

# WIDE ALPHAMETICS

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An alphametic, as most Word Ways readers are surely aware, is a puzzle like SEND + MORE = MONEY, in which letters are to be replaced with decimal digits to make a valid addition sum. Such puzzles were originally called "cryptarithms" and sometimes just used jumbles of letters rather than words or phrases; the term "alphametic" was introduced by J. A. H. Hunter in the 1950's for cryptarithms which use actual words.

The goal of this investigation was to construct examples of two-addend alphametics which are as wide as possible. Since alphametic composers generally prefer puzzles which have a unique solution (i.e., there is only one possible assignment of digits to letters which works), I only allowed alphametics which obey this constraint. As it turns out, enforcing this extra restriction only eliminated a few finds.

There are four types of two-addend alphametic, with the words having N, N, and N letters, or N, N, N+1, or N, N+1, N+1, or N, N+1, N+2. The tables below list the widest alphametics I was able to find for each of these four type. For a given type and value of N a computer program constructed all possible alphametics of the required form, using words lists of the appropriate length, and checked each to see if it has exactly one numerical solution. I then hand-checked the output and retained only those alphametics in which all three words are main entries in either Webster's Third Unabridged or the Oxford English Dictionary. Inferred plurals are also allowed.

If a list below is marked "Full", then it is the full list of all alphametics that were found for the given word lengths; if it is marked "Partial" then just a selection is given, favoring those using more common words, from among all those found.

Type N,N,N (12, 12, 12) Partial

ACOUSTICIANS	+	INCANTATIONS	=	TOTALITARIAN
ANTAGONISTIC	+	INTUITIONIST	=	DISSOCIATING
ANTAGONIZING	+	INTERROGATOR	=	REITERATIONS
ASSASSINATES	+	MISPLACEMENT	=	LISTLESSNESS
ASSASSINATES	+	DISPOSITIONS	=	CONSTIPATION
ATTAINMENTS	+	ILLITERATELY	=	RESTLESSNESS
ELIMINATIONS	+	NECESSITATES	=	SOLICITATION
IMPRISONMENT	+	INSCRIPTIONS	=	SPECTROMETER
INCINERATORS	+	INTEGRATIONS	=	CONCRETISING
INSTANTIATES	+	STANDARDIZES	=	DEREGISTERED
LITERARINESS	+	REAPPRAISALS	=	BRISTLETAILS
MALTREATMENT	+	TERRESTRIALS	=	ANTISEMITISM
MEASUREMENTS	+	REAPPEARANCE	=	TEMPERATURES

REINCARNATES + TERRESTRIALS = CONTRACTIONS  
 TEARLESSNESS + TRANSVESTITE = RESERVATIONS

**Type N,N,N (13, 13, 13) Full**

AEROGEOLOGIST + ASTROLOGASTER = ESSENTIALNESS  
 ALANTOLACTONE + CONDENSATIONS = INSATIATENESS  
 CONCUPISCENCE + CONSCIOUSNESS = SUPERSEDECES  
 ECTOCARPACEAE + POSTPROCESSOR = NONPERCEPTION \*\*  
 ELECTROTACTIC + INTERZOOECIAL = CONTORTIONATE  
 POSTCANONICAL + TRIPARTITIONS = COCONSPIRATOR

**Type N,N,N+1 (12, 12, 13) Full**

ALIMENTATION + TESTIMONIALS = SENTIMENTALLY  
 ANTIPARALLEL + PRETREATMENT = IMPERTINENTLY  
 CAPACITATION + INCAPACITATE = TENTATIVENESS  
 CONCATENATES + NEUROCENTRUM = RESTAURATEURS  
 CONSPIRATORS + STEREOSTATIC = REAPPROPRIATE  
 CORRECTITUDE + UNCTIOUSNESS = REDUCTIONISTS  
 DETERMINANTS + REASSESSMENT = MILLENNIARISM  
 EOSINOPHILIA + OSCILLOSCOPE = SHAPELESSNESS  
 EXAGGERATORS + REINSERTIONS = INSENSATENESS  
 INOBTAINABLE + SELENOLOGIST = BIBLIOGENESIS  
 RETALIATIONS + SINISTERNESS = LINEARIZATION

**Type N,N+1,N+1 (12, 13, 13) Partial**

ADESSENARIAN + TETRODONTIDAE = TRANSMISSIONS  
 ANACHRONISMS + TRANSMISSIONS = ASCOTHORACICA  
 ASSASSINATES + CANCEROUSNESS = CONCURRENCIES  
 CITRICULTURE + BACCALAUREATE = RECOLLECTIBLE  
 OPPOSITIONAL + TRANSPERSONAL = TASTELESSNESS  
 PHAEOSPOREAE + SENSELESSNESS = SHARECROPPERS

**Type N,N+1,N+2 (11, 12, 13) Full**

CENTERPIECE + CONIFICATION = PROPRIOCEPTOR  
 CONCOCTIONS + UNPERCIPIENT = OPPORTUNISTIC  
 IRRITATIONS + PREPOSITIONS = TETARTEMORION

\*\* POSTPROCESSOR is the only exception I permitted to the rule of requiring words to appear in Web3 or the OED. This word is a common term in computer engineering, so I allowed it in order to snag another (13,13,13) solution.

Each type was searched with increasing values of N until no alphametics of the given form could be found. No (14,14,14) or (13,13,14) or (13,14,14) or (12,13,14) alphametics were found – indeed, no alphametic having even a single 14-letter word. Readers are challenged to find such an alphametic – especially one having that most pleasing form, (14,14,14). Note that words longer

than 13 letters can be easily incorporated into an alphametic if we're allowed to go beyond two addends.

### A Variant: Alphametic with cryptoclue

I came across this alphametic variant recently in correspondence with Zoran Radisavljevic, a wordplay enthusiast in Serbia, who showed me this wide example of the form composed in Croatian:

PISMOSISTOKA + PROKRSTARITI = STAROKATOLIK  
cryptoclue: 7082493 95613

The goal here is to first solve the alphametic, which must by necessity have a unique solution, and then back-substitute letters for the digits in the cryptoclue to get the final answer, a word or phrase, which in this case is TROPSKA KLIMA, Croatian for "tropical climate". Zoran sent me this puzzle (composed by Josip Stifter and Vladimir Kuterovac, published in *Kvizorama* No. 548, May 10, 2002) as challenge: could a similar puzzle be constructed in English to equal or better the 12-letter width of this example? Note that the cryptoclue should include all the different digits which appear in the puzzle, but of course some digits may be used more than once.

The answer to Zoran's challenge is "yes", since several of the (13,13,13) alphametics listed above can be extended to a (13,13,13)+13 alphametic-plus-cryptoclue puzzle. Here are two examples:

ECTOCARPACEAE + POSTPROCESSOR = NONPERCEPTION  
cryptoclue: 2309686854137

ALANTOLACTONE + CONDENSATIONS = INSATIATENESS  
cryptoclue: 5668902317843

Remarkably, each of these puzzles consists entirely of 13-letter words, with no need for multi-word phrases. In these two the cryptoclues are two-word phrases:

AEROGEOLOGIST + ASTROLOGASTER = ESSENTIALNESS  
cryptoclue: 51546 94703082

CONCUPISCENCE + CONSCIOUSNESS = SUPERSEDECES  
cryptoclue: 98624 59123077

Readers who take up the challenge of finding a 14,14,14 (or larger!) alphametic may also wish to try extending any successful constructions to also have a cryptoclue. Or, ignore the challenge and just enjoy solving the 41 alphametics!