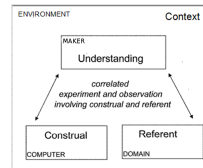## Varieties of construal



- Making construals as 'making connections in personal experience'
- The nature of this connection can be very varied: the referent may be more or less precisely identified, personal or objective, situated in the world or in the imagination etc



Representing numbers in base 10, 2, 3 and 6 (wmb/numberreps)



Representing prime numbers in base 10, 2 and 3 (wmb/scratch/prime)

## Construals as mental models

- Mental models of number that inform basic arithmetic and elementary number theory
- 'objects to think with' in Papert's sense
- Concrete physical metaphors that inform abstract models of great generality and power
- How a mathematician might visualise representations in different bases / primes

Visualising ratios in everyday relationships (sbr/ratioSimonSophie)

## Making construals as situating

- Number representation are 'pure maths'
- Abstract mathematical concepts such as number and ratio feature in 'applied maths'
- Applying maths means making connections you can directly experience ('sense-making') between abstract and concrete observables
- The hexary representation of numbers serves as a (familiar!) metaphor for time



Solving Elap's Hailstorm puzzle Listener Crossword No 4386 (wmb/puzzles/hailstorms)

## Making construals & learning skills

- Elap's Hailstorm puzzle is an ingenious way of making reasoning and calculating fun
- It features the Hailstorm sequence: based on two arithmetic ops that can be simply enacted on the number representation construal
- The aspiration is to make a detective game in which numbers identify people and houses etc
- Moving/deducing = calculating/reasoning