

K-5 INSTRUCTIONAL FRAMEWORK FOR MATHEMATICS

RANDOLPH COUNTY SCHOOL SYSTEM

Classroom Expectations

- Both the Mathematical Content Standards and the Standards for Mathematical Practice in the North Carolina Standard Course of Study for Mathematics guide the planning and implementation of each math lesson.
- Mathematics is taught daily for 75 - 90 minutes. The time allotted for mathematics may be sustained for one block or divided into smaller blocks to ensure the inclusion of essential lesson components.
- *Into Math* published by Houghton Mifflin Harcourt is the core curriculum and is utilized as the primary resource for planning and instruction. Additional resources and supplemental materials are integrated to support instruction and meet the expectations of the NC Standard Course of Study.
- A variety of formative assessment tools are used to determine instructional decisions and meet the needs of students.



Guiding Principles

Teachers will provide opportunities for students to:

- Work in a variety of formats (independent, pairs, and small groups)
- Use multiple strategies to solve problems and demonstrate understanding (pictures, models, manipulatives, diagrams/tables, words, numbers, equations)
- Persevere and persist through challenging problems
- Develop a productive disposition that is built on confidence and sense-making
- Apply and connect mathematical concepts in meaningful, real world situations
- Demonstrate and develop deep conceptual understanding
- Justify and explain solution methods orally and in writing using precise language and vocabulary
- Engage in critical thinking, communication, creativity, and collaboration through high-level tasks
- Practice and develop fluency with procedures by improving accuracy, efficiency, and flexibility
- Use a variety of tools, including technology, to explore and represent mathematical concepts
- Self-assess and set goals for personal growth

Mathematical Mission

The mathematical mission of the Randolph County School System is to provide rigorous and engaging, student-centered instruction that empowers students to become flexible and proficient problem solvers.

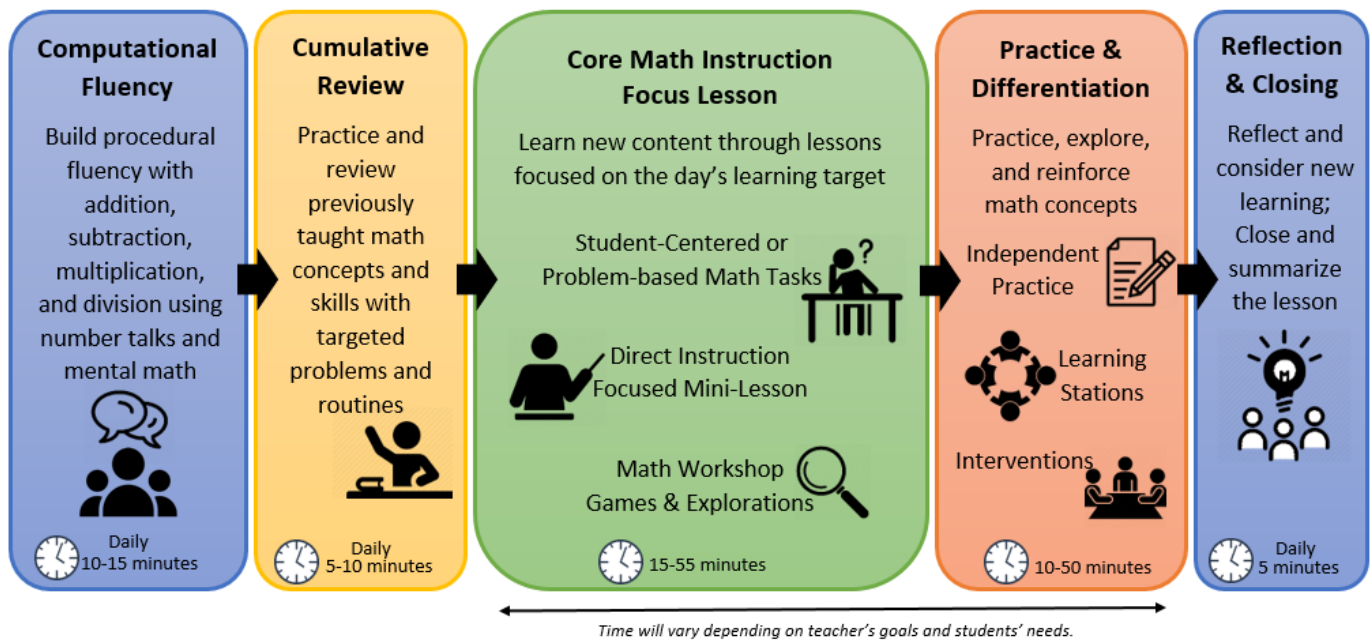
Mathematical Lesson Components

In the elementary classroom, a variety of lesson components guide mathematics instruction. Regular use of the components ensure opportunities for students to become flexible, fluent, and proficient problem solvers. Teachers have flexibility to incorporate and sequence several core components to meet the needs of their students. Designated times for computational fluency, cumulative review, and closing/reflection should occur daily.

The allotted time for the focus lesson or core math instruction and practice and differentiation will vary. Teachers will make specific and intentional choices for structuring this time based on student needs and the goals of the lesson.

The following descriptions of each component can guide teachers in planning the math block. The tables on the following pages will define teacher and student roles that represent best practices in mathematics education.

- Computational Fluency
- Cumulative Review
- Core Math Instruction
- Practice & Differentiation
- Reflection & Closing



Components of an Elementary Mathematics Classroom

Computational Fluency

Computational fluency includes accuracy, flexibility, efficiency, and appropriateness. Students need to be fluent in mental math, estimation, and recall of basic facts. Daily opportunities should be provided for students to build flexibility with numbers and solution strategies, compute fluently with numbers, and investigate computation strategies based on place value, properties of numbers, and relationships of operations. Number Talks, conducted daily for 10-15 minutes, are opportunities for students to collectively reason about numbers and develop mental computation strategies for adding, subtracting, multiplying, and dividing numbers.

Grade	NCSCOS Fluency Requirements
K	Add/Subtract within 5
1	Add/Subtract within 10
2	Add/Subtract within 20 using mental strategies Add/Subtract within 100 using computation strategies
3	Multiply/Divide within 100 (Know from memory all products with factors up to and including 10) Add/subtraction within 1,000
4	Add/Subtract within 100,000
5	Multi-digit multiplication

Teacher Role

- Ground procedural methods with conceptual understanding
- Purposefully craft and plan computation problems for classroom discussions
- Facilitate discussion of multiple computational strategies
- Scaffold instruction to allow students to build fluency with increasingly larger numbers and across multiple operations
- Sequence instruction so students develop flexibility, fluency, and connections across operations
- Use a variety of formative assessment tools (excluding timed tests) to assess students' fluency
- Model and reinforce strategies to develop fluency

Student Role

- Use a strategy, or multiple strategies, to efficiently determine the answer to a problem or series of problems
- Determine the most efficient strategy to use for each problem
- Share solution strategies
- Analyze solution strategies and discuss how one strategy compares and/or connects to another strategy
- Set goals and track progress

Resources

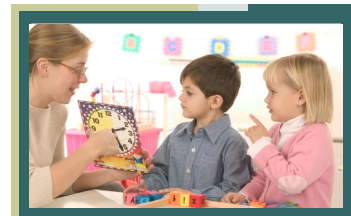
- Number Talks: Whole Number Computation & Number Talks: Fractions, Decimals, Percentages by Sherry Parrish
- Making Number Talks Matter & Digging Deeper by Humphreys & Parker
- Tools4NCTeachers: Additional Resources (www.tools4ncteachers.com)
- Mental Math in the Primary Grades & Mental Math in the Middle Grades by Hope, Reys, & Reys
- Mastering the Basic Facts in Addition and Subtraction & Mastering the Basic Facts in Multiplication and Division by O'Connell & SanGiovanni
- Teaching Channel: Number Talks & Mental Math Videos (www.teachingchannel.org)
- Inside Mathematics: Number Talks (www.insidemathematics.org)



Cumulative Review

Cumulative Review may include Spiral Review, Math/Number Sense Routines, Problem of the Day, Classroom Routines/Ten Minute Math, Daily Math Minutes, or other brief activities that provide ongoing practice and review of key mathematical concepts and vocabulary.

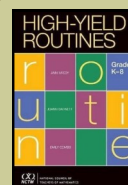
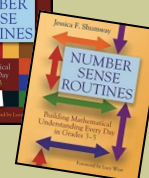
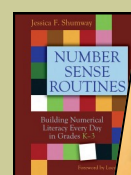
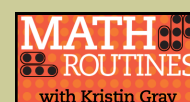
Cumulative Review occurs daily at regular intervals throughout the week. These short activities, which can take place during the math block or at another time in the day, are designed to take no longer than 5 - 10 minutes and are intended to support and balance the core curriculum with regular opportunities for review and reinforcement. Problems and activities should be targeted, deliberate, and intentionally planned to match student needs. They may provide practice with current concepts and skills or review of previously taught material. Such spiraling keeps skills fresh and allows students to extend, make connections, and clarify their understandings.



Teacher Role	Student Role
<ul style="list-style-type: none"> Review previously taught concepts and skills Use the progression of K-6 standards to intentionally design review tasks that correlate with the needs of students Use assessments to determine concepts or skills that students need to practice Model and reinforce strategies for developing understanding and fluency Provide daily opportunities for students to practice skills and improve fluency Spiral concepts in order to extend and make connections to previously learned material 	<ul style="list-style-type: none"> Be actively involved and engaged in the activity Discuss strategies with others Listen attentively to the strategies and justifications of others When appropriate, use various representations to model understanding Communicate precisely and justify strategies both orally and in writing Evaluate the reasonableness of solutions

Resources

- Classroom Routines and Ten-Minute Math (<https://investigations.terc.edu/inv2/curriculum-features/classroom-routines/>)
- Using Classroom Routines and Ten-Minute Math Activities (<https://investigations.terc.edu/inv2/curriculum-in-the-classroom/classroom-routines-and-ten-minute-math/>)
- Daily Math Minutes (RCSS K-5 Instruction Website)
- Teaching Channel: Math Routines with Kristin Gray (<https://www.teachingchannel.org/blog/number-routines/>)
- Marcy Cook Math (www.marcycookmath.com)
- Number Sense Routines (K-3 & 3-5) by Jessica F. Shumway
- High-Yield Routines for Grades K-8 by Ann McCoy
- Mathematically Productive Instructional Routines (<https://www.oercommons.org/courseware/lesson/78969/overview>)
- What is an instructional routine? (<https://illustrativemathematics.blog/2018/04/10/what-is-an-instructional-routine/>)
- Howard County: Routines by Grade Level (<https://hcpss.instructure.com/courses/124>)
- Riverdale Numeracy Routines (<https://wiresources.dpi.wi.gov/groups/riverdale-numeracy-routines/16/>)



Core Math Instruction: Student-Centered Math Tasks

The majority of the math block will focus on students learning new content, exploring complex mathematical ideas and relationships, or practicing and reinforcing newly learned concepts and skills. Teachers may choose from a variety of structures to maximize instructional time and address the day's learning targets. These components may include student-centered or problem-based math tasks, direct instruction or focused mini-lessons, and math workshop involving math games and explorations.

Student-centered math tasks are inquiry based tasks that stimulate student thinking, begin where students are, and require justification for answers and solution methods. Students engage in a task for which the method for determining the solution is not known in advance. Problem solving enables all students to build new mathematical knowledge, solve problems that arise in interesting and relevant contexts, apply and adapt a variety of appropriate strategies to solve problems, and monitor and reflect on the process of mathematical problem solving.

Lesson Format:

◆ **Launch (5 - 10 minutes)**

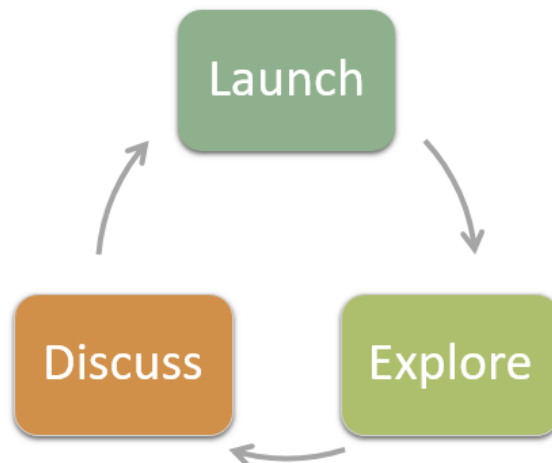
Teacher presents the problem/task to the class. The teacher should give students enough information so that they can do the lesson, but avoid leading students so the level and challenge of the task is not diminished.

◆ **Explore (15 - 45 minutes)**

Students work individually or in small groups to solve the problem. A variety of manipulatives and tools should be available. The teacher moves around the classroom, questioning students to probe their thinking and determining the mathematical focus for the whole-group discussion.

◆ **Discuss & Summarize (15 - 30 minutes)**

Teacher facilitates whole-group discussion of solution strategies. This time allows for the comparison of strategies and discussion of misconceptions and correct/incorrect solutions. The teacher and/or students summarize the mathematical concepts, learning targets, and emphasis of the lesson.

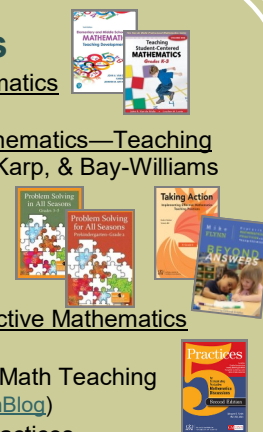


Student-Centered Math Tasks

Teacher Role	Student Role
<ul style="list-style-type: none"> Throughout the year, establish a classroom environment that encourages students to explore, take risks, and question one another. This supportive community allows students to share and discuss multiple strategies, successes and failures in the problem-solving process, and correct and incorrect solutions. <p>Anticipation & Planning:</p> <ul style="list-style-type: none"> Select or create worthwhile problems and mathematical tasks that are interesting and relevant to students Anticipate students' solution strategies, misconceptions, and challenges Create meaningful critical thinking questions to be used throughout the lesson <p>Launch:</p> <ul style="list-style-type: none"> Clarify any unknown words or vocabulary that are relevant to solving the problem Make the task relevant and interesting to the students <p>Explore:</p> <ul style="list-style-type: none"> Monitor students as they work and listen carefully to their solution strategies Assess students' understanding and progress Provide questions to stimulate student thinking Purposefully select and sequence students to share whose responses will further the understanding of the group If the whole class is having the same problem, pull the students together to discuss issues and clarify <p>Discuss:</p> <ul style="list-style-type: none"> Orchestrate the discussion so students are guided to the big ideas and mathematical learning targets of the lesson Assess how well your students are progressing toward the goal and use this to guide further instruction Summarize the key mathematical ideas and concepts of the lesson 	<ul style="list-style-type: none"> Be persistent and resourceful in making a plan and solving the problem Use multiple tools and representations (pictures, words, equations, tables, diagrams, graphs) to help conceptualize and solve the problem Solve problems in a variety of ways and describe how these approaches are related to each other Monitor and evaluate the progression of the process and change course if necessary Ask "Does this make sense?" and "Is this reasonable?" Communicate precisely and justify strategies both orally and in writing Actively participate and collaborate with others in productive conversations Understand the approaches of other students' problem-solving strategies Evaluate the reasonableness of results Work with other students to formulate and explore conjectures and listen and understand conjectures offered by classmates Detect possible errors by using estimation and other mathematical knowledge Continually progress to more efficient strategies and representations

Resources

- Teaching Student-Centered Mathematics by Van de Walle & Lovin
- Elementary and Middle School Mathematics—Teaching Developmentally by Van de Walle, Karp, & Bay-Williams
- Problem Solving for All Seasons by Markworth, McCool, & Kosiak
- Beyond Answers by Mike Flynn
- Taking Action by Huinker & Bill
- 5 Practices for Orchestrating Productive Mathematics Discussions by Smith & Stein
- "Student-Centered" vs "Traditional" Math Teaching by Marilyn Burns (<http://bit.ly/MBMathBlog>)
- Math Agency: Student Centered Practices (www.mathagency.org/student-centered-math-practices)
- Connected Mathematics: Planning Lessons (<https://connectedmath.msu.edu/classroom/getting-organized/lesson/>)
- SFUSD Units (<https://www.sfusdmath.org/accessing-core-curriculum-unit-plans.html>)
- Tools4NCTeachers (<https://tools4ncteachers.com/>)
- 3-Act Tasks (<https://qfletchy.com/3-act-lessons/>)

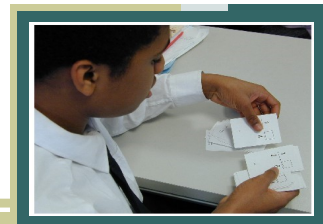


Practice & Differentiation: Math Workshop & Learning Stations

Students need opportunities to practice, explore, and reinforce mathematical concepts and skills. This time will vary each day and may be implemented through independent practice or learning stations. Instruction is differentiated and targeted, based on student understanding.

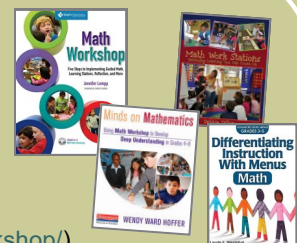
Math Workshop is a structure that allows individuals, pairs, or small groups to work on a set of related activities that focus on similar mathematical content and can be utilized during or after core math instruction. It often includes a variety of small group activities or learning stations designed for students to explore and reinforce concepts being learned. The activities are not sequential; as students move among them, they continually revisit the important mathematical concepts and ideas. By repeatedly playing a game or solving similar problems, students are able to refine strategies, apply learning in different contexts, and bring new knowledge to familiar experiences. Student groups are fluid and should be created and changed frequently based on the needs of students as determined by data. This time allows the teacher to work with individuals and small groups, implement interventions, and to assess students' learning and understanding.

Teacher Role	Student Role
<ul style="list-style-type: none"> • Create a routine and set of expectations for working in groups • Intentionally plan activities to correlate with standards and goals • Provide clear directions and expectations for each activity/station • Organize materials and manipulatives so they are readily accessible to students • Work with individuals and small groups of students • Frequently monitor and assess for student understanding and engagement • Provide feedback to students as they interact with tasks and assignments • Ask high level questions to encourage deep thinking about the concept or skill • Help students develop independence and learn to take responsibility for their learning as they choose activities, keep track of their work, use classroom materials, and work with others • Facilitate a whole group discussion at the culmination of the math lesson to reinforce procedures and summarize critical mathematical understandings 	<ul style="list-style-type: none"> • Follow procedures and expectations • Productively engage in activities and tasks • Complete assignments thoughtfully • Participate in small groups and respectfully collaborate with peers to discuss mathematical thinking • Ask questions of other students when stuck • Communicate precisely and justify strategies both orally and in writing • Take responsibility for learning • Use time efficiently to complete activities



Resources

- [Math Workshop](#) by Jennifer Lemp
- [Minds on Mathematics: Using Math Workshop to Develop Deep Understanding](#) by Hoffer
- [Math Work Stations](#) by Debbie Diller
- [Differentiating Instruction with Math Menus](#) by Laurie Westphal
- HMH Into Math Small-Group & Math Center Options
- Role of Math Workshop (<https://investigations.terc.edu/inv2/curriculum-features/math-workshop/>)
- Making Math Workshop Work (<https://investigations.terc.edu/inv2/curriculum-in-the-classroom/math-workshop/>)
- “Using Math Menus” by Marilyn Burns (<http://bit.ly/MBMathMenus>)
- Tools4NCTeachers (<https://tools4ncteachers.com/>)
- Teaching Channel: Learning Menus (<http://bit.ly/TCLearningMenus>)
- K-5 Math Teaching Resources (www.k-5mathteachingresources.com)



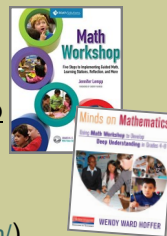
Reflection & Closing

The final component of the math block includes reflection and closing. It occurs daily during the last 5-10 minutes of the math block and is a deliberate and meaningful time for students to reflect on what they have learned and experienced. The intent is to ensure students understand and retain their learning. Therefore, students need opportunities to share their thinking, respond to the thinking of others, make mathematical connections, share, compare, and analyze strategies, reflect on challenges and misunderstandings, ask questions or voice concerns, contemplate new understandings, and consider how their ideas have changed and grown. A variety of strategies, such as exit tickets, classroom discussions, journal prompts, turn-and-talk, sentence starters, error analysis, gallery walks, and self/formative assessment strategies (Four Corners, Stop Light, etc.), may be utilized to gather data and monitor student progress on the intended mathematical concept or skill. Additionally, to solidify the lesson, the teacher may close the lesson by reviewing the learning targets and/or vocabulary, summarizing key concepts, providing feedback on students' performance, or preview upcoming lessons.

Teacher Role	Student Role
<ul style="list-style-type: none"> • Create a consistent routine for including reflection and closing in each lesson • Intentionally plan reflection and closing activities to correlate with the lesson's intended learning targets • Provide clear expectations for sharing and class discussions • Facilitate discussion and reflection at the culmination of the math lesson to reinforce procedures and summarize critical mathematical understandings • Monitor and assess for student understanding • Gather data about students' self-perception of their strengths and weaknesses 	<ul style="list-style-type: none"> • Reflect on learning and progress • Productively engage in reflection activities • Take responsibility for learning • Openly and honestly share challenges and misunderstandings • Respectfully participate and collaborate with peers to discuss mathematical thinking • Ask questions • Communicate precisely and justify strategies both orally and in writing • Follow procedures and expectations

Resources

- [Math Workshop](#) by Jennifer Lemp
- [Minds On Mathematics: Using Math Workshop to Develop Deep Understanding](#) by Hoffer
- HMH Into Math: Wrap-Up, Exit Tickets, Put It in Writing Prompts, I Can Scales
- Tools4NCTeachers (<https://tools4ncteachers.com/>)
- K-5 Math Teaching Resources - Journal Prompts (www.k-5mathteachingresources.com)
- Owl Teacher: Lesson Closures (<https://theowlteacher.com/lesson-closure-for-math-workshop/>)
- Writing a Lesson Plan (<https://www.thoughtco.com/lesson-plan-step-5-closure-2081851>)



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Second Grade: Melanie Burgess
Third Grade: Amie Kay
Fourth Grade: Holly Dunn, Sarah Remery
Fifth Grade: Ashley Brewer, Sarah Kiser

**Instructional Websites**

Randolph County School System
www.randolph.k12.nc.us

RCSS K-5 Instruction
<https://sites.google.com/randolph.k12.nc.us/k-5instruction/home>

NC Department of Public Instruction - Standards, Curriculum, & Instruction
<https://www.dpi.nc.gov/>

NCDPI K-12 Mathematics
<https://sites.google.com/dpi.nc.gov/k-12-mathematics/home>

North Carolina Collaborative for Mathematics Learning
<https://www.nc2ml.org/>

HMH Into Math
<https://www.hmhco.com/programs/into-math>

National Council of Teachers of Mathematics
<http://www.nctm.org/>

