The Dozenal Society of America

Systematic Dozenal Nomenclature*

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Introduction

Systematic Dozenal Nomenclature (SDN) is a new scheme for expressing dozenal numbers in word form, based on familiar numeric word-roots derived from classical Latin and Greek. SDN was recently developed as a result of an extended discussion this author had with a number of other dozenalists collaborating over the Web on the DozensOnline forum.[1] Readers are encourage to visit the forum to see SDN being applied on a daily basis!

SDN is inspired in part by the Systematic Element Name[2] scheme used by the International Union of Pure and Applied Chemistry (IUPAC). Whenever a new transuranic chemical element is synthesized in the laboratory, IUPAC systematically generates a temporary name for it based on its (decimal) atomic number. In fact, SDN actually subsumes this element naming scheme (with dozenal extensions) as a part of its own system.

SDN is also inspired by the dozenal-metric prefix system which Tom Pendlebury devised as an adjunct to his TGM system of measurement units.[3] In fact, a subset of SDN, the so-called power prefixes, are structurally similar to (though superficially different from) Pendlebury's prefixes. These power prefixes are suitable for use with TGM units of measure, or indeed any system of measurement units.

However, SDN goes beyond both of these schemes, providing a robust and flexible numeric nomenclature with broad applicability.

Digit Roots

At the heart of SDN is a simple set of twelve numeric word-roots distilled from classical Latin and Greek, one for each digit in dozenal arithmetic[4]:

nil	(0)	*un*	(1)	*bi*	(2)	*tri*	(3)
quad	(4)	*pent*	(5)	*hex*	(6)	*sept*	(7)
oct	(8)	*enn*	(9)	*dec*	(↊)	*lev*	(↋)

*Originally published in 51 The Duodecimal Bulletin 1 (11↋↊), this is a newly typeset article from an updated version provided by the author.

[1] http://z13.invisionfree.com/DozensOnline

[2] http://en.wikipedia.org/wiki/Systematic_element_name

[3] Tom Pendlebury, *TGM: coherent dozenal metrology based on Time, Gravity and Mass*, 3rd PDF ed., May 2011$_d$ (11↋7$_z$) (http://www.dozenalsociety.org.uk/pdfs/TGMbooklet.pdf).

[4] This article follows the Dozenal Society of America's convention for transdecimal digits: ↊ for ten, ↋ for eleven.

We refer to these as "roots" rather than "words" because SDN does not simply leave them to stand alone as words by themselves. Instead, as we will see shortly, SDN provides various ways to glue these roots together with other syllables to form compound words.

The first ten of these, *nil* through *enn*, are identical to the roots which IUPAC uses to express atomic numbers within systematic chemical element names. IUPAC carefully selected from among the various available Latin and Greek words for numbers, so that each of these roots would start with a unique letter. This makes them amenable to single-letter abbreviations.

Extending this into a *dozenal* scheme, of course, requires two more digits. Given the classical theme, the obvious choice for digit ten is *dec*. The only truly new coinage is *lev*, which is clearly a contraction for English *eleven*. However, even *lev* could be granted a classical etymology, if we imagine it deriving from Latin *laevus* (combination forms *laevo-*, *levo-*, *lev-*), which signifies "to the left." Eleven is, after all, the integer just to the left of twelve on the number line! Fortuitously, these two additions also start with unique initials, preserving our ability to use single-letter abbreviations for them.

Digit Strings and Element Names

With just these twelve roots, we can (at least in principle) represent any whole number: We can simply string roots together in the same manner we string together Hindu-Arabic digits to form multi-digit numerals, relying on the familiar place-value arithmetic system. This is what IUPAC's systematic element names do in order to express their atomic numbers, which are now well into three (decimal) digits at the bottom of the periodic table.

For instance, as of this writing, the latest element synthesized in the laboratory has (decimal) atomic number 118_d[5] (one hundred eighteen). Consequently, IUPAC has assigned it the temporary name *Ununoctium* (abbreviation *Uuo*). This name is assembled from the digit roots *un* (one) in the hundreds place, *un* (one) in the tens place, and *oct* (eight) in the units place, plus the common suffix *-ium* for a chemical element.

Of course, in dozenal, this atomic number is $9↊_z$ (nine dozen ten). Consequently, the SDN version of this element name pastes together the digit roots *enn* (nine) in the dozens place and *dec* (ten) in the units place. To these we attach *-izium*, the chemical element suffix marked with a *z* to distinguish the element name as dozenal rather than decimal. The result is *Enndecizium*. Its abbreviation, *Edz*, is also marked with a *z* to distinguish it as dozenal.

For the next heavier element, atomic number 119_d (one hundred nineteen) or $9↋_z$ (nine dozen eleven), IUPAC will generate the decimal name *Ununennium* (abbreviation *Uue*), whereas SDN will generate the dozenal name *Ennlevizium* (abbreviation *Elz*). For the element after that, atomic number 120_d (one hundred twenty) or $↊0_z$ (ten dozen), the corresponding names will be decimal *Unbinilium* (abbreviation *Ubn*) and dozenal *Decnilizium* (abbreviation *Dnz*). Notably, both of the latter names feature the root *nil*, highlighting the vital importance of digit 0 for place-value arithmetic, be it decimal or dozenal.

[5] To avoid ambiguity, this article indicates the radix of every number (except for single-digit integers), using a right-subscript notation: with a subscript "d" for decimal, and a subscript "z" for dozenal. The period or full stop (.) is used as the radix point regardless of base, but only when there is a fractional part to the value.

SDN Prefixes

SDN goes well beyond chemical elements, however. From strings of these twelve basic roots, SDN derives two different types of numeric prefixes with broad applications: *multiplier* and *power* prefixes. Both types amend the basic digit string with an extra final syllable that clearly distinguishes what kind of prefix it is, and also provides a point of attachment to a following word.

Multiplier Prefixes

A multiplier prefix simply indicates that the word attached to it is to be multiplied by the whole number encoded in the string of digit roots. The first dozen of these multiplier prefixes are as follows:

nili	(0×)	*uni*	(1×)	*bina*	(2×)	*trina*	(3×)
quadra	(4×)	*penta*	(5×)	*hexa*	(6×)	*septa*	(7×)
octa	(8×)	*ennea*	(9×)	*deca*	(↊×)	*leva*	(↋×)

If these seem familiar, that is by design. These multiplier prefixes are intended to resemble, as much as possible, the numeric combination forms already in common use, while at the same time regularizing them. Generally speaking, a multiplier prefix is formed by attaching a connecting *-a-* or *-i-* onto the end of the digit string. If the string represents a multi-digit number, only the final root in the string gets this extra syllable. The choice of which ending to add is based on which vowel usually appears in the original numeric combination form for that final root. In fact, sometimes either vowel can be used interchangeably, as acceptable variants with no difference in meaning.

In some cases, another letter is interposed between the final root and the connecting vowel: specifically, the *-n-* in *bina-*, *trina-*; the *-r-* in *quadra-*; and the *-e-* in *ennea-*. In these cases, this is done to make the resulting prefix easier to say and hear (i.e., to make it more "euphonious"). This also serves to recover the original spelling of the classical combination form. Indeed, one of the design goals of SDN was to avoid overloading these pre-existing forms with new meanings. SDN achieves this goal by simply incorporating those forms, with their existing meanings, as instances of SDN!

So, for instance, *quadrilateral* still refers to a four-sided polygon. *Pentagon* still refers to a five-sided polygon, while *pentameter* still refers to a style of poetry with a five-beat rhythm; in a similar vein, a *pentaminute* would be a block of time equal to five minutes, or one twelfth of an hour. A *hexahedron* (i.e., a cube) and an *octahedron* are still Platonic solids with six and eight faces, respectively; just as *hexane* and *octane* still refer to hydrocarbon compounds with six and eight carbon atoms, respectively. A week of seven days would be a *septaday*. And so forth.

When a multiplier is prefixed onto a word that begins with a vowel, the final connecting vowel of the prefix can be elided. Thus, given the common suffix *-ennium* or *-ennial*, referring to a period of time measured in years, the *-a-* in *quadra-* can be elided to yield *quadrennial* (the frequency of presidential elections in the United States). Similarly, the *-a-* in *hexa-* can be elided to yield *hexennial* (the frequency of senatorial elections in the United States).

Given that the word *ocular* relates to the eye, we can derive the word for a stereoscopic telescope with two eyepieces, by using the prefix *bina-* and eliding away the *-a-*, to yield *binoculars*. (We can similarly derive *trinoculars*, which would be a telescope suitable for a three-eyed space alien.)

In the case of *bina-* and *trina-*, the added syllable can sometimes be omitted. Since *bi-* and *tri-* already end in a vowel, that makes them amenable to attachment as prefixes themselves, reflecting pre-existing usage. This means *bicycle* (a pedal-powered vehicle with two wheels) and *tricycle* (a pedal-powered vehicle with three wheels) are perfectly good examples of SDN, as is *unicycle* (a pedal-powered vehicle with just one wheel) and *quadracycle* (a pedal-powered vehicle with four wheels). (A *nilicycle* would be a pedal-powered vehicle with zero wheels, the design and construction of which is left as an exercise for the reader.) On the other hand, we can see the final *-na-* syllable (or the variant *-ni-*) in such words as *binary*, *trinary*, and *trinity*. We shall soon see that there are certain instances where this syllable is necessary and not at all optional.

Of course, multiplier prefixes are not limited to representing only single-digit numbers. Just as in the element names, digit roots can be concatenated to represent as many digits as necessary, relying on position to indicate their place-value.

Hence, the next couple dozen multiplier prefixes turn out to be:

unnili	$(10_z\times)$	*ununi*	$(11_z\times)$	*unbina*	$(12_z\times)$	*untrina*	$(13_z\times)$
unquadra	$(14_z\times)$	*unpenta*	$(15_z\times)$	*unhexa*	$(16_z\times)$	*unsepta*	$(17_z\times)$
unocta	$(18_z\times)$	*unennea*	$(19_z\times)$	*undeca*	$(1\text{Ƨ}_z\times)$	*unleva*	$(1\text{Ɛ}_z\times)$
binili	$(20_z\times)$	*biuni*	$(21_z\times)$	*bibina*	$(22_z\times)$	*bitrina*	$(23_z\times)$
biquadra	$(24_z\times)$	*bipenta*	$(25_z\times)$	*bihexa*	$(26_z\times)$	*bisepta*	$(27_z\times)$
biocta	$(28_z\times)$	*biennea*	$(29_z\times)$	*bideca*	$(2\text{Ƨ}_z\times)$	*bileva*	$(2\text{Ɛ}_z\times)$

This is where SDN diverges from pre-existing numeric word-forms to create a more regular system. Where the standard decimal nomenclature involves unique Latin or Greek words for multiples of ten and hundred, SDN multiplier prefixes dispense with any need for similar forms for multiples of dozen and gross. Instead, SDN simply relies on the place-value system to endow each digit root with its scale.

So for instance, the *dodecahedron* and *icosahedron* are Platonic solids with 12_d(twelve) and 20_d (twenty) faces, respectively. In dozenal nomenclature, these become the *unnilihedron* and *unoctahedron*, solids with 10_z (dozen) and 18_z (dozen-eight) faces, respectively.

Decimal nomenclature refers to numeric bases twelve, sixteen, and twenty as *duodecimal*, *hexadecimal*, and *vigesimal*. SDN can refer to bases dozen, dozen-four, and dozen-eight as *unnilimal*, *unquadral*, and *unoctal*.

Where decimal language would refer to a superstitious dread of the number thirteen as *triskaidekaphobia*, SDN would call it *ununiphobia*, fear of the number dozen-one.

A *fortnight* of fourteen or dozen-two days can be described as an *unbiday*. Similarly a British stone of fourteen or dozen-two pounds can be described as an *unbipound*.

The TGM equivalent of a minute, a duration of one gross Tim, is one-twelfth of a *pentaminute*. This is 25_d (twenty-five) or 21_z (two dozen one) seconds long. In SDN, this can be referred to as a *biunisecond*.

In SDN, an hour of sixty, or five dozen, minutes can be called a *pentnili**minute*, and a minute a *pentnili**second*. Similarly, base sixty, known decimally as *sexagesimal*, can become base five dozen, or *pentnili**mal* in SDN.

A 30_d-day month (26_z days) can be called a *bihexa**day*, while a 31_d-day month (27_z days) would be a *bisepta**day*. A short February of 28_d or 24_z days would be a *biquadra**day*, while a February in a leap year would be a *bipenta**day*.

Note that, while each of these prefixes constitutes a multiplier, each of the digit roots within them do not act as multipliers individually. For instance, in *bihexa**day*, the *bi* is not a multiplier on the *hex*. If that were so, then the whole prefix would represent $2\times6 = 10_z$, one dozen. Instead, using the familiar place-value system, the *bi* and the *hex* together represent the number 26_z (two dozen six), so that the whole prefix *bihexa-* concatenated with the word *day* represents 26_z days.

Venturing into three digits, a year of 365_d (three hundred sixty-five) or 265_z (two gross six dozen five) days can be referred to as a *bihexpenta**day*. A leap year of 366_d (three hundred sixty-six) or 266_z (two gross six dozen six) days would be a *bihexhexa**day*.

In four digits, a conventional mile of 5280_d (five thousand two hundred eighty) or 3080_z (three grand[6] eight dozen) feet could be described as a *triniloctnili**foot*. A nautical mile of decimal 6080_d (six thousand eighty) or dozenal 3628_z (three grand six gross two dozen eight) feet would be a *trihexbiocta**foot*. A kilometer of 1000_d (one thousand) or $6Ɛ4_z$ (six gross eleven dozen four) meters becomes a *hexlevquadra**meter* in SDN.

In theory, any whole number may be represented by an SDN multiplier prefix. In practice, however, there is a point of diminishing returns after which appending any more digit roots, even if they are just *nil*, starts to make the prefix too unwieldy. While *unnili-* for one dozen may be palatable, and perhaps *unnilnili-* for one gross might be tolerable, beyond that *unnilnilnili-* for one grand and so forth become just too unmanageable. Clearly, some more compact way of referring to large numbers is needed. This is where power prefixes come in.

Power Prefixes

Power prefixes are SDN's signature feature. As the term suggests, they represent powers of twelve. Just like a multiplier prefix, each power prefix starts with a string of digit roots. However, unlike a multiplier prefix, the digit string in a power prefix does not encode a simple whole number. Instead, it encodes the exponent for a power of twelve. SDN clearly marks the power prefixes as dozenal powers, by concatenating the digits strings with novel and distinctive endings not found in pre-existing numeric word-forms. SDN further distinguishes the positive powers of twelve from their reciprocals, the negative powers of twelve, by using distinctly different endings for positive versus negative powers.

The first dozen positive power prefixes are:

nilqua-	$(10^0{}_z)$	*unqua-*	$(10^1{}_z)$	*biqua-*	$(10^2{}_z)$	*triqua-*	$(10^3{}_z)$
quadqua-	$(10^4{}_z)$	*pentqua-*	$(10^5{}_z)$	*hexqua-*	$(10^6{}_z)$	*septqua-*	$(10^7{}_z)$
octqua-	$(10^8{}_z)$	*ennqua-*	$(10^9{}_z)$	*decqua-*	$(10^{Ɛ}{}_z)$	*levqua-*	$(10^{Ɛ}{}_z)$

[6]This article uses the word *grand* to signify the third power of twelve (1728_d or 1000_z). It can be interpreted as a shortened version of "grand gross" or "great gross." It is also a take-off on the slang usage of "a grand" as meaning "$1,000_d$".

The first dozen negative power prefixes are:

nilcia-	$(10^{-0}{}_z)$	*uncia-*	$(10^{-1}{}_z)$	*bicia-*	$(10^{-2}{}_z)$	*tricia-*	$(10^{-3}{}_z)$
quadcia-	$(10^{-4}{}_z)$	*pentcia-*	$(10^{-5}{}_z)$	*hexcia-*	$(10^{-6}{}_z)$	*septcia-*	$(10^{-7}{}_z)$
octcia-	$(10^{-8}{}_z)$	*enncia-*	$(10^{-9}{}_z)$	*deccia-*	$(10^{-\text{↊}}{}_z)$	*levcia-*	$(10^{-\text{↋}}{}_z)$

As shown, a positive power is formed by marking a digit string with a *-qua-* syllable (with suggested English pronunciation /kwə/). Its corresponding reciprocal, a negative power, is formed by marking the same digit string with a *-cia-* syllable (with suggested English pronunciation /sjə/ or /ʃə/). The contrast of a hard *q* sound merging into the labial glide of the *u*, versus the soft *c* sound merging into the fronted glide of the *i*, clearly distinguish these endings from each other. Furthermore, these are novel endings that will not be confused with any prior usage, including the endings marking the multiplier prefixes.

The positive power prefixes are also known as the *unqual* prefixes, after *unqua-*, the prefix for twelve to the first power $(10^{1}{}_z)$. Similarly, the negative power prefixes are known as the *uncial* prefixes, after *uncia-*, the prefix for twelve to the negative first power $(10^{-1}{}_z)$. Notably, the latter prefix is identical to the ancient Latin word *uncia*, which literally meant "one twelfth." (The English word *inch*, meaning "a twelfth of a foot," as well as *ounce*, meaning (originally) "a twelfth of a pound", are both derived from Latin *uncia*.) The Romans, as it turns out, had a robust system of words for common fractions, thoroughly dozenal in nature, with *uncia* as the centerpiece. Including this word as a power prefix in SDN was a deliberate coincidence.

Higher orders of magnitude, with exponents containing multiple digits, can be represented by simply concatenating multiple roots into a string before the final power-marking syllable, just as multi-digit whole numbers can be represented by stringing multiple roots before the final multiplier-marking vowel.

So for instance, the next couple dozen positive power prefixes are:

unnilqua-	$(10^{10}{}_z)$	*ununqua-*	$(10^{11}{}_z)$	*unbiqua-*	$(10^{12}{}_z)$	*untriqua-*	$(10^{13}{}_z)$
unquadqua-	$(10^{14}{}_z)$	*unpentqua-*	$(10^{15}{}_z)$	*unhexqua-*	$(10^{16}{}_z)$	*unseptqua-*	$(10^{17}{}_z)$
unoctqua-	$(10^{18}{}_z)$	*unennqua-*	$(10^{19}{}_z)$	*undecqua-*	$(10^{1\text{↊}}{}_z)$	*unlevqua-*	$(10^{1\text{↋}}{}_z)$
binilqua-	$(10^{20}{}_z)$	*biunqua-*	$(10^{21}{}_z)$	*bibiqua-*	$(10^{22}{}_z)$	*bitriqua-*	$(10^{23}{}_z)$
biquadqua-	$(10^{24}{}_z)$	*bipentqua-*	$(10^{25}{}_z)$	*bihexqua-*	$(10^{26}{}_z)$	*biseptqua-*	$(10^{27}{}_z)$
bioctqua-	$(10^{28}{}_z)$	*biennqua-*	$(10^{29}{}_z)$	*bidecqua-*	$(10^{2\text{↊}}{}_z)$	*bilevqua-*	$(10^{2\text{↋}}{}_z)$

And the next couple dozen negative power prefixes are:

unnilcia-	$(10^{-10}{}_z)$	*ununcia-*	$(10^{-11}{}_z)$	*unbicia-*	$(10^{-12}{}_z)$	*untricia-*	$(10^{-13}{}_z)$
unquadcia-	$(10^{-14}{}_z)$	*unpentcia-*	$(10^{-15}{}_z)$	*unhexcia-*	$(10^{-16}{}_z)$	*unseptcia-*	$(10^{-17}{}_z)$
unoctcia-	$(10^{-18}{}_z)$	*unenncia-*	$(10^{-19}{}_z)$	*undeccia-*	$(10^{-1\text{↊}}{}_z)$	*unlevcia-*	$(10^{-1\text{↋}}{}_z)$
binilcia-	$(10^{-20}{}_z)$	*biuncia-*	$(10^{-21}{}_z)$	*bibicia-*	$(10^{-22}{}_z)$	*bitricia-*	$(10^{-23}{}_z)$
biquadcia-	$(10^{-24}{}_z)$	*bipentcia-*	$(10^{-25}{}_z)$	*bihexcia-*	$(10^{-26}{}_z)$	*biseptcia-*	$(10^{-27}{}_z)$
bioctcia-	$(10^{-28}{}_z)$	*bienncia-*	$(10^{-29}{}_z)$	*bideccia-*	$(10^{-2\text{↊}}{}_z)$	*bilevcia-*	$(10^{-2\text{↋}}{}_z)$

The most important use of power prefixes is to serve as dozenal equivalents for the decimal prefixes provided by the Metric System, or as it is now styled, the International System of Units (SI). SDN power prefixes represent orders of magnitude just as the SI prefixes do, albeit SDN's are dozenal rather than decimal. Unlike SI, SDN requires no formal committee to coin ad hoc new names for ever greater orders of magnitude. As demonstrated, we can generate SDN power prefixes in a completely systematic way, using just the twelve dozenal roots. In fact, where SI can only manage to assign a prefix to every *third* order of decimal magnitude (every power of one thousand), SDN is able to construct a prefix for *every* order of dozenal magnitude, because of this systematic scheme.

In this regard, SDN's power prefixes are similar to those which Pendlebury devised for his TGM system. Pendlebury also derived his prefixes from familiar classical Latin and Greek roots, appending them systematically to achieve any desired order of magnitude. However, when facing the issue of how to distinguish his prefixes from pre-existing numeric forms, Pendlebury picked a very different strategy. Rather than keeping those forms intact and appending a distinctive ending, Pendlebury chose to mutate the classical roots in ad hoc, and in some cases, rather odd ways. In this author's opinion, this rendered his prefixes unnecessarily alien to most people already comfortable with Latin and Greek numeric forms.

Another difficulty with Pendlebury's prefix scheme was that he chose to distinguish his positive and negative power prefixes from each other without introducing any consonant sounds, but only by the difference of a single terminating vowel: *a* for the positives, *i* for the negatives. Unfortunately, these appear in unstressed syllables, which English speakers tend to pronounce, in both cases, as an indistinct schwa sound /ə/. In order to be clearly understood, this forces speakers to over-pronounce the ending vowels in an awkward and unnatural way.

However, SDN power prefixes, which were designed to avoid these drawbacks, do work quite well with the unit names from Pendlebury's TGM system. Thus, a one-dozen-Tim duration (slightly more than 2 seconds) can be called an *unquaTim*. A one-gross-Tim duration (25_d seconds) can be called a *biquaTim*. A one-grand-Tim duration (5 minutes or 1 *pentaminute*) can be called a *triquaTim*. A dozen-grand-Tim duration (1 hour) can be called a *quadquaTim*. A day is equivalent to 2 *pentquaTim*, a month is about 5 *hexquaTim*, and a year is a bit more than 5 *septquaTim*. A dozenth of a Tim is an *unciaTim*, a dozenth of that (about 1.2_d milliseconds) is a *biciaTim*, and a dozenth of that (about a tenth of a millisecond) is a *triciaTim*.

Similarly, a one-dozen-Grafut length (about twelve feet) can be called an *unquaGrafut*, a one-gross-Grafut length can be called a *biquaGrafut*, a one-grand-Grafut length (about a third of a mile or half a kilometer) can be called a *triquaGrafut*, and a dozen-grand Grafut length (about 3.8_d miles, somewhat longer than a league) can be called a *quadquaGrafut*. A dozenth of a Grafut (about an inch) can be called an *unciaGrafut*, a dozenth of that (about 2 millimeters) a *biciaGrafut*, a dozenth of that a *triciaGrafut*, and a dozenth of that a *quadciaGrafut*.

Notice, for example, the clear distinction between a *triGrafut* (a three-Grafut length, about a yard) using the multiplier prefix *tri(na)-*, versus a *triquaGrafut* (a one-grand-Grafut length, about a third of a mile) using the power prefix *triqua-*.

SDN power prefixes are suitable for use not just with TGM, but with any dozenally-based system of measurement units, for instance Takashi Suga's Universal Units System (UUS).[7]

[7] http://dozenal.com.

In fact, there is nothing in principle to restrict applying SDN prefixes to other systems of measure that are not inherently dozenal, such as SI or Imperial units. Thus we might speak of *unquameters* or *biciagrams* or *triquafeet* or *hexciaseconds* or *septquapounds*, and so forth. However, SDN is most "at home" with dozenal metrologies.

Power prefixes can be used in other contexts beyond just units of measure. For instance, a *dodecahedron* can not only be called an *unnilihedron* (using the SDN multiplier prefix), it can also be called an *unquahedron* (using the SDN power prefix). And of course, the dozenal base itself can be called not only *unnilimal* (meaning "base one-zero") but also *unqual* (meaning "base dozen-to-the-first").

Combining Multiplier and Power Prefixes

So far, we have seen that multiplier prefixes allow us to express any whole number, although they do become quite tedious if the number is very large and requires a long string of *nil*s. And power prefixes allow us to express very large (or very tiny) numbers in a compact way, although they are strictly limited to exact powers of twelve. However, by simply concatenating a multiplier prefix with a power prefix, we gain a great deal of versatility to express arbitrary whole numbers.

For instance, since a day is two gross grand Tims ($200{,}000_z = 2{\times}10^5{}_z$ Tm), we can call it a *binapentquaTim*. In this case the *bina-* is a multiplier prefix signifying 2, and the *pentqua-* is a power prefix signifying $10^5{}_z$. Note that the final syllable on the multiplier prefix is *not* optional in this case. If we were to omit the *-na-* and just use *bi-*, this would be indistinguishable from a digit root and would be interpreted as part of the power prefix *bipentqua-*, which means $10^{25}{}_z$. Visually, it might help readers to hyphenate between the multiplier and power prefix: *bina-pentquaTim*. But the *-na-* syllable is still needed to make the distinction audible when spoken out loud.

Since a *triquaGrafut* is approximately a third of a mile, or a half a kilometer, we could speak of a *trina-triquaGrafut* ($3{\times}10^3{}_z$ Gf) as a TGM approximation of a mile, and a *bina-triquaGrafut* ($2{\times}10^3{}_z$ Gf) as a TGM approximation of a kilometer. (The colloquial names *gravmile* and *gravkay*, respectively, have been suggested for these lengths.)

Since an *unciaVolm* ($10^{-1}{}_z$ Vm) is intermediate between a U.S. and Imperial half-gallon, two of these ($2{\times}10^{-1}{}_z$ Vm) would approximate a gallon in either system. This could be called a *bina-unciaVolm* (although Pendlebury himself suggested the colloquial name *galvol* for this, and *halvol* has been suggested as a colloquialism for the *unciaVolm*).

Half an *unciaVolm*, i.e. 6 *biciaVolm* ($6{\times}10^{-2}{}_z$ Vm) approximates a U.S. or Imperial quart. This amount could be called a *hexa-biciaVolm*. (Pendlebury suggested the colloquialism *quartol*.)

Half of this, 3 *biciaVolm* ($3{\times}10^{-2}{}_z$ Vm) approximates a U.S. or Imperial pint. This could be called a *trina-biciaVolm*. (Pendlebury suggested the colloquialism *tumblol*, although *pintvol* has also been suggested.)

Half of this again, 16_z *triciaVolm* ($16{\times}10^{-3}{}_z$ Vm) approximates a U.S. or Imperial cup. This could be called an *unhexa-triciaVolm*. (The colloquialism *cupvol* has been suggested.)

One ninth of this, 2 *triciaVolm* ($2{\times}10^{-3}{}_z$ Vm) approximates a U.S. or Imperial fluid ounce (fl. oz.). This could be called a *bina-triciaVolm*. (The colloquialism *ozvol* has been suggested. Since there are 8 fluid ounces per U.S. cup, and 10_d fluid ounces per Imperial cup, a ratio of

9 ozvol per cupvol makes a nice compromise. Also, in dividing the galvol by four powers of 2 to get to the cupvol, we have strayed into what seems to be a binary system, but dividing by two powers of 3 at this point makes the ozvol one pergross of a galvol, returning us to a dozenal system.)

Dividing by two again yields one *tricia Volm* ($10^{-3}{}_z$ Vm). This happens to approximate a U.S. or Imperial tablespoon (approximately 15_d ml). (The colloquialism *supvol* has been suggested, the "sup" indicating that this is a "supper" or "soup" spoon.)

A third of this, or 4 *quadcia Volm* ($4{\times}10^{-4}{}_z$ Vm), approximates a U.S. or Imperial teaspoon (approximately 5 mL). This could be called a *quadra-quadcia Volm*. (The colloquialism *sipvol* has been suggested, since this kind of spoon gives you just a sip of tea.)

These combination forms are not limited to decorating only units of measurement, of course. For instance, base sexagesimal can not only be called *pentnilimal* ("base five-zero") using the multiplier prefix, it can also be called *penta-unqual* (base "five times dozen to the first") using a combination form. Similarly, base 120_d or $\text{Ɛ}0_z$, i.e., the so-called "long hundred" base, can be called either *decnilimal* or *deca-unqual*.

A 24_d-cell (20_z-cell), a four-dimensional Platonic hypersolid with two dozen octahedral cells, can be called a *binilichoron* or a *bina-unquachoron*. Likewise, a 120_d-cell ($\text{Ɛ}0_z$-cell), a four-dimensional Platonic hypersolid with a long hundred unquahedral cells, can be called a *decnilichoron* or a *deca-unquachoron*.

In some of the examples above, the power prefix began with a vowel, which is slightly awkward for some people to pronounce directly after a multiplier prefix (which always ends in a vowel): *bina-uncia Volm*, *penta-unqual*, *deca-unqual*, *bina-unquachoron*, *deca-unquachoron*. (This situation can also occur if the power prefix is *octqua-*, *octcia-*, *ennqua-*, or *enncia-*, but *unqua-* and *uncia-* are more common.) The hyphen provides some assistance, but SDN does offer an optional feature that can work around this issue: Append an extra *-n-* onto the multiplier prefix. Hence we can have: *binanuncia Volm*, *pentanunqual*, *decanunqual*, *binanunquachoron*, *decanunquachoron*. This extra *-n-* does not change the meaning and is entirely optional. It is just there for "euphony", i.e. to make the whole word easier to pronounce and easier to understand when heard.

Adding a Dash of "Dit"

With the combination forms above, we can now express any whole multiple of any power of a dozen. This scheme, in word form, is beginning to resemble what scientific notation does with mathematical symbols. In fact, only one more element is needed to completely reproduce scientific notation with words: some way of expressing a radix point. Note that this would be a *dozenal* point, not a *decimal* point.

Fortunately, there is a ready pronunciation for such a radix point: When a semicolon is used as a so-called "Humphrey point", it is customary to pronounce it "dit," in contrast to pronouncing a period as "dot". (This "dit" pronunciation could certainly be granted to any symbol used as a dozenal point, even the period used in this article.) Accordingly, SDN incorporates *dit* as a syllable that is acceptable within a multiplier prefix.

Recall our previous example giving the systematic name for the *cupvol* as the *unhexatricia Volm* ($16{\times}10^{-3}{}_z$ Vm). This can now be rendered equivalently as *undithexabicia Volm* ($1.6{\times}10^{-2}{}_z$ Vm), or even as *ditunhexa-uncia Volm* ($0.16{\times}10^{-1}{}_z$ Vm).

One twelfth of an hour, a *triquaTim*, is equivalent to 1 *pentaminute*, a 5-minute block of time. One twelfth of this, a *biquaTim*, is equivalent to 1 *biunisecond* (25_d or 21_z seconds). To continue dividing by twelve will require using *dit*: An *unquaTim* is equivalent to 2.1_z seconds, so it can be described as a *biditunisecond*. Dividing once more by twelve yields the Tim itself, which is equivalent to 0.21_z second. This can be described in SDN as a *ditbiunisecond*.

As shown, the *dit* syllable may appear between multiplier digits, or even at the start of the multiplier prefix. (A *dit* following all the digits would be redundant and is not allowed.) No more than one *dit* may appear, somewhere among the digit roots.

With this feature, SDN can now render any value that can be expressed in the dozenal version of scientific notation. However, this has not actually increased the number of rational numbers we can express, because any such numbers can always be recast as a whole-number multiple of some different power of dozen. All that introducing *dit* has done is provided more flexible ways of expressing the same values.

. . . and a Pinch of “Per”

To actually render even more rational numbers requires one more feature: an optional *per* syllable as part of a multiplier prefix. What this syllable does is divide the digits of a multiplier into a numerator string and a denominator string, expressing an arbitrary fraction.

For example, if we wish to express lengths of 5⁄7 Gf (five-sevenths of a Grafut) or 7⁄5 Gf (seven-fifths of a Grafut), neither can be expressed exactly in dozenal scientific notation, because neither 7 nor 5 is a factor of twelve. However, using a *per* syllable, we can describe these as a *pentperseptaGrafut* and a *septperpentaGrafut*, respectively.

At most one *per* may appear within a multiplier prefix, as long as it is followed by at least one digit root for a denominator. The *per* may be the first element in the multiplier prefix, in which case the numerator is presumed to be 1, without the need for a preceding *un* syllable. So, for instance, if a teaspoon is one third of a tablespoon, and hence one *sipvol* is one-third of a *supvol*, and the *supvol* is exactly 1 *triciaVolm*, then the *sipvol* can be described as a *pertrina-triciaVolm*.

If a *biquaTim* is equivalent to 21_z seconds, then we can take the reciprocal and say that one second is equivalent to ($1/21_z$)of a biquaTim. Using per, this can be described as a *perbiuni-biquaTim*.

Conclusion

In summary, SDN takes a set of just one dozen numeric roots, adds three distinctive prefix endings (*-a-*/*-i-*, *-qua-* and *-cia-*), plus two optional syllables (*dit* and *per*), and from those basic elements derives an arbitrarily extensible system of numeric prefixes that may be applied to a variety of purposes with great flexibility. The roots themselves should be readily recognizable, not only to dedicated dozenalists, but in fact to anyone reasonably acquainted with existing numeric combination forms, and certainly to anyone conversant with IUPAC’s standards. By capitalizing on such an international standard (and in fact incorporating it wholesale), while at the same time clearly distinguishing the new dozenal features, the expectation is that this will maximize the likelihood that a systematic nomenclature based on dozenal arithmetic can achieve broad acceptance.