NUMBER-SPECIFICATION IN NUMERAL *CIEN*: WHERE GENERALITY MEETS LEXICAL SPECIFICITY

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ABSTRACT. Numbers express the primary concept of cardinality, the measure of the number of elements in a set that answers the question *how many?* Linguistically, they are conveyed through simple (*dos* 'two') or complex (*doscientos* 'two hundred'). Although numerals higher than 1 are inherently plural, plurality only overtly appears on *cien* 'hundred' and *millón* 'million' and only when the numeral is part of a multiplicative number (*doscientas sillas* 'two hundred.f.pl chairs' vs. additive *ciento dos sillas* 'one and hundred two chairs'). The additive vs. multiplicative constraint on overt number is analyzed as follows: complex numerals have a functional head that encodes plurality. This head is potentially realized as an affix that attaches to the root. Since additive numerals involve coordination, the *Coordinate Structure Constraint* blocks -*s* from attaching to the root. Multiplicative numerals, on the other hand, allow for -*s* to attach to the root, since no additional structure blocks attachment. Plurality only appears overtly on *cien* 'hundred' and *millón* 'million' because the morphological insertion rules for plurality in cardinals treats the null plural as default and the -*s* plural as marked (and restricted to a few roots). Approximative numerals (*miles de personas* 'thousands of people') obligatorily show plural marking and *de*, instantiating yet another source of number, a functional DIV(ision) head.

Keywords. numerals; agreement; number; nominal structure; plurality; multiplicative numerals; additive numerals; Spanish.

RESUMEN. Los números expresan el concepto primario de cardinalidad, es decir, la medida del número de elementos en un conjunto que responde a la pregunta *¿cuántos?* Lingüísticamente, se expresan mediante formas simples (*dos* 'dos') o complejas (*doscientos* 'doscientos'). Aunque los numerales mayores que 1 son inherentemente plurales, la marca de pluralidad solo aparece de manera explícita en *cien* 'cien' y *millón* 'millón', y únicamente cuando el numeral forma parte de una estructura multiplicativa (*doscientas sillas* 'doscientas.f.pl sillas') frente a la aditiva *ciento dos sillas* ('ciento dos sillas'). La restricción entre numerales aditivos y multiplicativos respecto a la expresión explícita de número se analiza del siguiente modo: los numerales complejos poseen un núcleo funcional que codifica la pluralidad. Este núcleo se realiza potencialmente como un afijo que se adjunta a la raíz. Dado que los numerales aditivos implican coordinación, la *Restricción de Estructura Coordinada* impide que la -*s* se una a la raíz. En cambio, los numerales multiplicativos permiten que la -*s* se adjunte a la raíz, al no haber una estructura adicional que bloquee esa unión. La pluralidad solo se manifiesta explícitamente en *cien* 'cien' y *millón* 'millón' porque las reglas morfológicas de inserción para la pluralidad en los numerales cardinales tratan el plural nulo como forma por defecto y el plural en -*s* como una forma marcada (y restringida a unas pocas raíces). Los numerales aproximativos (*miles de personas* 'miles de personas') muestran obligatoriamente marca de plural y la preposición *de*, constituyendo así otra fuente de número, un núcleo funcional de DIV(isión).

Palabras clave. numerales; concordancia; número; estructura nominal; pluralidad; numerales multiplicativos; numerales aditivos; español.

1. Introduction

Numbers express the primary concept of CARDINALITY, the measure of the number of elements in a set that answers the question *how many?* From a mathematical point of view, natural numbers have the basic property that any N has a successor N + 1 regardless of what N is (Gelman & Butterworth 2005), making all numbers equal. Linguistically, however, numbers are conveyed through NUMERALS, which can be SIMPLE (*two*) or COMPLEX, formed by combinations of simple numerals (*twenty-two*). Although numerals above 1 convey semantic plurality (and trigger plural agreement), grammatical number is not uniformly realized as an overt morpheme for all numerals.[1] Grammatical number sometimes appears as an overt morpheme on the numeral itself, and sometimes it does not, depending on different factors. In (1)a, *cientos* 'hundred' is obligatorily marked for number (and gender), while *dos* 'two' in that example cannot be marked as plural. Similarly, *cuatro* 'four' in (1)b-c must be unmarked for plurality. As we will see, this depends on two separate factors: whether the numeral instantiates morphological plural marking at all (*cien* 'hundred' does, *cuatro* 'four' does not), and if it does, whether the numeral is simple, additive or multiplicative.

(1)   a.   Dos-cient-o-s   árbol-e-s
                two-hundred-M-PL   tree-EV-PL
                'Two hundred trees'
        b.   Cuatro   árbol-e-s
                four   tree-EV-PL
        c.   *Cuatro-s árbol-e-s
                four-PL   tree-EV-PL

While the mapping between semantic plurality and morphological number expression varies depending on the type of numeral, it is systematic in the sense that it applies uniformly to each numeral category, as in (1)a vs. (1)b. In this paper, I propose an analysis of how overt number morphology appears with specific numbers and not with others in Spanish. I propose that semantic plurality will be instantiated in different positions in the syntactic structure, supporting previous proposals (e.g. Borer 2005, Mathieu & Zareikar 2015, among others, see below). This basic structural pattern interacts with the different syntactic structures I will propose for additive vs. multiplicative complex numbers, resulting in the overt realization of number or its absence. The paper is organized as follows: section 1.1 presents the basic taxonomy of numerals in Spanish. Section 2 describes the patterns of word-order-dependent number morphology. Section 3 raises the question of why number patterns are so limited and simultaneously so systematic. Section 4 proposes an account of those patterns, arguing for a combination of different syntactic structures (one for additive numerals, another one for multiplicative numerals), and restricted lexical entries for specific cardinal numerals that determine whether number is overtly realized as a morpheme. Finally, section 5 argues that

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[1] Throughout the paper, I use "1", etc. to refer to the mathematical concept, and "numeral" to refer to the linguistic expression corresponding to a number (*two*). "Number" will refer to the syntactic concept (sg. vs. pl.), while "plurality" will be used primarily for the semantic concept.

cardinals show at least two distinct types of number with different distributions, that may provide evidence for distinct structural positions. Section 6 offers conclusions.

1.1. Basic word-order taxonomy of numerals in Spanish

NPs containing a cardinal numeral (henceforth NPC) can appear with or without an overt noun in Spanish, as seen in (2). When the noun is missing (see (2)b), it is generally contextually recovered, so that *seis* 'six' in (2)b can refer to ice-creams, or to whatever other relevant nominal is salient in the context.

(2)   a. Compramos seis   helados.
          bought   six   ice-creams
        'We bought six ice-creams.'
      b. Compramos   seis.
         bought   six
        'We bought six.'

While simple numerals are morphologically simple: *dos* 'two', *tres* 'three', etc, complex numerals combine two or more numerals using two strategies, ADDITIVE and MULTIPLICATIVE, that correlate with different word orders in languages like Spanish and English.[2, 3] Additive numerals express the grammatical equivalent of mathematical addition, frequently using an overt conjunction such as *i* in (3)a, or appear juxtaposed as in (3)b. In (3)a, the base *diez* '10' precedes and is conjoined with the numeral *seis* '6'.

(3)   a. Diec-i-seis   (Additive strategy)
        ten-and-six
        'sixteen'
      b. Ciento   nueve
        hundred   nine
        'One hundred and nine'

By contrast, multiplicative numerals join a base with another numeral, resulting in a complex numeral interpreted as multiplication, as illustrated in (4)a, where *seis* 'six' precedes the base *cientos* 'hundreds' to produce *seiscientos* 'six hundred', interpreted as 6 x 100. These two operations are combined in (4)b.

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[2] Ordering restrictions are not properties of mathematical multiplication or addition, for which order is not relevant:
    (i) $100 + 6 = 6 + 100$
    (ii) $6 \times 100 = 100 \times 6$

[3] Higher cardinals generally follow lower cardinals in multiplicative contexts, so that 200 is pronounced as *two hundred*, not **hundred two* (see Ionin & Matushansky 2018: 59).

(4) a. Seis-cient-o-s   (Multiplicative strategy)
        six-hundred-M-PL
        'Six hundred'
     b. Seis-cient-o-s   diec-i-seis   (Multiplicative and additive combined)
        six-hundred- M-PL   ten-and-six
        'Six hundred and sixteen'

Both Spanish and English show systematic deviations from these patterns. The numbers between 13 and 19 have a base-last pattern in English, as seen in (5)a. This is also true for numbers between 11-15 in Spanish, (see (5)b). These subregularities go hand-in-hand with variations in the morphology of the base in both languages (-*teen* vs. -*ty* 'ten' and *diez* vs. -*ce* 'ten' respectively).

(5) a. six-<u>teen</u>, seven-<u>teen</u>, eight-<u>(t)een</u>, nine-<u>teen</u>   (additive, base last)
     b. on-<u>ce</u>,   do-<u>ce</u>,   tre-<u>ce</u>,   cator-<u>ce</u>, quin-<u>ce</u>   (additive, base last)
        one-ten,   two-ten, three-ten, four-ten, five-ten

As suggested, the additive and multiplicative strategies correlate a meaning difference (addition, multiplication) with a word order difference that plays an important role in the overt morphological expression of number and gender in numerals like *cien* 'hundred', *mil* 'thousand' and *millón* 'million' in Spanish. Specifically, overt morphological number is only instantiated in multiplicative numerals, an issue we turn to in the following section.

2. Number and gender patterns in NPCs in Spanish

Grammatical number is active in two NPC domains in Spanish. First, numerals above 1 trigger obligatory plural marking on the noun, as seen in (6). The noun *libro* 'book' is obligatorily plural when it appears with the numeral *tres* 'three' (see (6)a vs. b), although the numeral itself is unmarked for number. Similarly, the verb is obligatorily plural when the NPC is a subject, as shown in (7)a vs. b and (8)a vs. b. Conversely, *un(o)* 'one' requires singular agreement on the verb (see (9)a-b, which can also be interpreted as indefinite 'a').

(6) a. Tres libro-s
        three book-PL
        'Three books'
     b. *tres   libro
        three   book.SG
(7) a. Llega-ron cuatro.
        arrive-PL   four
        'Four arrived.'
     b. *Lleg-ó   cuatro.
        arrive-SG four
        'Four arrived.'

(8) a. Seis-cien-t-a-s   person-a-s   solicit-aron   asilo.
        Six-hundred-F-PL   people--F-PL   requested-PL   asylum
        'Sixhundred people requested asylum.'
     b. *Seis-cien-t-a   person-a-s solicit-aron   asilo.
        Six-hundred-F.SG   people-F-PL requested-PL   asylum
(9) a. Un   estudiante/un-o   entró   por la puerta.
        One.M.SG   student.M.SG/one-M.SG entered   for the door
        'One student/one entered through the door.'
     b. *Un   estudiante/un-o   entra-ron   por la puerta.
         one.M.SG   student/one-M.SG entered-PL   for the door

Ionin & Matushansky (2006, 2018) argue that the nominal *libros* in (6)b is semantically singular despite appearances, and that the source of plurality is the entire DP, which undergoes "semantic concord" with the NP.

Second, certain numerals show overt morphological phi-features. This state of affairs is not unusual in many languages, since lower numerals tend to be more adjectival, and higher numerals tend to be more nominal (see Corbett 1978). Consequently, lower numerals trigger agreement. In Spanish, however, the distribution does not depend on whether the numeral is low or high. Only *cient-* 'hundred' and *millón* 'million' have overt morphological number with *cient-* also showing overt gender, as seen in (10).[4] The same pattern can be seen for *millón* 'million', which requires overt number in (11)a. By contrast, *mil* 'thousand' has no overt number in (12).

(10) a. Cuatro-cient-a-s person-a-s
          four-hundred-F-PL   persons-F-PL
          'Four hundred people'
      b. *Cuatro-cient-o/-a   person-a-s
          four-hundred-M/F.SG   persons-F-PL
(11) a. Cuatro millon-e-s   dos   person-a-s
          four   million-EV-PL two   persons-F-PL
          'Four million two people'
      b. *Cuatro   millón   dos   person-a-s
          four   million.SG two   persons-F-PL
(12) a. *Cuatro mil-e-s   person-a-s
          four thousand-EV-PL   persons-F-PL

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[4] *Cient-* 'hundred', *mil* 'thousand' and *millón* 'million' show plural marking in their partitive use, which can be approximative or cardinal. These include examples like (i)-(ii). See section 5.
   (i)   Mil-e-s   de persona-s
            thousand-EV-PL   of person-PL
            'Thousands of people'
   (ii)   Millon-e-s   de mosquito-s
            Million-EV-PL of mosquito-PL
            'Millions of mosquitos'

b. Cuatro mil   person-a-s
  four   thousand.SG   persons-F-PL
  'Four thousand people'

Numeral and indefinite *un* 'a, one' also shows overt gender in most varieties of Spanish, as seen in (13). Given its meaning, there is no overt plural counterpart of cardinal *un* 'one' (see (14)a vs. b), but the indefinite use of *un* 'a' can appear in the plural (see (14)c). By contrast, numeral *cuatro* 'four' cannot mark plurality, as seen in (13).[5]

(13)   a. Eran un-a   mujer   y   cuatro niñ-a-s.
          were one-F   woman.SG and four   girl-F-PL
          'They were one woman and four girls.'
       b. *Eran un   mujer   y   cuatro niñ-a-s.
          were   one   woman.SG and four   girl-F-PL
(14)   a. Veinti-un-(a) mujer-e-s
          twenty-one-F woman-EV-PL
          'Twenty-one women'
       b. *Veintiun-a-s   mujer-e-s
          twenty-one-F-PL woman-EV-PL
       c. Llegaron un-a-s   mujer-e-s
          arrived   indef-F-PL woman-EV-PL
          'Some women arrived'

These examples show an initial partition: numerals that can mark number overtly (*cient-, millón*, possibly singular for *un*) and those that cannot (all others).

In addition to this initial division, overt phi-morphology is only required for *cient-* in complex multiplicative numerals (see (10) and (15)a), not in additive ones (see (15)b-c), setting aside partitive contexts for the moment (see section 5).[6]

(15)   a.   Seis-cient-a-s   biciclet-a-s
            six-hundred-F-PL bicycle-F-PL
            'Six hundred bikes'
       b.   *Cient-a-s seis   biciclet-a-s
            hundred-F-PL   bicycle-F-PL
       c.   Ciento   seis biciclet-a-s

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[5] The forms in (14)a with and without overt gender marking on *un* are equally attested throughout the Spanish-speaking world.

[6] It is impossible to test the two contexts for *un* 'one', since it does not function as a head in multiplicative contexts:

  (i)   *Cien   un-o-s
           hundred   one-M-PL
           Intended meaning: 'one hundred ones'

    hundred six   bicycle-F-PL
    'One hundred and six bikes'

Millón 'million' follows a similar pattern: the numeral is marked as singular in additive contexts (see (16)a), and as plural in multiplicative contexts (see (16)b vs. c). The nominal is necessarily plural in all three examples.

(16)   a.   Un   millón   tres mil   biciclet-a-s
             one   million three thousand   bicycle-F-PL
             'A million three thousand'
      b.   Tres millon-e-s   tres mil   biciclet-a-s
             three million-EV-PL three thousand   bicycle-F-PL
             'Three million three thousand'
      c.   *Tres millon   tres mil   biciclet-a-s
              three million.SG three thousand   bicycle-F-PL

    Table 1 describes the number and gender patterns just described. All numerals (except for *un* 'one') require a plural noun or verb, but only *cient-* and *millón* overtly mark plurality in multiplicative numerals, and only *cient-* and *un* overtly agree in gender.

Table 1. Summary of the distribution of numerals

|	**Un 'one'/ cient- 'hundred'/ *millón* 'million'**	***Mil* 'thousand'**	**Other simple numerals**
External number agreement with N/V	Yes	Yes	Yes
Internal number morph. (multiplicative)	NA/Yes/Yes	No	No
Internal number morph. (additive)	No	No	No
Internal gender morph. (multiplicative)	Yes/Yes/No	No	No

3. The distribution of number in numerals

3.1. The structure of numerals

    Semantic analyses of numerals come in two basic types: those that propose a single semantic type for all numerals, simplex and complex (Ionin & Matushansky 2006, 2018), and those that

propose different types (e.g. Rothstein 2013, 2016, 2017). For a full summary of semantic accounts, see Ionin & Matushansky (2018).

Ionin & Matushansky (2018: 6) propose that simple cardinals have the semantics of modifiers (type $<<e,t>, <e,t>>$) that can combine with either a lexical NP (*three books*) or an NP that includes a multiplicative numeral (*three hundred books*). The cascading syntactic structure that underlies this semantic analysis merges the noun with the closest cardinal, and the result can merge with another cardinal, as in (17). The two cardinals in this structure do not form a constituent, while they do in other proposals (see He & Her 2022 for several arguments against Ionin & Matushanski's phrase structure).

(17)
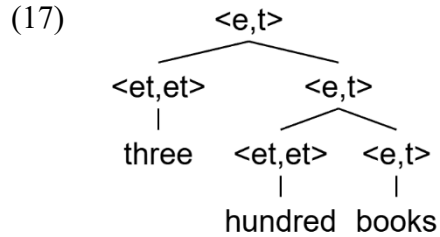
For additive numerals, Ionin & Matushansky (2018) propose a different structure that relies on the coordination of two full NPs. The additive numeral in (18)a derives from the conjunction in (18)b, with the first noun not pronounced. Semantically, the meaning of (18)a stems from the additive meaning on *and* that is derived by a set-product operation.

(18)   a.   Twenty two   books
        b.   twenty books & two books

Rothstein (2013, 2016, 2017) proposes that simplex cardinals have the semantic type of degrees (d) or numbers (n). Lower cardinals have type $<n>$, higher multiplicands have type $<n,<e,t>>$.

Syntactically, Franks (1994), Giusti (1997, 2002), Kayne (2010) propose that cardinal numerals are specifiers of a nominal projection, while Ritter (1991), Giusti (1997), Longobardi (2001), Shlonsky (2004), Borer (2005), Cardinaletti & Giusti (2006), among others, propose they are heads in their own projection. Danon (2012) suggests they can be both. The first proposal is more compatible with the cascading structure in (17), where the complex numeral does not form a separate constituent (e.g. Ionin & Matushansky 2006, 2018). As noted by Tatsumi (2021: 327), the cascading structure makes the wrong prediction in NP-ellipsis cases like (19)c (examples from Martínez Vera, p.c., cited by Tatsumi 2021). Taking (19)a as the overt baseline, (19)b illustrates that the elided element (indicated by *e* in the second conjunct) is interpreted as *fotos* 'photos'. However, when both *cientas* 'hundred' and the NP *fotos* 'photos' are missing, the second conjunct cannot be interpreted as "they took three hundred photos", as seen in (19)c. While the cascading structure in (20)a predicts the reading in (19)b (where only the NP is missing), it also seems to predict a similar reading with the structure in

(20)b, which is nevertheless unavailable for (19)c (see He & Her 2022 for other arguments against the cascading structure).

(19)   a.   Juan tomó   seis-cient-a-s   foto-s,   y   María tomó   tres-cient-a-s
            Juan took   six-hundred-F-PL photo.F-PL and Maria took   three-hundred-F-PL
            foto-s.
            photo.F-PL
            'Juan took six hundred photos and Maria took three hundred photos.'
       b.   Juan tomó   seis-cient-a-s   foto-s,   y   María tomó   tres-cient-a-s *e*.
            Juan took   six-hundred-F-PL photo.F-PL and Maria took   three-hundred-F-PL
            'Juan took six hundred photos and Maria took three hundred.'
       c.   Juan tomó   seis cient-a-s   foto-s,   y   María tomó   tres *e*.
            Juan took   six-hundred-F-PL photo.F-PL and Maria took   three
            'Juan took six hundred photos, and Maria took three (photos/*hundred photos).'
(20)   a.   [NP seis [NP cientas [NP fotos]]] &… [NP tres [NP cientas [~~NP fotos~~]]]
       b.   [NP seis [NP cientas [NP fotos]]] &… [NP tres [~~NP cientas [NP fotos~~]]]

Alternatively, complex numerals have been proposed to form a constituent independent of the NP (e.g. He 2015, He & Her 2022, Cinque 2023). The unavailability of the interpretation 'Maria took three hundred photos' in (19)c would follow if *trescientas* 'three hundred' forms a constituent whose parts cannot be elided separately. Tatsumi (2021) argues that some languages may have a cascading structure, while others do not. He further proposes that numerals in multiplicative structures have a different status: the multipliers are phrases while multiplicands are heads (see also Rothstein 2013, 2016, 2017). Žoha, Wągiel, & Caha (2022) suggest that the cascading and the constituent structures may be attested in different languages. Žoha et al. (2022) specifically propose the cascading structure for languages like Irish, while the alternative structure where the complex numeral forms a constituent without the NP may be more appropriate for Mandarin, Vietnamese and other classifier languages.

3.2. Number and gender agreement in numerals
   Hurford (1975) noted that cardinals tend to be defective with respect to the syntactic category they belong to. Cardinals in Spanish illustrate this observation, since they do not display the full range of phi-features compared to adjectives, nouns, or determiners. On the one hand, only a few numerals show overt phi-features, and only two show overt gender (*un* 'one,' *cient-* 'hundred'). On the other hand, overt phi-features are restricted to specific syntactic structures, i.e., multiplicative contexts, a constraint that does not apply to regular adjectives, nominals or determiners. While some adjectives have overt gender morphology (see *chiquito/a* 'small' in (21)) and others lack it (see *azul* 'blue' in (22)), those patterns are systematic: adjectives that appear with overt gender always do so whenever there is a noun that triggers agreement, as *chiquito/a* 'small' shows in (21). This adjective cannot omit the gender morphology or replace it with an unmarked *-e*.

(21)   a.   bus   chiquit-o
          bus.M   small-M
          'Small bus'
     b.   *bus   chiquit-a
          bus.M   small-F
     c.   *bus   chiquit-e
          bus.M   small

(22)   a.   muñec-a   azul
          doll-F   blue
          'Blue doll'
     b.   muñec-o   azul
          doll-F   blue

By contrast to gender, plural morphology appears on all adjectives, as nouns and determiners do, as seen in (23). Missing plural inflection on the determiner or the adjective is ungrammatical (see (23)b-c respectively).

(23)   a.   L-a-s   muñec-a-s roj-a-s
          the-F-PL doll-F-PL   red-F-PL
          'The red dolls'
     b.   *L-a   muñec-a-s roj-a-s
          the-F.SG doll-F-PL   red-F-PL
     c.   *L-a-s   muñec-a-s roj-a
          the-F-PL doll-F-PL red-F.SG

In this sense, Spanish numerals are in a categorial cline where *un,* and *cien* are closer to regular adjectives or nouns in showing overt gender and number morphology, while numerals like *cuatro* 'four' are further away because they never show overt gender and number morphology. I formalize this observation in Distributed Morphology terms by stating that the vocabulary insertion rules for *cuatro* 'four' do not list an overt morpheme for the plural number feature, while the rules for *un* or *cien* do, as we will see below. Importantly, this categorial cline based on overt phi-feature expression does not match the traditional typological observations about numerals that separate lower numbers from higher numbers (see the discussion in sections 2 and 3.1, as well as Corbett 1978 and Rothstein 2013, 2016, 2017).

In addition to the unusual division observed for Spanish numerals from a typological perspective, it is not obvious why the overt expression of phi-features would be restricted to multiplicative contexts. Assuming that *cient-* 'hundred's phi-features would be expected to appear regularly, not only in specific contexts. For concreteness, let us assume Ionin & Matushansky's (2006, 2018) cascading structure for multiplicative numerals and the coordinating structure for additive numerals (*three hundred students and forty students*) with deletion of the first NP. Based on the distribution of other items that realize phi-features, we

might expect adjoined structures always to trigger agreement or always to avoid it, and we would expect full agreement in additive coordination, just like adjectives do when conjoined (see (24) and Camacho 1999, 2003, Bosque 2006). In the first example, the two adjectives match the gender of the noun *lluvi-a-s* (rain-F-PL). In contrast, when the adjectives do not match the noun's gender, the result is ungrammatical, as seen in the second example. This is true even if the adjective is in the "unmarked" masculine.

(24)   a. Intens-a-s   y   dens-a-s   lluvi-a-s
             intense-F-PL   and   dense-F-PL rain-F-PL
          'Dense and intense rains'
        b. *Intens-o-s   y   dens-o-s   lluvi-a-s
             frequent-M-PL   and   dense-M-PL rain-F-PL

If cardinals behave like adjoined adjectives, we would expect a pattern similar to (24), but that is not what happens, as we see in (25). In the first example, gender and number agreement are impossible between feminine, plural *ventanas* 'windows' and *cient* 'hundred'. The only possibility is to have *ciento* in singular, with a default word marker *-o* that does not agree in gender with feminine *ventana* 'window', as seen in (25)b.

(25)   a. *Cient-a-s   seis   ventan-a-s
             hundred-M-PL   six   window-F-PL
        b. Cient-o   seis   ventan-a-s
             hundred-wM   six   window-F-PL
   'One hundred and six windows'

    In sum, while regular adjectives that overtly mark phi-features do so systematically, cardinals that realize phi-features, do so only in syntactically conditioned environments. Furthermore, the adjunction vs. coordination analysis for multiplicative vs. additive contexts makes the opposite predictions with respect to phi-feature agreement than what we find with regular adjectives: coordinated adjectives agree, while coordinated numerals cannot.

4. The structure of numerals
    The main goal of this proposal is to account for the conditioned appearance of overt plural marking on the numeral *cient-* 'hundred'. Although this might seem a limited goal, the distribution we have seen is systematic and relies on general mechanisms available in other areas (number agreement, coordination, etc.). The account, therefore, reveals interesting properties of the structure of numerals that extend to other, more general cases. The basic premise is that the presence or absence of overt plurality in *cient-* 'hundred' reflects different syntactic structures (see Ionin & Matushansky 2006, 2018). I propose that plurality can be located in two distinct sites (see Borer 2005, Acquaviva 2008, 2009, 2016a, b, Wągiel & Caha (2020),), one as a feature of the numeral and the other as a separate functional head NUM.

The representation for a simple cardinal is given in (26) within a Distributed Morphology framework (Halle & Marantz 1993, Embick & Noyer 2007, among others). It includes a root corresponding to the cardinal and a nominalizer with two features: an interpretable, unvalued plural feature and a feature [CARD] that triggers certain lexical insertion rules specific to cardinals. For example, cardinal numerals like *cinco* ´five' lack overt plural morphology, so the corresponding insertion rule for plural will avoid the regular insertion of *-s* as a plural morpheme due to the presence of [CARD].[7] Note, in particular, that the default for plural in the context of [CARD] is ∅, while the plural default for nouns, adjectives and some determiners is *-s*. In this sense, a word like *docena* 'dozen' would not be marked as [CARD] despite its closeness to *diez* 'ten', because *docena* follows the regular morphological instantiation of plural with *-s* (*docena-s* 'dozens', thanks to an anonymous reviewer for discussion).

Following Pesetsky & Torrego (2007), I assume that phi-features are independently marked for valuation and interpretability. The feature [+PL] is interpretable and will yield semantic plurality in the case of a simplex cardinal (see Ionin & Matushansky 2006, 2013, for a different implementation of this assumption). However, this feature is unvalued (expressed as [__ +PL] in (26)); as a result, it will appear morphologically unmarked for plurality.

(26)   Seis 'six'

$$nP$$

$$n \left[\begin{array}{c} \_ + PL \\ CARD \end{array}\right] \quad \sqrt{6}$$
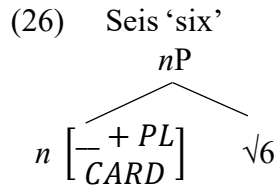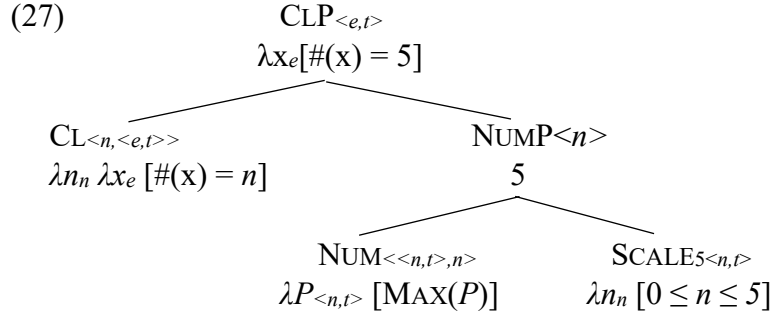
Following Wągiel & Caha (2020), I assume that numerals include two further functional heads. Those authors distinguish between numerals as abstract-counting or object-counting devices. The first type refers to objects such as the ones used in arithmetic calculations. The second one is the more frequent use of numerals in language (*five books*). The meaning of an object-counting number has three components, as in (27) for 5.[8] SCALE (for example [0,5] for 5) is a closed interval that contains all natural integers from 0 to the maximum (5 in this case). NUM is a function from intervals to numbers that maximizes the largest number in the scale, in this example, 5. Finally, CL is a function from an integer to a counting device that shifts the number to a predicate modifier that has the pluralization operation * (Link 1983) and the

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[7] Other quantified determiners like *cada* 'each' also lack plural morphology. It is possible that the analysis can be extended to this quantifier by revising the feature [CARD] to a one related to division or sorting. I leave this issue open.

[8] Wągiel & Caha (2020) and Wągiel (2024) formalize their proposal in a Nanosyntax framework (see Starke 2009 and subsequent work).
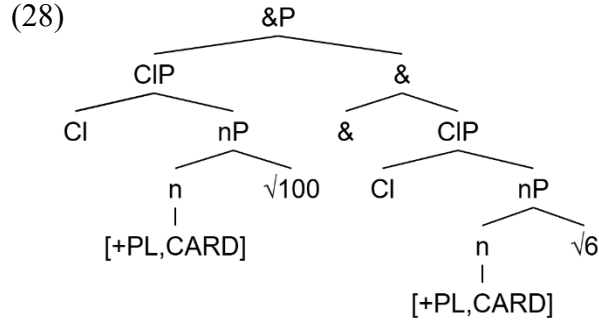
measure function #(P) (Krifka 1989).[9] One possible way of combining the representations in (26) and (27) is suggesting that the feature +PL in (26) corresponds to SCALE in (27), and NUM and CL are functional heads above nP (see also Ritter 1991, Borer 2005, Kayne 2005, Acquaviva 2008, 2009, 2016a, b).

(27)   CLP$_{<e,t>}$
              $\lambda x_e[\#(x) = 5]$

CL$_{<n,<e,t>>}$ NUMP$<n>$
$\lambda n_n \, \lambda x_e \, [\#(x) = n]$ 5

              NUM$_{<<n,t>,n>}$ SCALE5$_{<n,t>}$
              $\lambda P_{<n,t>} \, [\text{MAX}(P)]$ $\lambda n_n \, [0 \leq n \leq 5]$

Additive complex numerals such as *ciento seis* 'one hundred and six' are coordinated structures, as presented in (28). The head CL takes &P (a coordinated phrase, see Munn 1993 and subsequent work) as a complement; its first conjunct is the nP corresponding to *cien* and its second conjunct is the one corresponding to *seis*. The realization of & depends on the range of the numerals. For example, complex numerals under 100 overtly realize & in Spanish as */i/* in *noventa y nueve* 'ninety nine' but not in English (*ninety nine*). In contrast, numerals above 100 have the opposite pattern: & is null in Spanish (*ciento seis* 'one hundred and six') and overt in English *(one hundred and six)*. This distribution seems idiosyncratic and does not seem to have other syntactic or semantic consequences that I can see. I suggest it could be accounted for by a notation in the lexical insertion rule for & that restricts it to Ø for nP whose roots include √20 → √90. One possible alternative to (28) would be coordination at the CLP-level.

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[9] Ionin & Matushansky (2006, 2018: 14) propose a recursive semantic analysis for complex multiplicative numerals. It is based on the cascading syntactic structure in (ii).

(i) a. [[three hundred books]] = $\lambda x \in D_e \, . \, \exists S \, [\Pi(S)(x) \wedge |S| = 3$
                    $\wedge \, \forall s \in S \, \exists S' \, [\Pi \, (S')(s) \wedge |S'| = 100$
                    $\wedge \, \forall s' \in S' \, [[book]](s')]].$
     b. $\lambda x \in D_e \, . \, x$ is a plural individual divisible into three nonoverlapping individuals p_i such that their sum is x and each p_i is divisible into one hundred nonoverlapping individuals p_k such that their sum is p_i and each p_k is a book.

(ii) [$_{NP<e,t>}$ three [$_{NP<e,t>}$ [$_{NP<e,t>}$ hundred [$_{NP<e,t>}$ books]]]

(28)

```
                          &P
                ┌─────────┴─────────┐
              CIP                    &
          ┌────┴────┐        ┌───────┴───────┐
         CI        nP        &              CIP
              ┌─────┴─────┐          ┌────────┴────────┐
              n         √100        CI               nP
              |                               ┌────────┴────────┐
         [+PL,CARD]                           n               √6
                                              |
                                         [+PL,CARD]
```

An anonymous reviewer points out that the semantic interpretation for & cannot be Boolean 'and' because it would result in a plurality of two numbers rather than a single number. As a possible alternative, Wągiel (2024) proposes a formalization of arithmetical addition. The basic idea is that non-Boolean conjunction creates mereological sums (⊔) from the scales, which are formalized as vector-like objects that stack up when added, leaving no gaps and allowing no overlap. The resulting object is maximally self-connected, i.e. every part of the entity is connected to the whole and maximal. *Funf-und-zwanzig* 'twenty-five' in (29)a is interpreted as in (29)b: The maximal portion of the stacked vectors resulting from the sum of the two scales, represented in Figure 1 (see Wągiel 2024 for details on LOC).

(29)　　a.　funf-und-zwanzig　　　　　　　　　　　　　　　　　　(German)
　　　　　　　five-and-twenty
　　　　　　　'twenty-five'
　　　　b.　〚funf-und-zwanzig〛
　　　　　　　= MAX(LOC(〚SCALE$_5$〛⊔〚SCALE$_{20}$)〛)

*Figure 1. Representation of the sum of the two scales involved*
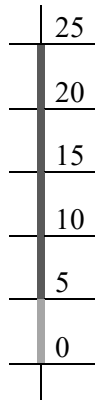
I assume that plural *-s* reflects the realization of the head CL. As an affix, *-s* must merge with *n*. Looking first at the additive context like *ciento seis* 'one hundred and six', *-s* cannot merge with *n* because both instances of the nominalizer are inside a conjoined phrase. As is well-known since Ross' (1967) **Coordinate Structure Constraint (CSC)**, conjuncts cannot

be individually extracted from a coordination. Extending the CSC to coordination within morphology, (30)a shows that the coordination of two stems sharing a number affix is ungrammatical, while coordination in (30)b occurs above the *n*P+CL level.[10] Although the exact reason why the CSC exists and applies to cases like (30)a remains to be fully explained, the generalization it encodes is strong (but see Lakoff 1986).

(30)   a. *L-a-s   [entrad-a   y salid-a]-s del   edificio
            the-F-PL entrance-F.SG and   exit-F.PL of.the building
       b. L-a-s   [entrad-a-s y salid-a-s] del   edificio
            the-F-PL entrance-F.PL and   exit-F.PL of.the building
       'The building's entrances and exits'

Given the structure in (28), the merger is blocked because *n* is inside a coordination phrase, and CL cannot attach to it, assuming that the CSC extends to morphological coordination.

(31) presents the structure corresponding to complex multiplicative numerals like *seiscientos* 'six hundred'. In this case, the multiplier (*six*) appears as the specifier of CL and the multiplicand (*hundred*) as a complement.

(31)

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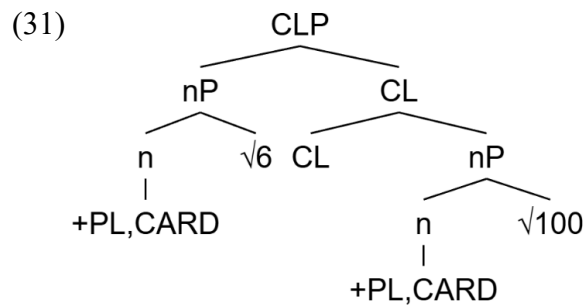
[10] Judgments are less sharp with clitics:

   (i)   Recóge-lo y   tráe-lo
           pick.up-CL and bring-CL
           'Pick it up and bring it.'
   (ii)   ??[Recóge y   tráe]-lo
             pick.up and bring-CL
   (iii)   *[Recóge-lo   y   trae]
             pick.up-CL   and   bring

The acceptability of (29a) itself varies depending on several factors, including ordering, so that (iv) is much mor acceptable, as an anonymous reviewer points out (see Camacho 1999, 2003).

   (iv)   Las   entradas   y   salida   del   edificio
           the-F-PL   entrance-F-PL and   exit-F-PL of.the building
           'The building's entrances and exit'

CL can merge with the *n* to its right in the structure in (31), appearing overtly as *-s*. I further assume that the Vocabulary Item (Halle & Marantz 1993, Embick & Marantz 2008) for CL depends on the type of cardinal: *cient-,* and *millón* have an entry for *-s*, but other cardinals do not. This assumption accounts for why only those numerals appear with overt plural marking. The proposed Vocabulary Items for CL are provided in (32). Following the conventions determined by the Subset Principle (Halle 1997), the more general rule for number in the context of cardinals inserts *-Ø* for plural in (32)b; the more specific rule in (32)a inserts *-s* for *cien* 'hundred' and *millón* 'million'.[11, 12]

(32)   a. CL[+PL,CARD] ⟷ -s / {√100, √1,000,000} __
       b. CL[+PL, CARD] ⟷ Ø

In sum, the two observed properties of numerals (having plural marking only on *cient-* and *millón,* and having gender/number only in multiplicative contexts) are accounted for by proposing a separate CL head combined with different structures for each type of complex numeral and by having separate Vocabulary Items for *cient-* and *millón* than for other cardinals.

It is worth pointing out that the root *cien* 'hundred' has another use to refer to, for example, a set of one hundred dollar bills (*hay dos cienes* 'there are two hundreds'). The plural in this case is directly attached to the root, and the numeral lacks gender. Furthermore, other cardinals are possible as well (*dos cuatros* 'two fours'), as in a card game. This does not reflect a cardinal interpretation: *dos cuatros* does not express the cardinality of a set that totals 8, but rather a cardinality of 2 (thanks to an anonymous reviewer for bringing my attention to these cases).

The analysis developed so far does not account for the distribution of gender, an issue we turn to next.

4.1. The role of *-to/-ta* in *ciento/cienta*

While the distribution of overt number morphology is derived from the analysis presented in the previous section, one important fact about *cient-* 'hundred' remains open. The only possible form for 100 as a simplex numeral is *cien*, as seen in (33)a vs. (33)b. Conversely, when the numeral 100 is part of a complex numeral (additive or multiplicative), the bare form *cien* is not possible (see (34)a), and the suffix *-to/-ta* must be added, as in (34)b. Finally, overt plural morphology requires *-to/-ta* (see (35)a vs. b). I gloss *-to/-ta* as T-M/T-F when the following vowel clearly indicates gender agreement, and as -TO when the role of the final vowel is unclear (as in *ciento seis plantas* 'hundred and six plants' in (34)b, where *plantas* is feminine).

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[11] An interesting observation is that the more marked plural morpheme *-s* in (24)a is the default for plurals with nominals and adjectives.

[12] As a reviewer points out, this an *ad hoc* claim, or to put it differently, the fact that only *cientos* 'hundreds', and *millones* 'millions' mark plurality overtly is a lexical property without wider syntactic or semantic consequences (as far as I can tell). The idiosyncratic nature of this property is formalized as a lexical insertion rule, where these kinds of variation are expressed.

(33)　　a. Cien　　(plantas)
　　　　　　hundred plants
　　　　　　'One hundred plants'
　　　　b. *Cien-to　　(plantas)
　　　　　　hundred-TO　plants
(34)　　a. *Cien　　　seis　(plantas)
　　　　　　hundred　　six　plants
　　　　b. Cien-to　　seis (plantas)
　　　　　　hundred-TO six plants
　　　　　　'One hundred six plants'
(35)　　a. Seis-cien-t-a-s　　　plant-a-s
　　　　　　six-hundred-T-F-PL　plant-TO-F-PL
　　　　b. *Seis-cien-(a)-s　　　plant-a-s
　　　　　　six-hundred-F-PL　　plant-TO-F-PL
(36)　　a. Seis-cien-t-o-s　　　libr-o-s
　　　　　　six-hundred-T-M-PL book-M-PL
　　　　　　'Six hundred books'
　　　　b. *Seis-cien-t-a-s　　　libr-o-s
　　　　　　six-hundred-T-M-PL　book-M-PL

Since *-to/-ta* varies according to the gender of the noun in multiplicative contexts (compare (35)a vs. (36)), we can further decompose *-to/-ta* into *-t* and *-o/-a*. The latter exponents correspond to gender, while *-t* may be the exponent for *n*. If this analysis is correct, the categorizer *n* in *cien* must be Ø, assuming that roots without a categorizer are not possible (Embick & Marantz 2008).

This analysis does not extend to *cien-to seis libros* 'hundred-TO six book-M-PL', since the final vowel is fixed and does not vary depending on the gender of the noun (see (34)b). It may be the case that this vowel is a default word marker that appears when gender is not overtly marked (see Harris 1991).

5. Approximative numerals

We turn to the relationship between the expression of number in exact numerals and approximative numerals, arguing that they involve different structures, specifically with respect to number. As suggested, exact numerals refer to the cardinality of a set, while approximative numerals indicate an approximate amount. In this sense, example (37)a indicates that the number of people denoted by the DP is close to a range determined by the numeral (100~900), but that example does not indicate an exact amount (similarly for *miles* 'thousands', *millones* 'millions'). These approximatives must appear with a partitive *de* 'of' (see (37)a, b), and must obligatorily mark plurality, as seen in (37)c. Only cardinals that can appear as multiplicands can also be used approximatively: *cientos* 'hundreds', *miles* 'thousands', *millones* 'millions', or combinations thereof (see (38)).

(37) a. Cien-to-s   de persona-s
         hundred-TO-PL   of people-PL
         'Hundreds of people'
      b. *Cien-to   person-a-s
         hundred-T.SG   people-F-PL
      c. *Cien-to   de person-a
         hundred-T.SG   of people-F.S

(38) Mil-e-s   de millon-e-s   de persona-s
      thousand-EV-PL of million-EV-PL of people-PL
      'Thousands of millions of people'

Millón 'million' has a more complex pattern: when it is a multiplicative numeral, it requires *de* and plurality (see (39)a vs. (39)b-c), unlike *cien* 'hundred' and *mil* 'thousand'. However, (39)a is ambiguous between an approximative or cardinal reading (made explicit in *exactamente seis millones de personas* 'exactly six million people'). To complicate matters further, if the complex numeral includes another additive numeral, then plural is possible, and *de* is not required or possible (as in (39)d).

(39) a. Seis millon-e-s   de persona-s
         six   million-EV-PL of people-PL
          'Six million people'
      b. *Seis millone-s persona-s
          six million-PL people-PL
      c. *Seis millon   de persona-s
          six   million.SG of people-PL
      d. Seis millon-e-s   cincuenta   person-a-s
         six   million-EV-PL fifty   people-F-PL
         'Six million fifty people'

5.1. Approximatives vs. exact numerals

Approximative numerals differ from exact numerals in several ways. First, as Rothstein (2017: 37) notes, only lexical powers (*ten, hundred, thousand*, etc.) can be used as approximatives, as seen in (40) for Spanish (see Zweig 2006 for a similar observation). (40)a-b show two possible lexical powers with the partitive, while (40)c shows a non-lexical power numeral that cannot appear with the partitive.

(40) a. Cien-to-s   de pat-o-s   (cf. seiscientos patos 'six-hundred ducks')
         hundred-TO-PL   of duck-M-PL
      b. Mil-e-s   de pat-o-s   (cf. seis mil patos   'six thousand ducks')
         thousand-EV-PL of duck-N-PL
      c. *Veinte-s   de pat-o-s   (cf. *seis veinte patos   'six twenty ducks')
         twenty-PL of duck-M-PL

Second, approximatives cannot include complex numerals, as seen in (41)a. In this sense, approximatives also differ from measure words, which can be quantified with a numeral (see (41)b), although they share having a partitive *de*.[13]

(41)   a. *Seis cien-to-s/cient-a-s   de person-a-s
            six   hundred-TO-PL/hundred-F-PL of people-F-PL
        b. Tres taz-a-s   de agua
            three cup-F-PL   of water

5.2. Number expression in approximatives and measure words

The number patterns in approximative cardinals are very similar to number patterns in partitive constructions with measure words such as *taza* 'cup' in (42)a. The measure word must be plural in Spanish, as seen in (42)b, unlike in languages like Persian or Azeri (Mathieu & Zareikar 2015). This suggests that their structure may be similar to that of approximatives.

(42)   a. Tres taz-a-s   de agua
            three cup-F-PL of water
            'Three   cups of water'
        b. *Tres   taz-a   de agua
            three   cup-F of water

Mathieu & Zareikar (2015) extend Borer's (2005) account proposing that the plural marking in measure words instantiates a higher type of plural related to counting (# in (43)). The lower
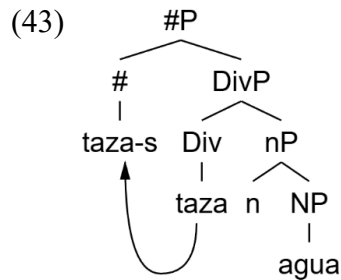
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[13] While approximatives cannot include a complex numeral (see (41)a), the counterpart with the adverb *aproximadamente* 'approximately' can. In this case, it lacks the partitive preposition (see (i)). Oddly, the adverb is also incompatible with a true approximative, as in (ii).

(i)   Aproximadamente seiscient-a-s   person-a-s
           approximately   sixhundred-F-PL   people-F-PL
           'Aproximately six hundred people'
   (ii)   ??Aproximadamente cien-to-s   de personas
              approximately   hundred-TO-PL   of people

(i) has subtly a different meaning than the true approximative in (37)a. It refers to a group of people whose approximate cardinality is 600. It could be 610 or perhaps 590, but *aproximadamente* points to the closest number that the speaker can guess for the size of a group, in other words, the cardinality is not undefined, just not precisely known. (37)a, on the other hand, does not suggest a group whose cardinality is close to 100, but rather a group whose precise cardinality is undefined, and ranges between 200~900.

One possible account of the difference is that the meaning of the numeral in (i) is the typical one for numerals: in the current analysis, it denotes a scale from $0 \longleftrightarrow 600$, maximized to 600. The adverb hedges on what the upper edge of that scale is. For (37)a, the scale seems different: $200 \longleftrightarrow 900$, and the maximation function does not apply to that scale, so cardinality is simply unknown.

number head is related to dividing. The measure word is in Div and moves to #, where it merges with the plural marker -*s*.

(43)

```
        #P
      /    \
    #      DivP
    |      /   \
  taza-s  Div   nP
         |     /  \
        taza  n   NP
                   |
                  agua
```

In this account, *de* is a case marker with no structural representation. However, *de* appears to play a role, or at least to signal an important difference, at least for approximatives, which cannot have a complex numeral with *de* (see (41)a), but can without *de* (see (44), without the approximative meaning).

(44)   Seiscient-a-s person-a-s
       six-hundred-F-PL person-F-PL
       'Six hundred people'

Making this analysis compatible with the assumptions presented in section 4, I would argue that the higher number-related head (# in (43), related to counting) corresponds to CL in (27), related to pluralization and measuring. The resulting structure appears in (45).
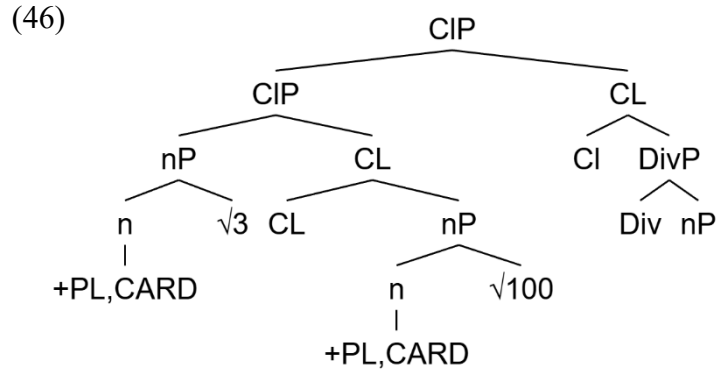
(45)

```
        ClP
      /     \
    Cl      DivP
    |       /   \
  mil-e-s  Div   nP
          |     |
         mil  personas
```
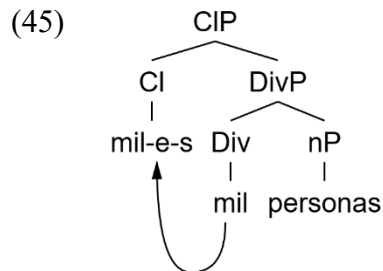
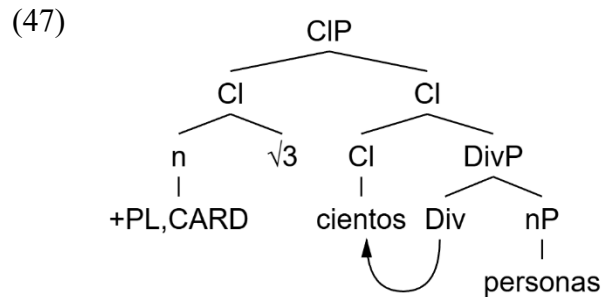The comparative properties of complex numerals, approximatives and measure phrases are presented in Table 2.

Table 2. Comparative properties of approximatives, measure phrases and complex numerals

	Approximatives	Measure phrase	Complex numeral
Allow for complex numerals	No	Yes	Yes
Appears with *de*	Yes	Yes	No

To account for this difference between approximatives and measure phrases with respect to the possibility of having complex numerals (see (41)a-b), consider the two possible derivations for a complex numeral with an approximative. In the first one in (46) assumes that the complex numeral forms a constituent, as other complex numerals do. In this structure, DIV and the CL heads on the right branch would remain null, possibly preventing a approximative reading.

(46)

```
                        ClP
              ┌──────────┴──────────┐
            ClP                     CL
       ┌─────┴─────┐            ┌────┴────┐
      nP           CL          Cl        DivP
   ┌───┴───┐    ┌───┴───┐            ┌────┴───┐
   n      √3   CL       nP          Div      nP
   │         ┌──┴──┐
 +PL,CARD    n    √100
             │
          +PL,CARD
```

If the structure is the one in (47), where the two numerals do not form a constituent, *cientos* would merge in DIV and raise to CL, licensing the approximative interpretation, but then it would not be possible to have a complex numeral interpretation.

(47)

```
                  ClP
          ┌────────┴────────┐
         Cl                 Cl
     ┌────┴────┐         ┌───┴────┐
     n        √3        Cl       DivP
     │                  │      ┌───┴───┐
  +PL,CARD          cientos   Div     nP
                        ↑↓              │
                                     personas
```

The remaining question is why (47) cannot be interpreted as "3 groups of approximately one hundred people", just as we can say *tres tazas de agua* 'three cups of water'. I believe the answer is that in *tres tazas, tazas* denotes individuated units, while in *tres cientos de personas*, *cientos* does not and it is therefore incompatible with the numeral. In other words, the nature of CL is different in each case.

6. Conclusions

Although the distribution of number morphology with numerals is limited, it is systematic. It follows naturally once we combine certain general structural principles with mechanisms to encode individual variability of morpheme insertion rules. The general structural principles involved are coordination and the specifier-head relation, two widely attested structures. Lexical entries determine that only a few numerals show the distinction between obligatory and impossible number agreement. The paper also extends previous findings that number can

be expressed at different levels: *n* or CL. However, these number heads do not equate to the CL number head proposed for measure words.

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References

Acquaviva, P. (2008). *Lexical Plurals*. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780199534210.001.0001

Acquaviva, P. (2009). Roots and lexicality in Distributed Morphology. In A. Galani, D. Redinger, & N. Yeo (Eds.), *Fifth York-Essex Morphology Meeting (YEMM)*, York Papers in Linguistics (Vol. 10, pp. 1–21). Retrieved from https://www.york.ac.uk/language/ypl/ypl2/10.html

Acquaviva, P. (2016a). *Categorization as noun construction. Gender, number, and entity types*. Retrieved from https://ling.auf.net/lingbuzz/003317

Acquaviva, P. (2016b). Structures for plurals. *Lingvisticae Investigationes*, *39*(2), 217–233. https://doi.org/10.1075/li.39.2.01acq

Borer, H. (2005). *Structuring Sense: Volume I: In Name Only*. Oxford linguistics. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199263905.001.0001

Bosque, I. (2006). Coordinated Adjectives and the Interpretation of Number Features. In L. Brugè (Ed.), *Studies in Spanish Syntax* (pp. 47–60). Venezia: Università Ca' Foscari.

Camacho, J. (1999). La Coordinación. In I. Bosque & V. Demonte (Eds.), *Gramática Descriptiva de la Lengua Española* (pp. 2635–95). Madrid: Espasa-Calpe.

Cardinaletti, A., & Giusti, G. (2006). The Syntax of Quantified Phrases and Quantitative Clitics. *The Blackwell Companion to Syntax* (pp. 23–93). John Wiley & Sons, Ltd. https://doi.org/10.1002/9780470996591.ch71

Cinque, G. (2023). *On Linearization: Toward a Restrictive Theory*. MIT Press. https://doi.org/10.7551/mitpress/14681.001.0001

Corbett, G. (1978). Universals in the syntax of cardinal numerals. *Lingua*, *46*, 355–368. https://doi.org/10.1016/0024-3841(78)90042-6

Danon, G. (2012). Two structures for numeral-noun constructions. *Lingua*, *122*(12), 1282–1307. https://doi.org/10.1016/j.lingua.2012.07.003

Embick, D., & Marantz, A. (2008). Architecture and blocking. *Linguistic inquiry*, *39*(1), 1–53. https://doi.org/10.1162/ling.2008.39.1.1

Embick, D., & Noyer, R. (2007). Distributed morphology and the syntax-morphology interface. In G. Ramchand & C. Reiss (Eds.), *The Oxford handbook of linguistic interfaces*. Oxford: Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199247455.013.0010

Franks, S. (n.d.). Parametric properties of numeral phrases in Slavic. *Natural Language & Linguistic Theory*, *12*(4), 597–674. https://doi.org/10.1007/BF00992929

Gelman, R., & Butterworth, B. (2005). Number and language: how are they related? *Trends in Cognitive Sciences*, *9*(1), 6–10. https://doi.org/10.1016/j.tics.2004.11.004

Giusti, G. (1997). The categorial status of determiners. In L. Haegeman (Ed.), *The New Comparative Syntax* (pp. 95–123). Longman.

Halle, M. (1997). Distributed morphology: Impov-erishment and fission. In B. Bruening, Y. Kang, & M. McGinnis (Eds.), *Papers at the Interface* (Vol. 30, pp. 425–449). Cambridge, MA: MIT Working Papersin Linguistics.

Halle, M., & Marantz, A. (1993). Distributed Morphology and the Pieces of Inflection. In K. Hale & S. J. Keyser (Eds.), *The View from Building 20* (pp. 111–176). Cambridge, Mass.: MIT Press.

Harris, J. W. (1991). The Exponence of Gender in Spanish. *Linguistic Inquiry*, *22*(1), 27–62.

He, C. (2015). Complex numerals in Mandarin Chinese are constituents. *Lingua*, *164*, 189–214. https://doi.org/10.1016/j.lingua.2015.06.014

He, C., & Her, O.-S. (2022). Complex numerals in English: constituents or not? *English language and linguistics*, *26*(4), 723–749. https://doi.org/10.1017/S1360674321000447

Hurford, J. R. (1975). *The Linguistic Theory of Numerals*. Cambridge University Press.

Ionin, T., & Matushansky, O. (2006). The Composition of Complex Cardinals. *Journal of Semantics*, *23*, 315–360. https://doi.org/10.1093/jos/ffl006

Kayne, R. S. (2005). A note on the Syntax of Quantity in English. *Movement and Silence* (pp. 176–214). https://doi.org/10.1093/acprof:oso/9780195179163.003.0008

Kayne, R. S. (2010). A note on the syntax of numerical bases. *Comparisons and Contrasts* (pp. 57–72). Oxford: Oxford University Press.

Krifka, M. (1989). Nominal reference, temporal constitution and quantification in event semantics. In R. Bartsch, J. van Benthem, & P. van Emde Boas (Eds.), *Semantics and Contextual Expressions* (pp. 75–115). Dordrecht: Foris. https://doi.org/10.1515/9783110877335-005

Lakoff, G. (1986). Frame Semantic Control of the CSC. In A. M. F. et al. (Ed.), *CLS 22 part 2. Papers from the Parasession on Pragmatics and Grammatical Relations* (Vol. 22). Chicago, Ill.: University of Chicago.

Link, G. (1983). The Logical Analysis of Plurals and Mass Terms: A Lattice-Theoretical Approach. In R. Bäurerle, C. Schwartz, & A. Von Stechow (Eds.), *Meaning, Use and Interpretation of Language* (pp. 302–23). Berlin: Walter de Gruyter. https://doi.org/10.1515/9783110852820.302

Longobardi, G. (2001). The Structure of DPs: Some Principles, Parameters, and Problems. In M. Baltin & C. Collins (Eds.), *The Handbook of Contemporary Syntactic Theory* (pp. 562–603). Oxford: Blackwell. https://doi.org/10.1002/9780470756416.ch18

Mathieu, É., & Zareikar, G. (2015). Measure words, plurality, and cross-linguistic variation. *Linguistic Variation*, *15*(2), 169–200. https://doi.org/10.1075/lv.15.2.02mat

Munn, A. (1993). *Topics in the Syntax and Semantics of Coordinate Structures*. University of Maryland.

Pesetsky, D., & Torrego, E. (2007). The Syntax of Valuation and the Interpretability of Features. In S. Karimi, V. Samiian, & W. Wilkins (Eds.), *Phrasal and Clausal Architecture: Syntactic Derivation and Interpretation* (pp. 262–294). Amsterdam: Benjamins. https://doi.org/10.1075/la.101

Ritter, E. (1991). Two functional categories in noun phrases. In S. Rothstein (Ed.), *Perspectives on phrase structure: Heads and Licensing* (pp. 37–62). San Diego, CA: Academic Press. https://doi.org/10.1163/9789004373198

Ross, J. R. (1967). *Constraints on Variables in Syntax*. MIT.

Rothstein, S. (2012). Numericals: counting, measuring and classifying. In A. Ana Chernilovskaya Aguilar-Guevara & R. Nouwen (Eds.), *Proceedings of Sinn und Bedeutung 16* (pp. 527–43). Cambridge, MA: MIT Working Papers in Linguistics.

Rothstein, S. (2013). A Fregean semantics for number words. In M. Aloni, M. Franke, & F. Roelofsen (Eds.), *Proceedings of the 19th Amsterdam Colloquium* (pp. 179–186). Amsterdam: Institute for Logic, Language, and Computation.

Rothstein, S. (2016). Counting and measuring: A theoretical and crosslinguistic account. *Baltic International Yearbook of Cognition, Logic, and Communication*, *11*, 1–49. https://doi.org/10.4148/1944-3676.1106

Rothstein, S. (2017). *Semantics for counting and measuring*. *Semantics for counting and measuring*. Cambridge, United Kingdom: Cambridge University Press. https://doi.org/10.1017/9780511734830

Shlonsky, U. (2004). The form of Semitic noun phrases. *Lingua*, *114*(12), 1465–1526. https://doi.org/10.1016/j.lingua.2003.09.019

Tatsumi, Y. (2021). The architecture of complex cardinals in relation to numeral classifiers. In M. Dočekal & M. Wągiel (Eds.), *Formal approaches to number in Slavic and beyond* (pp. 323–346). Berlin: Language Science Press. doi:10.5281/zenodo.5082476

Wągiel, M. (2024). *A non-Boolean analysis of conjunction in additive numerals*.

Wągiel, M., & Caha, P. (2020). Universal semantic features and the typology of cardinal numerals. *Catalan Journal of Linguistics*, *19*, 199–229. https://doi.org/10.5565/rev/catjl.296

Žoha, L., Wągiel, M., & Caha, P. (2022). The morphology of complex numerals: A cross-linguistic study. *Linguistics Beyond and Within (LingBaW)*, *8*, 200–217. https://doi.org/10.31743/lingbaw.14966