

# Hierarchy of Numbers & Number Sense - Wholes

## Sample Cards

Level 1: matching quantity to symbol

Level 2: hierarchical sequencing

Level 3: place value and reading larger numbers

The full set "Hierarchy of Numbers - Wholes" has 10 cards at each of three levels. Each card poses a situation or problem concerning an aspect of place value or number sense in a unique way, not replicated in the other cards in the series. Many contain exploration-oriented tasks. Each is designed to invite children to deeper interaction with the hierarchy of whole numbers, often through examination or manipulation of materials. These attributes help preclude the phenomenon that can occur when children successfully answer a series of questions based on patterns, without actually mastering the concept.

Because each card approaches the concept of hierarch from different perspectives, these problem sets can be used as mini-diagnostics. For example, if a child can correctly say that 23 falls between 15 and 30 (card 2.2) but cannot place 10 numbers correctly on a 0-100 number line (card 2.4), that suggests that further work with the 100 board and number lines is warranted.

Another unique feature to these cards is the cross-disciplinary nature of the subject matter. Many questions involve information about topics typically studied in Montessori elementary classrooms. This is done not only to provide relevance, but to draw the reluctant mathematician into engaging with the subject matter. It also provides an opportunity to reinforce key concepts from life, physical and Earth science, geography, astronomy, and other subject areas so as to make best possible use of the child's time. No story problems about how many cookies each friend gets in these cards!

Additionally, most cards have a bonus question or idea at the bottom of the card that extends or expands either the mathematical concept being tapped by the original question, or by the subject matter being referenced, or suggests a journal topic. See, for example, card 2.8, that asks the child to sequence a list of the largest river on each continent. The bonus question challenges the child to find the Nile River on a map and determine into which body of water it empties. The use of bonus questions is left to the discretion of the teacher. Children can be instructed to always bypass them, do them only if they are interested, do one per week, or any other strategy that fits with the rest of the classroom practices.

The commands and story problems do require reading, so emergent readers or non-readers would benefit from the activity being done with an adult (teacher, assistant or trained parent volunteer). The activities can be done with a partner or small group, pairing readers with non-readers.

These cards can also provide meaningful interaction with the materials for older children who are new to Montessori.

1.2 Lay out 5,472 Golden Beads on a rug with the thousands on the left.

How many hundreds are there?

What shape are the hundred pieces?

How many tens are there?

What shape are the ten pieces?

How many thousands are there?

What shape are the thousand pieces?

How many units / ones are there?

What shape are these pieces?

*Repeat this again with the number 2,989. Which number is larger - the first or the second?*

1.6 Build the quantity 1,731 using Golden Beads and again using Stamps.

With Golden Beads, how do you tell the difference between one thousand and one unit?

With Stamps, how do you tell the difference between one thousand and one unit?

Ask a friend to hand you quantity of Golden Beads while you have your eyes closed.

Can you tell what the quantity is?

Do the same thing with quantity of Stamps. Can you tell what the quantity is?

2.2 Aaliyah and her family are going on a trip to see her grandparents. They are going to fly. Her seat is in row 23. The airline boards by rows from the back to the front. The first group to board is seated in rows 30-45. The second group is seated in rows 15-30. The last group is seated in rows 1-15. In which group will Aaliya and her family board?

*If could fly anywhere on an airplane, where would you go? Why?*

2.8 These are the longest rivers on each continent. Please list these from shortest to longest.

South America - Amazon River: four thousand miles

Africa - Nile River: 4,135 miles

North America - Mississippi River: 3,902 miles

Australia - Darling River: 1,701 miles

Antarctica - Onyx River: nineteen miles

Europe - Volga River: 2,294 miles.

Asia - Yangtze River: three-thousand, nine hundred fifteen miles long.

*Find the Nile River (in Egypt) on a world map. Into what body of water does the Nile empty?*

3.1 Write the numeral 1,234,567 with hierarchical colors.

What is the place value of the 2? The 5? What color are they? Why?

What is the place value of the 6? The 3? What color are they? Why?

What is the place value of the 1? The 7? The 4? What color are they? Why?

*Build 1,234,567 on the Golden Mat or other material. Now switch the order of the numerals to 7,654,321 - which is the greater number? How do you know?*

3.9 Write the number 9,735,100 in hierarchical colors. Which two adjacent digits could you swap to create a larger number? Which two adjacent digits could you swap to create a smaller number?

*Trace a hexagon from the geometry cabinet. Color two adjacent sides red. Use a straight-edge to turn these two red line segments into a triangle. Color the triangle red. Repeat this with two different adjacent sides on the hexagon, coloring the new triangle blue. Finally, repeat with the remaining adjacent sides, coloring the new triangle green.*