CHAPTER 11: Mathematicians Prove

Justification is a major focus of this chapter. What types of arguments do students tend to formulate? What types of arguments are credible to mathematicians? How can we teach students to draw on the argument structures mathematicians know and love so deeply?

Discussion Questions

Pages 279–280   Discuss or write about the different images for proof. Which resonates with you?

Page 282   Discuss or reflect on this quote: "When we argue about politics or chores or who started it, we're trying to get the other person to agree with us. When we argue for a mathematical claim, we're trying to establish the truth" (Balacheff 1991). What are the implications?

Pages 286–288   The concepts and vocabulary around inductive and deductive reasoning can be confusing. Make sure to take some time making sense of the examples together. You might want to try to create your own as well.

Pages 288–290   Discuss when your students tend to appeal to perception. Are there specific content areas where it comes up most? What might you do to disrupt their arguments the way Mary Beth Schmitt did by rotating the poster?

Pages 291–294   Discuss the section on the limits of cases. What are you thinking about? Are there things you're doing or saying, such as, "If it works for three examples, you can assume it's true," that encourage students to lean too hard on cases? How might you update your language?

Pages 294–295   Discuss the role of counterexamples and how you might encourage them more. Do you feel a connection between this section and the discussion of Jasmine's 38 × 12 conjecture in Chapter 8? Can you try to put their connection into words?

Pages 303–304   Discuss the architect's work versus the draftsmen's work from the Halmos quote. What thinking does it spark in you?

Pages 303–307   Open a conversation with your colleagues about the process of proving, as measured by verbs, compared to finished products. How might you assess students' mathematical reasoning? What do you think?

Pages 307–309   Write or talk about the "Proof and Equity" section. What changes in your thinking or practice would ensure that all students' ideas and thinking are valued?

CHAPTER 11: Mathematicians Prove (continued)

Activities

Pages 296–303   **Analyze Students' Justifications**

Read and discuss this section carefully. What are you thinking about how students use words, numbers, pictures, and gestures to prove? Once you've read it, read the Even and Odd Numbers blog posts from *Teaching Children Mathematics* linked at tjzager.com and stenhouse.com/becomingmathteacher. Discuss the two texts as paired texts.

Calls to Action

Page 283   **Sentence Frames for Proof**

Copy or otherwise post the sentence frames in the blue box. Begin introducing them to your students one at a time. Reinforce when students use them. After some time, reflect on whether you feel an impact on the tone of your discussions. Let me know at tjzager.com (Chapter 11).

Pages 283–284   **Set a Goal**

Spend some time as a team with this bulleted list. Through your discussion, it might be helpful for participants to identify a specific goal to work on in their practice. For example, some people might want to work on their poker faces. Others might want to focus on asking follow-up questions whether the answer is right or wrong. Choose a goal for yourself and try it in your teaching for two weeks. Hold one another accountable. Come back together and discuss how it went. Let me know at tjzager.com (Chapter 11).

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:

- Links to related research articles from Harel and Sowder, Danny Bernard Martin, Stylianides, and more
- Optical illusions you can use to disrupt students' appeals to perception
- Mark Pettyjohn's lovely Math Celebration

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