

PRIME TIME

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What is a PRIME WORD? There are at least three possible answers to this question:

- many would say that it is a word made from the letters which occupy prime number positions in the alphabet: B(2), C(3), E(5), G(7), K(11), M(13), Q(17), S(19), W(23)
- some would identify it as a word whose letter total (A=1, B=2 to Z=26) is a prime number: 2,3,5,7,11,13,17,19,23,29,31,37,41,43,47,53,59,61,67,71,73,79...
- a few might say that it is a word with a prime number of letters

Many words fall into the second category including the word PRIME itself (total 61), and many fall into the third category. Fewer fall into the first category (a selection of words appears in Rex Gooch's "Abstemious, Prime, Fibonacci, Square Words" in the February 1999 Word Ways). The current exercise starts by taking a look at those word which fall into all three categories. I call these words triple primes.

Triple Primes

The list of 158 words on the next page consists of 3-letter triple primes (54 of them), 5-letter triple primes (92) and 7-letter triple primes (12). 2-letter triple primes are not listed although it is worth noting that the word BE is the only common example of the genre. The initial numbers are the prime letter totals of the words. Brackets enclose groups of transposals; asterisks* indicate pairs of reversals; palindromes (21 of them) are underlined. The majority of the words can be found in the Oxford English Dictionary (Second Edition) as head words, variant forms, or text words including citations. Sources of non-OED words are given at the end. A few of the examples look like abbreviations but they are words. Abbreviations are not included.

Triple Prime Word Ladders

A sizeable group of short words, made from a strictly limited number of different letters, is potential word ladder material because such a group invariably includes words which differ from each other by only a single letter. This is the case with both the 3- and 5-letter triple primes.

(a) 3-LETTER WORDS

All 54 of the 3-letter triple primes can be made into a single word ladder, given at the middle of the next page. 52 of the 54 words have more than one possible link; WGG and ECK each have just one link and are therefore destined to be the first and last words.

11 CEC
 13 [CEE, ECE]
 17 [EEG*-GEE*, EGE]
 19 [CEK*-KEC*, ECK] [EGG, GEG] BEEBE
 23 [EEM*-MEE*, EME] [GEK*-KEG*] EEECE
 29 CWC [EES*-SEE* ESE] [KEM*-MEK*]
 31 [CEW*-WEC*, EWC] [EMM, MEM] [GES*-SEG*, SGE*-EGS*] GECKE, GEGGE
 [EMCEE, MEECE]
 37 [EMS*-SME*, MES*-SEM*] [GWG, WGG] BEWEB, EKEKE, MCKEE, MEGGE, WEBBE
 [SEECE, CESE]
 41 [MEW*-WEM*, EWM*-MWE] SEQ [GEESE, SEEGE, SEGEE] [SCEGG, SECGG]
 43 MWG [SES, ESS*-SSE*] GEMME, KEKEK [CESKE, ECKES, ECKS, SECKE, SEECK]
 [EGGES*-SEGGE*, GEEGS, GESEG] BEEBEE
 47 MWK [SEW*-WES*, EWS*-SWE*, WSE] KEMME, WEGGE [GEEKS*-SKEEG*]
 [EMSEE, MEESE, SEEME, SEMEE] [WECKE, WEECK]
 53 SWK [EESSES, ESSEE, SEESE] [KEMES, KEMSE] GEKKS
 [MEEKS, MEKES, SKEME, SMEKE, SMEEK*-KEEMS*] GEE-GEES
 59 EMEQS [EMMEW*-WEMME*] [EESKS, ESKES, KESSE, SEKES, SEEKS*-SKEES*]
KGWGK [GEWES, SWEEG, WEGES]
 61 WSS [EMESS, ESMES, ESSEM*-MESSE* MESES, SEMES, SEEMS*-SMEES*]
 KEMMS, QWEKE, SKEGS, WEGGS EKE-EKES, KEE-KEES
 67 SKEMS [ESSES*-SESSE*, SESES] KEG-MEGS
 71 CWCWS [ESSEW*-WESSE*, SEWES, SEWSE, SSEWE, SWEES, WESES] [MEWKS, SMEWK]
 73 SWEGS [KECKSES, KECSKES] MESSEGE
 79 SMEWS [MESEEMS, SEMEMES]
 83 SWEEGES
 109 SWESSES

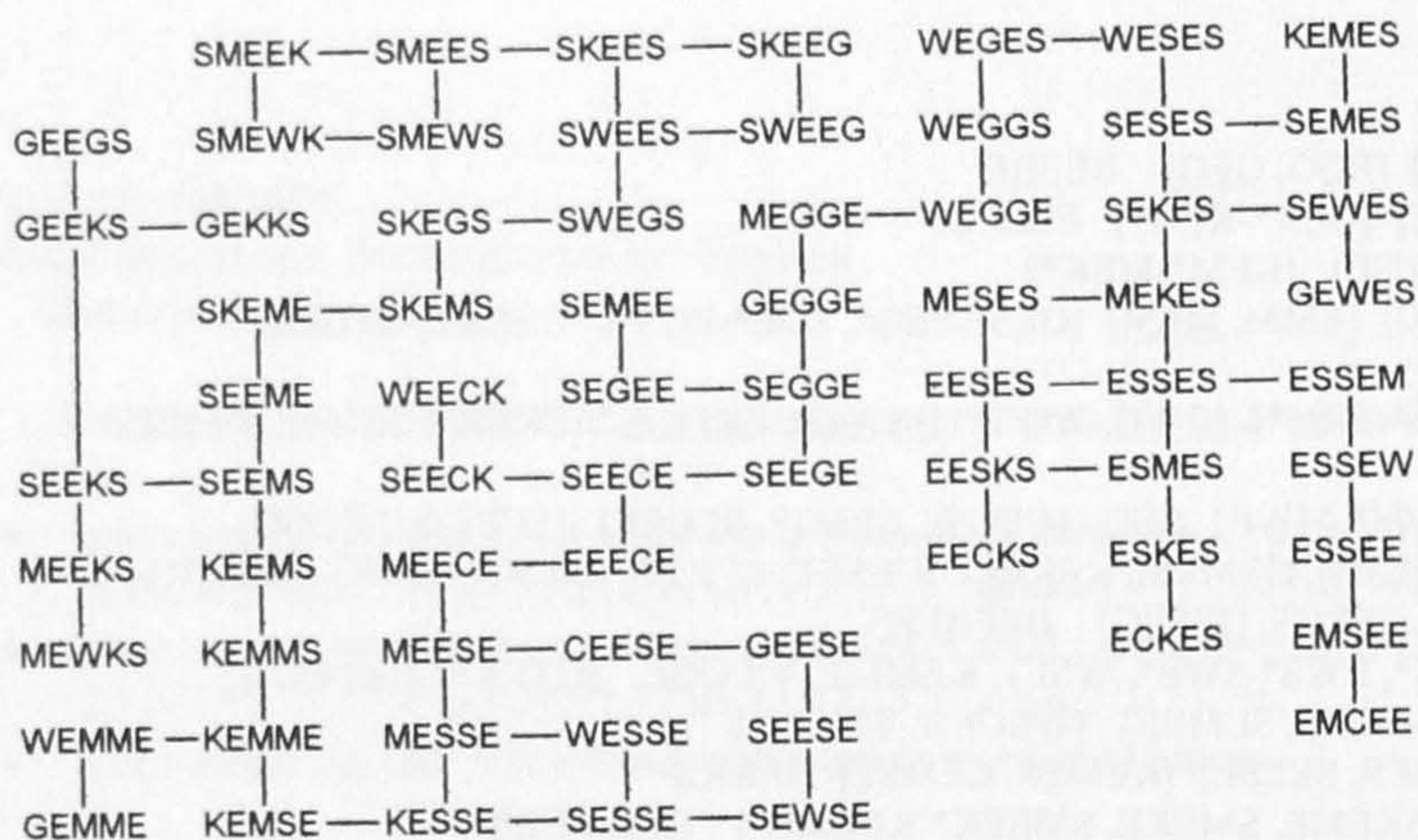
WGG-EGG-EGS-EGE-SGE-SSE-SME-EME-EMM-EEM-EES-EEG-KEG-KEM-KEC-WEC-
 WEM-SEM-SEG-GEG-GWG-MWG-MWK-SWK-SWE-MWE-MEE-SEE-SEQ-SEW-MEW-
 CEW-CEK-GEK-MEK-MEM-MES-SES-WES-GES-GEE-CEE-CEC-CWC-EWC-EWM-
 EWS-EMS-ESS-WSS-WSE-ESE-ECE-ECK

(b) 5-LETTER WORDS

70 of the 92 5-letter triple primes are here arranged as a network (given at the top of the next page). What is the longest word-ladder to be found in the network? (The answer is given in Answers and Solutions.) The 22 remaining 5-letter triple primes cannot be linked to any word in this network although some of them can be linked to each other: BEEBE, BEWEB, CESKE, CWCWS, EGGES, EKEKE, EMEQS-EMESS, EMMEW, GECKE-SECKE-WECKE, GESEG, KEKEK, KGWGK, MCKEE, QWEKE, SCEGG, SECGG, SMEKE, SSEWE, WEBBE.

(c) 7-LETTER WORDS

None of the 12 words can be linked to each other.



The Best of Primes...

Returning from my digression into the world of word ladders, I decided to apply further prime criteria to the triple primes in order to try and find one or more champion primes. The choice of new prime criteria, however, is limited.

My fourth prime criterion is a digital one. Consider the triple prime word SEEKS. Write down the alphabetical positions of its letters: 19.5.5.11.19. Now remove the stops between the letter values. This provides the number 19,551,119. Is this a prime number? In this case the answer is *no*, so SEEKS is crossed off my list of contenders for best prime. Applying this criterion to all the other triple primes immediately excludes all twelve of the 7-letter triple primes. Over all, it reduces the contenders to fourteen 3-letter triple primes and nine 5-letter triple primes. These twenty-three words are **QUADRUPLE PRIMES**:

CEC (353)	CEK (3,511)	EEG (557)	EES (5,519)
EGG (577)	EWC (5,233)	EWM (52,313)	GEG (757)
GWG (7,237)	KEC (1,153)	MEM (13,513)	MEW (13,523)
WGG (2,377)	WSS (231,919)		
EESKS (55,191,119)	GEEGS (755,719)	GEEKS (7,551,119)	GESEG (751,957)
SCEGG (193,577)	SEMES (19,513,519)	SKEES (19,115,519)	SMEEK (19,135,511)
WESES (25,519,519)			

My next, fifth and final prime criterion virtually chooses itself: reverse each of these twenty-three prime numbers to determine if the reversals are also primes. Applying this criterion to the 3-letter quadruple primes, we discover that six of them share the honour of being '3-letter champion prime'. They are **QUINTUPLE PRIMES**. Note that two of the prime number reversals are palindromic:

CEC (353) CEK (1,153) GEG (757) KEC (3,511) MEM (31,531) MEW (32,531)

Applying this same criterion to the surviving nine 5-letter quadruple primes, however, reveals that there is only one prime number whose reversal is also a prime. The numbers concerned are 755,719 and its reversal, 917,557. So we have an outright 5-letter champion. It is GEEGS, a Scots word: *the sounding boards, pegs, and wheels in a mill*. GEEGS is our only 5-letter quintuple prime!

Sources of non-OED Words

EMEQS,ESMES,MEEKS,SESES,WEGGS (Times Index-Gazetteer of the World)

EECKS,EESKS,GEEGS,SWEEG,SWEGS (Chambers Scots Dictionary)

ESKES (Readers Digest Complete Atlas of the British Isles, 1965)

EESSES,SKEEG (Webster's Second Edition)

BEWEB,EKEKE,GESEG,KEKEK,KGWGK (The Palindromicon, by Jeff Grant)

CWC,GWG,MWG,CWCWS (The Complete Welsh Dictionary, by Evans & Thomas)

EMM,EWM,EEECE,EMESS,GEKKS,KEEMS,KEMMS,MEWKS,SEECK,SKEMS,SWEGS,
WESES,EKE-EKES, SWEEGES (English Dialect Dictionary)