Amplify Desmos Math

Routine Facilitation Guides | Contents

These are instructional routines and math language routines used in Amplify Desmos Math. Many of these routines are built on foundations created by other educators. We are grateful for their work.

Instructional Routines

Math Language Routines

Choral Count

Grades K–3

Pacing ~5–10 minutes

Short on time?
Consider using this routine in between classes or as students line up.

This routine is designed to provide students with an opportunity to practice counting as a class. As students count aloud, the count sequence is displayed so that students can notice patterns or structures across numbers.

Facilitation

1. Invite students to count together by saying:
   a. "Let's count by _____, starting at _____ and ending at _____."
   b. "Let's count back by _____, starting at _____ and ending at _____."
2. Display or record each number as students count. Align the numerals to highlight the pattern you wish for students to notice.
3. To highlight patterns in the count, ask, "What patterns do you see?" Record a variety of students' responses.
4. Encourage students to apply their understanding by repeating the count, predicting the next number in the count, or connecting the count sequence with the lesson goals.

Math Identity and Community
When students are repeating their count, invite them to choose their volume or tone as a class to promote student engagement. Students could whisper, cheer, or use a robot voice as they repeat the count sequence.

ML/EL

Multilingual/English Learners
Consider displaying the sentence frame "Let's count/back by . . ." with a visual cue (e.g., If counting by a number, display an arrow pointing up or to the right. If counting back by a number, display an arrow pointing down or to the left). **(Speaking and Listening)**

A

Accessibility: Memory and Attention
As students count, invite them to jump, stomp, or fist pump with each number or group of numbers. As they become familiar with the routine, invite them to suggest other safe movements that could support their count.

Based on research from Megan Franke, Elham Kazemi, and Angela Chan Turrou. Megan Franke, Elham Kazemi, and Angela Chan Turrou, Choral Counting & Counting Collections (Routledge, 2018).

Decide and Defend

Grades 6–12

This routine is designed to support students in strengthening their ability to construct arguments, and to make sense of and critique the arguments of others. Students make sense of another's line of mathematical reasoning, decide if they agree or disagree with that reasoning, then draft an argument defending their decision.

Pacing ~8 minutes

Short on time?
Invite students to share with the whole class without sharing in pairs first.

Facilitation

1. Invite students to make sense of each claim and decide if they agree. Clarify any unknown words to increase access to the task.

2. Invite students to share their thinking with a partner and justify their reasoning. Encourage them to ask clarifying questions.

   To support conversation, consider displaying questions such as:

   - "What reasoning or evidence supports your claim?"
   - "What evidence or language was most convincing to you?"

   » **Movement Option:** Consider inviting students to move to different locations based on whether they agree or disagree with the claim. Encourage them to discuss their reasoning with others in their location. Invite one student from each location to share their reasoning. As students discuss, encourage them to move if they change their mind.

3. Poll the class or display the distribution of responses using the dashboard's Teacher View, calling attention to any conflict or consensus you notice.

4. Discuss each claim as a class and invite students to defend their thinking. If everyone is in agreement, consider making a class argument using different students' reasoning.

5. Invite students to share what evidence they found most convincing.

Math Identity and Community
Consider highlighting the value of changing one's mind by asking if any students revised their thinking from what they originally thought or wrote.

ML/EL **Multilingual/English Learners**
As students share in partner and whole-class discussions, display sentence frames such as:

- "I agree/disagree with you because _____."
- "I think that makes sense because _____."
- "How did you know _____?"

(Writing and Speaking)

A **Accessibility: Conceptual Processing**
Invite students to answer a more concrete question first to support abstract thinking.

Based on research from Amy Lucenta and Grace Kelemanik. Amy Lucenta, et al., "Decide and Defend", fosteringmathpractices.com.

Estimation Exploration

Grades 1–5

This routine is designed to strengthen students' ability to make reasonable estimates for amounts, lengths, or sizes. Over time, this routine promotes a shift from random guessing to using prior knowledge and problem-solving techniques as students make and revise estimates.

Pacing ~5–10 minutes

Short on time?
Consider facilitating during the Launch and Connect of an Activity, rather than a Warm-Up.

Facilitation

1. Display an image and, if needed, provide contextual information about the image.

2. Invite students to share their estimates and strategies. Record a variety of responses.

   » **Movement Option:** Consider having students line up in numerical order, as if on a number line, to visualize the range of student responses.

3. Continue the discussion to help students revise their estimates by:

   - Providing additional contextual information.
   - Providing a second image with additional information.
   - Asking, "Do you think the actual amount is higher or lower than your estimate? Why?"

Math Identity and Community
If the image requires contextual background knowledge, consider inviting students to share a time they have encountered something similar outside of the classroom.

ML/EL **Multilingual/English Learners**
Invite students to discuss their strategy with a partner before sharing with the class.
(Speaking and Listening)

A **Accessibility: Conceptual Processing**
To support students in making appropriate estimates, consider asking students to start with an estimate that they know is too high or too low.

Gallery Tour

Grades K–12

Pacing ~15 minutes

Short on time?
Invite students to visit 2–3 displays instead of all of them.

This routine supports students in sharing their work with their peers and exploring their classmates' work. Students display their work around the room and move around to discuss each display.

Facilitation

1. Invite students to display their work around the room.
2. Share that the goal is to understand rather than correct or critique. Consider assigning each student or pair a place to begin their tour.
3. Invite students to move around the room to discuss each display and record their observations independently or with a partner.
4. After the Gallery Tour, invite students to share about the designs they saw.

   Consider asking:

   - "What features of your classmates' designs helped you understand their thinking?"
   - "What is something you would change about your design now that you've seen how others approached the problem?"

Math Identity and Community
Invite students to share what others did well or share connections between their designs and the designs of others.

ML/EL

Multilingual/English Learners
Display sentence frames to support students' discourse and to support students in focusing on the purpose or goal of the Gallery Tour. **(Speaking and Listening)**

A

Accessibility: Executive Functioning
If students need to verbally explain their designs, divide the class into two groups. Invite one group to stand by their work and explain as the other group circulates. Then switch so that all students have the opportunity to share.

How Many Do You See? Grades K–5

This routine is designed to support students' development of counting strategies, subitizing, and utilizing visual and mathematical structures.

Pacing ~5–10 minutes

Short on time?
Display as many images as there is time for, making sure to display the images that are discussed.

Facilitation

1. Display an image for 2–5 seconds. Invite students to signal when they are ready with an answer.

2. Display the image for discussion. Ask students, "How many do you see? How did you see them?"

3. Invite several students to share their responses and record a variety of responses.

   Consider asking:

   - "What is another way to see them?"
   - "What if there was an additional group?"
   - "Could you write an expression that represents your strategy?"

4. If working through a series of images, display the next image and repeat the steps.

Math Identity and Community
Consider recording students' names along with their responses. Draw connections between students' responses and encourage students to visualize an image through another student's lens.

ML/EL

Multilingual/English Learners
Encourage students to use hand motions or a sketch to help describe how they visualized the amount. **(Speaking and Listening)**

A

Accessibility: Memory and Attention
Consider using an action-based signal for students to indicate their readiness, such as standing up, sitting down, or moving to a certain location in the classroom.

Mix and Mingle

Grades K–5

This routine is designed to provide an active way for students to share their questions, responses, or thinking.

Pacing ~10 minutes

Short on time?
Consider mixing and mingling for two rounds.

Facilitation

1. Display a prompt or distribute materials (cards with information or physical manipulatives) to each student. Establish the goal or purpose of the discussions students will have.

2. Invite students to move around the room and pair up with a partner.

   If using cards, consider photocopying different sets of cards on different-colored paper to make it easier for partners to find each other (e.g., "If you have a blue card, find a partner with a red card."), or using existing partner configurations (e.g., if students are usually split up for partner opportunities as "apples" and "oranges," say, "Apples, find an orange.").

3. Invite students to discuss the prompt or what is on their cards. Consider modeling how you want students to move around the room when pairing up with a partner.

   » **Movement Option:** Invite one partner to stay in place while the other mingles. After the first round, invite the partner who stayed in place to find their next partner.

4. Signal to students when the round has ended and invite them to trade materials, if applicable, with their current partner and find a new partner for the next round.

5. As time permits, repeat Steps 2–3 for each new round.

Math Identity and Community
This routine is used to get students up and talking to different students based on a common purpose or question, not necessarily needing cards or manipulatives. Consider applying any non-math Mix and Mingle classroom routines that students are familiar with.

ML/EL

Multilingual/English Learners
Encourage students to rephrase their partners' reasoning before sharing their own. Display sentence frames, such as "I think you are saying _____. Is that correct?" or "First, you _____ because _____. Is that correct?"
(Speaking and Listening)

A

Accessibility: Memory and Attention
Consider using a cue, such as music or chanting, to tell students when to stop circulating and pair up.

Notice and Wonder

Grades K–12

This routine is designed to promote curiosity and help students make sense of a math representation, tool, image, context, or task.

Pacing ~5–10 minutes

Short on time?
Invite students to share with the whole class without sharing in pairs first.

Facilitation

1. Display a mathematical representation, image, or other media. Then ask, "What do you notice? What do you wonder?"
   - » **Note:** Consider displaying sentence frames to support students in sharing what they noticed or wondered (e.g., "I notice . . ." or "I wonder . . .").
2. Invite students to think independently before sharing their thinking with a partner.
3. Invite several students to share something they noticed or wondered with the whole class. Record what students share along with their names.
4. Throughout the lesson or unit, refer to the things students noticed and wondered as they become relevant (e.g., "Do you remember when [NAME] wondered _____?").

Math Identity and Community
Celebrate variety and creativity in what students notice and wonder, including things that surprise you and things other students may not have noticed.

ML/EL **Multilingual/English Learners**
Create a list of words about the context that students might not know, along with visuals or translations of each word in languages your students speak. **(Reading and Listening)**

A **Accessibility: Memory and Attention**
To support students in keeping track of their ideas, invite them to record what they notice and wonder in their Student Edition or on paper.

Based on the work of Max Ray-Riek. National Council of Teachers of Math, "What is Notice and Wonder?", nctm.org.

Number Talk

Grades K–12

Pacing ~5–10 minutes

Short on time?
Invite two students to share their strategies in each round.

This routine is designed to support students to think flexibly about structure, patterns, and properties and to develop language for describing their thinking. Students solve a series of related problems mentally, then discuss their strategies aloud. Each problem in a Number Talk is designed to have multiple solution strategies.

Facilitation

1. Display the first problem.

2. Invite students to solve the problem mentally. Encourage them to find multiple strategies.

   Invite students to discreetly signal how many strategies they've come up with (e.g., holding up their fingers in front of their chests to indicate how many strategies they've found).

3. Invite a few students to share their strategies without sharing their solution. Consider inviting students with fewer strategies to share first.

   Take a moment to celebrate the variety of mathematical thinking and strategies used to solve the problem. Record a variety of strategies, along with the name of the student who shared each one.

   Consider asking:

   - "Does anyone have a question for _____ about their strategy?"
   - "Can someone explain _____'s strategy in their own words?"
   - "Did anyone use the same strategy as _____ in a different way?"
   - "Who solved this problem in a different way?"

4. Display the next problem and repeat Steps 1–3. Consider keeping the record from previous problems displayed to encourage students to use one of the previously shared strategies.

5. Repeat Step 4 until all the problems have been discussed. Invite students to make connections between the shared strategies.

Math Identity and Community
Celebrate students who share their incorrect solutions, assuring them that there is correct thinking in incorrect solutions.

ML/EL **Multilingual/English Learners**
Encourage students to paraphrase each other's strategies. **(Speaking and Listening)**

A **Accessibility: Memory and Attention**
To support abstract thinking, invite students to make connections between similar problems in the Number Talk. Consider asking, "How could you use a strategy shared from the first problem to support you in solving this new problem?"

Based on the research of Cathy Humphreys and Ruth Parker. Cathy Humphreys and Ruth Parker, Making Number Talks Count (Stenhouse Publishers, 2015)

Stories and Questions Grade K

This routine is designed to invite students to analyze the relationship between quantities in a math story and consider how they can use mathematics to model a real-world situation.

Pacing ~5–10 minutes

Short on time?
Invite students to share their stories and questions with the whole class without comparing with a partner.

Facilitation

1. Display a mathematical story, image, or other media. Invite students to think about the display.

2. Consider asking one or more of the following questions to support students in making sense of the context:
   - "What do you notice?"
   - "What math story could you tell about _____?"
   - "What math questions could you ask about this story?"

   Invite students to think independently for a moment and then invite them to share their thinking. Before students share with the class, consider inviting them to share with a partner. Use drawings, numbers, or words to record students' thinking.

3. Use a synthesizing question or statement to connect the discussion to the upcoming activities.

Math Identity and Community
Invite students to share connections with other students' responses by displaying a silent signal. Encourage them to use the signal to indicate agreement and connection while maintaining the pace of the lesson.

ML/EL **Multilingual/English Learners**
If possible, pair students with partners who speak the same primary language so they can discuss the context and ask questions in their primary language. **(Speaking and Listening)**

A **Accessibility: Conceptual Processing**
After asking how students could show a story, invite them to act it out using a group of students or objects.

Tell a Story

Grades 6–12

Pacing ~5–10 minutes

Short on time?
Invite students to share with the whole class without sharing in pairs first.

This routine invites students to use their knowledge and creativity to make sense of a representation. Students draw upon their experiences to tell stories based on images, videos, or mathematical representations. Storytelling is an important part of many cultures and "verbal expressiveness is a central cultural theme in oral cultural traditions."[1]

Facilitation

1. Display a graph, table, image, video, or mathematical expression. Invite students to draw upon their unique experiences, perspectives, and creativity to write a story based on the representation.

2. Invite students to write their story or jot down ideas independently. Consider reminding students that their stories do not need to be perfect or complete to be valuable.

3. Invite students to share their story with a partner or small group. Encourage them to ask questions and make connections between each other's stories.

   To support conversation, consider displaying prompts such as:

   - "How do you see the parts of _____'s story in the [table/graph/image]?"
   - "What parts of each of your stories are alike? How are they different?"
   - "What questions do you have about each other's stories?"

4. Invite students to share their stories or use the Snapshot tool to share them in Anonymize mode with the whole class. Discuss each story and how it connects to the representation.

Math Identity and Community
Celebrate stories that are unique or joyful, or that represent the situation with a different perspective.

ML/EL **Multilingual/English Learners**
Invite students to write their stories in their primary language. Consider displaying a word bank to support students in expressing their ideas, including words such as: *At first, In the beginning, then, next, finally.* **(Reading and Writing)**

A **Accessibility: Visual-Spatial Processing**
To support interpreting visual representations, invite students to choose a specific element on the graph, table, image, or video and describe what it means in relation to the story they are writing.

Based on the research of Lauren Baucom. Lauren Baucom, "An Exploratory Study on the Identity Work of Secondary Math Teachers and Their Engagement with Critical Statistical Literacy" (2022).

[1](Cazden, 2001; Ladson-Billings, 2009)

Think-Pair-Share

Grades K–12

This routine is designed to support student-to-student discourse and encourage deeper connections. Students engage in three steps. First, they think individually. Then, they discuss their ideas with a partner. Finally, they share their thinking with the whole class.

Pacing ~5 minutes

Short on time?
Invite two students to share in the whole class discussion.

Facilitation

1. Invite students to think independently about a question or prompt.
2. Invite students to discuss their ideas with a partner, asking clarifying questions as needed.

   Encourage students to determine who should share first, ensuring both partners have an opportunity to share their thinking.

   » **Movement Option:** To encourage movement, invite students to find a partner in a different location. If using this option, the prompt should not require students to have pencils, paper, notebooks, or calculators.
3. Invite several students to share their thoughts with the whole class.

Math Identity and Community
Invite students to share something they heard from their partner instead of their own idea during the whole-class discussion.

ML/EL **Multilingual/English Learners**
Consider pairing students with partners who speak the same primary language and inviting them to share in that language. Encourage students to paraphrase each other's ideas to help them make connections and incorporate vocabulary from the unit. **(Speaking and Listening)**

A **Accessibility: Affective Functioning**
To support students in sharing their thinking, ask students in advance if they, you, or a classmate can share their thinking during the whole class discussion.

Based on research by Frank Lyman. Frank Lyman, *Think-Pair-Share: An expanding teaching technique.* MACIE Cooperative News (1987).

The Stand and Talk modification based on the work of Sara VanderWerf. Sarah VanderWerf, "Stand and Talks. The best thing I ever did to get students talking to one another.", saravanderwerf.com, November 18, 2018.

True or False? Grades 1–5

This routine is designed to encourage students to notice and make use of structure as they use the properties of operations to determine equivalence without having to calculate. Students use what they know about place value, operations, and number relationships to justify and explain their thinking.

Pacing ~5–10 minutes

Short on time?
Invite students to share with the whole class without sharing in pairs first.

Facilitation

1. Display an equation/statement. Then ask, "Is this equation/statement true or false?" Encourage students to reason about the equation/statement without calculating.

2. Invite students to think independently. Encourage them to look for more than one way to reason if the equation/statement is true or false.
   - » **Note:** For false equations/statements, consider asking, "How could you make this false equation/statement true?"

3. Encourage students to share their responses and thinking with their partner.

4. Invite students to share their thinking with the whole class.

5. If working through a series of problems, display the next one and repeat the steps. Consider keeping previous equations/statements displayed and encourage students to use their classmates' ways to reason.

Math Identity and Community
Use this routine to support students in learning how to respectfully and productively agree or disagree. For example, prompt students to determine whether this statement is true or false: "A hotdog is a sandwich."

ML/EL **Multilingual/English Learners**
Consider providing the sentence frame, "_____ is true/false because _____" when students are sharing with their partner or the whole class. **(Speaking and Listening)**

A **Accessibility: Memory and Attention**
Consider inviting students to write their responses or use a visual cue for true and false.

What Do You Know About _____?

Grades K–5

This routine is designed to invite students to engage in discussion and share their background knowledge about a given topic.

Pacing ~5–10 minutes

Short on time?
Consider facilitating as a word association exercise. Instead of sharing full statements, invite students to share one thing that comes to mind.

Facilitation

1. Display the question and any related images or media. Ask students, "What do you know about _____?"
2. Invite students to think independently. Then invite them to respond.
3. Use drawings, numbers, or words to record students' thinking. Display the record throughout the lesson.

Math Identity and Community
Create and continually review class norms about how students react and respond to ideas that are different from their own to ensure that students feel safe and supported as they share.

ML/EL

Multilingual/English Learners
Invite students to make connections between mathematical concepts and their own lives and background knowledge by asking questions such as, "Where have you seen _____?" **(Speaking and Listening)**

A

Accessibility: Conceptual Processing
To ensure that all students have adequate think time, encourage them to silently and independently record thoughts or notes before sharing aloud.

Which One Doesn't Belong?

Grades K–12

Pacing ~8 minutes

Short on time?
Consider facilitating the whole class discussion without having students share with a partner.

This routine is designed to support students as they precisely describe characteristics of mathematical figures, diagrams, graphs, or expressions. The sets are designed so each item "doesn't belong" in some way, which helps students focus on their reasoning and communication without feeling the pressure to determine an answer.

Facilitation

1. Display the four items (e.g., figures, diagrams, graphs, or expressions). Then ask, "Which one doesn't belong? Why?"

2. Invite students to think independently. Encourage them to look for more than one reason why each item doesn't belong.

3. Encourage students to share their responses with a partner and determine at least one reason why each item doesn't belong.

   » **Movement Option:** Consider labeling each corner of the room as a different item and inviting students to move to the location that corresponds with the item they think doesn't belong. Encourage students to discuss their reasoning with others in their corner. Invite a student from each corner to share their reasoning.

4. As a class, discuss ways that each item is different from the rest, encouraging students to justify their thinking.

Math Identity and Community
Invite students to celebrate the variety of mathematical thinking shown in this activity. Encourage students to share how hearing the way different people think is valuable to everyone.

ML/EL

Multilingual/English Learners
Consider displaying sentence frames to support students in their explanation (e.g., "_____ doesn't belong because _____." or "_____ is the only one that has/doesn't have _____.)".
(Writing, Speaking, and Listening)

A

Accessibility: Executive Functioning
To support students in initiating complex tasks, consider identifying one item and asking, "How is this one different from the rest?"

Based on the work of Christopher Danielson, Megan Franke, and Sesame Street (among others).

MLR1: Stronger and Clearer Each Time

Grades K–12

Pacing ~15 minutes

Short on time?
Consider reducing the number of partners students share with.

This routine is designed to support students in revising and refining their ideas through written and verbal communication. Students engage in multiple rounds of explaining their ideas and making them stronger (by providing additional examples) and clearer (by using more precise language and/or visuals).

Facilitation

1. Invite students to think independently and create a first draft of their response. Consider sharing that first drafts don't have to be complete before moving to the next step.

2. Invite students to take turns sharing their response and giving feedback to a partner.

   To support conversation, consider displaying prompts such as:

   - "How do you know that _____?"
   - "What do you mean when you say _____?"
   - "Can you say that another way?"
   - "How could you use another representation to support your response?"

   » **Option 1:** Repeat Step 2 until each student has shared their draft with 2–3 different partners. Invite students to revise their draft to make it stronger and clearer after all the rounds of feedback.

   » **Option 2:** Invite students to revise their draft to make it stronger and clearer after each round of feedback.

3. Encourage students to reflect on how the feedback process strengthened and clarified their ideas.

Math Identity and Community
Consider drafting a class answer created from students' responses to emphasize that we are stronger together than we are as individuals.

Multilingual/English Learners
Invite students to write in their primary language and then translate their response into English during the second draft. **(Reading and Writing)**

Accessibility: Affective Functioning
To support students with collaboration, invite them to move around the room to find feedback partners to work with.

This routine is based on research from Jeff Zwiers and his colleagues. Jeff Zwiers, et al., "Principles for the Design of Mathematics Curricula: Promoting Language and Content Development", February 28, 2017.

MLR2: Collect and Display

Grades K–12

Pacing ~5–10 minutes

Short on time?
Consider using the dashboard's Teacher View to collect students' thinking and display it during the next lesson's Warm-Up.

This routine is designed to capture the developing math language students use throughout a lesson or unit. Teachers collect words and phrases students use during partner and class discussions, then organize and display that language for them to build on and make connections to in future discussions.

Facilitation

1. Listen for the language students use during partner, small group, or whole class discussions and collect specific words or phrases.

2. Organize the students' language, using examples or diagrams to visualize their words and phrases. Create a visual display to share with the class.

   To support conversation, consider asking:

   - "How are these words/diagrams/phrases useful for explaining _____?"
   - "How are the words and phrases related?"
   - "What do you mean when you say _____?"

3. Encourage students to refer to, build on, or make connections to the displayed language throughout the lesson and/or unit.

   Repeat Steps 1–3 as new student language surfaces.

   » **Note:** If making sense of a new vocabulary term, invite students to create a class definition using language that surfaced throughout the lesson and add it to the display.

4. Invite students to reflect on how developing their use of language helps communicate their thinking clearly.

Math Identity and Community
Consider naming strategies or phrases after the students who shared them and using those names throughout the lesson and unit.

ML/EL **Multilingual/English Learners**
As students make sense of new terms and phrases, invite them to share what the term reminds them of or how to say it in other languages (e.g., "When I hear [term], I think _____."). This may help surface multiple meanings and encourage students to connect to prior knowledge.
(Reading and Listening)

A **Accessibility: Memory and Attention**
Consider using poster paper to create an anchor chart that students can reference to activate prior knowledge.

This routine is based on research from Jeff Zwiers and his colleagues. Jeff Zwiers, et al., "Principles for the Design of Mathematics Curricula: Promoting Language and Content Development", February 28, 2017.

MLR3: Critique, Correct, Clarify

Grades 2–12

Pacing ~10 minutes

Short on time?
Consider creating a revised response as a whole class.

This routine is designed to support students in analyzing the mathematical thinking of others and communicating about its strengths, errors, and ambiguities. Students critique the reasoning of others and ask questions to clarify or improve arguments.

Facilitation

1. Share a response that contains early thinking, such as a misconception, an error in calculating, or a justification that uses vague or imprecise language.
   - » **Note:** Consider using a sample response, a student response in Anonymize mode, or a fictional response you created.
2. Invite students to read the response independently and read it again with a partner. Then invite them to:
   - **a.** Discuss what is **correct** about the response.
   - **b.** Discuss what is **incorrect** or **unclear.**
3. Invite several pairs to share their critique of the student thinking, dedicating equal time to what the student did well and what was incorrect or unclear.
4. Invite students to create a revised response, either by correcting the errors or by clarifying the language to make it stronger and clearer.

Math Identity and Community
Consider discussing how to effectively and respectfully critique others' ideas. Invite students to share what they think they can learn from analyzing both correct and incorrect thinking.

ML/EL

Multilingual/English Learners
Consider displaying sentence frames to support students in explaining their thinking (e.g., "_____ is correct in thinking _____." or "_____ did _____ correctly/incorrectly."). **(Writing, Speaking, and Listening)**

A

Accessibility: Executive Functioning
Consider chunking this activity by inviting students to analyze one step of student work at a time. To promote student focus, consider covering up steps until students are ready to address them.

This routine is based on research from Jeff Zwiers and his colleagues. Jeff Zwiers, et al., "Principles for the Design of Mathematics Curricula: Promoting Language and Content Development", February 28, 2017.

MLR4: Information Gap

Grades 3–5

Pacing ~10–15 minutes

Short on time?
Consider facilitating as a whole class instead of in pairs or small groups.

This routine creates a need for students to communicate and allows teachers to facilitate meaningful interactions by giving partners or team members different pieces of necessary information that must be used together to solve a problem.

Facilitation

Pairs

1. Arrange students in pairs and assign each student as Partner A or Partner B.
2. Give Partner A the problem card and Partner B the information card. Each reads silently.
3. Without showing their card to their partner, invite pairs to solve the problem together.
   - Partner A thinks about what information is needed.
   - Partner B asks: What specific information do you need?
     Partner A requests specific information from Partner B.
   - Partner B asks: Why do you need that information?
     Partner A explains how they will use the information to solve the problem.

Small Groups

1. Arrange students in small groups and place the stack of clue cards facedown. Ensure students understand the problem they will be answering together.
2. Every student takes a card. Students read their own card silently.
3. Starting with the first clue card, the cardholder will read aloud the information to the group. Groups discuss the shared information and how it could help solve the problem.
   Some questions could be:
   - "What information would be helpful to solve this problem?"
   - "Does this help us determine an answer? Do we need to pair it with another clue?"
4. Continue this process in numerical order, with the second clue card being read next by the cardholder, until all the cards have been read aloud and the group has solved the problem.

Math Identity and Community
Invite students to reflect on their experience. Consider asking:
- "How did it feel to have missing information?"
- "How did it feel to ask and answer questions about missing information?"

ML/EL Multilingual/English Learners
Consider modeling how to ask for and share information, clarification, justification, and elaboration. Display sentence frames or prompts to support students. **(Writing, Speaking, and Listening)**

A Accessibility: Executive Functioning
Invite students to share with their group what information they think is most important for solving. Invite one member of the group to record the group's ideas and use them as a checklist.

This routine is based on research from Jeff Zwiers and his colleagues. Jeff Zwiers, et al., "Principles for the Design of Mathematics Curricula: Promoting Language and Content Development", February 28, 2017.

MLR5: Co-Craft Questions

Grades K–12

Pacing ~5 minutes

Short on time?
Invite students to share their questions with the whole class without comparing with a partner.

This routine is designed to support students in making sense of a context by asking questions without feeling the pressure to produce answers.

Facilitation

1. Display a picture, video, context, or launch for a mathematical situation.
2. Invite students to write mathematical questions that could be asked about the situation.
3. Invite students to compare questions with a partner.
4. Discuss the different questions created by the class, celebrating the variety and creativity.
5. Display the specific question that will be the focus of the lesson.

Math Identity and Community
Consider inviting students to move around the room to find partners to generate and discuss their questions with.

ML/EL

Multilingual/English Learners
Consider pairing students with partners who speak the same primary language and inviting them to share and receive feedback in their primary language.
(Writing, Speaking, and Listening)

A

Accessibility: Conceptual Processing
To support students in distinguishing between a mathematical question and not, consider brainstorming a mathematical and non-mathematical question about the situation as a class before students begin.

This routine is based on research from Jeff Zwiers and his colleagues. Jeff Zwiers, et al., "Principles for the Design of Mathematics Curricula: Promoting Language and Content Development", February 28, 2017.

MLR6: Three Reads

Grades K–12

This routine is designed to support students in making sense of problems and what they are being asked to do. Students read a situation or problem three times, each time with a particular focus.

Pacing ~10 minutes

Short on time?
Invite pairs to use this routine on their own to make sense of a situation.

Facilitation

Read #1: Focus on understanding the text

1. Invite students to read the situation or problem aloud while everyone else reads along.
2. Consider asking, "What is this situation about?" Invite students to discuss with a partner.
3. Discuss what the situation is about as a whole class.

Read #2: Focus on the mathematical language and quantities

4. Invite students to read the situation aloud with their partner.
5. Consider asking, "What can be counted or measured in this situation? How are they related?" Invite students to discuss with a partner.
6. Discuss the relationships between the quantities as a whole class. Record students' ideas for them to reference later.

Read #3: Focus on possible solution strategies

7. Invite students to read the situation independently.
8. Display the final question or prompt. Consider asking, "What strategies could we use to solve this question?"
9. Discuss students' strategies as a whole class.

Math Identity and Community
Invite students to share why reading a question multiple times might help when solving a complex problem.

ML/EL **Multilingual/English Learners**
Consider showing images or videos, creating a list of words along with visuals or translations, or inviting students to act out scenarios to support them in making sense of the context during the first read. **(Reading and Listening)**

A **Accessibility: Executive Functioning**
To support students in processing the text, invite them to turn on the "Text to Speech" feature, which is available in the Accessibility Settings area in the student sidebar. (press the hamburger in the top-left corner of an activity).

This routine is based on research from Jeff Zwiers and his colleagues. Jeff Zwiers, et al., "Principles for the Design of Mathematics Curricula: Promoting Language and Content Development", February 28, 2017.

MLR7: Compare and Connect

Grades K–12

Pacing ~8 minutes

Short on time?
Consider facilitating as a whole class instead of independently.

This routine is designed to support students in comparing multiple mathematical strategies or representations for the same problem. Students make connections between the different strategies or representations.

Facilitation

1. Display a problem that has been solved using different strategies or representations.
   - » **Note:** Consider using two students' strategies or two fictional strategies. If a student used one of the strategies, consider skipping the screen and inviting them to explain their strategy instead.
2. Invite students to compare the different approaches independently. Consider asking, "What did each student do? How are _____'s and _____'s strategies alike? How are they different?" Discuss as a whole class.
3. Invite students to make connections across the different approaches. Consider asking, "Where do you see the same information in each strategy? How are these representations showing the same information?" Discuss as a whole class.
4. Invite students to compare and connect these strategies to their own. Consider asking, "How do these strategies compare to your own? What connections do you notice between your strategy and the others?" Discuss as a whole class.
5. Encourage students to reflect on and discuss why it's useful to have more than one strategy for solving the same problem.

   Consider asking:

   - "Why did the different strategies lead to the same outcome?"
   - "What was helpful about each strategy? When might we use each strategy?"
   - "Where do you see [key concept] in each approach?"

Math Identity and Community
Consider asking, "Why might having more than one strategy be useful?"

ML/EL Multilingual/English Learners
Consider displaying sentence frames to support students in explaining each student's strategy (eg., "First, they _____. Next, they _____. Finally, _____.") and what's clear and unclear about each strategy (e.g., "I see _____ in both strategies., What is clear to me is _____. What is unclear to me is _____."). **(Writing, Speaking, and Listening)**

A Accessibility: Executive Functioning
Consider chunking this activity by inviting students to focus on how the strategies are alike before focusing on how they are different.

This routine is based on research from Jeff Zwiers and his colleagues. Jeff Zwiers, et al., "Principles for the Design of Mathematics Curricula: Promoting Language and Content Development", February 28, 2017.

MLR8: Discussion Supports

Pacing Varies by support type

Short on time?
Varies by support

Grades K–12

This routine is designed to support precise and meaningful student discussion and the deepening of students' mathematical understandings. This routine can be combined and used together with any of the other routines to help students make sense of language and increase student engagement.

Facilitation

There are several types of Discussion Supports. Consider implementing one of the following:

- **Pressing for Details:** Focused questions can help clarify student reasoning. As students share responses, consider asking them to challenge an idea, elaborate on an idea, or give an example.
- **Revoicing:** Revoicing can support students in expanding and clarifying their ideas. Repeat back all or part of what a student shares in a discussion, verifying that you have interpreted their response correctly. Paraphrase a student's response to amplify and demonstrate precise mathematical language. Consider asking, "Did I get that right?" to ensure you've interpreted their response correctly.
- **Active Listening:** As students discuss with a partner, encourage them to summarize their partner's response before adding an idea of their own.
- **Making a Conjecture:** Ask students to make a conjecture about an idea. As students share, record their conjectures. Invite students to discuss:
  - "How do you know whether your conjecture is always true?"
  - "Are there any counterexamples that show your conjecture is false?"
- **Think-Aloud:** While solving a problem or completing a task, vocalize your problem-solving process to model for students how to develop their inner dialogue. Describe in detail your solving process, justify your reasoning, and question your strategies.
- **Choral Response:** As a whole class, practice saying new vocabulary terms or phrases through choral response.

Math Identity and Community
Invite students to revoice something they heard their partner share. Hearing their own mathematical ideas reflected back to them can increase students' awareness of their math identity.

ML/EL **Multilingual/English Learners**
Act out scenarios or invite students to do so, show videos/images, use gestures, or talk about a problem before discussing it as a class. **(Reading, Speaking, and Listening)**

A **Accessibility: Affective Functioning**
To support students in sharing their thinking, ask students in advance if they, you, or a classmate can share their thinking during the whole class discussion.

This routine is based on research from Jeff Zwiers and his colleagues. Jeff Zwiers, et al., "Principles for the Design of Mathematics Curricula: Promoting Language and Content Development", February 28, 2017.