

Contents

Foreword	v
Preface	vii
Introduction	1
Why Mathematical Reasoning?	1
Understanding Mathematical Reasoning	2
Big Ideas and Essential Understandings	3
Benefits for Teaching, Learning, and Assessing	4
Ready to Begin	5
Chapter 1	7
Mathematical Reasoning: The Big Idea and Essential Understandings	
The Power and Importance of Reasoning	8
The Process of Reasoning: The Big Idea	10
Conjecturing and Generalizing	13
Conjecturing and conjectures	13
Two types of generalizing activities	16
Recognizing relevant domains	23
Clarifying mathematical language and representations	26
Investigating <i>Why</i>	30
Reasoning about factors that explain <i>why</i>	30
Investigating <i>why</i> in alternative ways	31
Justifying and Refuting	35
Making logical arguments	35
Refuting mathematical statements	41
Evaluating the validity of arguments	45
Recognizing inappropriate bases for justifications	51
Conclusion	54
Chapter 2	57
Connections: Looking Back and Ahead in Learning	
Conjecturing, Generalizing, and Justifying in Pre-K–Grade 2	57
Conjecturing, Generalizing, and Justifying in Grades 3–5	62
Conjecturing, Generalizing, and Justifying in Grades 6–8	65
How Reasoning Can Develop across the Grades	71
Conclusion	72

Chapter 3	73
Challenges: Learning, Teaching, and Assessing	
Promoting Mathematical Reasoning	74
Vignette 1: Ms. Thomas's lesson on multiplication	74
Vignette 2: Ms. Lopez's small-group discussion	76
Vignette 3: Ms. Lopez's whole-class discussion.....	81
Assessing Reasoning to Guide Instruction	87
Why assess students' reasoning and what to assess?.....	87
How do we assess students' reasoning?	89
Conclusion.....	91
References	93