

## Equal Sharing Problems

**Structure:** Involves a total number of items to be distributed to a given number of groups, usually people.

Total number is **known** (total items)

Number of groups is **known** (sharers)

Number (fractional amount) in each group is **unknown** (each person's share)

### Two types of equal sharing Problems:

1. **Answer**, or number in each group, is **more than 1**: number of items is greater than the number of sharers.  
For example: 4 kids sharing 10 cookies  $4 \times n = 10$   $n = 2 \text{ and } \frac{1}{2}$
2. **Answer**, or number in each group, is **less than 1**: number of items is less than number of sharers.  
For example: 4 kids sharing 3 cookies  $4 \times n = 3$   $n = \frac{3}{4}$

### Children's Strategies for Equal Sharing Problems:

- ❖ No coordination between sharers and shares: Children do not think about how the number of people is related to how to partition the items being shared.
  - They create equal shares but do not use up everything to be shared (Ex. 1)
  - Or they use up everything to be shared but do not create equal shares (Ex. 2)
- ❖ Non Anticipatory Coordination: (Ex. 3)
  - Repeated Halving with Coordination at the end: Children begin by repeated halving and to finish by coordinating the fractional partitions at the end. Children are still not thinking, from the beginning, about how their partitioning is related to the number of people sharing.
  - Trial and Error to coordinate: Children are in the midst of learning how to coordinate the number of people sharing with the fractional partitions of the items but they are not able to use that knowledge to make sense of the problem in terms of a single all-encompassing relationship.
- ❖ Additive Coordination- One Item at a Time:
  - Children start by splitting the first item to be shared in exactly as many parts as there are people sharing. They then repeat the process for each item until everything is shared. Each item is shown and partitioned. (Ex. 4)
  - Transitional strategy: Eventually they realize they do not need to partition every single item to figure out how much one person sharing will get. Maybe just one or two items are partitioned. (Ex. 5)
- ❖ Additive Coordination-Groups of items: Children create the number of parts they want to make with the number of items to be shared, usually by aiming to create a number of parts equal to the number of people sharing. (Ex. 6)
- ❖ Multiplicative Coordination- Fraction as Quotient: **Mental** strategy in which the child carries out partitioning each unit individually and combining the fractional parts. They are coordinating the operation of division with its outcome, a fraction. This abbreviation from the one item at a time strategy is a significant advancement in the development of their thinking about fractions. (Ex. 7)
- ❖ Less Common Strategy: Ratio: Students reduce the sharing situation to equivalent ratios involving smaller numbers or people sharing and things being shared.  
8 kids sharing 6 is the same as 4 kids sharing 3 (Ex. 8)