

Contents

Foreword	vii
Preface	ix
Introduction	1
Pedagogical Content Knowledge	1
Model of Teacher Knowledge	3
Characteristics of Tasks	7
Types of Questions	8
Conclusion	10
Chapter 1	
Interpreting Variables and Expressions	11
Working toward Essential Understanding 1a and Big Idea 2	12
Summarizing Pedagogical Content Knowledge to Support Essential Understanding 1a and Big Idea 2	25
Knowledge of learners	25
Knowledge of curriculum	25
Knowledge of instructional strategies	26
Knowledge of assessment	26
Conclusion	26
Chapter 2	
Expression Equivalence	27
Working toward Big Idea 1 and Its Essential Understandings, 1a–1c	28
Summarizing Pedagogical Content Knowledge to Support Big Idea 1 and Its Essential Understandings, 1a–1c	42
Knowledge of learners	42
Knowledge of curriculum	42
Knowledge of instructional strategies	42
Knowledge of assessment	43
Conclusion	43

Chapter 3

Equations and Inequalities..... 45

Working toward Big Idea 3 and Its Essential Understandings, 3*a*–3*c*,
and Big Idea 5 and Essential Understanding 5*b*..... 46

Summarizing Pedagogical Content Knowledge to Support Big Idea 3 and Its
Essential Understandings, 3*a*–3*c*, and Big Idea 5 and Essential
Understanding 5*b* 63

Knowledge of learners 63

Knowledge of curriculum..... 63

Knowledge of instructional strategies 63

Knowledge of assessment..... 64

Conclusion..... 64

Chapter 4

Functions..... 65

Working toward Essential Understandings 4*a*–4*e*..... 66

Multiple representations of functions..... 75

Rate of change and linear functions..... 80

Summarizing Pedagogical Content Knowledge to Support Essential
Understandings 4*a*–4*e* 87

Knowledge of learners 88

Knowledge of curriculum..... 88

Knowledge of instructional strategies 88

Knowledge of assessment..... 89

Conclusion..... 89

Chapter 5

Looking Back and Looking Ahead with Expressions and Equations..... 91

Building Foundations: Expressions and Equations in Grades 3–5..... 91

Extending Understanding: Expressions and Equations in Grades 9–12..... 97

Conclusion..... 100

Appendix 1

The Big Ideas and Essential Understandings for Expressions, Equations, and Functions..... 103

Appendix 2

Resources for Teachers..... 107

Appendix 3

Tasks 111

 The Pizza and Drink Task..... 112

 The $k - 2$ Task 113

 The Pizza and Drink Task, Revisited..... 114

 Mari’s Conclusion 115

 Anne’s Conjecture..... 116

 The Equations Task..... 117

 The Difference Task 118

 Sammi’s Claim..... 119

 The Piano Skills Task 120

 The Rate of Change Task..... 121

References..... 123

Accompanying Materials at More4U

Appendix 1

The Big Ideas and Essential Understandings for Expressions, Equations, and Functions

Appendix 2

Resources for Teachers

Appendix 3

Tasks

- The Pizza and Drink Task
- The $k - 2$ Task
- The Pizza and Drink Task, Revisited
- Mari’s Conclusion
- Anne’s Conjecture
- The Equations Task
- The Difference Task
- Sammi’s Claim
- The n^{th} Shape Task
- The Piano Skills Task
- The Cookies and Hiking Task
- The Input/Output Table Task

Appendix 3

Tasks (continued)

The Graph Scenario Task

The Dollars to Euros Task

The Rate of Change Task