stage 24:
magnitude and place value

24

Big Idea: Repeated Equal Groupings and Hierarchical Groupings

The Repeated Equal Groupings Big Idea builds upon the Parts-to-Whole idea. With Repeated Equal Groupings, the whole is not only broken into parts but broken into a specific number of parts and each part is of equal size. Repeated equal groupings is the Big Idea that underlies multiplication and division. When multiplying, a part, (the multiplicand) is repeated a certain number of times and when dividing, the whole (the dividend) is partitioned into a certain number of equal groups that is equal to the size of the parts.

Hierarchical Groupings is the idea that amounts can be grouped into a system of sets and subsets. We count 11 objects and group them into 1 ten and 1 one, or we can call them 11 ones. At this level of mathematics, students can appreciate that our base-ten place value system is built on powers of 10; a critical building block of the system. The 1 in the tens place of the number 11 is ten times the 1 in the ones place. The magnitude of a base-ten number part is always 10 times more or 10 times less than the number part directly to its left or right. The 3 in the number 635 is different from the 3 in 390 because the 3 in 635 represents 3 tens while the 3 in 390 represents 3 hundreds, and is also 10 times the 3 in 635.

With an understanding of hierarchical groupings, students continue to appreciate how place value effects number magnitude. They also come to recognize the relationship between whole numbers and fractional numbers, and consider how decimal fractions relate to adjacent numbers on their right and left.

Why are Hierarchical Groupings Important?

In Stage 16, students experienced how numbers grow multiplicatively when using 1s, 10s, and 100s. Rather than simply learning a procedure of 'add a zero', in Stage 24 students are able to visualize the relationship between multiplying similar place values by powers of 10. Students will see a dot cards, and how multiplication by ten increases the value of each dot in a multiplicand by 10. Similarly, they see how division affects each dot in an inverse way. With the goal of highlighting how the number of zeroes increase and decrease in our base-ten place value system, the place value dot cards show students the mathematics of the relationships. Through all, the multiplicative relationship of the place value system is clarified and emphasized.

Stage 24 Learning Progression

Concept	Standard	Example	Description
24.1: Multiply by 10, 100, and 1000	5.NBT.1	7.01 x 100 = ?	Students experience how numbers grow multiplicatively when using 1s, 10s, and then 100s as the multiplier. Rather than have students use the short cut, "add a zero" when multiplying by 10, Symphony Math uses visual aids to show how numbers grow in an understandable manner. Dot cards allow students to see what 10 times a number looks like and then 100 times that same number and observe how the number of zeroes change. Multiplicative language, "Make a number 10 times as large..," is used.
24.2: Multiply by 1/10 and 1/100	5.NBT.1	392 x 1/100= ?	Students grow their understanding of the inverse relationships between multiplication and division. Multiplicative language, "Make a number 1/10 as large as...," is used. With visual modeling, students more readily understand the essential connection between multiplying by 1/10 and dividing by 10.
24.3: Divide by 10 and 100	5.NBT.1	35.6 ÷ 10= ?	Building on previous Stages, students are shown how they can move back and forth between decimal and fraction notations. They use their understanding of unit fractions to compare decimal places. The use of fractional language, '1/10 as large,' can be applied to both the fraction and decimal tasks as they work on comparisons and see how the resulting product is less than the multiplicand.

Using the Extra Practice Worksheets

The Symphony Math Worksheets provide extended practice using the Multiples Ways of Knowing from the Symphony Math program. Students should work through all worksheets in the order given:

Worksheet	Purpose	Instructions
Manipulatives	Use a visual model to represent the concept.	Create bars, dot cards, or number lines for each item.
Bridge	Connect symbols to their visual representations.	Create objects, numbers, and symbols to complete each item.
Symbols	Understand the concept at the abstract level.	Create numbers and symbols to complete each item.
Apply	Extend understanding to real-life problem solving.	1) Read the story presented at the top of the page. 2) Create a number model of the full solution. 3) Write the number sentence that matches the model.

Group Learning

The Symphony Math Extra Practice materials are designed to promote a conversation about the Big Ideas in math. One-on-one or small group instruction with the materials is recommended for students who need more time to make connections between the mathematical concepts in the Stage and the application of those concepts in their math curriculum.

Dot Cards

Symphony Dot Cards: Decimals