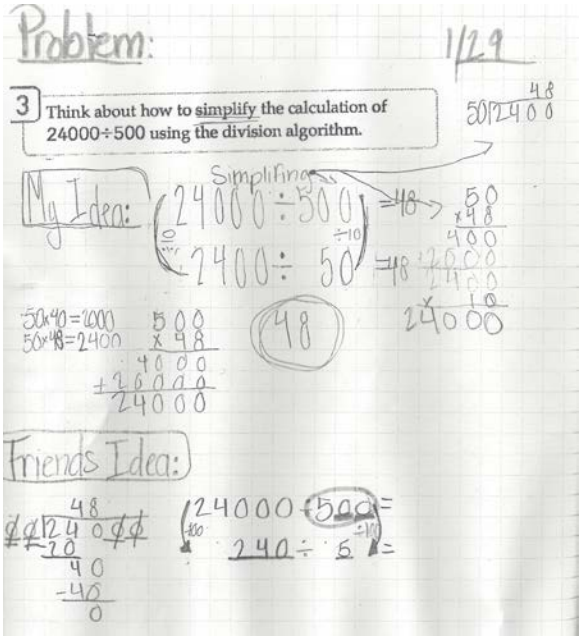
Getting Started with Reflective Mathematics Journals
Grades 2-5

How do mathematics journals support student learning?



Reflective mathematics journals give students a structured space where they work to solve the day's mathematics problem, examine other approaches and ideas, note important ideas from the board, and reflect on what they learned that day. Over time, the journal becomes a valued resource that students refer back to as they attack new problems. As they work out their ideas in the journal, students notice and correct mistakes in their thinking, develop the habit of reflecting on what they are learning, and build the confidence to share ideas with classmates. As students see their own ideas change and grow, they also build agency as mathematics learners, realizing that they can solve and explain problems that once seemed impossible.

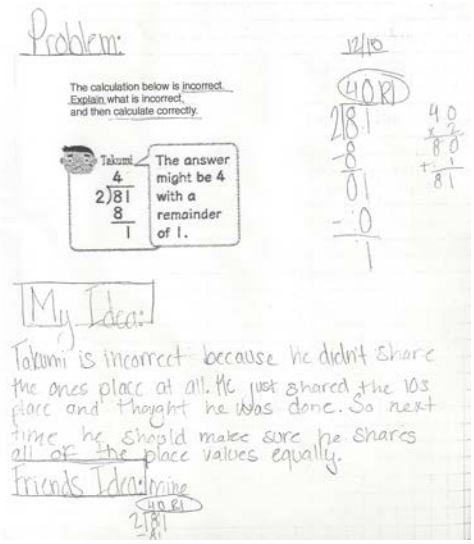
What do teachers find valuable about journals?

Journals provide a window into each student's thinking during a mathematics lesson, giving information teachers can use to adjust the next day's lesson or to look at a student's progress over time. Journals also provide a place for teachers and students to connect around mathematics and for a vehicle for teachers to share each student's ideas with the class on a regular basis.

When and how should I introduce journals to students?

The beginning of the year is a perfect time to build or re-establish the routine of writing in journals. Especially at the outset, it's good to respond to each student's journal each day—even if it's simply a brief comment to show you read their work and are noticing their progress. It's also good to begin each math lesson with several examples of student journals from the *prior* lesson. You can select

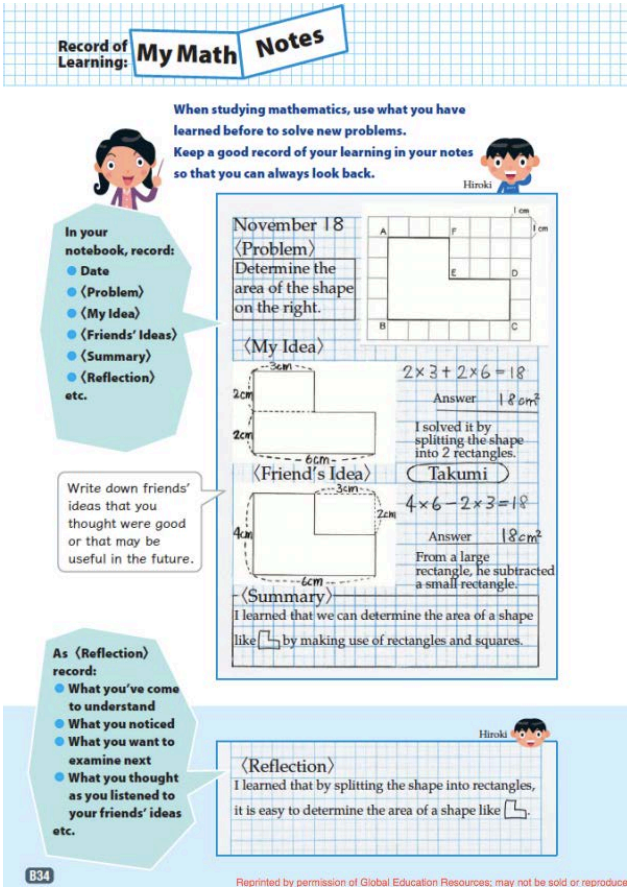
these to show what is possible and to highlight values you are trying to build as a class—for example, lining out and correcting mistakes rather than erasing them, representing a problem with a number sentence, persevering on a challenging problem, trying several problem-solving strategies, and so forth. A copy of your roster is a convenient place to track whose journals are shown at the beginning of class, so you can get around to all class members regularly.



What are the important elements of a journal?

The goal is for students see the value of journals as a way to help them work out their thinking, organize important ideas from the discussion, and reflect on what they have learned. Many different physical set-ups (such as a composition journal or ring binder) can serve this goal, as long as students can organize their work chronologically and look back at previous work for solutions, strategies, and ideas.

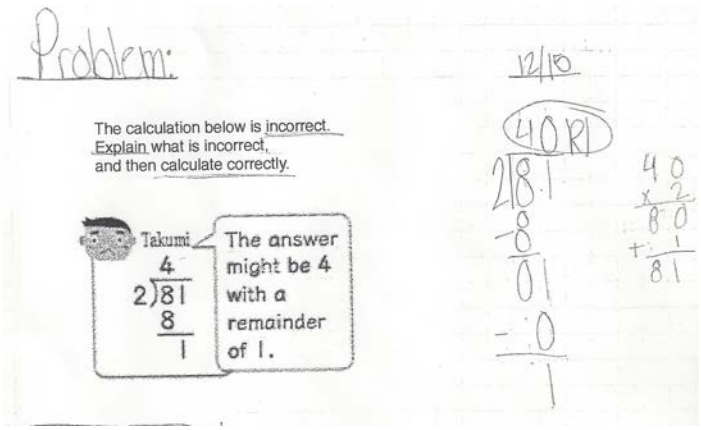
<u>Student Journal Page</u>



The key journal elements can be used from the outset or built gradually, depending on the experience and age of the students; they can be modeled initially, until they become second nature to students.

Date: The date allows the class to refer back to ideas from previous lessons

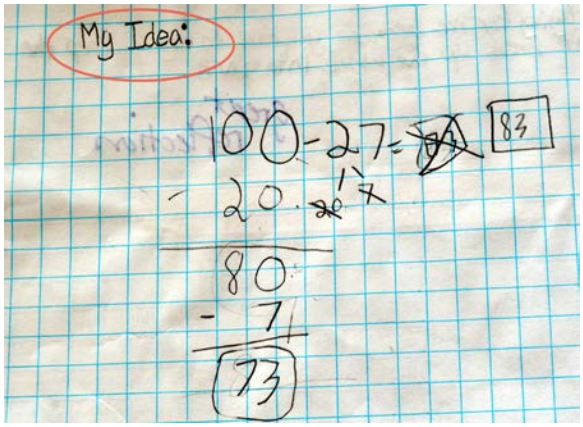
Problem: The problem can be copied by students from the board or, for lower-grade students, printed ahead of time and passed out for students to glue into their journals—especially in the lower grades. In the upper grades, many teachers have students carefully write the problem in their journals. Allowing plenty of time for all students to finish writing down the problem provides an important foundation for inclusion of all learners at the start the math class, and gives students time to re-read and think independently about the problem.



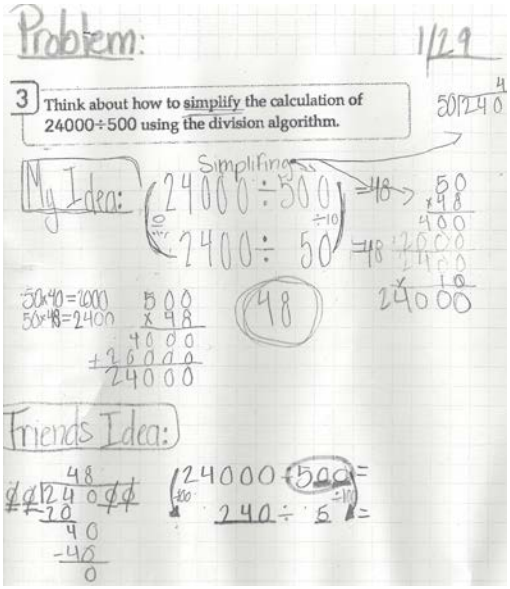
My Idea: In this section of the journal page,students lay out their thinking and try to solve the problem. Independent work-time (approximately 8-10 minutes) allows students to consider what they know (from their memory or their journal) attempt a solution.

Students should have enough time to identify a strategy and begin solving the problem, but it is not necessary for all students to complete the problem before the independent work-time is over. Early finishers can be encouraged to check their work and find a second strategy to solve the problem.

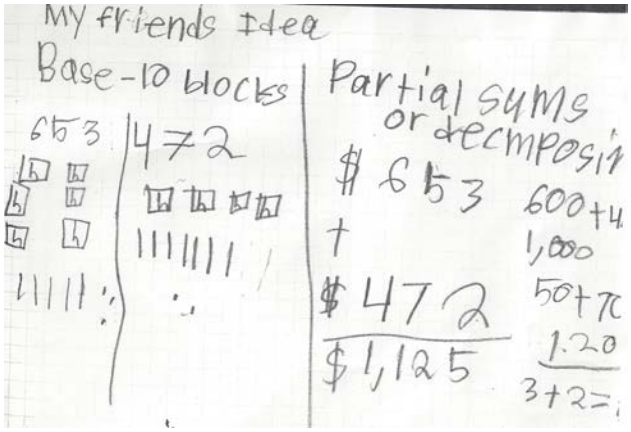
Encouraging students to cross out and correct errors, rather than erase them, highlights the value of learning from mistakes and of documenting one's entire thought process.



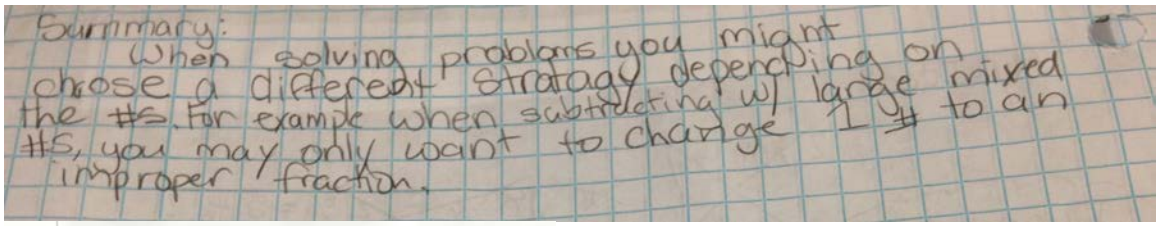
As students work individually, teachers can circulate to note down the different strategies that students are using and choose the work to be presented and the sequence of presentation. After independent work time and before class-wide discussion, many teachers like to include a brief time for students to use their journals to share their work in pairs.

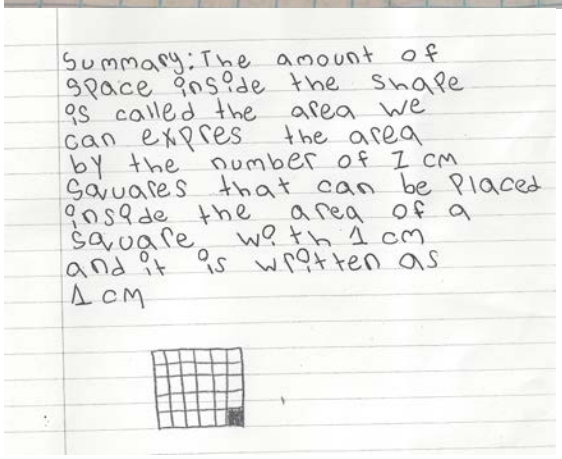


My Friend's Idea: Recording another idea besides their own can help students develop flexible mathematical thinking, see a problem from different perspectives, and identify problem-solving strategies they might use in the future. Typically this occurs at the end of class-wide discussion. In some lessons, you might identify a problem-solving approach that you want all students to record in their journals, because it is critically important (such as making tens). In other lessons, you might encourage students to choose a strategy that they "find the most interesting" or "would like to try in the future."



Summary of the Lesson: A brief summary (often just one sentence) captures the primary learning of the day's lesson. The summary captures the big learning goal of the lesson, not just the answer to the problem. For example, rather than writing "We solved the problem 65 - ? = 32, and learned that the ? is 33", the summary might be "We learned that sometimes we can use addition to solve subtraction problems." The summary grows out of the discussion at the end of the lesson, when students discuss what they learned from the lesson, and the teacher records their thoughts on the board. Building on what students have said, the teacher writes a summary and gives students sufficient time to record the lesson summary completely and accurately in their journals.

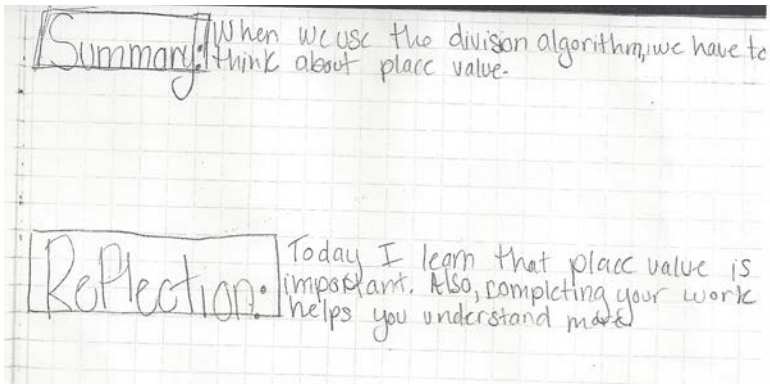




"What I learned" or "Reflection": In this important section, students look back over their work for the day and individually write about what they learned. This reflection should come directly from each student, and it can take many forms, such as:

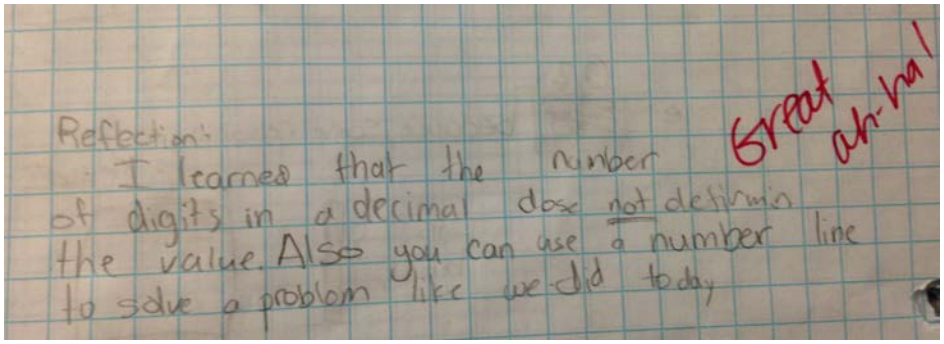
- how I solved the problem;

- what strategies I found interesting or useful;
- how I thought or felt about the day's lesson;
- a struggle or challenge;
- a question; or
- whatever is on their minds as a result of the lesson.



The "reflection" encourages students to be metacognitive—to think about their own thinking. Sentence starters may initially be needed for this section, e.g., "Today I learned . . ."

Teachers are encouraged to read each of these reflections and leave a comment, even if it is just a word or underline with exclamation point. A teacher's comments can offer encouragement with points students are trying to improve, such as writing more than one strategy, or can help students move forward in their thinking, by highlighting important connections the student made (e.g., "that's so interesting!"), or asking a follow-up question (e.g., "Why do you think that?" or "Have you tried this with different fractions?").

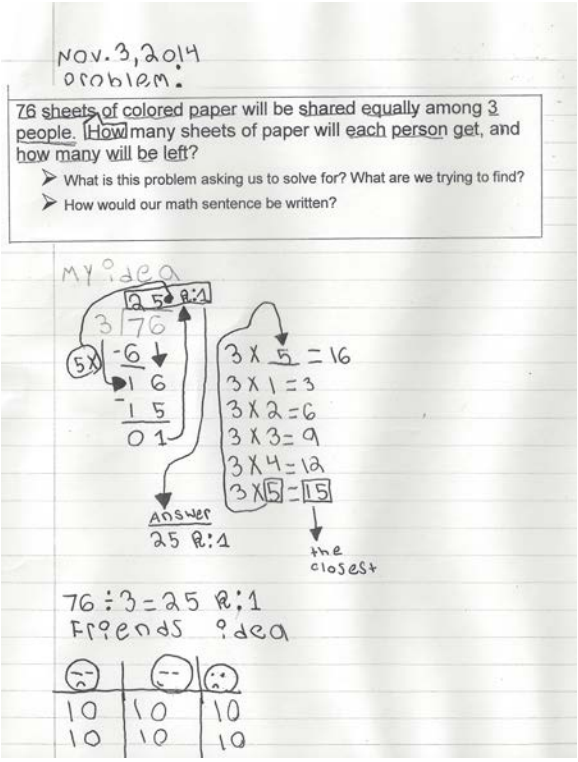


In addition to leaving individual comments, many teachers begin each mathematics lesson by reading aloud (or having the students read aloud) several math journals from the prior lesson, along with a projection on the overhead or printout of these entries so the whole class can follow along. The teacher selects these reflections intentionally to highlight an important learning from the prior lesson that will be important to the new lesson, or to highlight values you are trying to build as a class—for example, lining out and correcting mistakes rather than erasing, representing a problem with a number sentence, persevering on a challenging problem, and so forth. A copy of your roster is a convenient place to track whose journals are shown at the beginning of class, so you can get around to all class members regularly. Especially for students who are quiet or lack confidence in

mathematics, having their journal read aloud can provide an important entry point into the classroom mathematics community.

How can I help students learn to record their thinking?

Over time, students realize that their journal writing communicates their ideas to the teacher and classmates. Many students will be eager to have their ideas shared at the board, and will learn from models presented by the teacher and by other students' journals, highlighted at the beginning of class or during board work. If the journals you share at the beginning of class highlight features you want the whole class to develop, such as legible writing, use of mathematical expressions and diagrams, and so forth, other students will notice and incorporate these features.



How much attention should I pay to neatness and correct writing, especially of numerals?

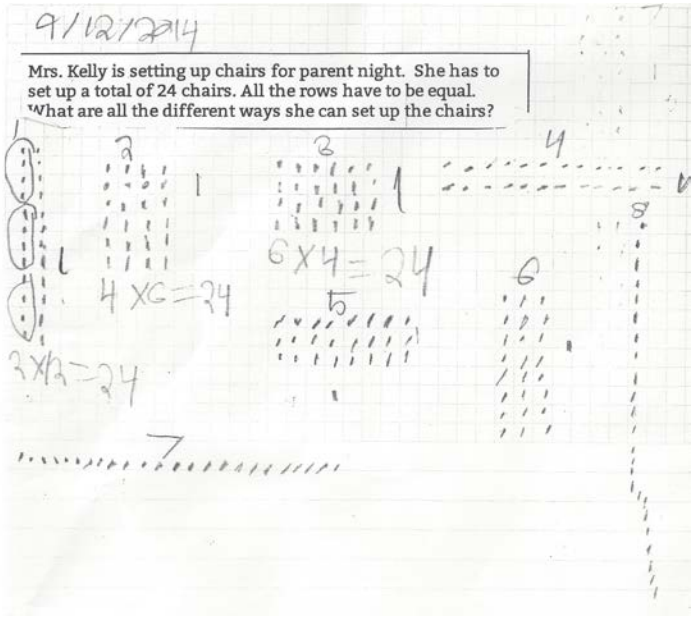
In general, the student and teacher need to be able to read or decipher what is written on that particular student's journal pages. Once students experience the power of sharing their ideas with others (verbally or at the board), they are likely to be motivated to express their ideas clearly in writing. If they write legibly, they can easily revisit their own thinking and communicate it to classmates.

Some students, especially in 2nd and 3rd grade, may still be working on numeral-writing skills. Don't be afraid to highlight the usefulness of legible, properly formed numbers and seek additional support outside of your mathematics block for students who are struggling with the mechanics of writing legibly. On the other hand, don't be afraid to focus on the big mathematical ideas—and ignore neatness–if you think the situation calls for it.

What kinds of issues or challenges do students typically have when writing in journals?

Spacing: Some students take up a great deal of space with their writing and go through journal pages quickly. Using a large-grid journal and encouraging one character per square may be helpful.

Recording: Some students struggle to record their mathematical ideas. Often they just don't know where to start. Or they may write what their neighbor has recorded without actually understanding it. Copying what is on the board or in other students' work may be a starting point for writing one's own ideas. Questions like "Tell me what you know about this problem" may help students get started.



Frustration: Some students can get frustrated quickly and give up. Over time, the teacher's noticing of tiny bits of progress can support persistence.

Erasing: Early in the school year is the perfect time to establish the habit of crossing out, not erasing. Let students know how much you want to see the changes in their thinking. As students develop new ideas and understanding over the lesson, remind them to cross out (not erase) what they initially wrote.

<u>What do students enjoy about journals</u>?

Most students enjoy seeing their journal projected under the document camera and many enjoy coming to the board to share their thinking. They learn that writing in their journal allows their teacher to see their thinking and perhaps ask them to share it at the board or as a journal entry. Many teachers provide several minutes to have students briefly share "My Ideas" with a partner immediately after trying to solve the problem. Students often look forward to sharing their ideas with their friends in this way.

What advice do teachers have for other teachers about starting journals in their classrooms?

"Be sure to utilize the journal tool consistently…the more regularly [you] ask the children to work in their journals, the more comfortable and fluent the students become."

"Share many examples of what the students have written in their journals. This is a great way for the students who might be struggling to build a greater understanding and base for what they could do to express their ideas."

What is teaching through problem-solving?

Japanese lessons center on "Teaching Through Problem-solving." Students grapple with a mathematical task they have not previously learned to solve that embodies the new mathematical ideas or procedures to be learned. Teaching Through Problem-solving is very similar to the *5 Practices for Orchestrating Mathematical Discussions* by Margaret Smith and Mary Kay Stein that is widely used in the U.S.

In a typical Teaching Through Problem-Solving lesson, the teacher starts the class by presenting a mathematics problem and making sure students understand what is being asked. Students write or glue a copy of the problem into their journals and begin solving it. As students work on the problem, the teacher walks around to see their work (often using a clipboard with a seating chart to note down each student's strategy). Having thought through in advance the "line-up" of work at the board that will build the major mathematical ideas of the lesson, the teacher selects several students to present their work and share their thinking at the board, in a sequence designed to build the key mathematical ideas. As each student shares their work and the class discusses it, the teacher makes sure each student strategy and important discussion points are recorded on the board in a way that is easy to read and follow. From comparing and synthesizing the various strategies, the lesson's new mathematical ideas emerge, and they are summarized on the board. So by the end of the lesson, the board provides a coherent story of the mathematics developed during the lesson.

What is the connection between journals, board work and discussion?

Journals, board work, and discussion provide important support for each other. By working in journals, students formulate their ideas so they can express them more effectively at the board. Discussion adds ideas, and the board tells the story. The board, with its coherent organization of the flow of ideas, provides a model for students' note-taking and reflection. Students can consult the board when they need to remember some idea discussed during the lesson, compare different representations or solution strategies, or synthesize what they learned that day. An interesting question to ask about a lesson's boardwork is whether someone who walks into a classroom can look at the board and understand the task and figure out what students thought, did and learned in math that day.