

Meaningful Learning and Practice: Multiplication Fact Strategies That Build Fluency (95)

*National Council of Teachers of
Mathematics (NCTM) Annual Meeting*
Boston, MA

April 16, 2014; 9:45 a.m. – 11:00 a.m.

Amanda Ruch, amandar@uchicago.edu
Gina Kling, gina.garza-kling@wmich.edu

**Center for Elementary Mathematics and Science
Education, University of Chicago
Western Michigan University**

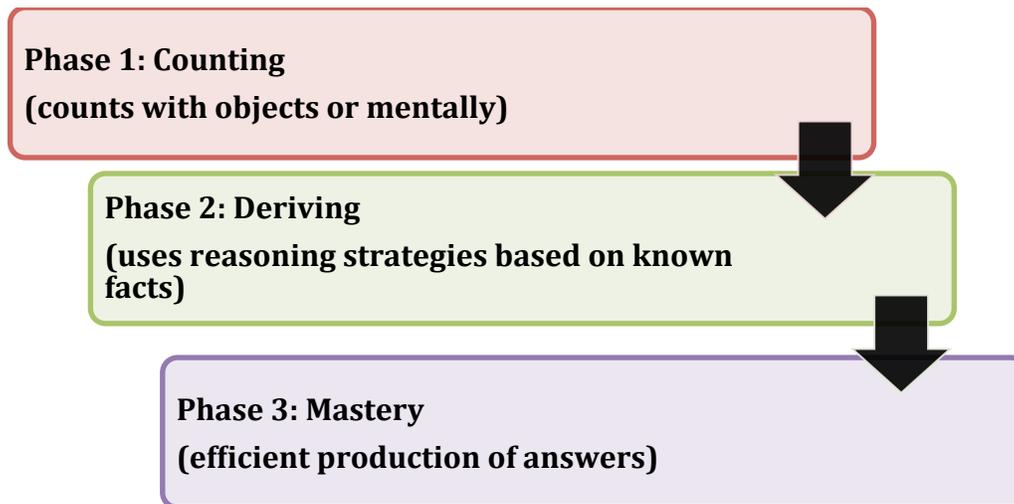


Defining Fluency

The Common Core State Standards (CCSS) for mathematics describes procedural fluency as “skill in carrying out procedures **flexibly, accurately, efficiently** and **appropriately**” (Council of Chief State School Officers, 2010, p. 6).

Likewise, Baroody (2006) describes basic fact fluency as “the **efficient, appropriate, and flexible application** of single-digit calculation skills and is an essential aspect of mathematical proficiency” (p. 22).

Phases of Basic Fact Mastery (Baroody, 2006)



CCSS-M Expectation for Multiplication Facts

Grade 3 3.OA.C.7	<i>Fluently</i> multiply and divide within 100, using <i>strategies</i> such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, <i>know from memory</i> all products of two one-digit numbers.
---------------------	---

Note: This illustrates that CCSS-M recognizes the importance of reasoning strategies (Phase 2) before expecting automaticity with their facts (Phase 3).

Developmental Sequence for Multiplication Fact Strategies

Foundational Facts*	
1. 2s, 5s, and 10s (begin these in late second grade)	Use story problems involving equal groups and arrays, skip counting, and repeated addition to learn these facts.
2. 0s*, 1s, Multiplication squares (2×2 , 3×3 , etc.)	
Derived Fact Strategies	
3. Adding a group	Start with a nearby 2s, 5s, or 10s fact and add a group to derive the unknown fact. <i>Ex: I don't know 6×8, so I think $5 \times 8 = 40$ and add one group of 8 to get 48.</i>
4. Subtracting a group	Start with a nearby 2s, 5s, or 10s fact and subtract a group to derive the unknown fact. <i>Ex: I don't know 9×6, so I think $10 \times 6 = 60$ and subtract one group of 6 to get 54.</i>
5. Halving and doubling	Look for an even factor. Find the fact for half of that factor, then double it. <i>Ex: I don't know 6×8, so I think $3 \times 8 = 24$ and double that to get 48.</i>
6. Near squares (adding or subtracting a group to a square).	Look for a nearby square. Find that fact and add on/subtract off the extra group. <i>Ex: I don't know 7×6. I use $6 \times 6 = 36$ and add one more 6 to get 42.</i>
7. Break apart a factor.	Decompose one of the factors into a convenient sum of known facts, find the two known facts and combine the products. <i>Ex: I don't know 7×6. I break the 7 into 2 and 5, because I know 2×6 and 5×6. Then I add 12 and 30 to get 42.</i>

* **Note: 0s are foundational, but are not typically used for derived fact strategies.**

Kling, G. & Bay-Williams, J. M. (May, 2015). Three Steps to Mastering Multiplication Facts. *Teaching Children Mathematics*.

