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Discuss: Is skip counting multiplication? Give reasons for why or why not with examples.

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Solve the following problem on your own in the space below:
The 3rd and 5th grades tied to win the school fundraiser competition. As a reward, the PTA decided to give the four 3rd grade classrooms $600 and the six 5th grade classrooms $800 to spend on classroom supplies. Do 3rd grade classes get more, less, or the same amount of money as 5th grade classes?

While monitoring students working on this problem, Mr. Oliver noticed all three solutions to the task. For each solution, how might the students be reasoning?
Less than?

The same as?

More than?

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Multiplicative reasoning – coordinating and reasoning about composite units (i.e., one pan of brownies has 3 units of 1/3; a unit of 3 as 3 units of one; nine as 3 units of 3); involves relative comparisons (Inhelder & Piaget, 1964)

Ex.) $600 for 4 third grade classes… $600 is composed of 4 units of $150 and $800 for 6 fifth grade classes… $800 is composed of 6 units of $133.33

In contrast with…

Additive reasoning – is coordinating and reasoning about a single unit; involves absolute comparisons (a one-to-one comparison)

Ex.) $600 is a unit of $600 and $800 is a unit of $800…
Comparing these to quantities in a one-to-one fashion, $800 is more than $600

For the following problems fill in the type of multiplication problem as Multiplicative Comparison, Equal-groups, Arrays and Areas, or Counting.

Multiplication Type	Problem
	Jean has 3 tomato plants. There are 6 tomatoes in each plant. How many tomatoes are there all together?
	A baker has a fudge pan that measures 3 inches on one side and 6 inches on the other side. If the fudge is cut into square pieces with 1 inch on the side, how many pieces of fudge does the pan hold?
	The kangaroo in the zoo is 6 feet tall. The giraffe is 3 times as tall as the kangaroo. How tall is the giraffe?
	The ice cream store has 3 types of cones and 6 flavors of ice cream. How many different desserts of one cone with one scoop of ice cream can they make?

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Using the meaning of multiplication for whole numbers and knowledge of algebra organize each problem under the algebraic equation that best fits the problem. Justify your answer.

A. $a \times b = ?$ **B.** $? \times b = p$ & $p \div b = ?$ **C.** $a \times ? = p$ & $p \div a = ?$

1. If 18 plums are shared equally into 3 bags, then how many plums will be in each bag?
2. If 18 apples are arranged into equal rows of 6 apples, how many rows will there be?
3. There are 3 rows of apples with 6 apples in each row. How many apples are there?
4. If 18 apples are arranged into 3 equal rows, how many apples will be in each row?
5. A blue hat costs \$6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost?
6. A red hat costs \$18 and a blue hat costs \$6. How many times as much does the red hat cost as the blue hat?
7. If 18 plums are to be packed 6 to a bag, then how many bags are needed?
8. There are 3 bags with 6 plums in each bag. How many plums are there in all?
9. A red hat costs \$18 and that is 3 times as much as a blue hat costs. How much does a blue hat cost?

Table From CCSSM

	Unknown Product	Group Size Unknown ("How many in each group?" Division)	Number of Groups Unknown ("How many groups?" Division)
	$3 \times 6 = ?$	**$3 \times ? = 18$, and $18 \div 3 = ?$**	**$? \times 6 = 18$, and $18 \div 6 = ?$**
Equal Groups	There are 3 bags with 6 plums in each bag. How many plums are there in all? *Measurement example*. You need 3 lengths of string, each 6 inches long. How much string will you need altogether?	If 18 plums are shared equally into 3 bags, then how many plums will be in each bag? *Measurement example*. You have 18 inches of string, which you will cut into 3 equal pieces. How long will each piece of string be?	If 18 plums are to be packed 6 to a bag, then how many bags are needed? *Measurement example*. You have 18 inches of string, which you will cut into pieces that are 6 inches long. How many pieces of string will you have?
Arrays,[4] Area[5]	There are 3 rows of apples with 6 apples in each row. How many apples are there? *Area example*. What is the area of a 3 cm by 6 cm rectangle?	If 18 apples are arranged into 3 equal rows, how many apples will be in each row? *Area example*. A rectangle has area 18 square centimeters. If one side is 3 cm long, how long is a side next to it?	If 18 apples are arranged into equal rows of 6 apples, how many rows will there be? *Area example*. A rectangle has area 18 square centimeters. If one side is 6 cm long, how long is a side next to it?
Compare	A blue hat costs \$6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost? *Measurement example*. A rubber band is 6 cm long. How long will the rubber band be when it is stretched to be 3 times as long?	A red hat costs \$18 and that is 3 times as much as a blue hat costs. How much does a blue hat cost? *Measurement example*. A rubber band is stretched to be 18 cm long and that is 3 times as long as it was at first. How long was the rubber band at first?	A red hat costs \$18 and a blue hat costs \$6. How many times as much does the red hat cost as the blue hat? *Measurement example*. A rubber band was 6 cm long at first. Now it is stretched to be 18 cm long. How many times as long is the rubber band now as it was at first?
General	$a \times b = ?$	$a \times ? = p$, and $p \div a = ?$	$? \times b = p$, and $p \div b = ?$

Teachers should provide experiences with multiple interpretations of multiplication and division, and solution strategies (with whole numbers and rational numbers)

- The Common Core State Standards for Mathematics (CCSS) now make explicit the need for students to be able to solve problems that utilize a variety of interpretations of multiplication and division.
- The interpretations of multiplication include Equal-Group, Array and Area, Multiplicative Comparison, and Counting.
- The interpretations of division include "Group size unknown" (or fair share) and "Number of groups unknown" (or Grouping).
- Students also need opportunities for solving for different pieces of corresponding equations (ie, missing product, factor, quotient, dividend, or divisor), and understanding of the connections between multiplication and division.

Teachers can build on students' understanding and solution strategies

Then, by allowing students to share their solution strategies students can build deeper understanding for the abstract representations of algebra

Once teachers provide their students with opportunities to invent and employ different solution strategies for arithmetic problems, deeper understanding of the mathematics can be gained from sharing and explaining various strategies.

By connecting to existing knowledge

- Teachers can plan to build on students' understanding of doubling and halving when introducing multiplication facts, division facts, and unit fractions.
- Recognizing students' intuitive understanding of fair share dividing, a teacher may use that strategy in explaining why the traditional division algorithm for long division works.
- A teacher may want to use an example of a partitioning strategy within a student's work to introduce the distributive property.

If teachers recognize students' natural tendency toward a "dealing" strategy for solving a fair share division problem, can plan appropriately to support students' first experiences with a grouping division problem. Further, once students gain proficiency with solving this grouping-type division problem, teachers can build on that knowledge to introduce division with rational numbers.

"While first learning how to integrate generalizing into instruction, many teachers use a classroom routine that provides a regular structure for this kind of investigation. They allocate a regular time several days each week – 10 to 15 minutes or longer – to noticing generalizations. Creating this regular routine helps students develop the habit of noticing, articulating, and investigating generalizations."

- Russell, Shifter, Bastable (2011)

Read page 16 to page 22.

As you are reading, highlight, underline, or make note of things you find significant or meaningful.

When your group is finished, take some time to discuss these things you highlighted, underlined, or made a note of.

NOTES:

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Focus Question #2 (pg. 23)

This section of Chapter 2 details some examples of routines that teachers can use to provide opportunities for their students to investigate generalizations.

- If you have used such routines previously, what is the same and what is different about the examples in the chapter in comparison to your past experiences?

- What routine might you try and what is it you would like to learn by implementing it?

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NAME:

Take a few moments to reflect on our time of thinking and learning today.

-- Jot down the meaningful and significant things you thought about.

-- Jot down the ways you thought mathematically and pedagogically.

-- Jot down how you contributed to our shared community of professionals.