

How Numbers Work

Teacher's Guide



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Line Masters

This Teacher's Guide includes access to modifiable and PDF line masters.

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Mathology Little Books

This series recognizes that children’s understanding of maths concepts develops over time, and so the series allows you to choose the book that best matches a child’s or group’s level of mathematical understanding. The books engage children at just the right level in a wide range of mathematical ideas, thinking, and activities in a variety of real-world and imaginary contexts.

How Numbers Work engages children in conversations, investigations, and activities that help to develop their understanding of the big maths idea that “Quantities and numbers can be grouped by units or split into units.”*

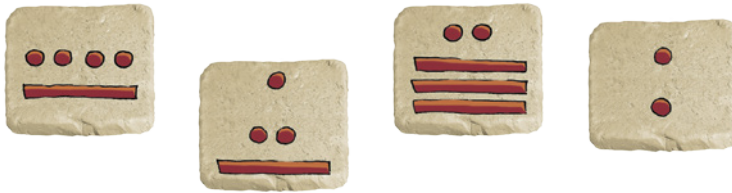
Big Idea: Quantities and numbers can be grouped by units or split into units (Skip counting, place value, fractions and decimals.)

TITLE	KEY MATHS FOCUS	MATHS SKILLS	STRATEGIES	ADDITIONAL FOCUS
	Split quantities into equal groups to count to 100 Compose/decompose to 100	Skip count using equal-sized units Keep track of number of sets and how many in each set Recognise patterns in repeated units related to 10 Share equally	Skip count to 100 Use benchmarks to make mental comparisons and estimate quantities Add and subtract Count in groups Count on for leftovers	Graph to show preferences Money combinations Describe and continue patterns Estimate area Estimate and calculate length Identify and describe 2-D shapes
	Split wholes into equal parts (fractions) Model equal grouping/sharing	Split a whole into equal parts Identify the relationship between the number of parts to the whole Share groups equally Create and solve grouping and sharing problems	Compare parts to whole to determine more/less/equal	Non-standard linear units Time: days, weeks, months 2-D shapes and their features
	Compose to 1000 based on place-value Compare/order numbers to 1000	Estimate, compares and orders quantities and numbers to 1000 Write, read, compose and decompose 3-digit numbers as hundreds, tens and ones Determine 10 or 100 more /less than a given number	Use benchmarks to estimate Count on Describe numbers using 100s, 10s and 1s	Use positional language to describe location and direction Duration of time (1min) Comparing and calculating amounts Comparing distance (1m, 100m)
	Compose/decompose 3-digit numbers Find and use number patterns	Identify and represent the value of a digit according to its position in a number Write and read 3-digit numbers as 100s, 10s, and 1s Represent and explain the relationship between 1, 10, 100, and 1000 Identify and describe numerical patterns Determine 10 or 100 more/less than a given number without counting	Compare digits Count forward and back by 5, 10, 25, 100 to 1000 Skip count Group quantities based on units of 10 (to 1000)	Describe 2-D shapes by lines, vertices, angles, symmetry Time (days, weeks, months)

* This book can also be used to address the big idea that “Numbers tell us how many and how much.”

Can You Solve the Mystery?

What do you think the pictures below might be?



They look like some sort of code, don't they?



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Finding and using patterns

- What do you notice about the symbols in the first row? (e.g., different combinations of arrows, triangles, and lines) Second row? (e.g., groups of dots, most of them have bars underneath them) Third row? (e.g., a single symbol, sometimes repeated)
- Do you think any of these symbols are following a pattern? Why?

Composing and decomposing numbers

- What do you notice about the Babylonian symbols? How do the numbers 1 to 9 compare to our numbers? (*there is just one symbol repeated, but we have different symbols for different digits*)
- We're asked what the numbers 31 and 50 might look like. What do you think?

Discuss children's ideas, inviting written predictions to accompany verbal descriptions.

- How can we write 31 in our number system using tens and ones? (*30 + 1 or 3 tens and 1 one*) In words? (*thirty-one*)

The Babylonian Number System

You were just looking at numbers! Some of the symbols are Babylonian numbers. They were used about 4000 years ago.

Babylonians wrote on pieces of damp clay. They used a pointed wooden rod called a *stylus* to press shapes and lines into the clay.



Babylonian Numbers

Below are the Babylonian symbols for the numbers 1 to 10.

What patterns do you notice in the symbols for 1 to 9?



CONNECTING TO GEOMETRY

2-D Shapes: Focus on the shapes of the symbols, asking children to describe the number of lines, vertices, and angles. You might also ask children to consider if the shapes are symmetrical.

Large Group Options

If you read *How Numbers Work* to a large group or whole class, you might project the book to facilitate reading aloud and better engage children in following the groups' progress. These activities engage children in composing and decomposing 3-digit numbers, and finding and using number patterns. Choose the activities that best address your children's learning needs.

MANY NUMBERS

ENGAGE

Focus attention on the symbols used to create numbers in the Babylonian number system. Project pages 5 and 7 from *How Numbers Work*. Review that there are only 2 symbols. Ask:

- **What do you notice about the 2 symbols in the Babylonian system? How do the symbols combine to make other numbers?**
- **We see that the symbol for 60 looks like the symbol for 1. How do we know when Υ means 1 and when it means 60? (its position makes the difference)**
- **How many digits does our number system have? (0 to 9, 10 in all)**

Record the following: 3 38 385. Ask:

- **What do you notice is the same about each of these numbers? What is different?**
- **In which number does the 3 mean 30? (38) 3? (3) 300? (385)**

Through discussion, establish that the position of a digit makes a difference, noting that our system has many more digits than the Babylonian system and position is important in both systems.

WORK ON IT

List 3 digits (5, 9, 2) and invite children to use them to make as many 2- and 3-digit numbers as they can. Many Numbers (LM 5) can support and guide recording.

- **Use these digits to make numbers. How many 2-digit numbers can you make? How many 3-digit numbers can you make? When you think you have made them all, choose one. Describe the number you chose in as many ways as you can.**

SHARE AND REFLECT

Initiate discussion by asking questions such as:

- **Let's list the numbers you made. Do you think you found them all?**
- **Which numbers have 5 (2, 9) hundreds (tens, ones)?**
- **How can we order the numbers from greatest to least?**
- **What number is 10 (100) greater/less than the greatest number?**
- **Which of the numbers listed are even? Odd?**

Depending on interest and time, repeat with 3 other digits.

MATHS FOCUS: compose and decompose 3-digit numbers; write and read 3-digit numbers

MATERIALS: *How Numbers Work*, pp. 5 and 7; Many Numbers (LM 5)

Making Numbers Using 5, 9, 2	
2-digit numbers	3-digit numbers
95 92	952 925
59 52	592 529
29 25	259 295

WATCH FOR...

- Does the child identify the 100s, 10s, and 1s in the different 3-digit numbers?
- How does the child describe a number?

DIFFERENTIATE: Some children will benefit from additional opportunities to build and describe 3-digit numbers. Invite them to do so at other times. Some children may be ready to use 4 digits to create different 4-digit numbers.

