE, BIN, GIRD
 HE, AIN, HIRD/JIRD/ONES
 JJ, HRH, MUCK
 KL, LAM, CONA/WKLY(abbr.)
 LC, COL, BETH/HETH/SPAM
 LI, COX, SPAY!!
 MN, BOA, CAPO/CETU?/GETS/GIXY
 NA, UGH, AVOW
 NJ, OAK, APOD/WHIT
 QM, RAN, WEFT
 RR, SAS, TABU (Special Air Services is intended to be secret)

AD, JIM, SIRE
 BB, ACE, FEHM?/NORM/TURM
 BE, GIN, BIRD/SLUG
 BH, ACK, HILA/KLOD/NOLA/POLA (name)
 BH, GEM, BINA/PINA/UNIV
 BM, CAN, ADES/BEFT/HEFT/ORSE/URSE
 CA, ILK, JAMB/LUIT?
 CB, BEG, ACHA?/ECHO/EGLE/GING/KING
 CD, BEA, CAFE/EGBA?/GIDE/GINO/KIDE/KINO/MOTS/MOTU/SUZY
 CG, FIB, FLUS
 DE, KGB, ALEC/ITMO/SHOQ/YNGE
 DH, OKS, APEX
 ED, DIE, AENI/PLUP/SOFA
 ED, NIM, GULY/SENA/WIRE
 EE, DIN, EIRD/KOFT/MIRD/PLUG/SOFT
 FB, CIG, BENG/BENU?/FIRK/FIRY/HENG/LIRK/RULE/SPYR/TWNG
 FB, KEG, TING
 FF, EKE, INCH/NITO
 GB, BIG, ACLE/GENG/GENU/GIRK/KIRK/SULE/TRIB?/TRIP/WULE
 GE, BID, GENJ/GIRN/KIRN/PRIE/PRIM/SULP/TRIE/TRIM/WYPT
 HD, AIM, FENA?/HIRE/ONER/TULY
 JJ, AKA, BALK/BALM/HITS/NODE/ONYX/OPED/PODE/STIH/TSHI
 KC, LAD, CONJ?/COPT/THIE
 KM, CNA, BEST/HEST/ROAB/RUGH/URDE
 LC, COR, SPAS
 LL, MAM, BONA/NABO/OBAN/REFS
 MO, CPA (qualified accountant), RUED
 ND, SEA, ATON/ATOP/TAFE
 PQ, BRA, CAST(!) QB, VEG, AWRY
 RR, ASA, ABUT/BATS/BATU/STAB/TUBA (American Standards for tubas?)

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 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, 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