

# Computer Algebra Systems (CAS)

## Why and How

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# A Cognitive Science Based Developmental Approach:

- Learners construct their own knowledge and understanding: We cannot transmit ideas to passive learners
  - Strive for active student learning
- Knowledge and understanding are unique for each learner
  - Learners must become aware of difficulties and misconceptions unique to them

# A Cognitive Science Based Developmental Approach:

- Reflective thinking is the single most important ingredient for effective learning
  - Metacognition = Thinking about your thinking
  - This can be explicitly taught to students
  - Predict, reflect, check for reasonableness
- Failure is part of the learning process
  - The conundrum
  - The solution = create a safe place to fail

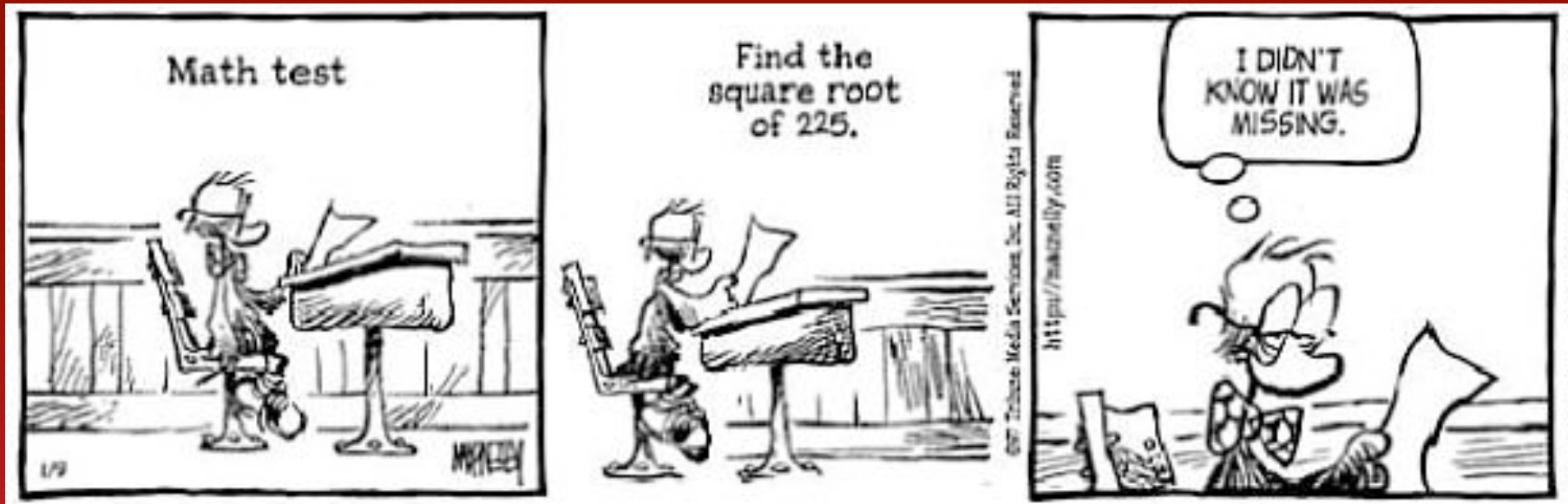
# Bloom's 2-Sigma Research

- Premise: 1-1 tutoring can improve student achievement 2 standard deviations above group work
- Effects size of other interventions
  - Mastery Learning 1.20  $\sigma$
  - Corrective Feedback 1.00  $\sigma$
  - Student Participation 1.00  $\sigma$
  - Cooperative Learning 0.80  $\sigma$
  - Classroom Morale 0.60  $\sigma$

# How CAS Can be Used to Support What Cognitive Science Research tells Us

- Promotes construction of knowledge through guided discovery
- Gives students corrective feedback
- Separates process from arithmetic
- Decreases intimidation that promotes deeper exploration of concepts
- Provides a means of checking work and reflection

# Using CAS to Reflect and Check



# Using CAS for Guided Discovery

- Construct their own knowledge
- Safe place to fail
- Individualized feedback
- Separates process from arithmetic



# CAS To Extend

