Building Math Talk for Sense Making in the Classroom

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a PK to Grade 6 math program

Heinemann
DEDICATED TO TEACHERS™

A nurturing meaning-making visual Math Talk Community

is an inquiry-based teaching/learning environment, and has a continual focus on sense-making by all participants.

Students are expected:

- to understand what they are doing,
- come to be able to explain their thinking,
- understand the thinking of other students,
- learn to seek help when they need it, and
- help others who need it.

Create a Nurturing Sense-Making Math Talk Community

The teacher orchestrates collaborative instructional conversations focused on the mathematical thinking of students, using these responsive means of assistance that facilitate learning and teaching by all:

- Engaging and involving
- Managing
- Coaching which is modeling, clarifying, instructing/explaining, questioning, feedback

Support Sense-Making in the Math Talk Community

The teacher supports the sense-making of all classroom members by using and assisting students to use and relate:

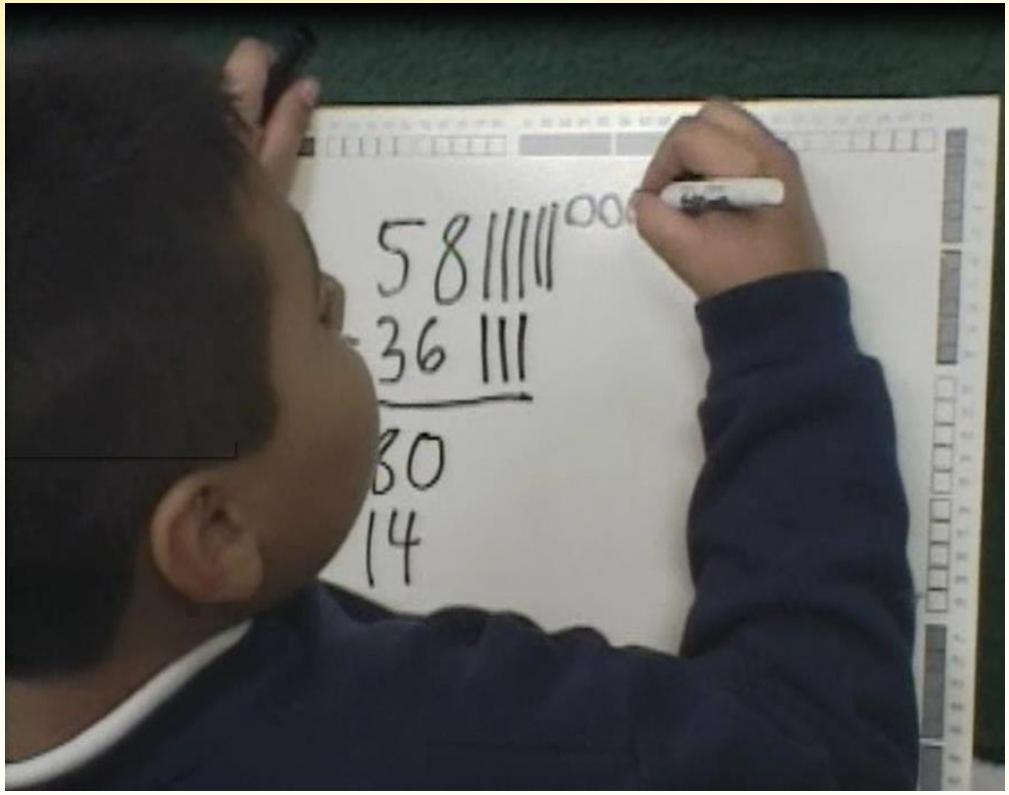
- Mathematical situations
- Pedagogical supports especially drawings
- Cultural mathematical symbols and words
- Student's own explanations of their thinking

Solve and Discuss Classroom Structure

Solve	Explain	Question	Justify
All students solve. Some solve at the board, and the rest at their seats.	**One student at the board** explains and then asks, "Are there any questions?"	**Other students** ask questions to clarify or extend.	The original explainer **responds to the questions** by explaining more (justifying the original explanation).

Any student at any time can ask for help from anyone.
For more practice, Solve and Discuss can take place in pairs or small groups.

Make the math thinking visible

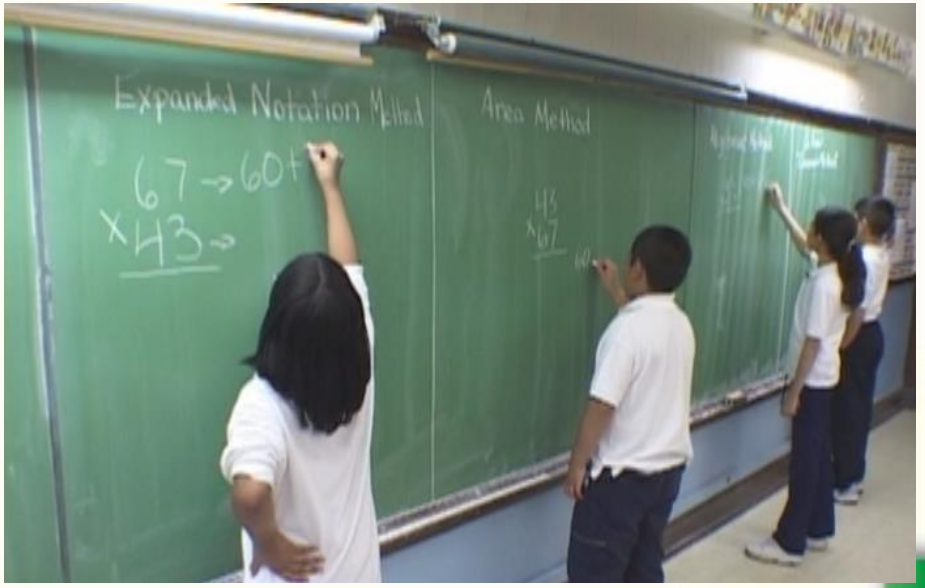


- Students must make some kind of math drawing related to the math symbols to show their thinking.
- This supports understanding by the listeners and promotes meaning.

Make the math thinking visible

- This is important for equity: less advanced students and English Learners are helped by the math drawing linked to the explanation by pointing.

- Be sure that important methods remain on the board or can be made visible again (e.g., on a Math Board) so they can be compared with other methods.



Students must speak and not just listen

2. “Bite your tongue” to provide wait time. Students will explain, ask questions, or add a comment if you wait.

1. Structure opportunities to explain to a partner and repeat what the partner says, if needed. Students eventually find their own words, but may need the security of saying an explanation they know is correct.

3. Help students speak to classmates by moving to the side or back of the room. Later remind students with a silent gesture to address each other.

A nurturing meaning-making visual
Math Talk Community
is what students and teachers need
to recover from the deprivations
of the covid years.

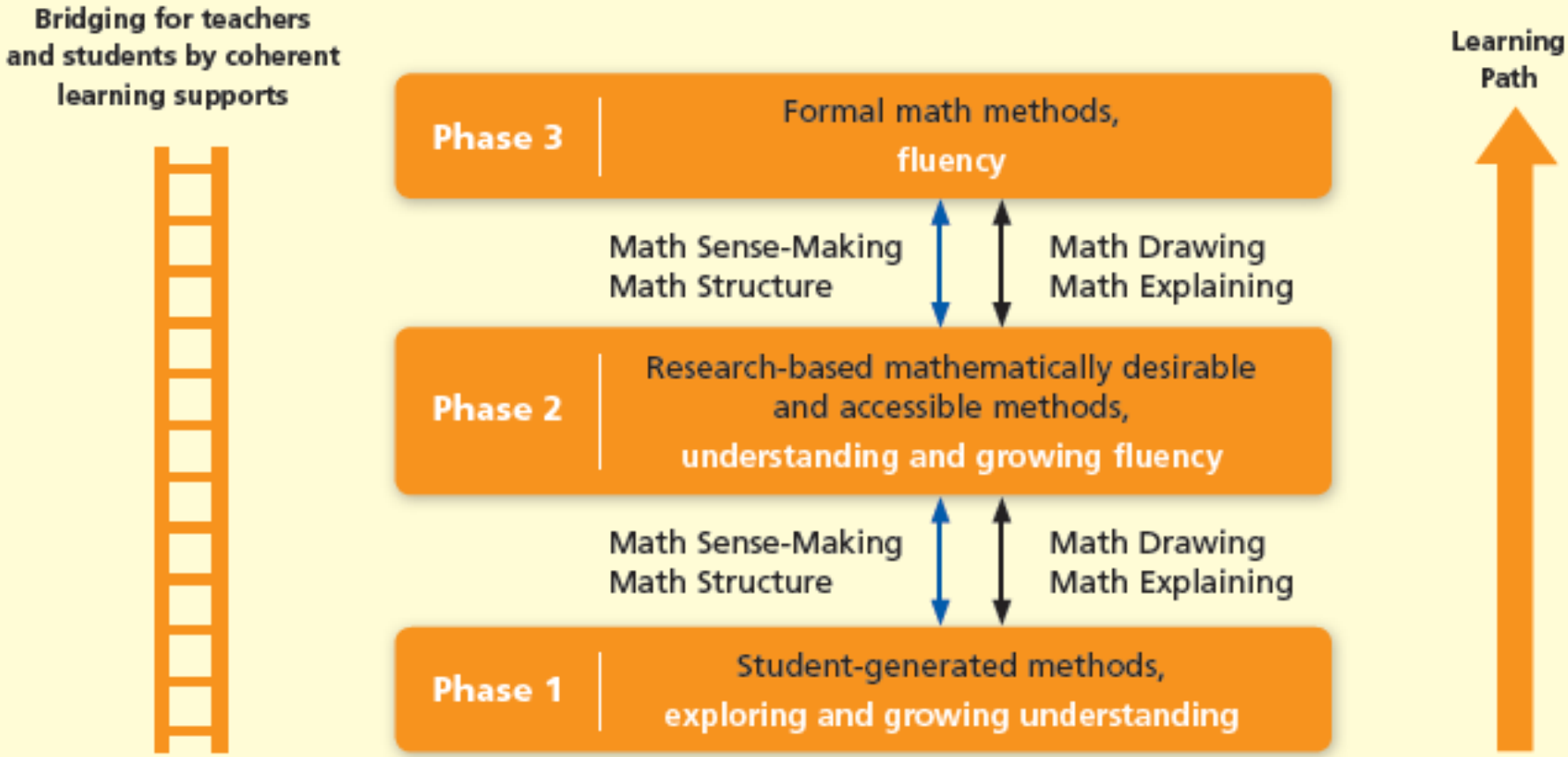
It is therapy for the soul and the self.
Everyone needs to belong to a community in which your thinking and your self is valued and in which you can help others.

A nurturing meaning-making visual
Math Talk Community
allows you to individualize within
whole-class discussions:

Several methods arise and are discussed, and you can introduce research-based methods that are accessible and mathematically desirable.

With the classroom math talk support, all students move to a strong method.

Inquiry Learning Path
in the Math Talk Community



Students develop math drawings to show their thinking.

Mathematical Practices			
Math Sense-Making	**Math Structure**	**Math Drawings**	**Math Explaining**
Make sense and use of appropriate precision.	**See structure and generalize.**	**Model and use tools.**	**Reason, explain, and question.**
MP1 Make sense of problems and persevere in solving them. **MP6** Attend to precision.	**MP7** Look for and make use of structure. **MP8** Look for and express regularity in repeated reasoning.	**MP4** Model with mathematics. **MP5** Use appropriate tools strategically.	**MP2** Reason abstractly and quantitatively. **MP3** Construct viable arguments and critique the reasoning of others.
Teachers continually assist students to do math sense-making about math structure using math drawings to support math explaining.			

Teachers continually assist students to do **math sense-making** about **math structure** using **math drawings** to support **math explaining**.

Balanced Inquiry Learning Path teaching requires situational diagrams, drawings of numbers, and mathematically-desirable and accessible computational methods.

My many years of classroom research focused on finding, developing, and testing these in varied classrooms of students.

These all involve learning paths to bring students from where they start to fluency with advanced enough methods.

You can find details of all of these on my website in the Teaching Progressions and in the Classroom Videos.

karenfusonmath.com

Teaching Progressions on karenfusonmath.com

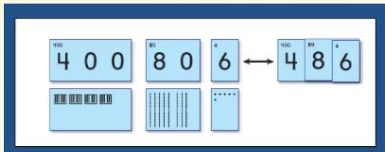
A Functioning Math Talk Community

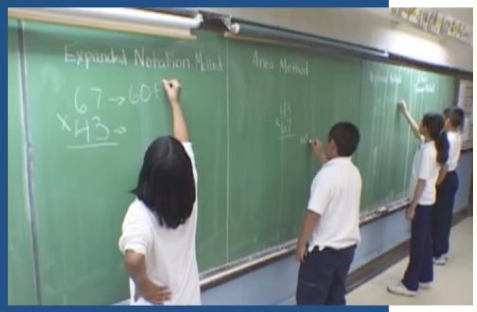
Source of Math Ideas

- The students contribute their ideas as the teacher or other students are teaching, confident that their ideas are valued.
- The students spontaneously compare and contrast and build on ideas.
- The teacher is still engaged and deciding what is important to continue exploring.

Responsibility for Learning

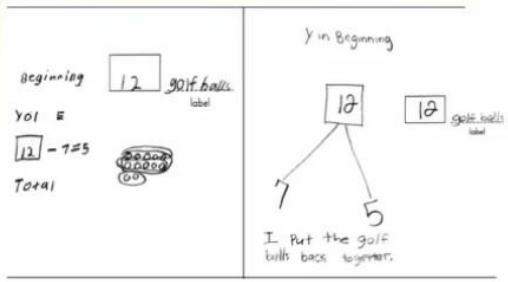
- The students listen to understand, then initiate clarifying other students' work and ideas for themselves and for others.
- The students assist each other in understanding and correcting errors.
- The teacher supports students as they help one another.





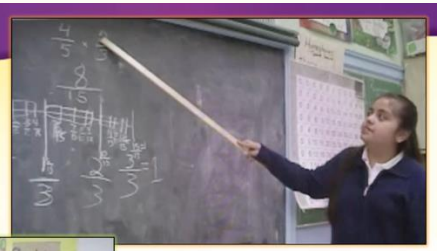
Yolanda has a box of golf balls. Eddie took 7 of them. Now Yolanda has 5 left. How many golf balls did Yolanda have in the beginning?

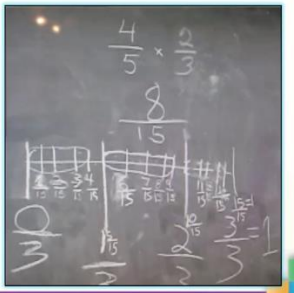
The key to solving story problems is understanding the situation. Students' equations often show the situation rather than the solution. Students drawings should be labeled to show which numbers or objects show which parts of the story situation.



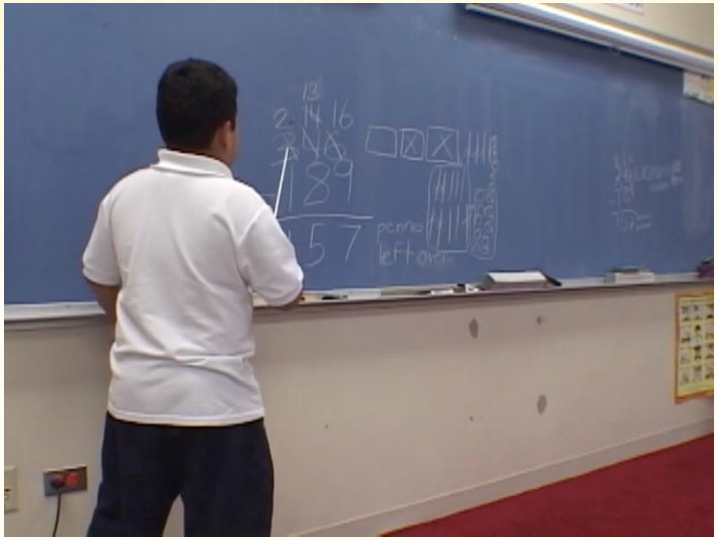
Math Talk Structure

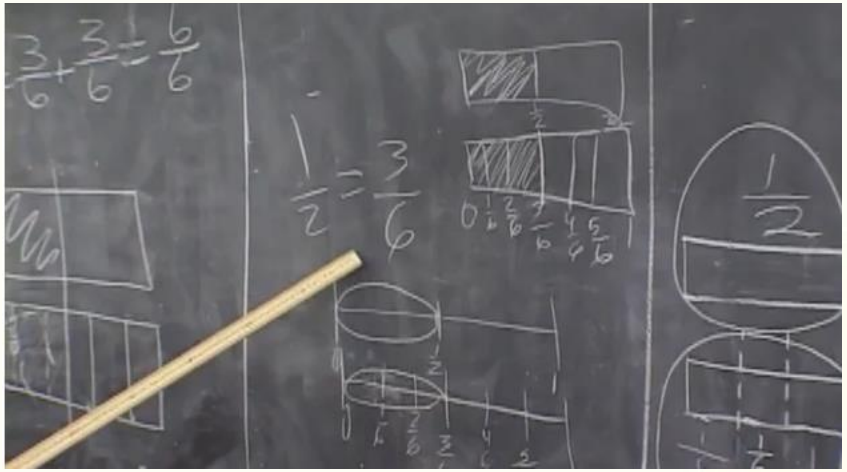
- Solve
- Explain
- Question
- Justify





Classroom Videos on karenfusonmath.com





The About menu on karenfusonmath.com
gives my background and describes each of the menu choices.
These include my publications and
visual presentations about my research.
The Teaching Progressions and Classroom Videos show the visual representations that help students show their thinking. They have been used in my math program *Math Expressions* to show that they work, but they can be used by anyone.

My email is karenfuson@mac.com

Expanding Number Talks
to Build Equitable Math Talk Classrooms

by Karen Fuson and Steve Leinwand

The paper above appeared in the March NCTM journal Mathematics Teacher: Learning and Teaching PK to G12.

It describes how limiting Number Talks are and how they can be extended to Math Talk in all lessons by having students use and discuss drawings and written methods.

It discusses some kinds of drawings students can make for different math domains, so it is a good resource for you in starting your Math Talk Community.

There is no one "standard algorithm." There are variations in ways to record efficient, accurate, and generalizable methods that form the collection of standard algorithms.

There are better methods; my research is about these. These are in Classroom Videos, papers, and Teaching Progressions on my website.

These are the mathematically desirable and accessible methods that are standard algorithms.

Most taken to be "standard algorithms" are difficult or misleading.

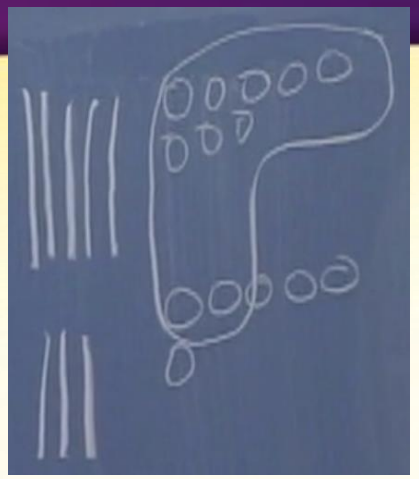
The CCSS say in the critical area for the first year of a given computation: "Students develop, discuss, and use efficient, accurate, and generalizable methods."

They do not say to wait until Grade 4 to do "standard algorithms."

More details are in the paper below (it is on my website under publications).

Fuson, K. C. & Beckmann, S. (Fall/Winter, 2012-2013). Standard algorithms in the Common Core State Standards. *National Council of Supervisors of Mathematics Journal of Mathematics Education Leadership, 14 (2)*, 14-30.

G1 New Groups Below 1.NBT.4



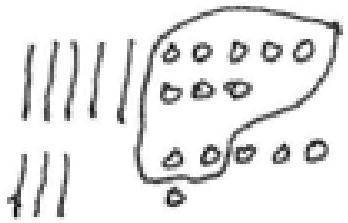
$$\begin{array}{r} 58 \\ +\ 36 \\ \hline 94 \end{array}$$

1

4

New Groups Below

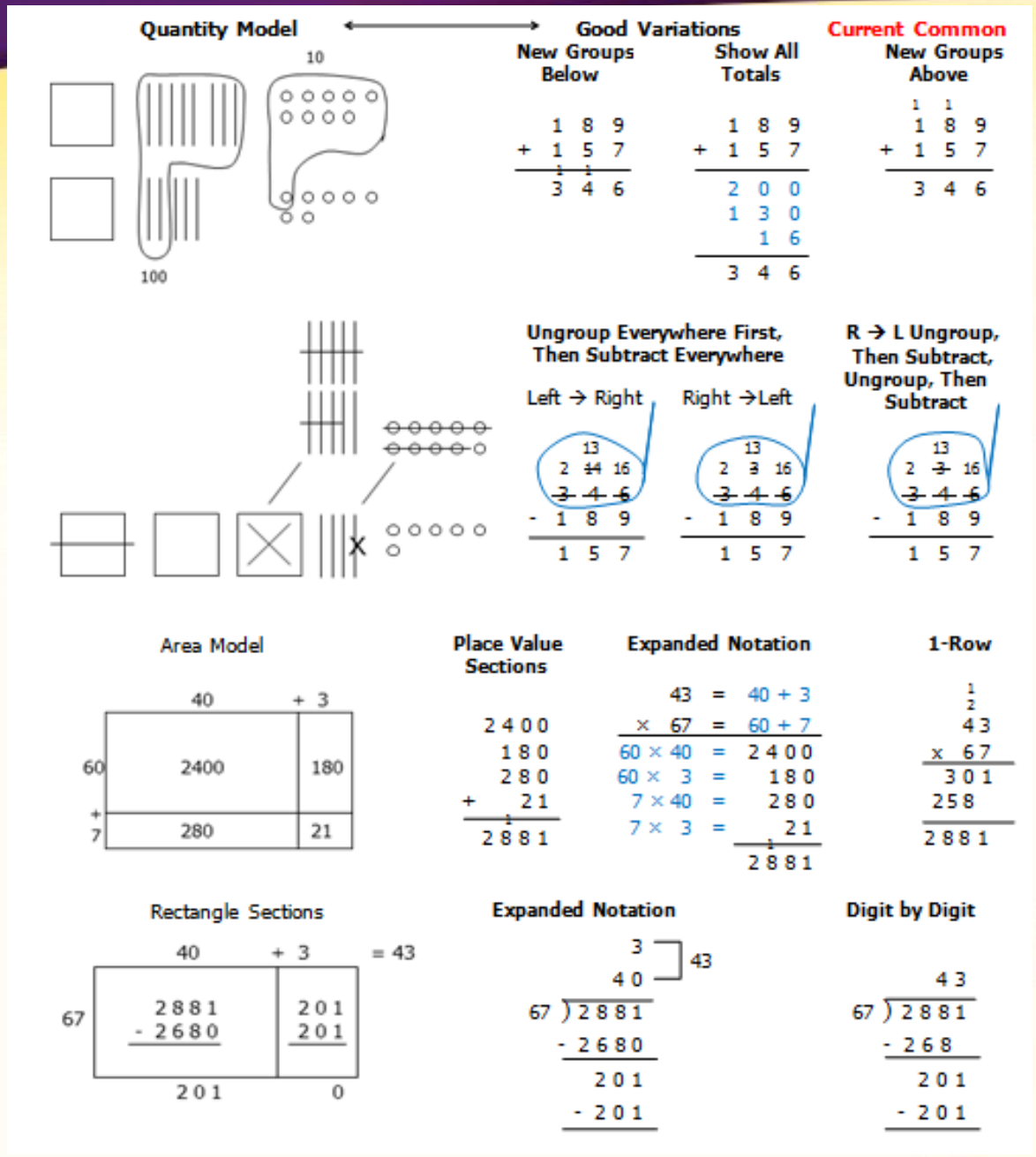
$$\begin{array}{r} 58 \\ +\ 36 \\ \hline 4 \end{array} \qquad \begin{array}{r} 58 \\ +\ 36 \\ \hline 94 \end{array}$$



New Groups Above

$$\begin{array}{r} {\scriptstyle 1} \\ 58 \\ +36 \\ \hline 4 \end{array} \qquad \begin{array}{r} {\scriptstyle 1} \\ 58 \\ +36 \\ \hline 94 \end{array}$$

Drawings and Written Variations of Standard Algorithms



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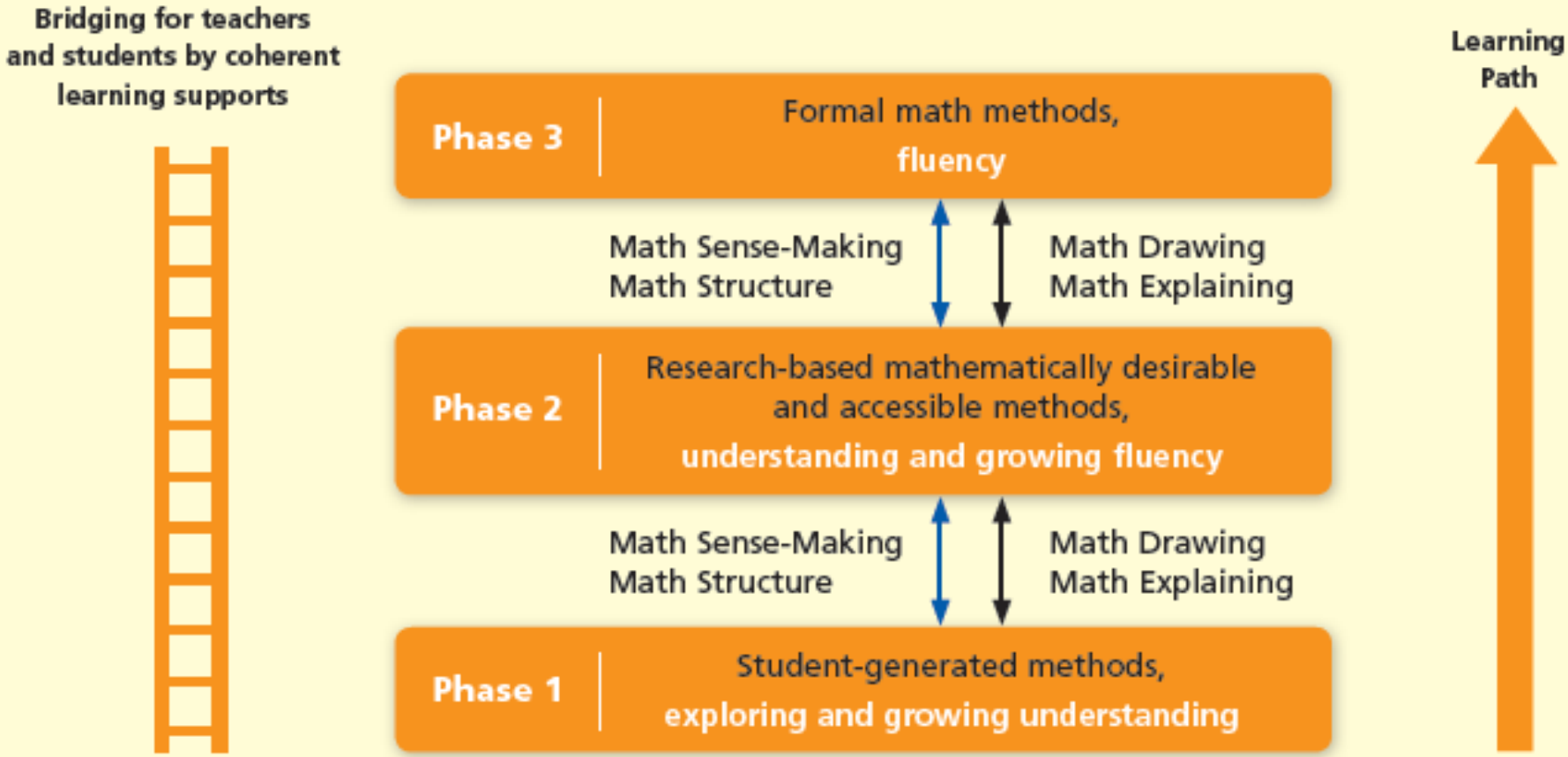

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