The First 20 Days of Math

Getting Started: Establishing Routines & Procedures

Overview: For students, a successful experience with math begins with the basics: how to think like an active mathematician, how to speak mathematically, and how to record and share their thinking. As you prepare to implement the First 20 Days of Math, keep in mind that it will be necessary to be flexible. The First 20 Days document includes classroom routines, expectations, and math tools that encourage the Standards for Mathematical Practice. It also provides lessons that allow students to develop number sense concepts within the structure of the CCSS Math Practices.

All points and aspects need to be repeated, charts or anchors of support are to be posted and referred to again and again.

Goals: The goals of implementing the instructional strategies included in this document are to

- help students think of themselves as mathematicians who enjoy and actively participate in math;
- establish consistent classroom roles, routines and procedures that support teaching and learning, such as number talks, math games, centers, mathematical vocabulary, talk moves, etc.
- increase rigor by having students explore, express, and better understand mathematical content though process skills (communication, connections, reasoning and proof, representations, and problem solving).

Background: Based on the idea of The First 20 days of Independent Reading by Fountas & Pinnell, these lessons have been developed to establish the roles, routines and procedures needed for effective mathematics instruction.

In the document, the Mathematician's Turn (K-2) or Three-phase Problem Solving (3-8), as well as Number Talks develop the routine of classroom conversations. Authors/researchers, Fosnot and Dolk (2002), state that the purpose of the class conversation is to support and direct the development of mathematicians in the classroom learning community, rather than fixing mistakes in the children's work. This conversation enables the teacher to focus the students on reasoning about a few big mathematical ideas derived from the mathematical thinking present in students' solutions. It focuses whole class discussion on two or three, strategically selected, student solutions in order to develop every student's mathematical learning.

The goals of the classroom conversations are to provide opportunities for students to (Smith, 2011) share ideas and clarify misunderstandings, develop convincing arguments regarding why and how things work, develop a language for expressing mathematical ideas, and learn to see things from other people's perspective.

"…the power of Number Talks comes from inspiring each child to think and make sense of the mathematics they are presented. They are never trying to figure out what the teacher wants. Rather they are totally engaged in their own sense making process…Number Talk is an opportunity for children to learn that they can figure things out for themselves in a way that makes sense to them… children can begin to apply what they are learning in lessons and try out ideas they may be pondering." Source: "What is the distinction between a Lesson and a Number Talk," by Kathy Richardson

Fostering a Growth Mindset is vital to the success of our students and ourselves. All students are told that they are already competent learners and can become even better through their persistent use of strategies and by reflecting on their efforts. Criteria for quality and work are explicit, accessible to all students, displayed publicly, and change over time to respond to level of rigor as learning deepens.

References: This document was compiled from the following sources: Los Angeles Unified School District Austin Independent School District, Department of Curriculum and Instruction (2009), Newton (2012), Atlanta Public Schools (2013)

Establishing the Daily Math Routine

Establishing a daily math routine that is flexible and can be adapted to a wide range of tasks is essential for efficient mathematics teaching. It is important for students to understand each phase of the daily routine and expectations for work and behavior.

The daily math routine begins with a **Number Talk** to help students develop and discuss strategies to build computational fluency and number sense, leading to accuracy, efficiency and flexibility. Accuracy is the ability to produce an accurate answer. Efficiency is the ability to choose an appropriate, expedient strategy for a specific computation problem. And flexibility is the ability to use number relationships with ease in computation.

A Number Talk is a short (5-15 minute), ongoing daily routine that provides students with meaningful practice with computation. Classroom conversations and discussions around purposefully crafted computation problems are at the very core of number talks. These are opportunities for the class to come together to share their mathematical thinking and develop efficient, flexible, and accurate computation strategies that build upon the key foundational ideas of mathematics such as composition and decomposition of numbers, our base ten system, and the application of properties of operations.

Number Talks allow students to make connections and find relationships and patterns. Number Talks also allow students to use the language of mathematics. The conversation is the focus of the Number Talks, and the teacher takes on the role of facilitator.

The teacher is not the ultimate authority in Number Talks. Students are clarifying their thinking with each other. Mental computation is a key component of number talks, encouraging students to build on number relationships to solve problems instead of only relying on memorized procedures.

Step 1: Problem

- The teacher says and writes a problem on the board horizontally. It can be as simple (like 9 + 17) or complex (500 ÷ 24), as long as it is appropriate as a mental math problem for the class.
- Problems are presented in many different ways: a word problem, number lines, dot cards, models. You can show problems on a document camera or write on the board.

Step 2: Think

- Students mentally solve the problem.
- They show the teacher whether they have the answer by (silently) giving a thumbs up at their chest. This prevents a small batch of quick students from shutting everyone else down. If students can come up with a second way to solve the problem, they hold up a second finger at their chest. This means that everyone can keep thinking about the problem even after they have the answer
- Wait until most have a thumb up.

Step 3: Listen & Share

- After enough time has passed that everyone or nearly everyone has a solution, the teacher asks students what their solutions are. The teacher writes down all solutions on the board; none are given preferential treatment, and the teacher doesn't say whether they are right or wrong.
- Students use "same" signal if they had the same total.
- Ask: can both/all these answers be correct? *(this isn't an everyday step, just once in a while as a reminder that there can only be one correct answer for each equation)*

Step 4: Explain & Defend

- Teacher could choose to have students think-pair- share before they share out their thinking.
- Once all solutions are written down, the teacher asks students to explain how they got their solution. Students explain (from their seat), while the teacher writes the steps they describe on the board
- Take time to ask students to name the strategy used (i.e. counting on, making a ten, using friendly numbers)
- Students use "same" signal if they used the same strategy and got the same total
- Repeat the process with another student's strategy (3-4 maximum)

Step 5: Discussion & Consensus

- Allow students to question each other about their thinking or the strategy they chose. *This may come later with younger students, after they have grown more comfortable with the Number Talks routine.*
- Have students identify similarities/differences between strategies
- Ideally, by the end of the discussion, the class should have a list of 3-6 different approaches to the problem, plus a consensus as to what the correct answer is.

Step 6: Follow-up

- The teacher then has the option to ask a follow-up question that builds on the last. (If 9 + 17 was the first question, 9 + 27 or 19 + 17 might be good follow-up.)
- Thank the students for their participation in the Number Talk.

The **Mathematician's Turn (K-2)** or **Three-phase Problem Solving (3-8)** structure (Before, During, and After) outlined in this document can serve two purposes: it can be utilized for both direct instruction and an inquiry lesson model. The three phase Problem Solving structure supports the introduction of a new skill/concept or clarifies and practices an emerging skill, through a rigorous math task. Teaching mathematics with problem-based tasks is student centered rather than teacher centered. It begins with and builds on the ideas that children have available. It is a process that requires faith in children, a belief that all children can create meaningful ideas about mathematics.

In the **Before Phase**, the teacher sets up the task with the whole group and makes sure that the students understand the problem or task. The teacher also sets up expectations, such as requiring students to explain their thinking in more than one way, rather than simply giving an answer. Behind the scenes, the teacher has solved the task in a variety of ways to anticipate student misconceptions, and has scripted questions to clarify, assess and advance learning.

The **During Phase** is independent/partner/small group work time to solve the task. As students complete the tasks they can use various resources and manipulatives of their choosing. Students will benefit from completing tasks that are open ended or where there is more than one solution path. It is important to allow students to use a variety of strategies to complete the task. The teacher may monitor group work by asking questions and actively listening to what students say as they reveal how they think, what they know, and how they are approaching the task.

In the **After Phase,** also called **"Share, Discuss and Analyze,"** students debrief their work and learning collaboratively. Student work samples are strategically shared and the teacher facilitates a discussion that ties student learning to the big mathematical ideas. The teacher asks students preplanned questions that require students to extend their understanding of the concept. A useful routine in this phase begins with the teacher displaying a student work sample on the document reader while inviting the class to make sense of the work displayed. Students are provided a minute of private think time and then an additional two minutes to discuss with an elbow partner. The teacher may ask students to explain the strategies they believe the student used to

solve the problem. The teacher may display a second sample and ask students to think about how this work sample is the same, yet different from the prior sample. Again, one minute of private think time is provided followed by an additional 2 minutes of partner or small group talk. This routine addresses Math Practice Standard 3, "Construct viable arguments and critique the reasoning of others."

Also important is the need to address misconceptions and errors that students may have about a skill or concept. The teacher may choose to display a work sample with a misconception or error without commenting on the validity of the response. Establishing a safe environment where all students learn from each other's mistakes is a key component. Students are asked to examine the work sample. Students think individually and then discuss with a partner. As they ask questions of each other, misconceptions or errors are surfaced. Wrong answers can be very useful as students make their own determinations of what is incorrect, and collectively determine how to correct the work.

It is often difficult for students to put their thoughts into words, because this requires metacognition and vocabulary development. Understanding and communicating HOW a problem was solved is often challenging but enormously worthwhile. The use of multiple representations helps students communicate their thinking visually, quantitatively, and with precision. It is also helps incorporate various learning styles into the daily math routine.

On the first day this routine is discussed, outlined and charted for the students in a whole group discussion.

Before: Set Up	During: Explore	After: Share, Discuss and Analyze
Whole group	Students work individually, with partners or with small groups	Whole group
Teacher led (rigorous task selected, misconceptions noted, questions written)	Teacher works with small groups or facilitates a task	Student led / Teacher facilitated Teacher strategically selects 3-4 solutions to be shared
Pose a question to explore a new concept or practice a skill	Students work on a math task or problem Requires problem-solving	Students and teacher ask questions to make sense of other's work

Small Group/Independent Center Time is the third component of the daily math routine, providing opportunity for students to practice their emerging math skills while the teacher differentiates instruction in small groups. Establishing independent and group work norms is a critical component of a successful Independent Work Time. Different factors will contribute to how well a class can work together in groups. It can be beneficial to assign each group member a specific role (materials getter, recorder, parliamentarian, etc.). Assigning roles helps to hold all students accountable. Groups should be flexible and reorganized regularly to meet the changing needs of students as they develop.

Closure, the last 5-7 minutes of math time, should be devoted to whole group reflection and assessment. This can vary daily, but is an important part of wrapping up the math time. It is a great time for teachers to observe questions that may be asked during this time, and to assess the comfort level of the students in terms of what might happen the following day.

Using the First 20 Days to establish these routines will create a classroom community of mathematicians to last all year long. The following is a day-by-day guide.

Resources

Resource	Description	Link
Math for Love Number Talks	An overview of number talks, tips for implementing, sample script, and resources.	http://mathforlove.com/lesson/number-talks/
Multiplication Number Talk: Fourth & Fifth Grade	Video of a number talk in 4th and 5th grade	https://www.teachingchannel.org/videos/4th-5th-grade-number-talks
Engaging in Productive Struggle: Number Talks	Video of 2nd grade	https://www.teachingchannel.org/videos/subtraction-math-lesson-ousd
Notice and Wonder Math Routine	Video of a routine in 3rd grade	https://www.teachingchannel.org/videos/notice-and-wonder
Meeting Students' Needs in Number Talks	Video of 5th-8th grade	https://www.teachingchannel.org/videos/number-talks-for-assessments
Improving Participation with Talk Moves	Video	https://www.teachingchannel.org/videos/student-participation-strategy
Number Talks	Sample Number Talks aligned to standards	http://www.mathtalks.net/index.html
Number Talks Videos	Videos of number talks	http://www.insidemathematics.org/classroom-videos/number-talks

Check out these tools in the Seton Teacher Resource Page!

Resource	Description	Folder Located
100 Questions that Promote Mathematical Discourse	100 questions in student friendly language	Math Resources All Grade Levels
Number Talks Resource	Resources for implementing, research behind math talks, and sample math games	Math Resources All Grade Levels
Number Talks Lesson Format - Conversation Starters Hand Signals	Format for number talks and printable nonverbal hand signals resource	Math Resources All Grade Levels
Math Talk Bookmarks	Bookmarks for math discourse	Math Resources All Grade Levels
Math Vocab Cards	Vocab cards for math word wall	Grade Level Math Folders
Math CCSS Tasks, Math Games, Centers Documents	Math games and tasks for centers	Grade Level Math Folders
Math Pencil Strategy Bookmarks	Pencil strategy bookmarks	Grade Level Math Folders