

Overview

The purpose of this document is to clarify the core tenets of our mathematics program along with the key indicators of excellence.

Alignment to our Mission

For students to thrive in the world they will face after college, they must be able to make sense of the world through a mathematical lens. Therefore, learning mathematics requires more than learning facts and procedures for solving certain types of problems. A well-prepared student will develop proficiency and expertise in a number of mathematical practices that have longstanding importance in mathematics education.

In the K-12 mathematics program at Achievement First, our vision is set by what we will see in our scholars. We are building a program in which we will see the mathematical practices come to life through the shifts ([focus](#), [coherence](#), [rigor](#)), called for by the standards. We will continue to refine the components of and resources for the program, on our path to seeing these practices and shifts embodied by our students and driving instruction.

Tenets of Achievement First's Mathematics Program¹:

1. Conceptual Understanding: comprehension of mathematical concepts, operations, and relations
 - While developing conceptual understanding, students make meaning of mathematics and make connections across mathematical ideas which allows for rapid acquisition of new knowledge, greater retention, and ability to apply in novel contexts.
 - Focus SMPs 1, 2, 3, 4, 5, 6, 7, 8
2. Procedural Fluency: skill in carrying out procedures flexibly, accurately, efficiently, and appropriately
 - The development of procedural fluency allows students to focus mental energy on flexibly approaching and thinking through problems, rather than the steps to perform an accurate calculation.
 - Focus SMPs 5, 6, 7
3. Strategic Competence & Adaptive Reasoning: ability to formulate, represent, and solve mathematical problems; capacity for logical thought, reflection, explanation, and justification
 - The development of these habits of mind prepares students to solve mathematical problems that they may encounter throughout the rest of their academic and social lives.
 - Focus SMPs 1, 2, 3, 4, 5, 7, 8
4. Productive Disposition: habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy.
 - Students approach challenging situations as opportunities to learn and mistakes made along the way as times for feedback and reflection, not representations of personal failure. This productive disposition is the hallmark of having a growth mindset as opposed to one that is fixed.
 - Focus SMPs: 1
5. Problem Solving: the umbrella under which all the opportunities to increase proficiency and expertise with the mathematical practices fall
 - While students engage in problem solving they are making sense of problems, thinking strategically about concept and skill applications, planning and executing a viable approach, and reflecting on process and solutions.
 - Focus SMPs: 1, 2, 3, 4, 5, 6, 7, 8

From the above tenets the standards for mathematical practice ([CCSS1 2010](#)) were derived:

- SMP1: Make sense of problems and persevere in solving them
- SMP2: Reason abstractly and quantitatively
- SMP3: Construct viable arguments and critique the reasoning of others
- SMP4: Model with mathematics
- SMP5: Use appropriate tools strategically
- SMP6: Attend to precision
- SMP7: Look for and make use of structure
- SMP8: Look for and express regularity in repeated reasoning

¹ Conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition are adapted from Kilpatrick, Swafford, and Findell, 2001 – Adding It Up: Helping Children Learn Mathematics

The tenets and practices are in service of the three shifts demanded by the Common Core:

1. **FOCUS: Focus strongly where the standards focus**

- Significantly narrow the scope of content and deepen how time and energy is spent in the math classroom.
- Focus deeply on what is emphasized in the standards, so that students gain strong foundations.

Grade	Focus Areas in Support of Rich Instruction and Expectations of Fluency and Conceptual Understanding
K–2	Addition and subtraction - concepts, skills, and problem solving and place value
3–5	Multiplication and division of whole numbers and fractions – concepts, skills, and problem solving
6	Ratios and proportional reasoning; early expressions and equations
7	Ratios and proportional reasoning; arithmetic of rational numbers
8	Linear algebra; linear functions

2. **COHERENCE: Across grades and linked to major topics**

- Carefully connect the learning within and across grades so that students can build new understanding on foundations built in previous years
- Begin to count on solid conceptual understanding of core content and build on it. Each standard is not a new event, but an extension of previous learning.

One of several staircases to algebra designed in the OA domain.

Expressions and Equations 6.EE

3. Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression $3(2 + x)$ to produce the equivalent expression $6 + 3x$; apply the distributive property to the expression $24x + 18y$ to produce the equivalent expression $6(4x + 3y)$; apply properties of operations to $y + y + y$ to produce the equivalent expression $3y$.

Operations and Algebraic Thinking 5.OA

2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation "add 8 and 7, then multiply by 2" as $2 \times (8 + 7)$. Recognize that $3 \times (9872 + 856)$ is three times as large as $9872 + 856$, without having to calculate the indicated sum or product.

Operations and Algebraic Thinking 3.OA

5. Apply properties of operations as strategies to multiply and divide. Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $3 \times 2 = 6$, then $6 \times 5 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property.)

Operations and Algebraic Thinking 1.OA

3. Apply properties of operations as strategies to add and subtract. Examples: If $8 + 3 = 11$ is known, then $3 + 8 = 11$ is also known. (Commutative property of addition.) To add $2 + 6 + 4$, the second two numbers can be added to make a ten, so $2 + 6 + 4 = 2 + 10 = 12$. (Associative property of addition.)

3. **RIGOR: In major topics, pursue conceptual understanding, procedural skill and fluency, and application**

- The CCSSM require a balance of:
 - Solid conceptual understanding
 - Conceptual understanding supports the other aspects of rigor (fluency and application)
 - Procedural skill and fluency
 - The standards require speed and accuracy in calculation

Grade	Standard	Required Fluency
K	K.OA.5	Add/subtract within 5
1	1.OA.6	Add/subtract within 10
2	2.OA.2 2.NBT.5	Add/subtract within 20 (know single-digit sums from memory) Add/subtract within 100
3	3.OA.7 3.NBT.2	Multiply/divide within 100 (know single-digit products from memory) Add/subtract within 1000
4	4.NBT.4	Add/subtract within 1,000,000
5	5.NBT.5	Multi-digit multiplication
6	6.NS.2,3	Multi-digit division Multi-digit decimal operations

- Application of skills in problem solving situations
 - Students can use appropriate concepts and procedures for application even when not prompted to do so
- Pursuit of all three requires intensity in time, activities, and resources

Math Lesson

Purpose	Intellectual Preparation & Assessment	Key Indicators of Excellence
Through the use of guided inquiry, students develop conceptual understanding of math topics and strategies to persevere by making connections to previously learned content, applying mathematical practices, and solving real-world problems.	Unit-Level Preparation: - Teachers read/complete and annotate the TBK, Unit Plan, and Unit Assessment, giving careful consideration to and researching concepts and processes that are potentially confusing and/or complex. - Teachers engage in the Unit Unpacking protocol with other teachers of their content and their dean, if possible. - Teachers also sequence lessons for the unit on the calendar and make decisions regarding the number of lessons to teach against the number of teaching days based on pre-assessment and classroom data. Lesson Planning: Daily lesson resources will be provided to teachers. Each plan aims to include clear key points, explanations, representations and/or examples to make the math explicit. The Teacher's job to prepare includes: - completing the lesson level IPP to ensure they have internalizing the key points, as well as the exemplar student strategies/approaches, misconceptions and responses, and the visual anchor - preparing materials, including manipulatives for the lesson	Funneled and Scaffolded Questioning: Questions asked of students encourage them to think critically and flexibly about the problems presented, develop number sense, and share their developing thinking about the content of the lesson. Funneled questions are used as a tool to focus student observation and contemplation to the most important ideas of the day while ensuring that students do the heavy lifting and make connections to previously acquired skills and knowledge. Scaffolded questions are used as needed to break down complex, demanding questions to develop student understanding. Aligned to Problem Solving Approach: When attempting problems individually, in groups or as a class, students utilize the thinking behind the AF grade-level problem solving approach (Visualize, Represent & Retell, Solve in ES) in order to make sense of, represent, and solve a problem – as well as gauge the reasonableness of the solution. While solving problems, students choose and use appropriate tools. Appropriate Visual Anchor: Visual anchors are created with students during the lesson and discussion to illustrate any combination of core concepts, strategies, vocabulary and CFS. VAs remain posted as long as appropriate to facilitate connections between concepts. Collecting and Responding to Data: Throughout the lesson, students respond to oral and written questions of varying levels of cognition. The teacher gauges student understanding of the key concepts and skills being taught and responds effectively, including a follow-up CFU or required revision to ensure a misconception has been clarified. Top Quality Responses: Students' work matches expectations set by teacher for quality and clarity based on the student work rubric through the use of CFS, a visual anchor created during the intro, or unit exam exemplars. The teacher connects informal language to precise grade level mathematical language. Discussion: Students are explaining their thinking to one another in large and small groups as a means of processing new information, exploring patterns and structures as they emerge, and sharing variations in solution methods in order to strengthen students' understanding of the content. Habits of discussion emphasize making sense of mathematics, constructing arguments, and critiquing the reasoning of others. Through this, students also develop presentation and public speaking skills. The teacher facilitates this discussion in a fashion that promotes student heavy-lifting and leads towards a summary of the mathematics discussed and used in student work. Student Practice: Students are given time and multiple opportunities to engage with grade-level problems and activities independently or in pairs. There are opportunities to solidify conceptual understanding, develop fluency in application, and engage in novel problems. Alignment of Time to Activity: The appropriate amount of time is spent introducing new material, giving students practice time, and discussing learned content. While this may vary from lesson to lesson, combined student practice time should be at least 40% of the block. Progression of Learning (CPA): The lesson fits into a unit sequence that moves from and makes connections between the concrete, pictorial, and abstract. For example, while one lesson may focus on the pictorial, links should be made back to the concrete to solidify the understanding for students. As students struggle with and learn new content, they should fluidly move between different C/P/A representations as needed. CPA representations should target aspects of rigor called for by the standard and as appropriate within the sequence of learning.
Schedule	Teachers may need to customize based on school specific needs, classroom data, and teacher coaching, using materials and approaches based on learning progressions, funneled questioning toward key points, and the problem solving approach. Teachers pull from other resources when necessary (Engage NY, etc.).	
M-Th: -45 minutes K/1 -50 minutes 2 nd -55 minutes 3/4	Assessment: - Interim: Network-wide Interim Assessment to gauge understanding of content taught throughout the year; includes novel problems - Unit: Shared Unit Assessment (and Pre-Unit Assessment) to gauge conceptual and procedural knowledge along with the ability to apply in novel real-world and mathematical problems - Weekly: Network-wide weekly quizzes assess progress toward mastery of the unit - Daily: Observational data, in-class work, Exit Tickets (task lessons do not have ETs, so collect CW)	

Math Stories

Purpose	Intellectual Preparation & Assessment	Key Indicators of Excellence
Students develop conceptual understanding of math stories by representing problems, making connections to previously learned content, applying mathematical practices, and solving real-world problems.	Unit-Level Preparation: - Teachers use the Story Problems S&S imbedded in the larger Elementary Story Problem Guide to plan the types of story problems students will engage with. Lesson Planning: Teachers will use the Story Problems S&S as well as data to plan daily based on the early, middle, or later agendas and classroom data. Lesson plans should include: - Story problem for the day - Possible representations/calculation strategies - Planned T&T questions and exemplar response for the 2-3 share that has a clear learning goal - Potential misconceptions Assessment: - Interim: network-wide Interim Assessment to gauge understanding of story problem content taught throughout the year - Daily: observational data, in-class work	Funneled and Scaffolded Questioning: Questions asked of students encourage them to think critically and flexibly about the problems presented as well as to share their developing thinking about the content of the lesson. Funneled questions are used as a tool to focus student observation and contemplation to the most important ideas of the day while ensuring that students do the heavy lifting and make connections to previously acquired skills and knowledge. Scaffolded questions are used as needed to break down complex, demanding questions to develop student understanding. Aligned to Problem Solving Approach: When attempting problems individually, in groups or as a class, students utilize the thinking behind the AF grade-level problem solving approach (Visualize, Represent & Retell, Solve in ES) in order to make sense of, represent, and solve a problem. While solving problems, students choose and use appropriate tools. Representations: Teacher and student representations are aligned to the story problem type and representations sequence. Students can articulate why they are using the representation and what it links to in the problem. Discussion: Students are explaining their thinking to one another in large and small groups as a means of processing new information, exploring patterns and structures as they emerge, and sharing variations in solution methods in order to strengthen students' understanding of the content. Habits of discussion emphasize making sense of mathematics, constructing arguments, and critiquing the reasoning of others. Through this, students also develop presentation and public speaking skills. The teacher facilitates this discussion in a fashion that promotes student heavy-lifting and leads towards a summary of the mathematics discussed and used in student work. Alignment of Time to Activity: The appropriate amount of time is spent in each part of the agenda based on the focus of the particular agenda (early, middle, later). Student thinking, discussion, and work are the vast majority of the agenda time. The teacher is a facilitator following a protocol. Progression of Learning (CPA): The story problem fits into a sequence that moves from and makes connections between the concrete, pictorial, and abstract. For example, while one lesson may focus on the pictorial, links should be made back to the concrete to solidify the understanding for students. As students struggle with and learn new problem types, they should fluidly move between different C/P/A representations as needed. CPA representations should target aspects of rigor called for by the standard and as appropriate within the sequence of learning. Manipulatives: Students should have access to and use, as needed, snap cubes or place value blocks to represent and solve. They may also use manipulatives during the discussion to explain their work. Increasing Efficiency: Over time and with greater exposure to a type of story problem, students become more efficient – needing less questioning support. They can articulate why and how they are representing and solving in the way they've chosen, and get to a solution in less and less time and with more abstract representations.
Schedule		
M-Th: -45 minutes K/1 (~21 min half of the kids Math Stories and half of the kids Math Fluency – then switch) -25 minutes 2-4 daily		

Math Fluency

Purpose	Intellectual Preparation & Assessment	Key Indicators of Excellence
Skill & Fact: Students develop automaticity over time with repeated exposure and practice with grade-level content at their own pace.	Year-Long Preparation: 1. Skill Fluency: For grades K and 1, skill fluency is a part of the daily block and ST Math is the resource. For grades 2-4, skill fluency becomes a part of the daily block along with fact fluency. ST Math is used for skill fluency. Teachers need to order the grade-level ST Math content to match the AF S&S when setting up their class. 2. Fact Fluency: There is no fact fluency in the K/1 block. For grades 2-4 Renaissance Learning – Math Facts in a Flash is used. Students take an assessment and the program moves them forward from there. There is no year-long planning needed from the teacher.	Funneled Questioning: Questions asked of students when they get stuck are in an effort to help them “figure it out” and continue moving forward. Routines: Students quickly get their computer, log-in, and get started with the program to maximize learning time. Circulation & Conferencing: The teacher circulates while students work, offering praise, encouragement, or support as needed. Conferences are as quick and efficient as possible, to maximize student time in the program.
Schedule		
M-Th: -45 minutes K/1 (~21 min half of the kids Math Stories and half of the kids Math Fluency – then switch) -25 minutes 2-4, 10 minutes Fact (MFiaF) and 15 minutes Skill (ST Math) (Thursday will be used for quizzes in grades 3-4) F: -45 minutes K/1 (~21 min half of the kids Math Meeting and half of the kids Math Fluency – then switch)	Lesson Planning: Skill Fluency: There is no lesson planning needed from teachers. Teachers work through the ST Math content ahead of their students so that as students are working and struggling, the teacher can offer support through questioning. Fact Fluency: There is no lesson planning needed from teachers. There is a teacher dashboard to view student results and progress. The teacher monitors this for continued improvement. Assessment: - Interim: Fact and Skill Fluency are constantly assessed as components in interim assessment items - Unit: Fact and Skill Fluency are constantly assessed as components in unit assessment items - Daily: ST Math/Math Facts in a Flash teacher reports provide achievement data	Data/Reporting Progress: Teacher's use reporting systems weekly to measure progress for all students. Progress gaps between students are minimal, demonstrating reporting use, prioritization, and effective conferencing from the teacher. Differentiation: Data drives what students are working on. Some students may be pulled into an intervention group with the teacher while others are on the computer. The teacher utilizes ET, Quiz, IA data, and the technology dashboard to make these decisions.

Math Meeting & Number Strings

Purpose	Intellectual Preparation & Assessment	Key Indicators of Excellence
Teachers lead accountable practice in foundational counting concepts and place value skills in a spiraling format in order to build stronger number sense and develop fluency.	Year-Long Preparation: 1. Teachers use the AF bi-monthly agendas to initially plan for Math Meeting. 2. Teachers prioritize before and within an IA cycle, the counting and place value concepts that need the most development. 3. Teachers use Every Day Counts Calendar Math and Contexts for Learning Mathematics Minilessons for Early & Extending Addition and Subtraction resources and videos posted on Better Lesson to further understand and customize the agenda content. Lesson Planning: Math Meeting teachers will plan activities from the agendas with clear routines and procedures that allow for meaningful, authentic practice (think: game show) for the Meeting portion. Teachers follow the Number Strings FOI when executing Number Strings. Agendas should be revisited on Data Day and at a mid-IA point. Assessment: - Interim: network-wide Interim Assessment to gauge understanding of content taught throughout the year - Weekly: weekly assessments include counting and place value work from Math Meeting - Daily: verbal and non-verbal observational data	100% Engagement: All students must be actively listening and participating through the use of high engagement strategies (choral, non-verbal, call-and-response, etc) J-Factor: To ensure 100% engagement, teachers incorporate a lot of joyful, fun rituals. Songs and cheers for counting and other topics are a regular part of the meeting. At-Bats: Every student should be practicing, even if just one is up in front. Have a meaningful way for each student to access the information and practice. The teacher chooses the right practice opportunity for students to get meaningful at-bats of the day's content. Ratio: The teacher utilizes every moment by ensuring the questioning ratio is 2:1 for whole group:individual response questions. This ensures participation and at-bats are maximized. Pacing and Urgency: This part of the day moves rapidly from activity to activity. Squeezing as much meaningful practice into this precious time is essential (think: so much to do, so little time). Planned and Rigorous Questioning: As part of planning the routines and activities for Math Meeting, teachers should have pre-determined questions to stretch student thinking and differentiate (why, how do you know, scaffolded questioning).
Schedule		
M-Th: -15 minutes K/1 (M, W Math Meeting; T, Th Number String) F: -45 minutes K/1 (~21 min half of the kids Math Meeting and half of the kids Math Fluency – then switch)		

Achievement First: Elementary Mathematics Program Overview

2016

The following information and visuals are meant to articulate how the data in and data out process in grades 2-4 works. This includes strategic use of the Cumulative Review block, Error Analysis Reteach, and Intervention/Re-do. Further information on each of these blocks can be found on the proceeding pages.

- **Daily Lesson Exit Tickets:** Teachers collect and grade daily Exit Tickets.
 1. **Response:** The first 20 minutes of the Friday Cumulative Review block should be used to respond to that week's Exit Ticket data. Based on student performance, some students may need to do Exit Ticket re-do, a small group may need to be pulled for further intervention or the whole class may need an Error Analysis re-teach. Students who do not need remediation should use ST Math or engage in a challenge problem/task with a partner.
- **Mixed Practice:** Friday Mixed Practice: 25 minutes of the Friday Cumulative Review block is used for mixed practice; the content covered should include the two cumulative review standards on the upcoming quiz. This provides an opportunity to give continued at-bats with major content and strategic use of Show Call to support student thinking.
 1. **Response:** The teacher will provide rapid feedback and utilize the strategic use of Show Call to address student needs in the moment. The standards will then appear on the following week's homework before formally assessed on the Thursday quiz.
- **Weekly Quiz:** The weekly quiz includes current and cumulative review content each week and is administered each Thursday during Fluency.
 1. **Response:**
 - Monday Error Analysis Re-teach Lesson: This EAR lesson is informed by the weekly quiz LASW and executed the following Monday in place of Math Stories as needed.
 - Cumulative Review Homework: Cumulative review homework in grades 3-4 is provided and covers the lesson aims on the week's weekly quiz, as well as the cumulative review standards from the prior week's mixed practice. This serves as an opportunity to give continued at-bats and to reassess the concepts before formally assessed on the quiz. Schools create HW to cover current content and any classroom specific needs.
- **Intervention/Re-do:** Math interventions are school based and serve three purposes: 1-To hold students accountable to work completion, 2-To help students understand math concepts from the lesson, 3-To remediate for students who are significantly below grade level.

Week 2 (M-F)					Week 3 (M-F)					Week 4 (M-F)				
M	T	W	Th	F	M	T	W	Th	F	M	T	W	Th	F
Aim 5	Aim 6	Aim 7	Aim 8 Quiz 1: -Aims 1-4 -CR standards A/B	Friday CR: (20m) Respond to Aim's 5-8 Exit Ticket data (25m) Mixed Practice of cumulative review standards C/D	Aim 9 EAR Q1: -Aims 1-4 -CR standards A/B	Aim 10	Aim 11	Aim 12 Quiz 2: -Aims 5-8 -CR standards C/D	Friday CR: (20m)Respond to Aim's 9-12 Exit Ticket data (25m) Mixed Practice of cumulative review standards E/F	Aim 13 EAR Q2: -Aims 5-8 -CR standards C/D	Aim 14	Aim 15	Aim 16 Quiz 3: -Aims 9-12 -CR standards E/F	Friday CR: (20m)Respond to Aim's 13-16 Exit Ticket data (25m) Mixed Practice of cumulative review standards G/H
Homework: 1) Current Aims 5-8 (school created) 2) Aims 1-4 3) CR Standards A/B					Homework: 1) Current Aims 9-12 (school created) 2) Aims 5-8 3) CR Standards C/D					Homework: 1) Current Aims 13-16 (school created) 2) Aims 9-12 3) CR Standards E/F				
Seeing the Cycle – When do I reteach and provide ongoing review (for Aims 5-8 and Cumulative Review standards C/D)?														
- Aims 5-8 are taught and practiced through 1 page of school created homework - On Friday, teacher addresses Exit Ticket data for current Aims 5-8 during the first 20 minutes of Cumulative Review - Mixed Practice on Friday contains cumulative review standards C/D; teachers use Show Call as needed to highlight exemplar work or a misconception					- Aims 5-8 and CR standards C/D are moved to HW for continued practice and assessment of learning - Aims 5-8 and standards C/D are formally reassessed on Thursday's quiz to ensure mastery of the concepts - On Friday, teachers and leaders engage in LASW and prioritize which concepts need final reteaching through an Error Analysis Reteach on Monday (as needed)					- Error Analysis Reteach of Quiz 2 content on Monday as the final step to ensuring mastery of content				

Seeing the Cycle Continued...

Week 2:

M-Th: Teach Aims 5-8

Th: Quiz 1: Aims 1-4 and CR standards A/B

F: Respond to Exit Ticket Data for Aims 5-8 and practice CR standards C/D during Mixed Practice

Homework: **Practice current aims 5-8** and Quiz 1 content

F: LASW of Quiz 1 (Aims 1-4 and A/B)

Week 4:

M: EAR to address Quiz 2 data (Aims 5-8 and C/D)

M-Th: Teach Aims 13-16

Th: Quiz 3: Aims 9-12 and CR standards E/F

F: Respond to Exit Ticket Data for Aims 13-16 and practice CR standards G/H during Mixed Practice

Homework: Practice current aims 13-16 and Quiz 3 content (Aims 9-12 and E/F)

F: LASW of Quiz 3 (Aims 9-12 and CR standards E/F)

Week 3:

M: EAR to address Quiz 1 data (Aims 1-4 and A/B)

M-Th: Teach Aims 9-12

Th: Quiz 2: Aims 5-8 and C/D

F: Respond to Exit Ticket Data for Aims 9-12 and practice CR standards E/F during Mixed Practice

Homework: Practice current aims 9-12 and **Quiz 2 content (Aims 5-8 and C/D)**

F: LASW of Quiz 2 (Aims 5-8 and C/D) (F)

Math Cumulative Review (2-4)

Purpose	Intellectual Preparation & Assessment	Key Indicators of Excellence
Individualized and whole group instruction used to solidify skills and understandings students have acquired as well as revisit strategic topics in order to facilitate the making of connections.	Weekly Preparation: - Based on that week's exit ticket data, teachers determine concepts that students need to continue to refine and build on. The first 20 minutes of the block are designated to address this data. Based on student performance, some students may need to do Exit Ticket re-do, a small group may need to be pulled for further intervention or the whole class may need an Error Analysis re-teach. Students who do not need remediation should use ST Math or engage in a challenge problem/task with a partner. - The remaining 25 minutes of the block is mixed practice of two cumulative review standards from the previous IA cycle, determined by the review content on the upcoming week's quiz. Teachers will use rapid feedback and data collected in the moment to strategically utilize Show Calls to address need (may include show calling exemplary work or a misconception). Lesson Planning: - Teachers determine the appropriate path for addressing Exit Ticket data and create supporting materials for re-teach, re-do or extension. - Teachers create cumulative review packet that represents the prioritized skills and concepts. While the mathematical skills and concepts are things that students need to revisit, students are also capable of practicing them with little to no instruction from the teacher or within a more cognitively demanding context. Teachers should create the exemplar student work for the mixed practice in order to provide high quality feedback in the moment. In addition, teachers should plan to pull small groups based on student data to provide additional support as needed throughout. Teachers utilize multiple resources when planning: - For creation of worksheets: (Shared plans, Engage NY, Illustrative Mathematics, Shell Center, ExemplarsLibrary.com, Investigations, EnVision, Ready, Brilliant) - Web-based individualized practice: ST Math, MFiaF Assessment: - Interim: standards are re-assessed according to the blueprint/SAS - Weekly: cumulative review standards on weekly quizzes assess review content as well as the previous week's aims - Unit: additional questions may be added to further assess cumulative content - Daily: data is collected and fuels decision making	Ratio: The vast majority of the thinking is done by the students. If significant prompting is needed from the teacher, for the student to engage in the problem, then student understanding is not yet in a place where cumulative review is appropriate (re-teaching may be a better choice). If students are applying or synthesizing multiple previously mastered/pre-mastery skills, struggle may be appropriate. Student Practice: Pending the standard and place in the unit, student practice time should be 60-80%. The time that students are not practicing is reserved for setting expectations or providing feedback/class discussion. Feedback: Students know how their learning is developing by the end of the review time. Teachers can provide this feedback on student work, in conversations, or by providing answers to the problems at the end of CR time. Collecting and Responding to Data: The content of cumulative review continuously evolves based on student data. When many students are struggling with a topic, a decision for a small or whole group re-teach is appropriate. If the class has demonstrated mastery of a standard, it is time to move on to different content. Data needs to be collected (circulation, collecting work, discussion, etc.) on an on-going basis to facilitate this strategic decision-making. Differentiation: Data drives what students are working on. There may be skills and concepts that are appropriate for the entire class to continue working on – there will be many times however where students should be working on different material and/or through different modalities based on their assessment data and learner profile. Alignment of Time to Activity: Cumulative Review is focused on practice to increase proficiency and ability to make connections. It should be largely student-led.
Schedule		
Friday: -45 minutes		

Math Error Analysis Re-Teach

Purpose	Intellectual Preparation & Assessment	Key Indicators of Excellence
Lessons are devoted to concepts and skills for which students have previously demonstrated unacceptable levels of mastery (<65%), evidenced by weekly assessment, unit assessment, diagnostic or IA data.	Lesson Planning: As part of the weekly data cycle, teachers use the LASW protocol to prioritize skills and concepts that students demonstrated unacceptable levels of mastery on and plan for re-teach. The lesson should always close with a final Exit Ticket to assess mastery. This happens both in response to weekly exit tickets during the first 20 minutes of the cumulative review block, as well as the Monday following the Weekly Quiz, as needed. The aim of a math re-teach is to clear up students' misconceptions and errors, and drive mastery of previously taught and not-mastered content to ensure success with grade level material. The teacher approached re-teaching the content through engaging students in error analysis to allow students to reflect on their previous misconceptions and errors. The teacher decides what student work to show that will most effectively drive student mastery given the extent of misunderstanding. Teachers select standards or skills for re-teaching based on student data. Data comes from weekly quizzes and exit tickets. Typically, any standard or skill that less than 60% or 65% of scholars have mastered is re-taught. Learning is a process that occurs over time and our expectations for mastery should reflect that. Re-teaching after collecting data for one lesson is appropriate when fluency or complete conceptual understanding is expected after a series of lessons have been taught.	Funneled and Scaffolded Questioning: Questions asked of students encourage them to think critically and flexibly about the errors and misconceptions presented as well as to share their developing thinking about the content of the lesson. Funneled questions are used as a tool to focus student observation and contemplation to the most important ideas of the day while ensuring that students do the heavy lifting and make connections to previously acquired skills and knowledge. Scaffolded questions are used as needed to break down complex, demanding questions to develop student understanding. Aligned to Problem Solving Approach: When attempting problems individually, in groups or as a class, students utilize the thinking behind the AF grade-level problem solving approach (Understand, Plan, Solve, Check in MS) in order to make sense of, represent and solve a problem. While solving problems, students choose and use appropriate tools. Appropriate Visual Anchor: Visual anchors are created with students during the lesson and discussion to illustrate any combination of core concepts, strategies, vocabulary and CFS. VAs remain posted as long as appropriate to facilitate connections between concepts. Collecting and Responding to Data: Throughout the lesson, students respond to oral and written questions of varying levels of cognition. The teacher gauges student understanding of the key concepts and skills being taught and responds effectively, including a follow-up CFU or required revision to ensure a misconception has been clarified. Top Quality Responses: Students' work matches expectations set by teacher for quality and clarity based on the student work rubric through the use of CFS, a visual anchor created during the INM or unit exam or task exemplars. The teacher connects informal language to precise grade level mathematical language. Discussion: Students are explaining their thinking to one another in large and small groups as a means of processing new information, contemplating common errors/misconceptions, exploring patterns and structures as they emerge, and sharing variations in solutions methods in order to strengthen students' understanding of the content. Habits of discussion emphasize making sense of mathematics, constructing arguments and critiquing the reasoning of others. Through this, students also develop presentation and public speaking skills. The teacher facilitates this discussion in a fashion that promotes student heavy-lifting and leads towards a summary of the mathematics discussed and used in student work. Student Practice: Students are given time and multiple opportunities to engage with grade-level problems and activities independently or in pairs. There are opportunities to solidify conceptual understanding, develop fluency in application, and engage in novel problems that potentially can provoke the common error(s)/misconception(s) central to the lesson. Alignment of Time to Activity: The appropriate amount of time is spent introducing material, giving students practice time, and discussing learned content. While this may vary from lesson to lesson, combined student practice time should be at least 40% of the block. Progression of Learning (CPA): The instruction or lesson fits into a sequence that moves from and makes connections between the concrete, pictorial, and abstract. As students struggle to make sense of the errors and misconceptions that hinder their understanding, they should move between different C/P/A representations as needed. CPA representations should target aspects of rigor called for by the standard and as appropriate within the sequence of learning.
Schedule (As needed in response to data) -Friday Cumulative Review block -Monday weekly quiz response	Practice provides students with opportunities to engage in work that hones in on common misunderstandings and allows students to be reflective of their misconceptions as a means to developing a more coherent understanding of the previously not-mastered material. Assessment: - Interim: Standards are re-assessed according to the blueprint/SAS. - Unit: Additional questions may be added to further assess re-taught content on unit assessments - Weekly: Network-wide and school based weekly quiz data should inform re-teach as well as reassess review content - Daily: Observational data, in-class work, Exit Tickets	

Math Intervention/Re-do

Purpose	Intellectual Preparation & Assessment	Key Indicators of Excellence
Math interventions serve three purposes: 1-To hold students accountable to work completion 2-To help students understand math concepts from the lesson 3-To remediate for students who are significantly below grade level	Unit-Level Preparation: 1. Teachers use MPG, IAs, weekly quizzes, and previous unit assessment data to determine any students who will need continued math intervention before a new unit begins. 2. Teachers also preview upcoming units to identify pre-requisite skills that may need to be taught through math intervention before the new content is taught. 3. Teachers consult First Steps/Navigating Number, Investigations, enVision, TBKs, Illustrative Mathematics, and Engage NY for math intervention resources. Daily/Weekly Re-do Preparation: 1. Teachers check homework and exit tickets daily for completion and accuracy. Students who need additional support or did not complete to the best of their ability are given re-do opportunity within the same week.	Group Size: Intervention groups should be no larger than 6 students in order to maintain an appropriate scholar to teacher ratio when working with our most struggling scholars. At-Bats: Regardless of the intervention type, students need multiple at-bats to master the intervention skill. Planning: The teacher knows the type of intervention they are trying to accomplish. They have materials appropriate to that intervention prepared for all students beforehand. Pacing and Urgency: Interventions are designed to be short periods of time, so the students and teachers must be working to maximize the time they have together.
Schedule	Lesson Planning: Teachers are responsible for the planning and execution of interventions and re-do. Interventions and re-do are planned for implementation both during the math block as well as during designated intervention friendly times when the math teacher is not teaching. The teacher bases the intervention and re-do on data from exit tickets, quizzes, and IAs, and should use their best professional judgment along with careful looking at student work protocols to determine which type of intervention is most appropriate. Assessment: - Interim: interim assessments are used to determine further need for math intervention - Universal Screener/Progress Monitor: All students are formally assessed three times annually using the nationally benchmarked MPG (K-2) assessment to determine initial placement in one of three tiers for intervention and measure progress throughout the year. - Unit: unit assessments are used to determine further need for math intervention - Weekly Quizzes: weekly quiz data is used to determine further need for math intervention - Daily: observational data, intervention completed work	Assessment: Teachers have a clear method of assessing whether students have mastered the intervention skill at the end of the intervention, generally a very short exit ticket. Progression of Learning (CPA): The lesson fits into a sequence that moves from and makes connections between the concrete, pictorial, and abstract. For example, while one session may focus on the pictorial, links should be made back to the concrete to solidify the understanding for students. As students struggle with and learn new content, they should fluidly move between C, P, and A as needed.
Full-Day: -school-based; some recommendations include: - Small group during ST Math in K-1 - After school Half-Day: -school-based		