

CHAPTER 10: Mathematicians Reason

In this chapter, I dug into the different elements of mathematical reasoning and then got very practical. There are many classroom routines and techniques to try. Therefore, there's a lot to discuss as you make sense of the overall framework, and then there's a lot to experiment with in the classroom. I hope you'll lean on one another and reach out to me as you dabble with different ideas. Much of the content of this chapter has historically (and inappropriately) been saved for older students. We're in new territory. Let's work together.

Discussion Questions

Pages 244–245 What do you make of the argument that counterintuitive or paradoxical math is a motivator for proof? Discuss or write about this idea.

Pages 244–245 Discuss the list of counterintuitive concepts. Do you have any to add? Let me know at tjzager.com (Chapter 10).

Pages 272–274 Discuss this idea of leaving the door open to revision as students learn more mathematics. Karp, Bush, and Dougherty's (2014) "13 Rules That Expire" is a super article to read and discuss in conjunction with this section. It's linked at tjzager.com.

Page 278 Discuss or write about the final passage of this chapter, about intuition, mathematical reasoning, and sexism. What are you thinking right now? I'd love to hear your reflections at tjzager.com (Chapter 10).

Activities

Pages 247–252 **Elements of Mathematical Reasoning**

Working together with your colleagues, dig into this hypothetical story and analysis. Engage in raw thinking together. Talk it through. It may help you make sense of these terms and ideas.

Pages 257–261 **Visual Patterns**

Once you've read the section about visual patterns, go to mathtalks.net and work through the transcripts from at least five different pattern talks. You choose which five. Can you see the pattern the way the students saw it? After these five, choose a sixth pattern. This time, try to anticipate different student solutions before looking at the transcript. Any surprises? What did you learn?

Pages 265–269 **Game Night!**

After reading the section about games, peruse the resources at stenhouse.com/becomingmathteacher or tjzager.com. Play some games, watch some videos, and share what you learned with your colleagues.

Calls to Action

Pages 252–253 **Noticing Students Noticing Patterns**

For the next five math lessons you teach, keep a notebook with you. Jot down any patterns you hear students notice. Are they parenthetical comments, or do students seem to realize they are doing important mathematical work? Share your findings with your colleagues and tell me about them at tjzager.com (Chapter 10).



CHAPTER 10: Mathematicians Reason (continued)**Pages 253–258 Choral Counting**

Read the section on *Choral Counting* carefully. Watch the suggested videos and explore *Choral Counting* on tedd.org. When you have a good sense of it, plan a count with your colleagues. Write a few ways you might record the count. When you're ready, teach the count, and then debrief with your colleagues. If you can snap a picture of your recording and link to it at tjzager.com (Chapter 10), I'd love to see it!

Page 262 Questions to Encourage General Thinking

Study this list of questions. Post them somewhere you'll see them. In the next week, choose a few and try them out with students. How did students respond? Talk with your colleagues about next steps, and feel free to report back at tjzager.com (Chapter 10).

Pages 263–264 Open Number Sentences and True/False Number Sentences

Choose one of these routines to try out. Plan it with your colleagues. Spend a long time choosing the numbers and the number sentence based on your mathematical goal for the lesson and what you've seen in your students' work. If you can teach it together, all the better. How did it go? Debrief together or in writing at tjzager.com (Chapter 10).

Pages 274–278 Always, Sometimes, Never

Plan and teach an *Always, Sometimes, Never* routine with your colleagues. As part of planning, read the blog posts about this routine that are collected at stenhouse.com/becomingmathteacher and tjzager.com (Chapter 10). You'll learn tips and techniques from your peers that way. After you've taught it, discuss the role of *ambiguity* in opening powerful conversations. How did the "sometimes" category encourage students to craft claims and consider conditions? Let me know at tjzager.com (Chapter 10).

Page 275 Keywords

Here's the firmest Call to Action I can suggest: please take any keywords posters down from your walls and remove any keyword lists from students' notebooks. Let's stop teaching math as if it's a code to crack, and instead teach students to make sense. *Always, Sometimes, Never* can help us do so.

Additional Resources

At stenhouse.com/becomingmathteacher and at tjzager.com, you'll find a collection of supplemental resources that may come in handy for further thinking and discussion. I keep the links fresh, so the contents will change, but you will certainly find:

- A lot of web resources for this chapter in particular, including many blogposts from colleagues and lots of videos of classrooms in action
- Further context about the role of proof. I've gathered highly readable, thought-provoking essays, blog posts, and articles
- Collections that will help you with the routines discussed in this chapter, such as banks of *Always, Sometimes, Never* statements, free games that encourage proof-like reasoning, and Fawn Nguyen's beautiful *Visual Patterns*

