Math Practice 3: Construct Viable Arguments and Critique the Reasoning of Others (Facilitation Guide)

Presenter:

Intended Use

This facilitation guide is intended to be used by educators when viewing the voice-over recording of Math Practice 3: Construct viable arguments and critique the reasoning of others. State Support Team staff, Educational Service Center consultants, districts, and schools are encouraged to use this resource as part of a professional learning series that covers all 8 of the Standards for Mathematical Practice.

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 making 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 QUESTION

PowerPoint Slide 17:

- What makes a courtroom so dramatic?

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 QUESTION

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 35 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: Breakout Room Discussions Debrief

- Who used visuals in their proof with this last task?
- How did those visuals represent the proof?

DISCUSSION QUESTIONS

PowerPoint Slide 83: Breakout Room Discussions

As you look through the rubrics, discuss the following:

- What do you like and what do you not like about them?
- How could you use them in your classroom?
- Do some need to be modified for your classroom? If so, how?

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: