

LAGB 2015 Meeting, 17 September 2015

Fractions, scales and granularity

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Modified fractions

- Fractions modified by expressions such as
 - *More than*
 - *Less than*
 - At least
 - At most
 - About, etc. etc.
- Sometimes called *hedges*
 - However, items discussed here have crisp speaker commitments
 - e.g. “more than $2/3$ ” true iff quantity exceeds exactly $2/3$

Modified cardinalities

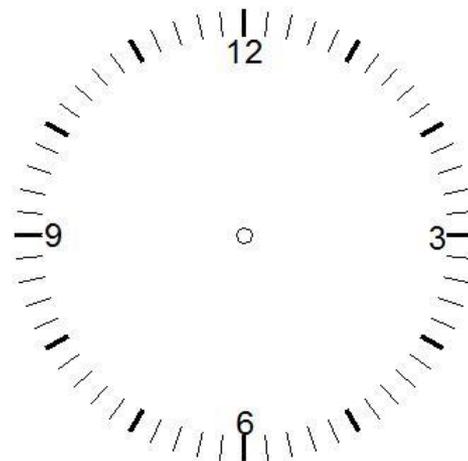
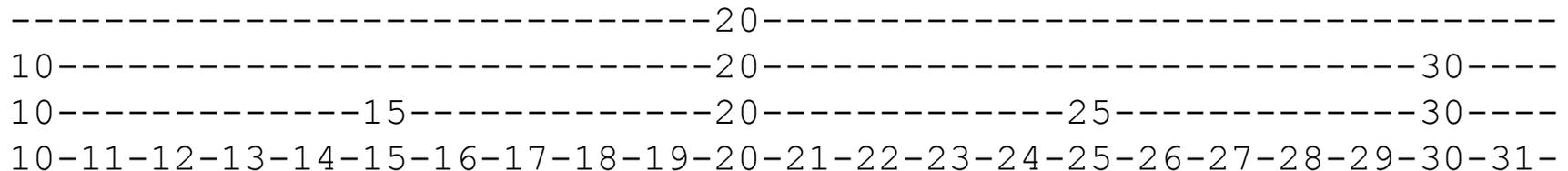
- Cummins, Sauerland and Solt (2012) looked at the interpretation of modified numerals, in cardinal settings
 - “There were more than n people present”
- Addressed question of whether quantity implicatures arise from “more than n ”
 - Generally (and superficially) depends on n
 - Implicatures from “more than 40”, not from “more than 4”, say
 - Presence of implicatures could account for why it’s odd to say “More than 1000 people live in London”

Round bounds

- Where present, pragmatic range interpretations for “more than n ” refer to salient (i.e. round) alternatives to n
 - “more than 40” \rightarrow “not more than 50”, rather than “not more than 41”
- Given some assumptions about the structure of the number line, this is easily explicable from any pragmatic perspective
 - Speaker prefers “more than 50” to “more than 40” if both true
 - Speaker may still prefer “more than 40” to “more than 41” if both true
 - Hearer therefore rational to infer bound at 50, not at 41

Which bounds are implicated?

- Fairly clear predictions for the domain of numerals, and others where granularity is well-understood



- Might the implicatures tell us something about fractions?

Motivation: their use

- Modified fractions used quite widely
 - Including in “high-stakes” contexts
 - Long-running debate in the medical literature about how to convey quantity information effectively
 - e.g. 32%, or “about a third”, or “almost one in three”, or “more than three in ten”, or “some”?
- Relatively little semantic and pragmatic research on this, with the notable exception of “more than half”

“More than half” vs. “most”

- Semantic similarity motivates a closer look (Solt, in press)
 - Some distributional differences:
 - More than half of / *most coin tosses land heads.*
 - More than half / *most of the US population is female.*
 - Federer has won most / *more than half of the Slams since 2003.*
- Proposals to explain the difference have focused on semantics (does “most” have a more complex meaning?)
- Little attention to the pragmatic enrichments that might arise (from either expression)

Empirical questions

- Does “more than a quarter” implicate “less than half”?
- Does “more than $\frac{3}{4}$ ” implicate “less than nine-tenths”?
- ...

Theoretical questions

- Which alternatives are salient, or relevant, for a given expression?
 - Is it possible for “finer-grained” alternatives to be pragmatically relevant, contra the approach of Krifka (2009)?
- Do we draw classic quantity implicatures in such a case, or do we exploit considerations of typicality instead?
- What kind of fractions do we find particularly salient?
 - Halving proposed as a cognitively efficient operation (cf. Jansen and Pollmann 2001)
 - Decimal system could also privilege tenths, etc.
 - Are thirds, fifths etc. pragmatically consequential to us?

First pilot studies

- Two questionnaires (15 and 14 items) fielded separately on Mechanical Turk (n=20 for each)
 - v1 aimed at “less than one quarter/fifth...” and counterparts
 - v2 aimed at quarters, fifths, tenths

A market research company has conducted a detailed survey on a large group of people, and has written up the results. For instance, “More than 50% of the participants are female”, “Less than 20% of the participants own two cars”, and so on.

You’re now going to read some expressions that have been used to summarise the results from the survey. For each one, please state the range of possible values, in percent, that you think the expression means.

For example, if the expression is “about half”, you might say that that means between 45% and 55%, or between 40% and 60%, etc.

There are no ‘correct’ answers: we’re interested in knowing what you think.

Outcome

- Three kinds of responses
 - Literal, no implicature – 0%/100% bound (about half the responses)
 - Apparent implicatures connected with stronger scale points
 - Sometimes of equally coarse or coarser granularity: *more than one tenth* = 10-20%, *more than a quarter* = 25-50%
 - Sometimes of finer granularity: *more than three quarters* = 75-90%
 - A few enrichments that don't seem to associate with scalar alternatives (but occur multiple times and don't look like errors)
 - *more than three quarters* = 75-85%, *more than four fifths* = 80-95%

Follow-up: order of presentation?

- Possible to get “ad hoc” scales for quantity too
- Test: two versions of a similar small experiment
 - v1: thirds and sixths, then tenths
 - v2: tenths, then thirds and sixths
- Little sign of any effect due to order:
 - Tenths are a salient alternative to thirds/sixths in some cases; the reverse is generally not true

(Necessarily tentative) conclusion

- Small samples, and eliciting percentages not ideal...
- However, appears that there is a clear distinction between what is coarse-grained and what is salient
 - Normal “rules” of granularity do not seem to apply here

Future directions

- Trying to get a clearer sense of what's going on in this domain
 - Mapping interpretations, perhaps modelling mechanisms
- Exploring relevance of this for high-stakes communication
 - Interpreting, for instance, “ $p < 0.05$ ”
- Scrutinising some experimental work on cognitive biases
 - e.g. is “5% fat” pragmatically the same thing as “95% fat-free”?