

## Grade 3 Mathematics Lesson Plan

Thursday, June 19, 2014

3rd period (10:40 – 11:25)

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Class: Koganei Elementary School

attached to Tokyo Gakugei University, Grade 3,

Class No. 2 (35 Students)

1. Name of Unit: *Division – Calculations for Finding “Times As Much”*
2. Goals of the Unit:
  - Students eagerly try to understand the meaning of division and the calculation process by manipulating concrete materials and making connections to multiplication. (Interest, Eagerness, and Attitude)
  - Students understand partitive and quotitive division as one operational meaning of division and represent the division process of calculating with concrete materials, diagrams, and mathematical expressions. (Mathematical Way of Thinking)
  - Students learn and are able to consistently and accurately carry out division calculations. (Mathematical Skills)
  - Students understand problem situations that involve division, the relationship between division and multiplication, and the meanings of division. (Knowledge and Understanding)

3. About the Lesson:

In general, students in my class are active and are starting to feel the joy of exchanging ideas among classmates during lessons. My students are developing the skills needed to solve problems, such as explaining their ideas to others in words, drawing diagrams, writing mathematical expressions, and anticipating or speculating about their classmates' ideas. However, students remain somewhat hesitant to share their opinions openly and freely during class discussions.

When solving problems such as those involving quotitive division, time, and elapsed time, my students are accustomed to using diagrams, including tape diagram models and array models and using grid lines in their journals. However, most have not developed an understanding of the difference between diagrams that represent and result from the process of thinking through problem solving and those that are used to explain the result of problem solving.

Falling within the “Division” unit, this lesson is the first lesson of the sub-unit “Calculation for Finding Times as Much.” Prior to this sub-unit, students learned the two meanings of division: partitive and quotitive division. If the meaning of multiplication is identified as [number of objects in each group] x [number of groups] = [total number of objects], two meanings of division are distinguished as follows: (1) when division is used to find the number of objects in each group, it is called “partitive” division (dividing an amount into a given number of groups, to find the number in each of the

equal-sized groups/parts) and (2) when division is used to find the number of groups it is called “quotitive” division (dividing an amount into a given number in each group to find the number of those equally-sized groups).

In this lesson, the meaning of division as “number of groups,” will be extended to the meaning “times as much.” As students expand their understanding about the meaning of division, I would like them to discover that in the case of finding how many “times as much,” they can use the same division process for finding the “number of groups” (quotitive division). To do this, we will discuss solution ideas that students might use for finding the answer, namely solutions which are associated with repeated addition and repeated subtraction. I expect to see them utilizing and manipulating diagrams (e.g., tape diagrams) and hear them discussing as well as using mathematical expressions. In addition, by making connections to the multiplication expression [length of 1 tape]  $\times$   $\square$  = [total length of the rope], I want students to notice that they are engaged in a solution process similar to quotitive division problem situations they learned in previous lessons.

4. Plan of the Unit (Total: 9 lessons):
  - Sub-Unit 1: Quotitive division (5 lessons)
  - Sub-Unit 2: Partitive division (3 lessons)
  - Sub-Unit 3: Calculation for finding “times as much” (1 lesson, described below)

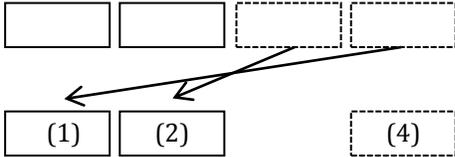
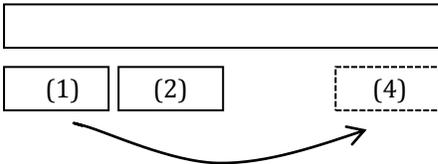
5. Instruction

(1) Goals of the Lesson:

- Students will understand that they use division to solve problem situations for finding how many times as much is the given quantity (quantity to be compared) as the base quantity.

(2) Flow of the Lesson:

Process	Activities and Students' Anticipated Responses	○ Instructional Points to Remember ★ Evaluation Points and Methods
Grasping	<p><b>1. Grasping the problem situation</b></p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>The length of a red tape is 36 cm. The length of a blue tape is 9 cm. How many times as long is the red tape as the blue tape?</p> </div> <p>T1: Write your solution methods and the reasons why the methods work clearly in your notebook, so your friends can understand your thinking.</p>	<p>○ Provide scissors, rulers, 36 cm strips of red tape, and 9 cm strips of blue tape (for students).</p> <p>○ Ask students to show their own solution methods using diagrams.</p>
Investigating and Confirming	<p><b>2. Solving the problem on their own</b></p> <p>&lt; Student Anticipated Solutions &gt; C1: (Repeated subtraction)</p>	<p>○ Ask students to manipulate the blue and red strips of tape on the board. Ask them to express how they manipulate the tape and make</p>

	 <p>Just as I show my thinking in the diagram, I tried to find out how many 9 cm strips of tape I can take from the longer (36 cm) tape. I took them one by one and lined them up next to the bottom 36 cm strip. After all the 9 cm strips of tapes are aligned to the bottom, I counted the number of strips of tape I moved. There are 4 strips of tapes so I think it is 4 times as much. The math sentences for this is: <math>36 - 9 - 9 - 9 - 9 = 0</math>. So it is 4 times as much.</p> <p>C2: (Repeated addition)</p>  <p>As you can see, I placed 9 cm tape one by one next to the long 36 cm tape. When you do that you place the 9 cm tape 4 times. So it is 4 times as much. The math sentence is: <math>9 + 9 + 9 + 9 = 36</math>. (*When a student says something like “I placed 9 cm tape...,” ask the student why s/he decided to place 9 cm strips of tape several times (to clarify the difference between C1’s method and C2’s method). Through this discussion, I want students to grasp the idea of measurement, such as “how many times a 9 cm tape can be fit into or taken away from the 36 cm tape.)</p> <p>C3: <math>9 \times \square = 36</math></p> <p>C4: <math>36 \div 9 = 4</math></p>	<p>connections among the manipulation process, their words and math sentence(s). By doing so, help students see and make the connection with the manipulation process of quotitive division that they learned previously.</p> <ul style="list-style-type: none"> <li>○ Go over each solution method with students though discussion and clarify the similarity and differences of the solutions.</li> <li>○ The order of the students’ presentation should be: Repeated subtraction method → repeated addition method → multiplication method → division method (with math sentence). When the division method is presented, ask the students if and why they can use division although the problem asks them to find out “how many times as much (as long).”</li> <li>○ Ask students to be sure they put headings in their notebook that indicate which solution method is their own and which solution methods are their friends’.</li> </ul> <p>★Are the students eager to solve the problem on their own?</p> <ul style="list-style-type: none"> <li>○ If there are students who used the division symbol (<math>\div</math>) to solve the problem, make sure the students know this problem situation is different from the division situations they studied previously. Press the students to think about how and why they can use division in this problem situation.</li> </ul>
<p>Presenting</p> <p>Summarizing</p>	<p><b>3. Presenting and Summarizing</b></p> <p>C5: I tried to find out how many 9 cm strips of tape I can take from the 36 cm tape. I took the 9 cm strips of tape one-by-one and aligned them to the bottom 36 cm strip. After all the 9 cm strips are moved to the bottom, I counted</p>	<p>★Do the students understand that division is used when problem situations ask how many times as much a given quantity is as a base quantity?</p>

	<p>the number of tapes. There are 4 strips of tape, so I think it is 4 times as much. (Same as anticipated response C1 above)</p> <p>T2: What do you think?</p> <p>C6: I did this the same way.</p> <p>T3: Do you have something to add to C5's explanation?</p> <p>C7: I don't have anything to add to C5, but I did it a similar way.</p> <p>T4: Please explain your way.</p> <p>C8: As you can see, I placed 9 cm strips of tape one-by-one next to the 36 cm long tape. When you do that you can place the 9 cm tape 4 times. So it is 4 times as long. (Same as the C2 anticipated response above)</p> <p>T5: I see, do you have anything you want to add or do you have a a similar way?</p> <p>C9: I used multiplication.</p> <p>C10: The diagram that C2 used shows addition of 4 tapes that are 9 cm. So, just like we studied before, the math sentence is <math>9 \times [4] = 36</math>.</p> <p>C11: C1's math sentence could be multiplication, because there are 4 tapes of 9cm ... but it is shown as subtraction.</p> <p>T6: Do you have something to add to that?</p> <p>T7: It looks as if each one of the methods includes the math sentence <math>9 \times [4] = 36</math> and the manipulation process of division that we learned previously. So we have found that in the case of problem situations for finding "times as much" using calculation, we can use division also.</p> <p>This is the end of the lesson, please write your reflection in your notebooks.</p>	<ul style="list-style-type: none"> <li>○ If students are not actively responding after <i>hatsumon</i> question T5, ask "Can you write math sentences for methods C1 and C2 using a math sentence structure we learned before today's lesson?" Refer students to the solution methods on the board. If the <i>hatsumon</i> helps bring out the multiplication sentence, <math>9 \times [4] = 36</math>, or the division sentence, <math>36 \div 9 = 4</math>, ask students to think about why they can use the division sentence in this situation. After the discussion, help students to understand the relationship between the division sentence and multiplication sentence.</li> <li>○ When students respond similarly to the response of C9, be sure to ask the students the reason why they are using the idea of multiplication, which is related to what they learned previously,. If the reasons are something related to the manipulation process for quotitive division, help students understand that division can be used. Although the problem situation is different from those learned previously, it is similar in its process of manipulation and diagramming used in quotitive division.</li> </ul>
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