Computational problem solving

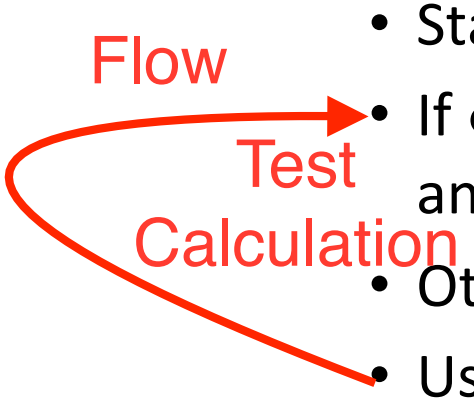
- What is computation?
  - What is knowledge?
  - Declarative knowledge
    - Statements of fact
  - Imperative knowledge
    - “how to” methods or recipes

Declarative knowledge

- "The square root of a number x is a number y such that $y*y = x$"
- Can you use this to find the square root of a particular instance of x? No

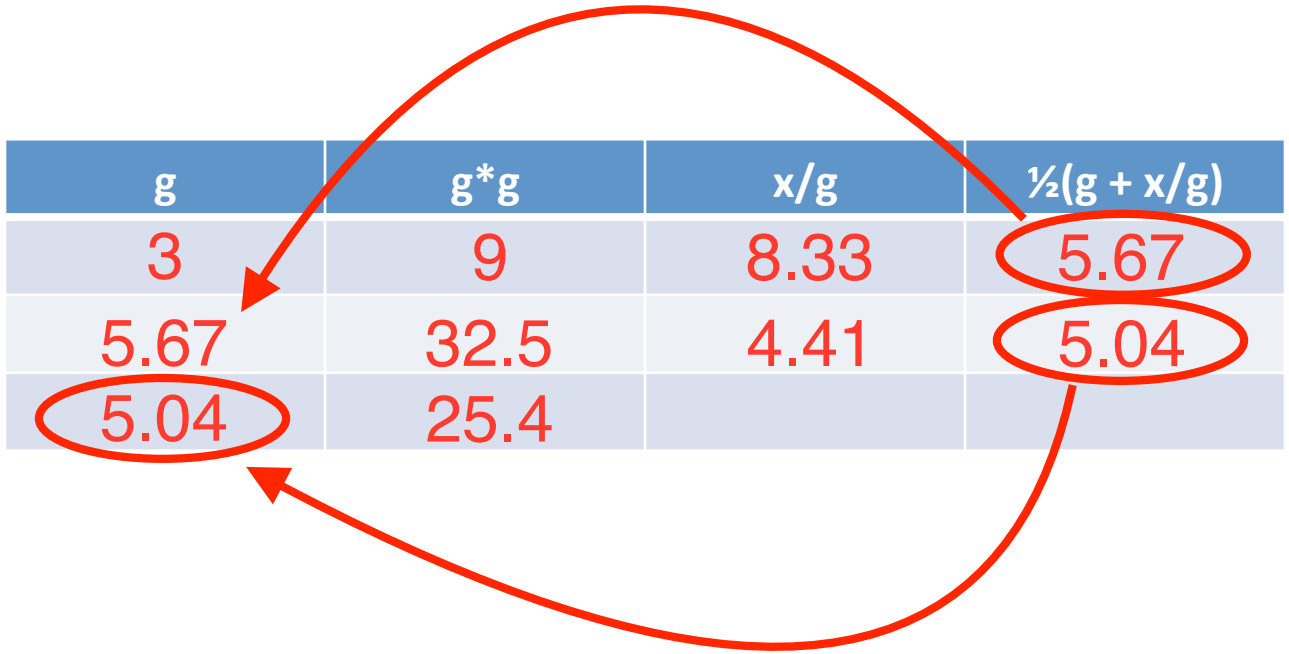
Imperative knowledge

- Here is a "recipe" for deducing a square root of a number `x` – attributed to Heron of Alexandria in the first century AD
  - Start with a guess, called `g`
  - If `g*g` is close enough to `x`, stop and say that `g` is the answer
  - Otherwise make a new guess, by averaging `g` and `x/g`
  - Using this new guess, repeat the process until we get close enough



An example

- Find the square root of 25



g	g*g	x/g	½(g + x/g)
3	9	8.33	5.67
5.67	32.5	4.41	5.04
5.04	25.4		

Algorithms are recipes

1. Put custard mixture over heat
2. Stir
3. Dip spoon in custard
4. Remove spoon and run finger across back of spoon
5. If clear path is left, remove custard from heat and let cool
6. Otherwise repeat from step 2