GENERALISED FIBONACCI SUMS IN WORDS

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In the November 2004 Kickshaws, Dave Morice noted that, in the word HOW, the sum of the ordinal values of H and O equalled that of W ($8 + 15 = 23$); and similarly for subtraction in WHO, $23 - 8 = 15$. Eric Iverson (WW05-310) generalised the problem by using any word length, and by shifting the ordinal values, so that A also takes on the values of 2 to 26. This article, however, reverts to using $A = 1$ etc. The series in which a term is the sum of the previous two is the Fibonacci series, though here we are adding the ordinals of letters. This article explores the generalised Fibonacci sequences, in which the position of a letter is the sum of the previous n positions. Thus for $n = 3$ in the case of HEREBY, the second E is the sum of H, E, and R ($8 + 5 + 18 = 31 = 5$ modulo 26); and B and Y are likewise the sum of the three previous letters.

It turns out that, even as far as $n = 11$, there are substantial numbers of results. Therefore, this investigation also included the alternative of not permitting wraparound past Z: the longest "word" in this case is clearly 25 As followed by a Z. In fact, no words were found beyond $n = 9$. Explicitly, the approximate number of words found was:

n	2	3	4	5	6	7	8	9	10	11
wraparound	720	2400	9100	20000	27000	30000	31000	28000	24000	19000
no wrap	27	430	535	262	56	6	2	1	0	0

Rarely, wraparound or not, there existed longer words in which the relationship went further than in the case of the best whole word. For example, with $n = 4$ and wraparound, the longest word has eight letters (Moss Nook); but in the place Malyy Kudin, the relationship holds for all bar the last letter, ie nine letters.

It will be obvious from the figures above that the following are only a small selection of the words found. However, I have given enough well-known words in some cases for a party game! Words are from the OED, and places from the NIMA database unless otherwise stated.

n = 2, no wrap [in addition to Iverson's examples in offset 0]. 5: Cadei [Barrey] (Somalia, 2°56, 43°26), Kalmy (Poland, 54°11, 21°09). 4: dein, kalm (shrub kalmia named after Peter Kalm), mano (perhaps mistyped as msno in Iverson).

n = 2, wrap [in addition to Iverson's examples in offset 0]. 6: poetys (famose 1530q), Doshai (Pakistan, 28°38, 66°54). 5: Lamna (Chambers, genus of shark), manoc (Web2). 4: crum, dosh, mylk (milk).

n = 3, no wrap. 5: labor, paart (part). 4: alan, away, babe, bail, boar, bobs, celt, chit, clap, draw, easy, eden, eggs, flew, fray, hair, hoax, idly, khat, neat, pact.

n = 3, wrap 7: Ch'a-lu-ho (China, 43°42, 125°58). 6: dilyte, Crider [penstemon] (ITIS plant), hereby, Pudong (China, 37°01, 112°10). 5: envoy, pupal, rider, style, whine.

n = 4, no wrap 6: [Seil] Abadho (Saudi Arabia, 17°01, 42°00), dabbin (dab I 1 1887q). 5: abbot, aides, beaks, bidet, bleat, debit, Denby (in Derbyshire), eager, feces, habit, ideas, jacky, Libby (personal name), paddy, tabby.

n = 4, wrap 8: Moss Nook (Manchester, England, Ordnance Survey). 7: graffer, grasser, old chap. 6: croaks, endure, entree, fibril, furled, gingko, packet, redder, roller, settle. Malyy Kudin (Belarus, 54°02, 29°49) fails at letter 10.

n = 5, no wrap 6: Adidas (leisure footwear), anabas, babies, badges, cabals, cachet, deejay, maccau (macaw).
n = 5, wrap 9: pirameter. 8: perusals, pidgeons, bay-snipe (bay 5), duseling. 7: aidance, degrain, dernful, dry-wash, enamels, enrolls, fan-mail (fan 2 1937q), fleeced, frilled, fronded, fuss-box (fuss 4), impugns, jackpot, Nureyev (ballet dancer), oneiric, orectic, perusal, pricket, Prud'hon (French Neoclassical painter), realist, rebuker, scamble, secondo, shyness, snabble, stubble, subbass (sub- 4 1880q), sunless, upbring.

n = 6, no wrap 7: Addamax (Corporation brought a federal antitrust suit against Open Software Foundation), bacchar, bajadas, Bedagat (Web 1), cabages, cadbait (Web2), café-bar (café 2), Cake-day (cake 1 b 1864q), hadadas (plural).
n = 6, wrap 9: [Thamnophis] cyrtopsis [collaris] (ITIS animal), dustering, food-cards (food 8), fore-yards, landscape, pulsejets (reaction 5 1967q), Sky Valley (1990 pop. 187, Rabun co., Ga., Columbia Gazeteer), [Ochrotrichia] wojcickyi [cyanogenys] (ITIS animal). Floxacillin (Dorland) fails at letter 11.

n = 7, no wrap 8: places like [Arroyo] Chagaday (Argentina, -25°06, -58°42), [Artezianskiy Kolodets] Daldabay (Kazakhstan, 46°49, 64°32), Dehbaday (Afghanistan, 33°13, 67°43).
n = 7, wrap 11: [Tullbergia] krausbaueri [coastalis] (ITIS animal), [Thalassiosira] weissflogii [fernaldii] (ITIS plant). 10: akrolithos (Greek, whence acrolith), color-music (colour 19 1903q), crap-madder (madder 2b), epicurical, Flower Hill (1990 pop. 4,490, Nassau co., SE N.Y., Columbia Gazeteer), form-boards (form 22), myorrhexis (Dorland), Octomacrum [carri irakensis] (ITIS animal), Ocymastrum (poppy 3 1597q), off one's box (Peevish Dict), Pinkertons (detective agency), viripotens (Latin, whence viripotent).

n = 8, no wrap 9: Baba Hafez (Iran, 36°16, 54°08), Cad-Caddey (Somalia, 1°45, 44°50).
n = 8, wrap 12: somatotonics, Uvala Kremena (Yugoslavia, 42°27, 18°40). 11: back air pipe (Web2), conspecific, cresoxydiol (www.chemindustry.com/chemicals/150745.html), Giant Pandas (panda 2a 1928q), periodicals, somatotonic.

n = 9, no wrap 10: Cabbage Cay (Bahamas, 25°34, -77°43).
n = 9, wrap 13: relative major (Macquarie), 12: cyanhidrosis (Web2), dumb-sounding (disembogue 4b 1765q), Leyland Hills (http://www.linz.govt.nz/databases/geographic/geodist.html).

n = 10, wrap 13: crawler-loader (dozer, 1958q), cyclarthrosis, garret-windows (jetty 4 1667q), ionopherogram (www.dictionarybarn.com/IONOPHEROGRAM.php), [Equisetum hyemale] pseudohyemale (ITIS plant), sodioaluminic (Web2), Spanish cardon (Spanish 9), squirrel-holes (squirrel 6 1851q), Tothill-fields (peel 5a 1818q). Phytopalaeontologist, phytopalaeontology, and redemptoristine fail at letter 15.

n = 11, wrap 15: Saint-Gilles-Waas (Belgium, 51°14, 4°07. 14: craftischilder (crafts-child 1561q), cross-remainder, game of commerce (commerce 6b).

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