

Numerical alternatives and approximation of numerals using *some*

Curt Anderson (Michigan State University)

I investigate the interaction between the structure of cardinals and the use of the determiner *some* as an approximator, where it can be used in both a pre-numeral and post-numeral position (see 1, 2). I show that the post-numeral *some* approximative is constrained by the syntax of cardinal numbers, while the pre-numeral *some* is not. Based on interpretative differences between the constructions, I suggest that the pre-numeral *some* selects from a set of numerical alternatives modeling a pragmatic halo, while the post-numeral *some* relies on alternatives constrained by the syntax of the cardinal number. Using the tools of alternative semantics (Hamblin, 1973), I provide a compositional semantics for these constructions. The analysis is bolstered by data from Japanese, which has a similar approximative construction.

Some can be used for approximate interpretation with cardinal numbers both before numerals as in (1) and after numerals as in (2). In the pre-numeral construction, the modified numeral has an interpretation that can be paraphrased with *approximately*, e.g., *some twenty people* is akin to *approximately twenty people*. In the post-numeral construction, an “at least” interpretation arises, where the modified numeral specifies the lower bound of a set of possible numbers the numeral could denote. For instance, *twenty-some* specifies a set of numbers starting at 20 and increasing in value.

- (1) Pre-numeral *some*
 - a. ...a gigantic freshwater lake hidden under miles of ice for some twenty million years. (Google)
 - b. Some twenty-five species of butterfly have been considered... (Google)
- (2) Post-numeral *some*
 - a. We would load up a tank of gas at twenty-some cents per gallon... (Google)
 - b. ...the film was cut from an original eighty-some minutes... (Google)

There are semantic and syntactic restrictions on the post-numeral construction not shared by the pre-numeral construction. *Some* cannot freely occur post-numerally (see 3), even in cases where the pre-numeral *some* is licit (in 4). Second, not only does the post-numeral construction have an “at least” interpretation, but there is a bound on this interpretation set by the modified numeral: *twenty-some* is a set of numbers starting not just at 20, but ending at 29, and similarly, *hundred-some* is a set of numbers from 100 to 199. This meaning is an entailment and not an implicature (5, 6).

- (3) a. *five-some people b. *ten-some years
- (4) a. A shooting ... has left some five people injured. (Google)
- b. Some ten years ago I was walking around Reykjavik ... (Google)
- (5) There were twenty-some people at the party... (6) A hundred-some people were injured...
 - a. ...in fact, there were exactly twenty-five. a. ...in fact, it was exactly a hundred and fifteen.
 - b. * ...in fact, there were exactly thirty-two. b. * ...in fact, it was exactly two hundred.

These constraints are driven by the post-numeral *some* being sensitive to the syntax of cardinal numbers: numbers can be modified by *some* only if they may form a more complex cardinal through addition. *Twenty* can be modified by *some* because it can additively with *five* for *twenty-five*, for example, while *ten* and numbers lower than *ten* cannot be modified as they do not additively combine with other numerals in English. The upper bound on the interpretation arises from this constraint as well; 30 is not a possible interpretation for *twenty-some*, for example, due to the fact that *ten* would need to combine additively with *twenty*, which is impossible in English (**twenty-ten*).

Examples such as (7) and (8) show that *some* is not the head of the DP containing the modified noun, due to the presence of a definite determiner. Given this, I assume that *some* modifies the XP containing the numeral, and this XP is in turn adjoined to the NP. Numeral XPs themselves have structure and are recursively composed of other numeral XPs (Hurford, 1975).

- (7) ...among all the some 200 ethnic groups that we have in our country... (COCA)
- (8) Of all the teachers I knew in the 30 some years I taught here... (COCA)

An approximative construction similar in meaning occurs in Japanese. Japanese numerals “ten” through “nineteen” are syntactically complex (unlike English), and the indeterminate pronoun *nan(i)* “what” can abstract over syntactic positions in a complex cardinal, such as the ones-place in (9) or the tens-place in (10).

- (9) Juu -nan -nin -ka -ga kita. (10) Nan -juu -nin -ka -ga kita.
 Ten -what -CL(people) -KA -NOM came What -ten -CL(people) -KA -NOM came.
 ‘10 plus x people came.’ ‘x multiple 10 people came.’

Based on the Japanese evidence, I propose that a covert wh-word *wh* combines with the numeral in the post-numeral *some* construction, as in (11). *wh* denotes other numerical XPs that could possibly combine additively with the numeral *wh* has combined with. For example, *wh* would take the place of the ones-position in *twenty* and denote the set of numerical alternatives 1 through 9. These alternatives combine with the numeral via a rule of pointwise addition.

- (11) $[[[twenty\ wh] -some] people]$
 (12) $[[wh\ (in\ 11)]^c] = \{1, 2, 3, \dots, 9\}$
 (13) $[[twenty\ wh]^c] = \{20 + 1, 20 + 2, 20 + 3, \dots, 20 + 9\}$ (via pointwise addition)

Some binds this set of alternatives and selects a single alternative by way of a choice function (14). A typeshift *CARD* maps elements of D_n to $D_{\langle e, t \rangle}$ (see 15). *CARD* converts the chosen number to a property (16b), at which point it can combine intersectively with the denotation of the noun.

- (14) $[[\alpha - some]^c] = \{f_c([[\alpha]]^c)\}$, where f_c is a contextually defined choice function.
 (15) $[[CARD\ \alpha] = \lambda x\ [|x| = [[\alpha]]]$, where α is a numeral
 (16) a. $[[CARD\ twenty] = \lambda x\ [|x| = [twenty]]]$
 b. $[[CARD\ [[twenty\ wh] - some]] = \lambda x\ [|x| = f_c([[[twenty\ wh]]^c])]$

Additional support comes from Japanese. Kratzer and Shimoyama (2002) provide an analysis of Japanese indeterminate pronouns using an alternative semantics. Sets of alternatives combine until they are captured by quantificational operators. Slade (2011) and Cable (2010) argue that *-ka* denotes a choice functional variable, similar to the proposal above for *some*. *-Ka* selects from among the numerical alternatives, another parallel with post-numeral *some*. As expected by K&S’s analysis, when these alternatives are bound by *-ka* below the question operator *-ka*, the result is a yes/no question (17). When these alternatives are unbound and project to Q, a wh-question arises (18).

- (17) Nan -juu -nin -ka -ga kita ndesu ka?
 what -ten -CL(people) -ka -NOM came be Q
 ‘Is it the case that x multiple 10 people came?’ (yes/no question)
 (18) Nan -juu -nin -ga kita ndesu ka?
 what -ten -CL(people) -NOM came be Q
 ‘What is the number x, such that x multiple 10 people came?’ (wh-question)

In the pre-numeral construction, the numerical alternatives are supplied by the numeral’s pragmatic halo (Lasnik, 1999). The denotation of the numeral is unioned with its pragmatic halo, importing the pragmatic halo into the semantics, where it is visible to *some*. This is illustrated in (19), where $halo_c(\alpha)$ yields the pragmatic halo of some expression α .

- (19) $[[some\ twenty]^c] = \{f_c([[[twenty]] \cup halo_c([[[twenty]])])\}$

This work has several implications. The first is that numerical alternatives must be represented in the compositional semantics in order to be picked up by quantificational operators. Furthermore, these alternatives can be determined by the syntax, as in the case of the alternatives *wh* introduces, where the only licit alternatives are those that could combine additively with the numeral. This investigation of *some* gives us insight into non-canonical uses of the determiner and suggests *some* is sensitive to alternatives. Finally, this is a case study in how cross-linguistic data can be brought to bear on the syntax and semantics of approximation.

References

- Cable, S. A. (2010). *The grammar of Q: Q-particles, wh-movement and pied-piping*. Oxford University Press.
 Hamblin, C. (1973). Questions in Montague English. *Foundations of Language*, 10(1), 41–53.
 Hurford, J. R. (1975). *The linguistic theory of numerals*. Cambridge University Press.
 Kratzer, A., & Shimoyama, J. (2002). Indeterminate pronouns: The view from Japanese. In Y. Otsu (Ed.), *Third Tokyo Conference on Psycholinguistics* (pp. 1–25). Tokyo: Hituzi Syobo.
 Lasnik, P. (1999). Pragmatic halos. *Language*, 75(3), 522–551.
 Slade, B. M. (2011). *Formal and philological inquiries into the nature of interrogatives, indefinites, disjunction, and focus in Sinhala and other languages*. Unpublished doctoral dissertation, University of Illinois.