DIMENSIONS MATH IMPROVEMENTS ON *PRIMARY MATHEMATICS*

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For the past several years, Hillsdale K-12 has recommended the *Primary Mathematics, U.S. Edition.* This recommendation has been based on *Primary Mathematics*' thorough development of the conceptual understanding and procedural fluency of 1-6 mathematics topics, as well as its close alignment to the curriculum developed in Singapore. Alignment with Singapore's curriculum is significant because the nation-state of Singapore has a proven track record. Between 1995 and 2015, Singaporean 8th-grade students ranked first in the world four times in mathematics on the Trends in International Mathematics and Science Study (TIMSS), and finished no lower than third, while U.S. 8th-grade students ranked between 9th and 19th. During the same period, Singaporean 4th-grade students ranked first in the world five times, and finished no lower than second, while U.S. 4th-grade students ranked between 6th and 14th. Singapore Math, Inc., the group that supports *Primary Mathematics* in the U.S., designed the new *Dimensions* series "to better serve U.S. teachers and students" with updates to the *Primary Mathematics* materials that provide greater clarity of Singapore's techniques for improved instruction.

Based on our review of the *Dimensions Math* K-3 texts alongside the *Primary Mathematics, U.S. Editions*, Singapore Math, Inc., has accomplished the goal of making the Singapore math material more accessible to U.S. teachers and students. The generalist teacher will have greater facility in implementing Singaporean techniques as a result of the clarity the *Dimensions* series provides. More specifically, the *Dimensions Math* series for grades K-5 has maintained or improved upon the following parts of the *Primary Mathematics, U.S. Edition* to help support American teachers and their instruction:

- The scope and sequence parallels *Primary Mathematics, U.S. Edition* on all major topics.
- *Dimensions* maintains the Concrete–Pictorial–Abstract development.
- *Dimensions* stays faithful to the fundamentals of the Singaporean techniques: emphasis on place value, number bonds, and bar models.
- It provides greater clarity for teachers on when to use the different manipulatives as part of instruction.
- *Dimensions* expands and highlights important topics that are more subtly placed within the Primary Mathematics materials by making them into their own individual lesson. (As an example, Dimensions 1A gives two distinct lessons on making the number ten with number bonds whereas Primary Mathematics does not emphasize ten in a meaningful way.)
- As a result of having more distinct lessons, the *Dimensions* textbooks also offer more practice for the students than is available in *Primary Mathematics, U.S. Edition*.
- *Dimensions* keeps a consistent structure to each lesson: Think, Lesson, and Do, and many of the lessons offer creative activities that are useful practice of the topic covered.
- *Dimensions* develops math facts by inserting lessons for math fact practice, giving activities in which students can practice their math facts, and places more explicit emphasis on mental math than *Primary Mathematics, U.S. Edition* does.

- Number bonds are given emphasis as a tool that students can use to help solve problems in a greater number of lessons.
- The teacher guides provide images of the student textbook and workbook materials alongside the lesson notes so that teachers can see what to emphasize more clearly in each particular lesson.
- A "Notes" section before each chapter lays out what the student should know going into the chapter from a previous grade level as well as what conceptual pieces need to be given attention within the chapter.
- The teacher guides provide full solutions to the student workbook pages including sample bar models.
- The teacher guides provide a firm foundation for Singapore math as a whole, and within the introduction section of each book, a list of questions is given that teachers should try to emphasize in every lesson.
- Bar models are introduced on a very basic level in 2A as opposed to 3A which allows for a smoother transition into their use on more complex problems in 3rd grade.

It is important to note that *Dimensions Math* has separated their sequence into a Pre-Kindergarten through 5th grade set and a 6th–8th grade set. The notes above reference the Pre-Kindergarten–5th grade materials. The format of the 6th–8th grade materials is distinct from the earlier grades and matches the 7th grade materials we have already been recommending. Having a full K-8 series helps solve the problematic transition from *Primary Mathematics, U.S. Edition* 6th-grade texts to *Dimensions Math* 7th-grade texts. Chapters 9 and 10 of *Dimensions Math 6B* cover algebraic concepts and should be placed towards the end of the text and be covered by more advanced classes only. Our recommendation for 8th grade will continue to be *A First Course in Algebra* by Arthur Weeks and Jackson Adkins.

A review of the *Dimensions Math* series reveals that improvements have been made to help American teachers draw attention to the Singapore techniques for richer, more meaningful instruction. Additionally, by expanding on important topics, *Dimensions* goes deeper into the curriculum which aligns with a classical view of the significance of depth over breadth. No unnecessary topics have been inserted, and the Singapore emphases have been better highlighted. Based on this positive review, Hillsdale K-12 Education will support schools which use *Dimensions* for their math curriculum.

Below is a side-by-side comparison view of the topics in *Dimensions* and *Primary Mathematics, U.S. Edition*.

KINDERGARTEN:

The scope and sequence of *Dimensions* and the Earlybird Kindergarten textbooks are similar. *Dimensions* has less craft-like homework, so it is less cumbersome for parents to help students through their work. Regardless of the textbook, teachers are to rely on the Access Literacy form of writing numbers. Much of the Kindergarten curriculum focuses on writing and recognizing numbers, so the supplement from Access Literacy will constitute a large portion of the Kindergarten instruction.

1ST GRADE:

The comparisons below illustrate a number of things. The blue text shows sections that are important topics that are under-emphasized in the *Primary Mathematics, U.S. Edition*. The red text shows sections that are made into their own lessons thereby highlighting topics that could be passed over easily within the *Primary Mathematics, U.S. Edition*. Lastly, it demonstrates how closely the scope and sequences of the two texts are closely aligned. *Dimensions* has not inserted any extraneous information that would break the continuity of the original Singapore curriculum found in *Primary Mathematics, U.S. Edition*.

***Primary Mathematics, U.S. Edition* 1A (PMUS)**	***Dimensions* Math 1A**
Numbers to 10	**Numbers to 10**
"Counting" – pages 6-11	"Numbers to 10" – pages 1-5
Zero is not given special emphasis	"The Number 0" – pages 6-8
"Counting" – pages 14-15	"Order Numbers" – pages 9-10
"Counting" – pages 12-13	"Compare Numbers" – pages 11-14
PMUS 1A does not have a practice section.	"Practice" – pages 15-16
Number Bonds	**Number Bonds**
"Making Number Stories" – pages 16-17	Chapter Opener – page 17
"Making Number Stories" – page 18	"Make 6" – pages 18-19
"Making Number Stories" – page 19	"Make 7" – pages 20-21
"Making Number Stories" – page 20	"Make 8" – pages 22-23
"Making Number Stories" – page 21	"Make 9" – pages 24-25
"Making Number Stories" – page 21	"Make 10 – Part 1" – pages 26-27
"Making Number Stories" – page 21	"Make 10 – Part 2" – pages 28-30
PMUS 1A does not have section titled "Practice," but pages 22 & 23 correspond to the *Dimensions* "Practice" section for Number Bonds.	"Practice" – pages 31-32
Addition	**Addition**
"Make Addition Stories" – page 24	Chapter Opener – page 33

"Make Addition Stories" – pages 25-26	"Addition as Putting Together" – pages 34-36
"Make Addition Stories" – page 26	"Addition as Adding More" – pages 37-38
Addition with zero is not given special emphasis	"Addition With 0" – pages 39-40
"Addition with Number Bonds" – pages 30-32	"Addition with Number Bonds" – pages 41-43
"Other Methods of Addition" – pages 33-35	"Addition by Counting On" – pages 44-45
"Make Addition Stories" – pages 27-29	"Make Addition Stories" – pages 46-48
PMUS 1A does not have any math fact practice inserted as a lesson.	"Addition Facts" – pages 49-50
PMUS 1A does not have section titled "Practice," but pages 36 & 37 correspond to the *Dimensions* "Practice" section for Addition.	"Practice" – pages 51-54
Subtraction	**Subtraction**
"Making Subtraction Stories" – page 38	Chapter Opener – page 55
"Making Subtraction Stories" – pages 39-40	"Subtraction as Taking Away" – pages 56-58
"Making Subtraction Stories" – page 40	"Subtraction as Taking Apart" – pages 59-60
"Methods of Subtraction" – pages 48-49	"Subtraction by Counting Back" – pages 61-62
Subtraction with zero is not given special emphasis	"Subtraction with 0" – pages 63-64
"Making Subtraction Stories" – pages 41-43	"Make Subtraction Stories" – pages 65-67
"Methods of Subtraction" – pages 45-46	"Subtraction with Number Bonds" – pages 68-70
"Methods of Subtraction" – pages 47	"Addition and Subtraction" – pages 71-72
PMUS 1A does not have a section that clearly correlates with this one.	"Make Addition and Subtraction Story Problems" – pages 73-74
PMUS 1A does not have any math fact practice inserted as a lesson.	"Subtraction Facts" – pages 75-76
PMUS 1A does not have section titled "Practice," but pages 50 & 51 correspond to the *Dimensions* "Practice" section for Subtraction.	"Practice" – pages 77-79
	"Review" – pages 80-82
Ordinal Numbers – pages 52-53	***Dimensions* places ordinal numbers at the end of 1A**
Numbers to 20	**Numbers to 20**
"Counting and Comparing" – page 54	Chapter Opener – page 83
"Counting and Comparing" – pages 54-55	"Numbers to 20" – pages 84-85
PMUS 1A does not have a section that clearly correlates with this one.	"Add or Subtract Tens or Ones" – pages 86-88
"Counting and Comparing" – pages 58-59	"Order Numbers to 20" – pages 89-91
"Counting and Comparing" – pages 60-61	"Compare Numbers to 20" – pages 92-93
"Addition and Subtraction" – pages 62-65	"Addition" – pages 94-95
"Addition and Subtraction" – pages 65-66	"Subtraction" – pages 96-97

PMUS 1A does not have section titled "Practice," but pages 67 correspond to the *Dimensions* "Practice" section for Numbers to 20.	"Practice" – pages 98-100
This is an entire chapter that *Primary Mathematics, U.S. Edition* does not have.	**Addition to 20**
No corresponding lessons	Chapter Opener – page 101
No corresponding lessons	"Add by Making 10 – Part 1" – pages 102-104
No corresponding lessons	"Add by Making 10 – Part 2" – pages 105-107
No corresponding lessons	"Add by Making 10 – Part 3" – pages 108-112
No corresponding lessons	"Addition Facts to 20" – pages 113-114
No corresponding lessons	"Practice" – pages 115-116
This is an entire chapter that *Primary Mathematics, U.S. Edition* does not have.	**Subtraction within 20**
No corresponding lessons	Chapter Opener – page 117
No corresponding lessons	"Subtraction from 10 – Part 1" – pages 118-120
No corresponding lessons	"Subtraction from 10 – Part 2" – pages 121-123
No corresponding lessons	"Subtract the Ones First" – pages 124-130
No corresponding lessons	"Word Problems" – pages 131-134
No corresponding lessons	"Subtraction Facts Within 20" – pages 135-136
No corresponding lessons	"Practice" – pages 137-138
Shapes	**Shapes**
"Common Shapes" – page 68	Chapter Opener – page 139
"Common Shapes" – pages 69-70	"Solid and Flat Shapes" – pages 140-144
"Common Shapes" – pages 71-75	"Grouping Shapes" – pages 145-148
"Common Shapes" – pages 76-77	"Making Shapes" – pages 149-151
PMUS 1A does not have a practice section.	"Practice" – pages 153-154
Ordinal Numbers	**Ordinal Numbers**
"Naming Positions" – page 52	Chapter Opener – page 155
"Naming Positions" – page 53	"Naming Positions" – pages 156-159
No corresponding lessons	"Word Problems" – pages 160-161
PMUS 1A does not have a practice section.	"Practice" – pages 162-163
	"Review 2" – pages 164-168
Length – pages 78-83	***Dimensions* places Length at the beginning of 1B**
Weight – pages 84-88	**This is an entire chapter that *Dimensions* 1A/B does not have.**