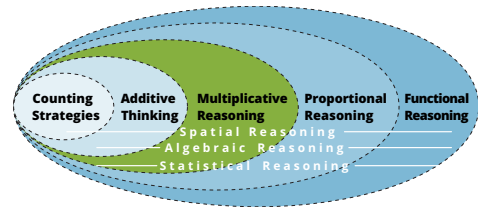


Multiplicative Reasoning

Part of the Development of Mathematical Reasoning

What is Multiplicative Reasoning?

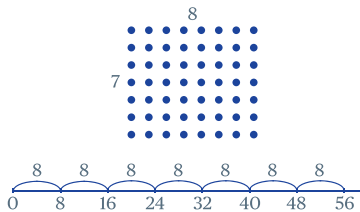
Multiplicative Reasoning builds on Counting Strategies and Additive Thinking when developing Mathematical Reasoning. Students can begin thinking about multiplication as repeated addition, but in order to be reasoning multiplicatively, one must be considering bigger sets than one group at a time. This sophisticated reasoning demands grappling with many things simultaneously, considering the number of groups, the number in each group, and then grouping the groups, all at the same time. Ideally students would develop Multiplicative Reasoning as they learn multiplication and division, which according to most standards begins in grade 3 and continues through grade 5. Multiplicative Reasoning is important because it is the foundation for the more sophisticated proportional reasoning which involve fractions, decimals, percents and many science applications, including exponential behavior.



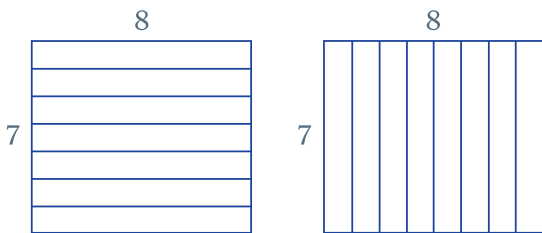
The Development of Mathematical Reasoning

What does Multiplicative Reasoning look like?

Below are examples that are **not** Multiplicative Reasoning.

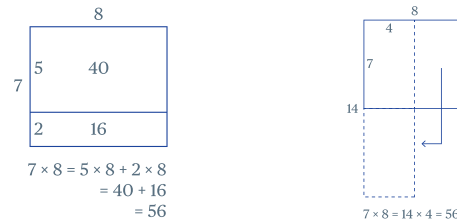


Counting each individual circle, or skip counting on a number line.



Thinking about one group at a time, illustrated with partially closed arrays.

Below are examples that are **are** Multiplicative Reasoning.



Examples of using Multiplicative Reasoning to solve 7×8 , illustrated with open arrays.

$$35 \times 16 = 7 \times 5 \times 2 \times 8$$

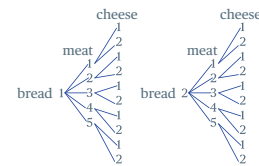
$$= 7 \times (5 \times 2) \times 8$$

$$= 56 \times 10$$

$$= 560$$

Using Multiplicative Reasoning to solve 35×16 .

How many types of bread, meat, cheese sandwiches can be made from 2 breads, 5 meats, 2 cheeses?



There are 20 possible types of sandwiches.

Using Multiplicative Reasoning to solve a combination problem illustrated with a tree diagram.

What does Multiplicative Reasoning look like in practice?

Below are four videos that demonstrate students' thinking.

Multiplication problem Not using Multiplicative Reasoning:		Division problem Not using Multiplicative Reasoning:	
Multiplication problem Using Multiplicative Reasoning:		Division problem Using Multiplicative Reasoning:	