Alberta Regional Consortia

Parent communication

+What is Multiplicative Thinking?

Multiplicative Thinking is:

- A capacity to work flexibly with the concepts, strategies and representations of multiplication and division as they occur in a wide range of contexts. (mathematical reasoning)
- going beyond memorization of basic arithmetic skills
- the means to communicate multiplicative understanding effectively in a variety of ways (for example, words, diagrams, symbolic expressions, and written algorithms).

+Why is it important?

According to research, both mathematical reasoning and arithmetic skills are predictors of mathematical achievement, however, students' ability to reason mathematically was the stronger predictor of success.

Students who use mathematical reasoning build connections. Multiplicative Thinking allows them to solve problems more easily.

+Potential Misunderstandings

The Question: (Focusing on the Misconception)	The Follow Up Question that will challenge the assumption.	Background Info
When you multiply 2 numbers, the product is bigger.	½ x 10 = ?	Misunderstanding: Students generalize this idea when they only see examples that have whole numbers for the multiplicand and multiplier; they only ever see answers that are bigger. Although only students in Grade 5 and higher are exposed to multiplication of decimals and fractions, students in lower grades can be exposed to simpler experiences with the idea. For example, "I have 10 cookies. I'm going to give ½ of them to my friend and keep ½ of them to myself."

When you divide 2 numbers, the quotient is smaller.	20 ÷ 0.5 = ?	Misunderstanding: Students generalize this idea when they only see examples that have is smaller. whole numbers for the dividend and divisor; they only ever see answers that are smaller. Although only students in Grade 5 and higher are exposed to division of decimals and fractions, students in lower grades can be exposed to simpler experiences with the idea. For example, “I have 3 cookies. I’m going to split each in half so I can give half a cookie to each person. How many people can I feed?”
Division stops when you end up with a remainder. Example 17÷ 4 = 4R1	Case 1: If I need 17 kg of flour and I can buy 4 kg bags, how many bags do I need? Case 2: I have 17 chocolate bars and am sharing between 4 people. How much do we each get?	Case 1: Students need to understand that in certain situations, a remainder must be interpreted appropriately. In this case, students must understand that they actually need 5 bags not 4 bags. Rounding up becomes necessary due to the context of the problem. Case 2: Students need to understand that in certain situations, a remainder can be divided some more. In this case, students must understand that a piece of the chocolate bar can be given to each person. Therefore, they are actually received 4 ¼ chocolate bars.
The associative property is possible with all 4 operations.	Is 125 + (25 ÷ 5) equal to (125 + 25) ÷ 5 ? Is 6 ÷ (4 ÷ 2) equal to (6 ÷ 4) ÷ 2?	Misunderstanding: Students learn that addition is associative so it doesn’t matter if you do 2 + (4 + 3) or (2 + 4) + 3 because you get the same answer. They may transfer this concept to questions with mixed operations.
All units work on base 10.	What is 3 ½ hours in minutes?	Time works on a different base. Therefore the answer is not 350 minutes.
For teacher knowledge only: Multiplicative Thinking is repeated addition.	0.5 x 1.6	Misunderstanding: “While repeated addition may be an appropriate beginning, to maintain that interpretation of multiplication is ultimately disabling because it does not provide children with important multiplicative structures. Multiplicative thinking cannot be generalised in any simple way from additive thinking. Unless teachers consciously help children develop multiplicative thinking, which goes well beyond repeated addition, it may not happen for many children.” (Jacob, L., & Willis, S.) Source

Activities Parents Can Do With Their Child

- Look through a grocery store flyer with your child, looking for examples of items that are sold as "2 for…", "3 for…", "6 for…" and so on.
    - Select an item and then work together to find the cost of different quantities. For example, tomato soup is 3 cans for $1.45. How much for a dozen cans?
    - Find a different item. For example, yogurt is 2 for $3.95. Figure out how many 6 would cost. ($11.85) Tell your child, how many yogurt containers could I get for $11.85?
    - Figure out how much a meal would cost per person. For example, breakfast might consist of an orange juice box (out of pack of 3 boxes), 2 eggs (out of a dozen), a croissant (out of a box of 6) and a yogurt (out of a pack of 8). Start by estimating.
- Introducing multiplication strategies:
    - Using cups/bowls/etc and candies/nickels/etc, explore the beginning ideas of multiplication. Place 3 cups on the table and say "In each cup, I will place 4 candies. How many candies will that be altogether?" Place the candies (or let your child do it) and determine how many there are altogether. Ask your child to explain the strategy used for figuring it out. They may:
        - dump out all of the candies and count each one. "1, 2, 3...10, 11, 12"
        - skip count by 4's "4, 8, 12"
        - skip count by 2's "2, 4, 6, 8, 10, 12"
        - add "4 + 4 = 8; 8 + 4 = 12"
    - You choose a different strategy for figuring it out (other than saying because I know 3 x 4 = 12"). Try to pick one that is slightly more challenging than the one your child used. This will expose them to more challenging strategies. Repeat this activity with the same number of cups several times, always changing the number of candies in the cup. After they've run through each possibility at least twice, give them a question to figure out (ex. 3 x 4) and ask them to estimate first how many candies there will be altogether. Then they can figure it out. If their estimation is right, congratulate them. If their estimate is close, tell them that's great too because they're still learning. At this point, you could also tell them you.
        - them you have 15 candies altogether. If you distribute them evenly, how many will each cup get?
        - are placing 0 candies in each cup
    - Show them the multiplication statements
    - Change the
        - number of cups
        - items
    - Talk about breaking each candy in half and placing half a candy in eachcup. Stick to even quantities of cups first and then move on to odd quantities of cups

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Newsletter Ideas:

From Alberta Education, on personal strategies:
https://education.alberta.ca/media/3115250/fs_clarif_expect_strat_maint.pdf

Expectations regarding basic number facts:
https://education.alberta.ca/media/3115249/fs_clarif_expect_number_facts.pdf