iM Math Instructional and Language Routines

Math Language Routines are structured with an adaptable format for amplifying, assessing, and developing student language. They are effective and practical for simultaneously learning mathematical practices, content, and language. These routines can be incorporated across lessons to fit the mathematical work wherever there are productive opportunities to support students in using and improving English and disciplinary language.

These routines facilitate attention to student language in ways that support teacher-, peer-, and self-assessment. Feedback from these routines helps students revise and refine how they organize and communicate their ideas as well as assist them in asking questions to clarify understanding of others' ideas. Below, each Math Language Routine is linked to what that specific routine looks like in the iM curriculum.

Math Language Routine	Description and Rationale
MLR1: Stronger and Clearer Each Time (Grades 3-5 only)	**Purpose:** To provide a structured and interactive opportunity for students to revise and refine both their ideas and their verbal and written output. This routine also provides a purpose for student conversation through the use of a discussion-worthy and iteration-worthy prompt. The main idea is to have students think and write individually about a question, use a structured pairing strategy to have multiple opportunities to refine and clarify their response through conversation, and finally revise their original written response. Subsequent conversations and second drafts should naturally show evidence of incorporating or addressing new ideas and language. They should also show evidence of refinement in precision, communication, expression, examples, and reasoning about mathematical concepts. **How it Happens** Prompt: The teacher provides a thought-provoking question or prompt. The prompt should guide students to think about a concept or big idea connected to the content goal of the lesson, and should be answerable in a format that is connected with the activity's primary disciplinary language function. Response - First Draft: Students draft an initial response to the prompt by writing or drawing their thoughts in a first draft. It is not necessary that students finish this draft before moving to the structured pair meetings step. However, students should be encouraged to write or draw something before meeting with a partner. This encouragement can come over time as class culture is developed, strategies and supports for getting started are shared, and students become more comfortable sharing their ideas with others. (2–3 min) Structured Pair Meetings: Next, use a structured pairing strategy to facilitate students having 2–3 meetings with different partners. Each meeting gives each partner an opportunity to be speaker and an opportunity to be listener. As a speaker, each student shares their ideas. As a listener, each student should (a) ask questions for clarity and reasoning, (b) press for details and examples, and (c) give relevant feedback (1–2 min each meeting). Response - Second Draft: Finally, after meeting with 2–3 different partners, students write a second draft. This draft should naturally reflect borrowed ideas from partners, as well as refinement of initial ideas through repeated communication with partners. This second draft will be stronger (with more or better evidence of mathematical content understanding) and clearer (more precision, organization, and features of disciplinary language function). After students are finished, their first and second drafts can be compared. (2–3 min)
MLR2: Collect and Display	**Purpose:** To capture a variety of students' oral words and phrases into a collective reference for students' own output. The teacher listens for and scribes the language students use during partner, small group, or whole-class discussions using written words, diagrams, and pictures. Throughout the course of a unit, teachers reference the displayed language as a model, update and revise the display as student language changes, and make bridges between prior student language and new math language. **How it Happens** *Collect:* Teacher circulates and listens to student talk during paired, group, or whole-class discussion. Jot down the words, phrases, drawings, or writing students use. Capture a variety of uses of language that can be connected to the lesson content goals, as well as the relevant disciplinary language function(s). Collection can happen on a word wall, anchor chart, digitally, or directly onto poster paper. Capturing on a whiteboard is not recommended due to risk of being erased and desire for students to refer to the chart in the future.

	Display: Display the language collected for the class to use as a reference during further discussions throughout the lesson/unit. Encourage students to suggest revisions, updates, and connections to be added to the display as they develop new mathematical ideas and ways of communicating ideas. The display provides an opportunity to showcase connections between student ideas and new vocabulary. It also allows students to highlight examples of students using disciplinary language functions, beyond just vocabulary words.
MLR3: Critique, Correct, and Clarify (Grades 3-5 only)	Purpose: To present students with mathematical writing that is not their own to analyze, reflect on, and develop. Student reflection is encouraged when correcting errors and clarifying meaning of an incorrect, incomplete, or ambiguous written mathematical statement. Teachers can demonstrate how to effectively and respectfully critique others' work with meta-cognitive think alouds. More than just error analysis, this routine purposefully engages students in considering both the author's mathematical thinking as well as the features of their communication. **How it Happens** Original Statement: Students are presented with a written mathematical statement that intentionally includes conceptual (or common) mathematical reasoning errors as well as ambiguities in language. (1–2 min) Discussion with Partner: Students discuss the original statement in pairs, and respond to the following questions: "What do you think the author means?", "Is anything unclear?" In addition to these general guiding questions, questions can be added to address specific content/language goals of the activity. (2–3 min) Improved Statement: Students individually revise the original statement, drawing on conversations with their partners, to create an improved statement. In addition to resolving any mathematical errors/misconceptions and clarifying ambiguous language, other requirements can be added for the improved response. (3–5 min).
MLR4: Informa-tion Gap (Grades 3-5 only)	**Purpose:** To create a need for students to communicate. This routine allows teachers to facilitate meaningful interactions by positioning some students as holders of information that is needed by other students. The information is needed to accomplish a goal, such as solving a problem or winning a game. With an information gap, students need to orally (or visually) share ideas and information in order to bridge a gap and accomplish something that they could not have done alone. The teacher should demonstrate how to ask for and share information, how to justify a request for information, and how to clarify and elaborate on information. **How it Happens** Problem/Data Cards: Students are partnered. Partner A is given a card with a problem that must be solved, and Partner B has the information needed to solve it on a data card (which may contain diagrams, tables, or graphs. Neither partner should read nor show their cards to their partners. Partner A decides the information they need, and asks Partner B for that specific information. Partner B should not share information unless Partner A specifically asks for it and justifies the need for the information. Because partners don't have the same information, Partner A must work to produce clear, specific requests while Partner B works to understand more about the problem through Partner A's requests and justifications. Bridging the Gap: ● Partner B asks, "What specific information do you need?" Partner A asks for information from Partner B. ● Before sharing requested information, Partner B asks for a justification: "Why do you need that information?" ● Partner A explains how they plan to use the information. ● Partner B asks clarifying questions as needed, and then provides the information. ● These four steps repeat until Partner A is convinced that they have the information needed to solve the problem. Solving the Problem: ● Partner A shares the problem card with Partner B. ● Partner B does not share the data card. Both students solve the problem independently, then discuss their strategies. Partner B can share the data card after discussing their independent strategies.
MLR5: Co-Craft Ques-	**Purpose:** To allow students to understand a context before feeling pressure to produce answers, to create space for students to produce the language of mathematical questions themselves, and to provide opportunities for students to analyze how different mathematical forms and symbols can represent different situations. Through this routine,

tions and Problems (Grades 2-5 only)	students are able to use conversation skills to generate, choose, and improve questions and situations as well as develop meta-awareness of the language used in mathematical questions and problems. **How it Happens** Hook: Teacher presents students with a hook—a context or a stem for a problem, with or without values included. The hook can also be a picture, video, or list of interesting facts. Students Generate Questions: Students generate possible mathematical questions that might be asked about the situation. These should be questions that students think are answerable by doing math and could be questions about the situation, information that is missing, and about assumptions that they think are important. (1–2 min.) Students Compare Questions: Students compare with a partner the questions they generated (1–2 minutes). As students share with the class, the teacher documents their questions for all to see and demonstrates (or asks students to demonstrate) identifying specific questions aligned to the content or language goals of the lesson. (2–3 min.) Actual Question(s) Revealed/Identified: The actual questions students are expected to work on are revealed or selected from the list that students generated.
MLR6: Three Reads	**Purpose:** To ensure that students know what they are being asked to do, the teacher creates opportunities for students to reflect on the ways mathematical questions are presented, and equip students with tools used to actively make sense of mathematical situations and information. This routine supports reading comprehension, sense-making, and meta-awareness of mathematical language. **How it Happens** In this routine, students are supported in reading and interpreting a mathematical text, situation, word problem, or graph three times, each with a particular focus. At times, the intended question or main prompt may be intentionally withheld until the third read so that students can concentrate on making sense of what is happening in the problem before rushing to a solution or method. Read #1: “What is this situation about?”: The first read focuses on the situation, context, or main idea of the text. After a shared reading, the teacher asks students, “What is this situation about?” This is the time to identify and resolve any challenges with any non-mathematical vocabulary. (1 minute) Read #2: “What can be counted or measured?”: After the second read, students list quantities that can be counted or measured. Students are encouraged not to focus on specific values, but instead on naming what is countable or measurable in the situation. It is not necessary to discuss the relevance of the quantities, just to be specific about them (e.g. “number of people in a room” rather than “people,” “number of markers after” instead of “markers”). Some of the quantities will be explicit (e.g. 32 apples) while others are implicit (e.g. the time it takes to brush one tooth). Record the quantities as a reference to use when solving the problem after the third read. (3–5 min.) Read #3: The teacher asks, “What are different ways or strategies we can use to solve this problem?” If initially withheld, the final question or prompt is revealed for the third read. Students discuss possible solution strategies, referencing the relevant quantities recorded after the second read. Students can create diagrams to represent the relationships among quantities identified in the second read or to represent the situation with a picture. (1–2 min.)

MLR7: Compare and Connect	**Purpose:** To foster students' meta-awareness as they identify, compare, and contrast different mathematical approaches and representations. Students make sense of mathematical strategies by relating and connecting other approaches to their own. Students should be prompted to reflect on and respond to these comparisons. **How it Happens** Students Prepare Displays of their Work: Students are given a problem that can be approached and solved using multiple strategies, or a situation that can be modeled using multiple representations. Students prepare a visual display of their work. Variation is encouraged among the representations that students use to show their thinking. Compare: Students investigate each others' work by taking a tour of the visual displays or reviewing a range of different approaches that all can see. Students can examine each other's work in a self-guided format, or the teacher can act as "docent" by providing questions for students to ask of each other, pointing out important mathematical features and facilitating comparisons. Comparisons should focus on what worked well in specific approaches, or what is especially clear in certain representations. Connect: The discussion turns to identifying similarities between representations, focusing on how specific mathematical relationships, operations, quantities, or values appear in each display. Students should refer to each other's thinking by asking them to make connections between specific features of expressions, tables, graphs, diagrams, and words of the same mathematical situation. During the discussion, the teacher should amplify language students use to communicate about mathematical features important to solving the problem or modeling the situation.
MLR8: Discus-sion Supports	**Purpose:** To support rich and inclusive discussions about mathematical ideas, representations, contexts, and strategies. Rather than another structured format, these instructional moves can be combined and used together with any of the other routines. They include multimodal strategies for helping students make sense of complex language, ideas, and classroom communication. The examples can be used to invite more student participation, conversation, and meta-awareness of language. Eventually, as the teacher continues to demonstrate, students should begin using these strategies themselves to prompt each other to engage more deeply in discussions. Examples of discussion supports: ● Revoice student ideas to demonstrate mathematical language use by restating a statement as a question in order to clarify, apply appropriate language, and involve more students. ● Press for details in students' explanations by requesting that students challenge an idea, elaborate on an idea, or give an example. ● Show central concepts multi-modally by using different types of sensory inputs: acting out scenarios or inviting students to do so, showing videos or images, using gestures, and talking about the context of what is happening. ● Practice phrases or words through choral response. ● Think aloud by talking through thinking about a mathematical concept while solving a related problem or doing a task. ● Demonstrate uses of disciplinary language functions such as detailing steps, describing and justifying reasoning, and questioning strategies. ● Give students time to make sure that everyone in the group can explain or justify each step or part of the problem. Then make sure to vary who is called on to represent the work of the group so students get accustomed to preparing each other to fill that role. ● Prompt students to think about different possible audiences for the statement, and about the level of specificity or formality needed for a classmate vs. a mathematician, for example.