

# Math Practice 3: Construct Viable Arguments and Critique the Reasoning of Others (School District/Building Leader Facilitation Guide)

## Presenter:

## Intended Use

This facilitation guide is designed for district and school leaders to use when delivering sessions on the Standards for Mathematical Practice 3: Construct Viable Arguments and Critique the Reasoning of Others. The document can be used by district and building leaders to facilitate broader conversations on the use of local data, focusing on the broader impact of the MPs across building and district levels. Its purpose is to help broaden discussions with staff members on Math Practice 3 (MP 3) to a building and district level.

Viewing the Math Practice series can be done in any order. While viewing the series is encouraged in groups, it can also be done individually. To get the full benefit of the professional development series, educators should engage in the tasks and participate in local discussions on Mathematical Practice. Therefore, viewing the professional learning series in small groups is encouraged over individuals watching it in isolation.

## Reproducing the Facilitation Guide

If you make copies of any portion of this facilitation guide or accompanying PowerPoint presentation, please credit the Ohio Department of Education and Workforce.

## During Facilitation: Discussion Questions

Pause the recording at the times indicated in the recording and have discussions in smaller groups, and then in the larger group.

### DISCUSSION QUESTIONS

*PowerPoint Slide 17*

- What makes a courtroom so dramatic?

### DISCUSSION QUESTIONS

*PowerPoint Slide 20*

- How can we ensure that Math Practice 3 is consistently implemented across all classrooms in our district?
- What strategies can we use to support teachers in constructing viable arguments and critiquing the reasoning of others at the building and district levels?

## DISCUSSION QUESTIONS

*PowerPoint Slide 21*

- What is the purpose of a trial?
  - Who are the characters in a courtroom?
  - Rank the level of convincing each person needs on the line from easiest to hardest.
  - Discuss your rationale for your rankings.

## DISCUSSION QUESTIONS

*PowerPoint Slide 22*

- If you wanted to convince someone of something, create a scenario and discuss who in your life would play each of the given roles.
  - Discuss how the roles shown in the slide relate to a mathematics class.
  - How do the roles relate to Math Practice 3: Construct viable arguments and critique the reasoning of others?
  - Who is the judge?
  - What role does the judge play in your classroom?

## DISCUSSION QUESTIONS

*PowerPoint Slide 23: Breakout Room Discussion Debrief*

- Share with the large group what you discussed in your breakout room.

## DISCUSSION QUESTIONS

*PowerPoint Slide 30*

- What do you notice about the pattern?
- What do you wonder about the pattern?
- What do you think are the next steps in our math story?

## DISCUSSION QUESTION

*PowerPoint Slide 31*

- What's the next number in my story?

## DISCUSSION QUESTION

*PowerPoint Slide 32*

- What's the next number in my story?

In slides 37-43, complete the task(s) for the grade band(s) you work with the most.

## DISCUSSION QUESTION

*PowerPoint Slides 38-39: Grades K-5 Task*

- An odd number + an odd number equal an odd number: TRUE or FALSE. Convince me.

## DISCUSSION QUESTION

*PowerPoint Slides 41-43: Grades 6-12 Task*

- Any two lines either intersect or are parallel: TRUE or FALSE. Convince me.

## DISCUSSION QUESTIONS

*PowerPoint Slide 44*

- What strategies or approaches did you find most effective in constructing an argument for your task and/or critiquing the arguments of others?
- How can these strategies be applied to enhance mathematical reasoning and problem-solving in your classroom?

In slides 46-69, complete the task(s) for the grade band(s) you work with the most.

## DISCUSSION QUESTIONS

*PowerPoint Slide 47: Grades K-2 Task*

- Some number patterns have a story to tell. What do you notice if you add up any two counting numbers that are next to each other?
  - What do you wonder?
- What's their story?
- Prove your idea.

## DISCUSSION QUESTIONS

*PowerPoint Slide 48: Grades K-2 Task*

- Is there a better way?

## DISCUSSION QUESTIONS

*PowerPoint Slide 49: Grades K-2 Task*

- Proof by example means that you have to try all examples that exist in the whole world. How long would that take?
  - Is it worth the effort?

## DISCUSSION QUESTIONS

*PowerPoint Slide 52: Grades 3-5 Task*

- Odd numbers also have a story to tell. What do you notice if you add up any two consecutive odd numbers that are next to each other?
  - What do you wonder?
- What's their story?
- Prove your idea.

## DISCUSSION QUESTIONS

*PowerPoint Slide 55: Grades 3-5 Task*

- Ask them what they think will happen if they add any sequence of odd numbers?
- How do their pictures help prove their idea?

## DISCUSSION QUESTIONS

*PowerPoint Slide 61: Grades 6-12 Task*

- Odd numbers also have a story to tell. What do you notice if you add up any two consecutive odd integers that are next to each other?
  - What do you wonder?
- What's their story?
- Prove your conjecture.

## DISCUSSION QUESTIONS

*PowerPoint Slide 62: Grades 6-12 Task*

- Is there a better way?

## DISCUSSION QUESTIONS

*PowerPoint Slide 63: Grades 6-12 Task*

- Proof by example means that you have to try all examples that exist in the whole world. How long would that take?
  - Is it worth the effort?

## DISCUSSION QUESTIONS

*PowerPoint Slide 64: Grades 6-12 Task*

- How do these visuals represent the proof?

## DISCUSSION QUESTIONS

*PowerPoint Slide 65: Grades 6-12 Task*

- How do these visuals represent the proof?

## DISCUSSION QUESTIONS

*PowerPoint Slide 66: Grades 6-12 Task*

- How do these visuals represent the proof?

## DISCUSSION QUESTIONS

*PowerPoint Slide 69: Grades 6-12 Task*

- Are the prosecutors convinced?

## DISCUSSION QUESTIONS

*PowerPoint Slide 70*

- What are the specific learning needs of our students across the building and district levels?
- How can we address these needs to ensure that students regularly demonstrate their understanding of Math Practice 3 in the classroom?

## DISCUSSION QUESTIONS

*PowerPoint Slide 83:*

- What local data do we currently collect that can help us understand the implementation of Math Practice 3?

- How can we use this data to improve our instructional practices and student outcomes?

## DISCUSSION QUESTION

### *Feedback on Additional Supports*

- What additional supports do our teachers and students need to effectively implement Math Practice 3?
- How can building and district leaders provide these supports?

## Engagement Activities

The following are optional activities for district and school leaders to use as part of their facilitation session(s) to further engage their audience.

### *Agree or Disagree?*

- Construct and critique viable arguments.
  - Divide participants into small groups and assign each group a mathematical statement to debate. One group will argue in favor of the statement (i.e., agree), while the other will argue against it (i.e., disagree). After the debate, facilitate a discussion on the effectiveness of the arguments and the mathematical reasoning used.

### *Case Study Analysis*

- Analyze real-world scenarios to construct viable arguments and critique reasoning.
  - Provide participants with case studies that involve mathematical problems or scenarios. Ask each group to analyze the case study, construct arguments, and critique the reasoning presented. Have each group present their findings and discuss the implications for classroom instruction.

### *Interactive Proof Activity*

- Engage participants in constructing visual or algebraic proofs.
  - Present participants with a mathematical problem that can be solved using a visual proof, an algebraic proof, or both. Divide them into small groups and ask each group to construct both types of proofs. Afterward, have each group present their proofs and discuss the different approaches and their effectiveness.

## Resource Links

### *Ohio Department of Education Documents*

- [Standards for Mathematical Practice](#)
- [Kindergarten - Grade 5](#)
- [Grades 6-8](#)
- [High School](#)

### *University of Arizona Progressions*

- [Standards for Mathematical Practice: Commentary and Elaborations for K-5](#)
- [Standards for Mathematical Practice: Commentary and Elaborations for 6-8](#)

### Other National Resources

- [Carnegie Learning SMP Teacher Rubric](#)
- [Illustrative Mathematics](#)
- [Implementing Standards for Mathematical Practice](#)
- [Inside Mathematics](#)
- [Math Argumentation Rubric](#)
- [NCTM Look Fors](#)
- [Rich Math Task Rubric](#)
- [Robert Kaplinsky: Math CCSS Math Practices Readable](#)
- [Standards for Mathematical Practice Rubric](#)
- [Student Language Math Argumentation Rubric](#)

### References

- “[Levels of Convincing](#)” by Robert Kaplinsky.
- “[How Mathematicians are Storytellers and Numbers are the Characters](#)” by Marcus du Sautoy.
- [Where Proof, Evidence, and Imagination Intersect](#) by Patrick Honner.
- Putting the Practices Into Action by Susan O’Connell and John SanGiovanni
- Taking Action: Implementing Effective Mathematics Teaching Practices
- Developing Essential Understanding of Mathematical Reasoning
- Focus on High School Mathematics: Reasoning and Sense Making
- “[The Power of Making Mistakes in Learning Math](#)” posted on the Tarheelstate Teacher. Pay special attention to the 8 Reasons Why Making Mistakes in Math Class Are Valuable, which she took from Tracy Zager’s book *Becoming the MathTeacher You Wish You Had: Ideas and Strategies from Vibrant Classrooms*.
- [Implementing Standards for Mathematical Practices](#) by Louisiana Department of Education
- [Implementing the Mathematical Practice Standards](#)

### Conversation Notes: