



Partition Division: The Numbers Matter to Young Children

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This paper was part of a larger study Multiplications and Division Investigations (MULDI) which investigated 5 and 6-year-old children's thinking about multiplication and division before they had been formally taught the topics in their first year of school. We interviewed 96 children and asked them to solve three problems by partitioning materials into equal groups. The problems used contexts of sharing sweets in jars for $12 \div 3$, playdough donuts shared to solve $7 \div 2$ and 22 cards to deal between four people for $22 \div 4$. As you might predict, the problems were designed to become more difficult across the interview. The first problem used familiar numbers with a divisible number of sweets and although we predicted that many children beginning school may be able to find the solution, we were surprised that 89% of children could do it correctly. Analysis of all the responses of 96 children revealed that many children could solve division problems even when the numbers were larger and where the divisor was not a factor of the dividend. Our results showed that 72% could share 7 donuts between 2 children and 43% shared 22 cards between 4 children.

We were also interested to know what thinking strategies children chose to use to solve partitive division problems. For example, earlier research (Davis & Pitkethly, 1990) had claimed that the "natural" way that young children approached division was via sharing by dealing. We found that for 12 sweets between 3 jars only about one third of the children (37%) shared by ones, whereas a total of 47% shared by groups. Of these children, 26% estimated groups of 3 and adjusted by ones. This strategy we called "estimate and adjust" had not been defined in the literature. Our observations led us to think that the strategy was a thoughtful application of number sense. In addition, it was a useful strategy for larger numbers where the problem was difficult with only 43% success, and of these children, one quarter dealt by ones and one sixth used "estimate and adjust".

We infer that *estimate and adjust* is an intuitive way of making equal shares for young children. They say things like, "I'll try six cards for each person" attempting to make the result of their division equal. Of course, making equivalent shares is the heart of division.

The study found that numbers matter when young children solve division problems. When numbers and contexts were familiar, children either: dealt by ones, dealt by groups, *estimated and adjusted* or used facts they knew to solve the problem. When numbers were small, contexts were familiar and the situation involved a remainder (e.g., donuts problem), most children could interpret the remainder mathematically. However, when the numbers were outside the children's experience and the division was more complex and involved a remainder, fewer than half of the children found a correct solution. Nevertheless children applied similar thinking strategies when numbers were more challenging. These findings offer fresh insights into the strategies young children use to solve partitive division problems, challenging the reliance on familiar numbers and situations where there are no "leftovers".

Davis, G. E., & Pitkethly, A. (1990). Cognitive aspects of sharing. *Journal for Research in Mathematics Education*, 21, 145–153.

For more information, please refer to the following paper presented at the 47th Annual Conference of MERGA in July 2025.
 Cheeseman, J., Downton, A. & Driscoll, K. (2025). Partitive division: The numbers matter to children. In S. M. Patahuddin, L. Gaunt, D. Harris & K. Tripet (Eds.), *Unlocking minds in mathematics education. Proceedings of the 47th annual conference of the Mathematics Education Research Group of Australasia* (pp. 109-116). Canberra: MERGA.