THE ALPHABET RULER

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Assigning each letter its positional value in the alphabet (A=1, B=2, etc.), adding the 26 values (351) and dividing by the number of letters in the alphabet (26) gives the Average Letter Value (ALV) of the alphabet (13.5). Similarly, dividing the total letter value of a word by the number of letters in the word gives the ALV of that word. Words with an ALV of 13.5 have been called *Balanced Words* (see "Balanced Words" by Susan Thorpe in the Nov 1994 Word Ways, and "Varieties of Balanced Words: Part 1" by Rex Gooch in the Aug 1997 issue). They may be regarded as halfway words, their ALV equating to the midpoint of the alphabet. This raises the question of words which equate to other strategic fractional points along the alphabet. What are these words and how do they relate to each other? I have attempted to answer these questions in this article.Most words can be found in the Oxford English Dictionary, Second Edition as head words, variant forms and text words. Non-OED words are given at the end.

RULER EQUATIONS

Dividing the alphabet into *n* equal parts provides *n-1* fractional points along the alphabet ruler (*1/n, 2/n,..., n-1/n*). What I call *Ruler Equations* are configured by adding various words which equate to specific fractional points on the ruler and rearranging their combined letters to make one or more words which also equate to specific fractional points. There are several ways of doing this and these are examined below. Wherever possible, I have selected examples which use familiar words.

The Twelfths Ruler

The figure below shows the alphabet divided into twelve equal parts and the ALVs associated with the points 1/12, 2/12, 3/12, etc. of the way along the alphabet. It also shows the number of letters possible for a word with a particular ALV. For example, a 3/12 word has an ALV of 6.75 and can only be made from 4 (or a multiple of 4) letters. This is indicated by *x4*.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

1/12	2/12	3/12	4/12	5/12	6/12	7/12	8/12	9/12	10/12	11/12
2.25	4.5	6.75	9.0	11.25	13.5	15.75	18.0	20.25	22.5	24.75
x4	even	x4	any	x4	even	x4	any	x4	even	x4

1. Adding two equal-length words to make a longer word, all words equating to the same point on the ruler

2/12 (ALVs 4.5)
2+2: ah + Ed = head   4+4: beef + Alda = fadeable
3/12 (ALVs 6.75)
4+4: lack + bike = kickable

4/12 (ALVs 9.0)
1+1: l + l = li   2+2: me + me = emme
3+3: gas + red = grades   4+4: ices + limb = miscible
5+5: denim + anger = meandering   6+6: italic + coshed = catholicised
7+7: agitate + gnathal = head-flattening   8+8: recorded + Spinacia = endopericardiacs
9+9: categoric + lee-boards = cerebrogalactoside

5/12 (ALVs 11.25)
4+4: alms + foes = foamless   8+8: actinium + detracts = circumstantiated
6/12 (ALVs 13.5)
2+2: by + ri = Irby   4+4: note + hype = neophyte
6+6 glints + ritual = illustrating   8+8: chittery + noseless = electrosynthesis

7/12 (ALVs 15.75)
4+4: yens + gout = youngest
8/12 (ALVs 18.0)
2+2: ky + ou = youk   3+3: mut + our = tumour
4+4: sort + pups = supports   5+5: nuous + putor = unportuous

2. Adding two words of different lengths to make a longer word, all words equating to the same point on the ruler:

2/12 (ALVs 4.5)
2+4: ah + deed = headed   2+6: ah+ beefed = beef-head
2+8: Ed + beef-head = beef-headed   4-6: head + beefed = beef-headed

3/12 (ALVs 6.75)
4+8: kaan + Abderian = Bandaranaike

4/12 (ALVs 9.0)
1+2: l + me = ime   1+3: l + bet = bite
1+4: l + maim = Miami   1+5: l + games = images
1+6: l + oracle = calorie   1+7: l + Angeles = lineages
1+8: l + magnetic = enigmatic   1+9: l + absconder = carbonised
1+10: l + raincoated = eradication   1+11: l + accomplices = complicacies
1+12: l + orchematical = iatro-chemical
2+3: me + din = mined   2+4: me + dram = rammed
2+5: me + dials = mislead   2+6: me + ridden = reminded
2+7: me + incised = medicines   2+8: me + chainlet = enclaimeth(?)
2+9: me + premiable = impermeable   2+10: me + deliberant = determinable
2+11: me + mendicating = mendicamenting
3+4: bud + real = durable   3+5: sag + chink = shacking

3+6:   bet + lexica = excitable
3+8:   din + cashmere = merchandise
3+10: lan + embrochate = thermobalance
4+5:   lads + harem = marshaled
4+7:   feet + Ireland = deferential
4+9:   bone + mainlined = indenominable
4+11: dire + embracement = Remembrancetide
5+6:   basin + racier = carabiniers
5+8:   roach + ablement = thermobalance
6+7:   cleans + Hamitic = mechanicalist
6+9:   Carmen + bemitered = Remembrancetide
7+8:   labiose + ranchman = elasmobranchian

3+7:   fat + indices = sanctified
3+9:   hen + categoric = tracheogenic
3+11: rah + accomplices = macrocephalics
4+6:   shah + snaked = handshakes
4+8:   chip + Damocles = accomplished
4+10: mend + disenables = able-mindedness

5+7:   belay + chirped = decipherably
5+9:   conal + benedicts = disconnectable
6+8:   dafter + definite = differentiated

5/12 (ALVs 11.25)
4+8:   palp + oriented = lepidopteran

4+12: seep + doctrinaires = depreciatoriness

6/12 (ALVs 13.5)
2+4:   lo + jest = jostle
2+8:   by + solarium = biramously
2+12: lo + polysulphide = lepidophyllous
4+6:   Slav + arrest = traversals
4+10: tans + co-inventor = contraventions
6+8:   polars + toothing = anthropologist

2+6:   sh + cousin = cushions
2+10: ri + fulmineous = luminiferous
4+8:   musa + insolent = mountainless
4+12: spar + propitiation = appropriationist
6+10: polars + foistiness = professionalists

7/12 (ALVs 15.75)
4+8:   moot + tipsters = optometrists

8/12 (ALVs 18.0)
2+3:   ky + our = rouky
2+5:   ou + potts = outpost
2+8:   ou + outspurn = unportuous

2+4:   ky + rots = stroky
2+6:   ou + stumps = postumus

3. Adding more than two words to make a longer word, all words equating to the same point on the ruler

(a) words same length

3/12 (ALVs 6.75)
4+4+4: cava + ilea + race = Clavariaceae
5/12 (ALVs 11.25)
4+4+4: hern + iota + Pisa = parishionate
7/12 (ALVs 15.75)
4+4+4: buoy + rull + sets = blusterously

4/12 (ALVs 9.0)
5+5+5: avail + eaten + cling = Anti-evangelical
6/12 (ALVs 13.5)
6+6+6: myopic + rivals + toilet = over-optimistically
8/12 (ALVs 18.0)
3+3+3: sot + sun + yon = syntonous

(b) words different lengths

4/12 (ALVs 9.0)
2+3+4: me + red + dole = remodeled
3+4+5: bet + earl + mined = determinable
1+2+3+4+5: I + Ii + bet + lads + elect = delectabilities

4. Adding pairs of words to make other pairs of words, all words equating to the same point on the ruler

2/12 (ALVs 4.5)
2+6 = 4+4 = 8: ah + beefed = beef + head = beef-head
4/12 (ALVS 9.0)
3+8 = 4+7 = 5+6 = 11: red + machines = dram + Chinese = mined + arches = merchandise
4+9 = 5+8 = 6+7 = 13: nail + schematic = match + silicean = cleans + Hamitic = mechanicalist
2+10 = 4+8 = 5+7 = 6+6 = 12:
me + co-adapting = neap + dogmatic = imago + pandect = acting + pomade = compaginated
3+12 = 4+11= 5+10 = 6+9 = 7+8 = 15:
lan+chemabrasion = bans+chloranemia = ambon+Lancashire = bacons+Mahlerian = Lebanon+charisma
6/12 (ALVs 13.5)   = elasmobranchian
4+8 = 6+6 = 12: yell + cross-tie = Tescos + Reilly = electrolysis
2+12 = 4+10 = 6+8 = 14: lo + trap-shooting = rota + phlogiston = polars + toothing = anthropologist
8/12 (ALVs 18.0)
2+8 = 3+7 = 4+6 = 5+5 = 10: ou + outspurn = sun + outpour = pout + unsour = troup + nuous
                                                                            = unportuous

5. Adding words which equate to different points on the ruler

(a) select three of the twelfths points on the ruler such that the intermediate one of the three is equidistant from the other two. A left hand word (L) plus a right hand word (R) of the same length make an intermediate word (I) of twice the length.

L + R = I | L + R = I
Abea (1/12) + fled (3/12) = fadeable (2/12) | caad(1/12) + vend(5/12) = advanced(3/12)
beef (2/12) + real (4/12) = reefable (3/12) | race (3/12) + fund (5/12) = furnaced (4/12)
care (3/12) + suds(7/12) = crusades (5/12) | shed (4/12) + roof (6/12) = serfhood (5/12)
come (4/12) + runs (8/12) = consumer (6/12) | hens (5/12) + cuts (7/12) = chunters (6/12)
pens (6/12) + sort (8/12) = posterns (7/12) | tret (7/12) + upsy (9/12) = sputtery (8/12)
ou (8/12) + ty (10/12) = outy (9/12)

(b) select three of the twelfths points such that the intermediate one is twice as far away from the left hand one (or right) as from the right hand one (or left). In this case, the word nearer to the intermediate one is twice the length of the more distant word.

L + R = I | L + R = I
agabanee(2/12)+coir (5/12)=Boraginaceae (3/12) | Aglaea (2/12) +tum(8/12)=Guatemala (4/12)
chemical (3/12)+pods(6/12)= accomplished(4/12) | brandies(4/12)+ruse(7/12)=unbrassiered(5/12)
literate (5/12)+pups(8/12)= perpetualist (6/12)

(c) select three of the twelfths points such that the intermediate one is three times as far away from the left hand one (or right) as from the right hand one (or left). The word nearer the intermediate one is three times the length of the more distant word.

L + R = I | L + R = I
Debbie (2/12) +lo (6/12) = obedible (3/12) | preaching (4/12) + our(8/12) = neurographic(5/12)
ocha (3/12) +optometrists (7/12) = somatoprosthetic (6/12)

(d) select three of the twelfths points such that the intermediate one is four times as far away from the left hand one (or right) as from the right hand one (or left). The word nearer the intermediate one is four times as long as the more distant word.

L   +   R   = I   L   +   R   = I
Ed (2/12) + neutrons (7/12)= undertones (6/12)   ball-race (3/12) +ky (8/12)= black-a-lyre (4/12)

(e) select three of the twelfths points such that the intermediate one is two thirds as far away from the left hand one (or right) as from the right hand one (or left). The word further away from the intermediate one is two thirds the length of the nearer word.

L   +   R   = I   L   +   R   = I
beefed (2/12) +tint (7/12) = benefitted(4/12)   care (3/12) + snouts (8/12) = courtesans (6/12)

(f) select more than three words to make an equation.
fil   (4/12) + ime (4/12) + our (8/12) + sun (8/12)   = luminiferous   (6/12)
Ainu (5/12) + lies (5/12) + tint (7/12) +   otis (7/12) = institutionalise (6/12)

The Eighths Ruler

Dividing the alphabet into twelve equal parts provided eleven fractional points. That six of these points required words with a multiple of four letters did not pose too great a problem. The exercise was helped by the 4/12 and 8/12 points being amenable to words of any length. Dividing the alphabet into eight equal parts, on the other hand, imposes more severe constraints.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

1/8	2/8	3/8	4/8	5/8	6/8	7/8
3.375	6.75	10.125	13.5	16.875	20.25	23.625
x8	x4	x8	even	x8	x4	x8

To start with, there are only seven fractional points available. Added to this, four of these points (1/8,. 3/8, 5/8, 7/8) have ALVs which extend to three decimal places such that, for these points, only words with eight letters, or multiples of eight, can be considered. The other points coincide with points on the twelfths ruler and, for ruler equations based solely on one or more of these points, the reader should refer to the twelfths ruler.

I found no single 8-letter words equating to the 1/8, 6/8 or 7/8 points. Single 16-letter words were found only for the 2/8, 3/8 and 4/8 points. It thus appears that the only type of ruler equation which it is possible to configure from points unique to the eighths ruler is the 3/8 case, shown below.

1. All words equating to the same point on the ruler

3/8 (ALVs 10.125)
sepaloid + Nicholas = colonial + disshape = Isaacson + phelloid = shale-oil + spondaic
= schooled + spinalia = Siphonocladiales

corn-meal + anoiling = cinnamol + regional = renaming + colonial = geonomic + Llanrian
= nonmineralogical

2. All words equating to different points on the ruler

(a) words same length
dick (2/8)   + lung (4/8)   = duckling (3/8)
filiates (3/8) + sponsors (5/8) = professionalists (4/8)
pimp (4/8)   + upsy (6/8)   = puppyism (5/8)

(b) words different lengths
base (2/8)   + unstress (5/8) = abstruseness (4/8)
biathlon (3/8) + upsy (6/8)   = unhospitably (4/8)

The Tenths Ruler

Dividing the alphabet into ten equal parts also imposes constraints. Eight of the nine fractional points (all except the midpoint) require words with multiples of five or ten letters.

	1/10	2/10	3/10	4/10	5/10	6/10	7/10	8/10	9/10
	2.7	5.4	8.1	10.8	13.5	16.2	18.9	21.6	24.3
	x10	x5	x10	x5	even	x5	x10	x5	x10

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

1. All words equating to the same point on the ruler

2/10 (ALVs 5.4)
5+5: Calef + dance = clean-faced
4/10 (ALVs 10.8)
5+5: gaols + shred = older + shags = lards + soghe = gas-holders
5+10: boner + replicates = plebs + recreation = brans + telecopier = precelebrations
10+10:diaphanous + door-places = pseudoachondroplasia
5+5+5:chess + chirp + llano = chancellorships
6/10 (ALVs 16.2)
5+5: loots + primy = lispy + motor = riots + pomly = myropolist
5+10: poyet + slottysshe = stylosteophytes
5+5+5:hosts + poyet + style = stylosteophytes

2. All words equating to different points on the ruler

(a) words same length

dance (2/10) + palpi (4/10) = applianced (3/10)

dance (2/10) + moult (6/10) = documental (4/10)

gaily (4/10) + newts (6/10) = sweatingly (5/10)

(b) words different lengths

tracheidal (3/10) + porgy (6/10) = dactyliographer (4/10)

adele (2/10) + ignorantly (5/10) = adrenogenitally (4/10)

RULER LADDERS

Progressively stepping from one fractional point to the next on an alphabet ruler, changing one letter at a time, makes a ruler word ladder. To achieve this, I used the twelfths ruler because it allows 4-letter words for all its fractional points. The numeric totals of the words equating to points 1/12, 2/12, 3/12 ,,, of the way along the alphabet ruler are 9, 18, 27, etc. In any particular position in a word, this allows two changes for each of the letters A to H and one change for the letters I to Q. The possible letter changes are: A-J-S, B-K-T, C-L-U, D-M-V, E-N-W, F-O-X, G-P-T, H-Q-Z and I-R.

The first five ladders change only a single letter (and hence can be only three steps long); the remainder involve letter-changes in more than one position in the word.

2/12	3/12	4/12	5/12	6/12	7/12	8/12
cheb	chek	chet				
hade	hame	have				
agee	agen	agew				
		clof	cloo	clox		
ha-ha	Qaha	Zaha				
bana	kana	tana	tawa			
caie	care	lare	larn			
daid	maid	vaid	vard	varm	varv	
dede	deme	meme	meve	veve		
deed	meed	mend	vend	vewd		
eage	nage	wage	wape	waye	wayn	
			huig	quig	quip	zuip
				bloy	buoy	buxy

Ha-ha is a Moroccan tribe, Qaha is a place in Egypt, and Zaha a place in Japan. Ladders which begin with a 1/12 word are rare, mainly because there are only a handful of 4-letter words whose total is 9. An added difficulty is that each of these words contains at least one letter A, and A + 9 = J! Here are three such ladders. The first, with seven words, is the longest of all my ruler ladders. The last is a geographical location ladder, featuring places in Tahiti, Cape Verde Islands, Iran and Japan, respectively.

bacc   balc   kalc   talc   tall   talu   tauu
cada   cama   lama   lava
Faaa   Faja   Fasa   Oasa

RULER SQUARES

A *ruler word square* is one whose words all have the same letter totals and same ALVs, thus equating to the same point on the alphabet ruler. For how many of the fractional points on the rulers can word squares be made? I ignored both those eighths points and tenths points which require 8- and 10-letter words, respectively. In most cases even 4x4 and 5x5 squares required the inclusion of lesser-known words.

3/12 (ALVs 6.75)	4/12 (ALVs 9.0)	5/12 (ALVs 11.25)	6/12 (ALVs 13.5)	7/12 (ALVs 15.75)	8/12 (ALVs 18.0)
D I C K	D R A M	C U B S	E T O N	Y A W N	S O Y M
I L E A	R I D E	U R E A	T O R A	A V O Y	O N R Y
C E R A	A D Z E	B E R T	O R B S	W O T E	Y R O N
K A A N	M E E M	S A T E	N A S T	N Y E S	M Y N T

4/10 (ALVs 10.8)	6/10 (ALVs 16.2)
S H A G S	H O S T S
H E R R E	O R O R O
A R B O R	S O N O R
G R O G G	T R O H T
S E R G E	S O R T I

A *palindromic word square* is the same read backwards from the bottom right, row by row, as read forwards from the top left row by row. The three palindromic word squares below are balanced; all words have an ALV of 13.5.

H O O P	O L L O	P E N S
O L L O	L O O L	E T O N
O L L O	L O O L	N O T E
P O O H	O L L O	S N E P

Each of the following word squares makes four different words when read backwards; they are *reversal squares*. Again, all words have an ALV of 13.5.

T A N S	P E N S
A X O N	E T O N
N O T E	N O X A
S N E P	S N A T

MORE RULER REVELATIONS

- HALF is a 3/12 word (Question: when is a half a quarter?)
- CAVERNILOQUY is a balanced word, a heterogram, and has AEIOUY in order

- AUDIO-MAGNETOTELLURIC is a 20-letter 5/12 word, and has AEIOU twice
  CANCELLANSES is a 4/12 word and a pair isogram (each letter appears twice)
- BEEF 2/12, ACER 3/12, ACHOR 4/12, BESS 5/12, BIJOUX 6/12, KNOW 7/12,
  JOTTY 8/12, HUZZ 9/12 are also alphomic words (letters in alphabetic order)
- FAAA 1/12, FEEB 2/12, MEED 3/12, SNIFFED 4/12, UREA 5/12, VOLE 6/12,
  SOON 7/12, YUROK 8/12 are reverse alphomic words
- Double square words are 9-letter 4/12 words with a letter-total of 81: the appropriate
  QUADRABLE and the Belgian placename ELLEMELLE (also a palindrome)
- Palindromes: DEED 2/12, EMME 4/12, VEEV 6/12, OOROOROO 7/12, OXO 8/12,
  ALALA 2/10, TALAT 4/10, AZZA 5/10, THYHT 6/10, TYRYT 8/10
- Tautonyms:: HAHA 2/12, AGAR-AGAR 3/12, DIN-DIN 4/12, COLOCOLO 5/12,
  FUFU 6/12, TUM-TUM 8/12, KNOCK-KNOCK 4/10, WILLY-WILLY 6/10
- red + ETCH = rETCHed: one fractional word enclosed by another to make a third

SPEAKING RULERS

At last some of our fractional words came together and spoke to us: RED + RED = REDDER, ELECT + HARI = HERETICAL, COOLED + RED = DECOLORED, FIDGET-ING + HEN = NIGHT-FEEDING, FAT + OLDIE = FOLIATED , PISS + TURD = DISRUPTS, BUSTS + DANCE = SUBSTANCED.

The three words can form a phrase: BRANDO + BET = BROADBENT, BET + RIFLED = FILTER-BED, SHEILA + BET = ELISABETH, AYA + BEGIRDLES = DISAGREEABLY, FIAT + RIDE = RATIFIED, GORE + FUND = UNFORGED, EARL + ROBS = LABORERS, ANTS + BITE = TIBETANS, TRIOS + DANCE = NARCOTISED.

Ultimately the fractional words got together and spoke to us without sign language. Each word of the twelfths, eights and tenths sentences equates to a different fractional point on the respective ruler:

Our jeweller thinks I begemmed Ray's head (8,5,6,4,3,7,2/12)
Wyn's hunk, Jake, sponsors biathlon (6,4,2,5,3/8)
Tragically, 'Popsy-Wopsy' upset foul, unbearable Eddie (4,7,6,5,3,2/10)

CHAMBERS ENGLISH Abderian Huig ilea over-optimistically phelloid thermobalance WEBSTER'S FIRST caie WEBSTER'S SECOND agabanee bemitered Boraginaceae chloranemia conal depreciatoriness head-flattening mountainless neurographic non-mineralogical precelebrations silicean Siphonocladiales unhospitably WEBSTER'S THIRD cancellanses hydrosulfite lexica STEDMAN adrenogenitally applianced biramously caverniloquy co-adapting pseudoachondroplasia somatoprosthetic spinalia stylosteophytes tracheogenic DORLAND chemabrasion TIMES INDEX-GAZETTEER Ellemelle Faaa li Llanrian Oasa Ollo Qaha Talat Tauu Zaha CHAMBERS OFFICIAL SCRABBLE WORDS decolored THE PALINDROMICON Meem Oorooroo Ororo DICTIONARY OF THE FLOWERING PLANTS AND FERNS (J C Willis) Aglaea NOMENCLATOR ZOOLOGICUS Abea WORD WAYS (May 1980) audio-magnetotelluric